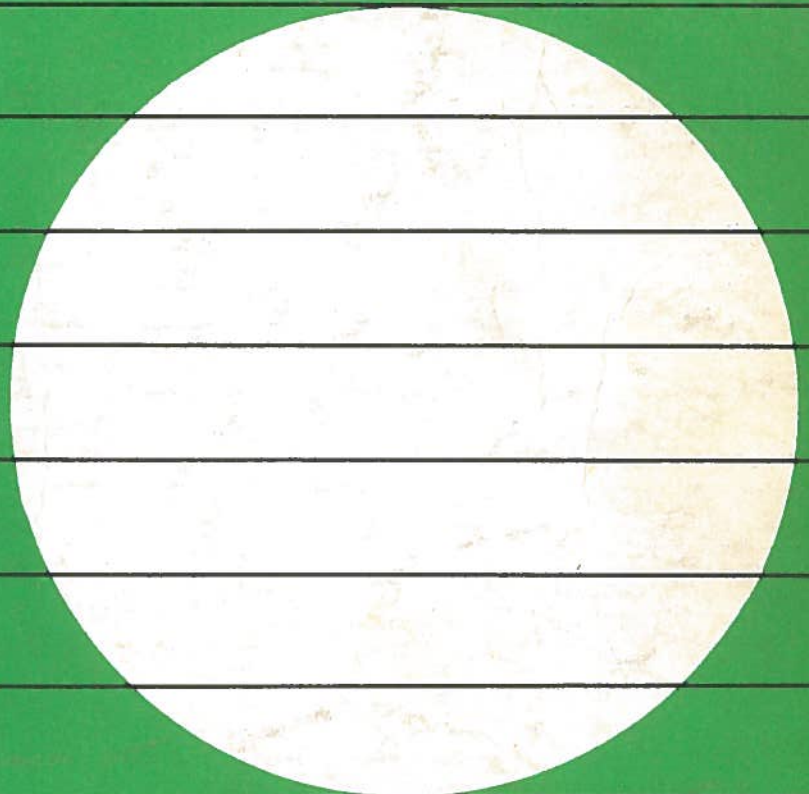


PETRICEVIC  
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# REPORT ON THE 1970 WORLD CENSUS OF AGRICULTURE



FAO Statistics Series

No. 10

REPORT ON THE 1970 WORLD CENSUS OF AGRICULTURE



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 1977

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FOREWORD

The 1970 World Census of Agriculture was the third decennial census of agriculture promoted by FAO. The numerical results of this Census, made available to FAO generally through national census publications in diverse forms and in many different languages, are processed in a comparable form and published in a series of issues of the Census Bulletin already distributed to Member Governments. The present publication deals with the concepts, definitions and methodology of census taking as applied by countries participating in the 1970 World Census of Agriculture. The information presented is drawn from the available national census reports, documents of various FAO meetings and sessions, and from the FAO experts who were actually involved in the planning and implementation of the census of agriculture taken around 1970 in the developing countries. While every effort was made to pool together all possible sources of information, it is by no means claimed to be exhaustive. Most of the census reports available from the countries were lacking in adequate information on the planning and methodological procedures. On a number of items the information presented in some of the national reports was too scanty for a comparative analysis to be included in the present volume. Naturally these limitations reflect correspondingly on the contents of this publication.

This report on the 1970 World Census of Agriculture is being presented as supplementary material to the Programme for the 1980 World Census of Agriculture in the hope that the experiences documented therein will provide useful guidelines to countries in planning and implementing their national census of agriculture. The last four Chapters dealing with methodological problems and the six Annexes illustrating specific country experiences on methodological problems, have been particularly designed with this end in view. The material contained therein should also prove useful for the training of national personnel who will be engaged in the conduct of the 1980 World Census of Agriculture.

R.D. Narain  
Director  
Statistics Division





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## CHAPTER I

### HISTORICAL EVOLUTION OF THE PROGRAMME FOR THE WORLD CENSUS OF AGRICULTURE

Since the first World Census of Agriculture was conceived more than 40 years ago by the International Institute of Agriculture (IIA) in Rome, the World Census of Agriculture has become an established international activity. The first World Census of Agriculture was carried out in 1930 under the auspices of the IIA and 63 countries and territories participated in it. More details about this census can be found in the report "The First World Agricultural Census (1930) - A Methodological Study of the Questions Contained in the Forms adopted for the Purposes of the Census in the Various Countries", IIA, Rome, 1937. The Programme for the 1930 World Census of Agriculture (1930 Programme) consisted of a list of items that were considered important for inclusion in a census of agriculture. The list was given the name of "Standard Form". This list was established after a review was made of agriculture in most parts of the world thus giving it an international significance. There was no consideration of regionalization of the Programme in the sense of a separate list of items that would meet the needs of the various regions of the world. The countries had to omit such crops and livestock which were not produced in the country. Countries were, however, advised that they could include other crops and subjects not mentioned in the Standard Form and further, they could amplify the questions so as to obtain any additional data they may desire to collect. All countries were urged to include in their census all the proposed questions in the Standard Form. The 1930 Programme basically neglected the methodological problems. It put the emphasis on "what" and restricted the discussion on "how".

It was the intention of the IIA that the 1930 World Census of Agriculture should be the first of a series of World Censuses of Agriculture to be undertaken every ten years. Thus, the IIA began in earnest the preparations for the 1940 World Census of Agriculture after the completion of the 1930 World Census of Agriculture. Various amendments were suggested to the Standard Form on the basis of the experience of the first World Census of Agriculture. After discussions in various expert committees and taking into consideration the recommendations made by various governments, a booklet "Programme of the World Agricultural Census of 1940" was finally issued in May 1938. The term "Standard Form" was still used for the schedule included in the 1940 Programme to indicate the type of schedule to be used for the census. However, instead of separate supplementary questions, the Standard Form was divided into three parts, namely: Part I contained essential questions to be asked from all holders; Part II contained questions on livestock production; and Part III contained questions considered optional. Also, many concepts were more clearly defined than in the previous census. The IIA also started providing each interested country with all the documents prepared for the census of agriculture from other countries as soon as they were available. The IIA also sent special questionnaires to all countries to obtain census results. The Second World War, however, upset the 1940 Programme which remained incomplete.

In 1945 the Food and Agricultural Organization of the United Nations (FAO) took over the activities of the IIA and started preparing for the Programme of the 1950 World Census of Agriculture. Although the framework of the 1950 Programme followed directly from the work done before, it introduced some new ideas. The most important among these was probably the emphasis on methodological questions. The introductory text of the 1950 Programme pointed out the difficulties that may be encountered in the collection of data and recommended a careful choice of approaches that were likely to fit the local circumstances. Although the 1950 Programme could not go into a systematic study of possible approaches, yet by pointing out the essential role of methodology, it has paved the way for many subsequent developments. Another important new element in the 1950 Programme was the establishment of both a short list of Census items (Programme A) and an expanded list (Programme B). Programme A gave the essential information on agriculture

to be provided to FAO by all countries. Programme B was a broader list of items worth considering in a census wherever difficulties of collecting data were not too great. The existence of two lists was probably based on the awareness of difficulties on data collection. This was the time when many new countries emerged on the international scene and most of them had no established statistical offices, no experience on data collection or resources needed for a large scale operation such as the census of agriculture. It was, therefore, necessary to think of a reduced effort to bring the idea of the census nearer to the group of developing countries. Other important changes were the inclusion of new items and/or emphasis on previous items. The Programme for the 1950 World Census of Agriculture was issued in December 1948. There were 78 countries and territories that participated in the 1950 Programme.

Although the Programme for the 1960 World Census of Agriculture did not introduce substantial changes in the list of items to be collected or their definitions it had considerably altered the presentation of the previous Programmes. All the proposed census items were arranged into ten sections according to the subject matter and each section consisted of an introduction, proposed items in the expanded list (short list printed in bold type), definition and explanatory notes, and the tabulation plans. The 1960 Programme, however, had made great developments in census methodology by introducing the use of sampling methods in census taking including post-enumeration sample surveys. The orientation towards sampling was followed by a broad programme to promote the use of sampling methods. This promotional programme had a considerable impact on subsequent developments and contributed greatly to the improvement of the knowledge of modern census technology. The other important development in the 1960 Programme was the idea of the Regional Programme in addition to the basic World Programme. Earlier experience indicated that national censuses deviated from the list of items proposed. In this situation it was thought advisable to examine the specific problems of each major region in the world from the point of view of both the methodology and the items to be included in the census questionnaire. The Regional Programme would consider all the specific problems of the various areas of the region and would thus be nearer to the real needs of the countries in the region. A detailed account of the changes in the 1960 Programme from the 1950 Programme is given in the Report of the 1960 World Census of Agriculture, Volume II.<sup>1/</sup>

The 1970 Programme, while retaining the structure of its predecessor, introduced some additional features. Among the major additions was an entirely new section dealing with association of agricultural holdings with other industries. In the section on holdings a new topic "type of holding" was introduced. In the section on employment in agriculture some new items were introduced to give a better picture of the input of labour by the holder's household and by hired workers. The introductory text continued the earlier interest in methodological problems. It elaborated on the use of sampling methods as a contribution to the development of flexible census methodology including their use in pretesting surveys, pilot censuses and surveys for checking the quality of data. For the first time, the 1970 Programme explicitly defined the place of the census of agriculture in the overall system of agricultural statistics. It indicated that "Agricultural censuses offer an excellent base and framework for planning surveys to secure agricultural statistics; their data can also be used as a bench-mark and as supplementary information for improving the provision of current agricultural statistics. Technical and organizational training of the personnel required for carrying out the agricultural census can be exploited for the purpose of organizing other agricultural statistics. In countries where no statistical organization exists to collect agricultural statistics the trained census personnel may form a nucleus for gradually developing a permanent statistical system. In other words, the 1970 Programme has clarified that a census of agriculture can be utilized more broadly for the establishment and/or the improvement of various surveys in the national system of agricultural statistics.

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<sup>1/</sup> Report of the 1960 World Census of Agriculture, Vol. II, FAO, Rome, 1969.



## CHAPTER II

### PARTICIPATION OF COUNTRIES IN THE DECENNIAL WORLD CENSUS OF AGRICULTURE

The world agricultural census implies that an agricultural census is to be carried out throughout the world at the same census period or time reference following the framework of the FAO Programme. For the First World Census of Agriculture in 1930 the census period was specified and thus all the countries had to carry out their censuses within this time period. For the 1950 World Census of Agriculture, the period extended from 1948 through 1955 and for the 1960 World Census of Agriculture from 1958 through 1964. The 1970 World Census of Agriculture covered the period from 1966 to the end of 1974.

The criteria used in deciding whether a country or territory has participated in the 1930 and 1950 Censuses were quite flexible. In these two censuses, the countries and territories that could not take a proper census but just had made efforts to obtain the required minimum data by estimation were considered as participants. In most cases they were colonial territories where an actual census could not be taken because of the local conditions. The criteria of participation for the 1960 and 1970 World Censuses of Agriculture were applied, rather strictly, in the sense that the census was to have been taken within the framework of the FAO world or regional programme. Although the unit of enumeration was supposed to be an agricultural holding, all the world agricultural censuses included also those countries in which the basic unit of enumeration was other than an agricultural holding, such as for example a farm household.

Table 2.1 gives the names of the countries participating in the World Census of Agriculture and the year during which the census was taken. This table includes independent countries as well as territories and political possessions. The nomenclature of a country used in this table as well as throughout this volume is the same as that at the time of participating in the latest World Census of Agriculture. Variations in nomenclature from one decennial census to another as well as the changes in name of the country after the participation in the latest World Census of Agriculture have also been indicated by footnotes. Figure 2.1 is a World Census of Agriculture map showing the countries and territories that participated in the 1930, 1950, 1960 and 1970 World Censuses of Agriculture sponsored by FAO.

Table 2.1 - Countries participating, with year of participation, in the World Censuses of Agriculture : 1970, 1960, 1950 and 1930

Region and country	Year of participation in the world censuses of :			
	1970	1960	1950	1930
Total participants in the world	102	94 (97)	78 (106)	52 (67)
<u>EUROPE</u>	24	17	20	23
Albania	-	-	-	1929
Austria	1970	1960	1951	1930
Belgium	1970	1959/60	1950	1929/30
Bulgaria	1970	-	-	-
Czechoslovakia	1971	-	1950	1930
Denmark	1970	1959	1949	1929
Estonia	-	-	-	1929 <sup>1/</sup>
Finland	1969	1959	1950	1929/30
France	1971	-	-	1929/30
Germany, Fed. Rep. of	1971	1960	1949 <sup>2/</sup>	1933 <sup>2/</sup>
Saar	-	-	1948 <sup>3/</sup>	-
Greece	1971	1961	1950	1929/30
Hungary	1972	-	1948	-
Iceland	-	-	-	1930
Ireland	1970	1960	1949	1929 <sup>4/</sup>
Italy	1970	1961	-	1930
Latvia	-	-	-	1929 <sup>1/</sup>
Lithuania	-	-	-	1930 <sup>1/</sup>
Luxembourg	1970	1960	1950	-
Malta	1969	1960 <sup>3/</sup>	1950 <sup>3/</sup>	-
Netherlands	1970	1960	1950	1930
Norway	1969	1959	1949	1929
Poland	1970	1960	-	-
Portugal	1968	-	1952/54	-
Romania	1970	-	1948	1930
				.../...

Table 2.1 - Cont.

Region and country	Year of participation in the world censuses of:			
	1 9 7 0	1 9 6 0	1 9 5 0	1 9 3 0
Spain	1972	1962	-	1929
Sweden	1971	1961	1951	1932
Switzerland	1969	-	1950	1929
United Kingdom	1970	1960/61	1950	1931
Yugoslavia	1969	1960	1951	1931
<u>NORTH AMERICA</u>	2	4	4	4
Alaska	-	1960 <sup>6/</sup>	1950	1929
Canada	1971	1961	1951	1931
Hawai	-	1959 <sup>6/</sup>	1950	1930
United States of America	1969 <sup>7/</sup>	1959	1950	1930
<u>LATIN AMERICA</u>	28	22 (24)	20 (29)	10 (14)
Antigua	1973/74	-	<u>8/9/</u>	<u>8/9/</u>
Argentina	1969	1960	1952	1930
Bahamas	-	-	1950	1929/30 <sup>8/</sup>
Barbados	1971	1961	1950	1929/30
Belize	1973/74	-	1950 <sup>8/ 10/</sup>	-
Bermuda	-	-	1950 <sup>8/</sup>	-
Bolivia	-	1964	1950	-
Brazil	1970	1960	1950	-
Chile	-	-	1955	1930
Colombia	1970/71	1960	1951	-
Costa Rica	1973	1963	1950	-
Cuba	-	-	1952	-
Dominica	1974	-	<u>8/11/</u>	<u>8/11/</u>
Dominican Republic	1971	1960	1950	-
Ecuador	1974	1962	1954	-
El Salvador	1971	1961	1950	1929
Falkland Islands	-	-	1950 <sup>8/</sup>	1929/30 <sup>8/</sup>
French Antilles	1972	-	-	-

.../...

Table 2.1 - Cont.

Region and country	Year of participation in the world censuses of:			
	1 9 7 0	1 9 6 0	1 9 5 0	1 9 3 0
Grenada	-	-	<u>8/10/</u>	<u>8/10/</u>
Guatemala	-	1964	1950	1930
Guyana	1968/69	-	1950 <u>8/12/</u>	-
Haiti	1971	-	1950	-
Honduras	1974	-	1952	-
Jamaica	1968/69	1961	1950	-
Leeward Islands	-	1960 <u>8/</u>	1950 <u>8/13/</u>	1929/30 <u>8/13/</u>
Mexico	1970	1960	1950	1930
Montserrat	1972	-	<u>8/9/</u>	<u>8/9/</u>
Nicaragua	1971	1963	-	-
Panama	1971	1961	1950	-
Paraguay	-	1961	-	-
Peru	1972	1961	-	1929
Puerto Rico	1970	1959	1950	1930
St. Lucia	1973/74	-	<u>8/ 11/</u>	<u>8/ 11/</u>
St. Vincent	1972/73	-	<u>3/ 11/</u>	<u>8/ 11/</u>
Surinam	1969	1959	-	-
Trinidad and Tobago	-	1964	1951 <u>8/</u>	-
Uruguay	1970	1961	1951	1930
Venezuela	1971	1961	1950	-
Virgin Islands (U.S.)	1970	1960	1950	1930
Windward Islands	-	1960 <u>8/</u>	1950 <u>8/14/</u>	1929/30 <u>8/14/</u>
<u>NEAR EAST</u>	10	7	5 (7)	1 (2)
Bahrain	1973/74	-	-	-
Cyprus	-	-	1950 <u>8/</u>	-
Egypt	-	1960/61 <u>15/</u>	1950	1929
Iran	1974	1960	-	-
Iraq	1971	1958	1952	-
Israel	1971	-	1950/51	-
				.../...

Table 2.1 - Cont.

Region and country	Year of participation in the world censuses of:			
	1 9 7 0	1 9 6 0	1 9 5 0	1 9 3 0
Jordan	-	-	1953	-
Kuwait	1970	-	-	-
Lebanon	1970	1960/61/62	-	1929/30 <sup>8/16/</sup>
Libyan Arab Republic	1974	1960	-	-
Saudi Arabia	1972	-	-	-
Sudan	-	1963	-	-
Syrian Arab Republic	1970/71	-	-	-
Turkey	1970	1963/64	1950	-
Yemen, Democratic	-	-	<sup>8/17/</sup>	-
<u>FAR EAST</u>	10	15	7 (12)	3 (5)
Brunei	-	1964	1950 <sup>8/</sup>	-
Burma	-	-	1953/54	-
China	-	1961 <sup>13/</sup>	-	-
India	1971	1960/61	1954	1929/30 <sup>19/</sup>
Indonesia	1973	1963	-	-
Japan	1970	1960	1950	1929
Korea, Rep. of	1970	1961	-	-
Laos	1973	-	-	-
Malaysia	-	1960 <sup>20/</sup>	1950 <sup>8/20/</sup>	1929/30 <sup>8/21/</sup>
Nepal	1972	1962	-	-
North Borneo <sup>22/</sup>	-	1961	1950 <sup>8/</sup>	-
Pakistan	1972/73	1960 <sup>23/</sup>	-	-
Philippines	1971	1960	1948	-
Ryukyu Islands <sup>24/</sup>	-	-	1951	-
Sarawak <sup>22/</sup>	-	1961	1950 <sup>8/</sup>	1929/30 <sup>8/</sup>
Singapore	1973	-	1950 <sup>8/</sup>	-
Sri Lanka	1973	1962 <sup>25/</sup>	1952 <sup>25/</sup>	1929 <sup>25/</sup>
Thailand	-	1963	1951	-
Viet-Nam, Rep. of	-	1960/61	-	-
				.../...



Table 2.1 - Cont.

Region and country	Year or participation in the world censuses of:			
	1 9 7 0	1 9 6 0	1 9 5 0	1 9 3 0
	22	24	16 (22)	7 (10)
Algeria	1973	-	1950/51	1930
Angola	-	1961	-	-
Botswana	1969	1962 <u>26/</u>	1950 <u>26/</u>	-
Cameroon	1972	-	-	-
Central African Republic	1973	1960	-	-
Chad	1972	-	-	-
Congo	1972	1960 <u>27/</u>	-	-
Dahomey	-	-	-	<u>28/ 8/</u>
Gabon	1973/74	1960	-	-
Gambia	-	-	1950 <u>8/</u>	-
Ghana	1970	1964	1950 <u>8/ 29/</u>	-
Guinea	1974/75	1964	-	1929/30 <u>8/ 28/</u>
Ivory Coast	1973/74	-	-	<u>8/ 28/</u>
Kenya	1969/70	1961	1954	1930
Lesotho	1970	1960 <u>30/</u>	-	-
Liberia	1971	-	-	-
Madagascar	-	1961/62	-	-
Malawi	1969	-	-	-
Mali	-	1961	-	<u>8/ 28/</u>
Mauritania	-	-	-	<u>8/ 28/</u>
Mauritius	-	-	1950	1929/30
Morocco	-	1962	-	-
Mozambique	-	-	1951	1930
Niger	-	1960	-	<u>8/ 28/</u>
Nigeria	1974/75	-	1950 <u>31/</u>	1929/30 <u>8/</u>
Portuguese Guinea <u>32/</u>	-	1960/61	-	-
Rhodesia and Nyasaland, Fed. of <u>33/</u>	-	1960/61	1950 <u>34/</u>	1929/30 <u>8/ 35/</u>
St. Helena	-	-	1950 <u>8/</u>	-
Senegal	-	1960	-	<u>8/ 28/</u>
Seychelles	-	1960	1950	1929/30

.../...

Table 2.1 - Cont.

Region and country	Year of participation in the world censuses of:			
	1 9 7 0	1 9 6 0	1 9 5 0	1 9 3 0
<u>AFRICA</u> (Cont.)				
Sierra Leone	1971	-	1950 <sup>8/</sup>	-
Somaliland (British) <sup>36/</sup>	-	-	1950 <sup>8/</sup>	-
South Africa	1970/71	1960	1950	1930
South West Africa <sup>37/</sup>	-	1959/60	-	-
Swaziland	1972	-	1950	1930
Tanzania	1972	1960 <sup>38/</sup>	1950 <sup>38/</sup>	-
Togo	1970	1961	-	-
Tunisia	-	1961/62	1949/50	-
Uganda	-	1963/64	1950	-
Upper Volta	-	1961	-	<sup>8/</sup> <sup>28/</sup>
Zaire	1971	-	1950 <sup>39/</sup>	-
Zambia	1971	-	-	-
Zanzibar and Pemba <sup>40/</sup>	-	-	1950 <sup>8/</sup>	-
<u>OCEANIA</u>	6	5 (6)	6 (12)	4 (9)
American Samoa	1970	1960	1950	1930
Australia	1971	1960	1950	1929/30
British Solomon Islands	-	-	1950 <sup>8/</sup>	1929/30 <sup>8/</sup>
Cook Islands	-	-	1950 <sup>8/</sup>	-
Fiji	1968	1960 <sup>8/</sup>	1950 <sup>8/</sup>	1929/30 <sup>8/</sup>
Gilbert and Ellice Islands	-	-	1950 <sup>8/</sup>	1929/30 <sup>8/</sup>
Guam	1970	1960	1950	1930
New Hebrides	-	-	1950 <sup>8/</sup>	1929/30 <sup>8/</sup>
New Zealand	1972	1960	1950	1930
Pacific Islands (Trust Territory)	1970	-	-	-
Papua and New Guinea	-	1961/62	1951	-
Tonga	-	-	1950 <sup>8/</sup>	1929/30 <sup>8/</sup>
Western Samoa	-	-	1950	-

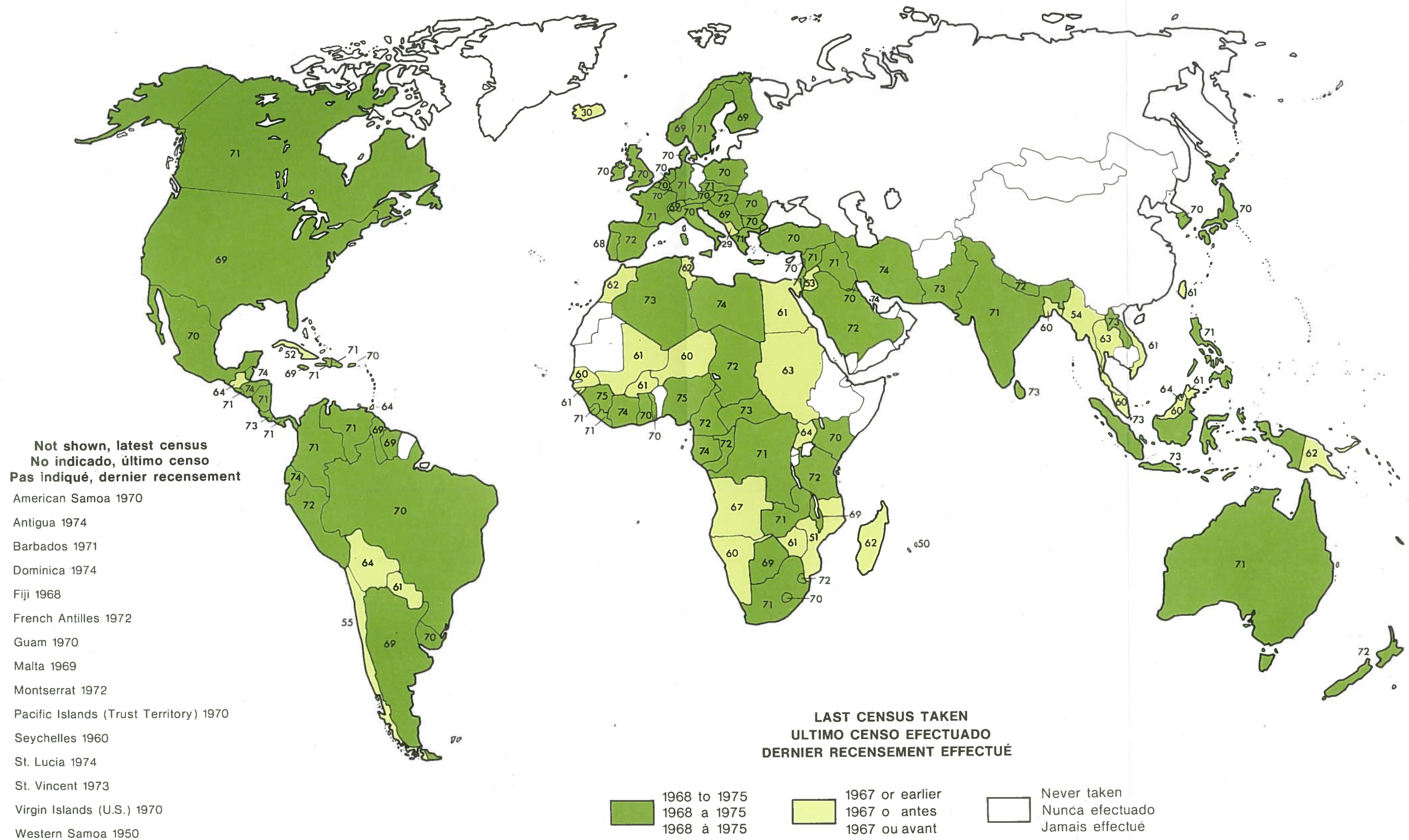
Note: Number in brackets includes countries for which data were obtained through special estimates.

FOOTNOTES

- 1/ Later became part of the USSR.
- 3/ Later became part of Germany, Fed. Rep.
- 5/ Then called Malta and Gozo.
- 7/ Including Alaska and Hawaii.
- 9/ Then part of Windward Islands.
- 11/ Then part of Leeward Islands.
- 13/ Then consisted of the now separate territories of Dominica, Grenada, St. Lucia and St. Vincent and was counted as one country.
- 15/ Then called United Arab Republic.
- 17/ Then called Aden Protectorate.
- 19/ Including areas which later formed Pakistan.
- 21/ Then called Malaya which now forms part of Malaysia.
- 23/ Then including East Pakistan which is now Bangladesh.
- 25/ Then called Ceylon.
- 27/ Then called Congo (Brazzaville).
- 29/ Then consisted of Gold Coast and British Togoland, counted as one country.
- 30/ Then called Basutoland.
- 32/ Now called Guinea-Bissau.
- 34/ Then counted as three separate countries called Northern Rhodesia, Southern Rhodesia and Nyasaland.
- 35/ Relates to Nyasaland only.
- 37/ Now called Namibia.
- 39/ Then called Belgian Congo.
- 2/ Then boundaries were different.
- 4/ Then called Irish Free State.
- 6/ Later became part of United States of America
- 8/ Special estimates.
- 10/ Then called British Honduras.
- 12/ Then called British Guinea.
- 14/ Then consisted of the now separate territories of Antigua, Montserrat, St. Kitts-Nevis and Virgin Islands (United Kingdom), and was counted as one country.
- 16/ Then called Lebanese Republic.
- 18/ Census year refers to Taiwan only.
- 20/ Then called Federation of Malaya which now forms part of Malaysia.
- 22/ Now forms part of Malaysia.
- 24/ Now forms part of Japan.
- 26/ Then called Bechuanaland.
- 28/ Then formed part of French West Africa (counted as one country), and consisted of Dahomey, Guinea, Ivory Coast, Mali, Mauritania, Niger, Senegal and Upper Volta.
- 31/ Then included British Cameroon which is now a part of Cameroon.
- 33/ Now three separate countries: (a) Malawi (former Nyasaland); (b) Zambia (former Northern Rhodesia); and (c) Rhodesia (former Southern Rhodesia).
- 36/ Now forms part of Somalia which includes former Italian Somaliland also.
- 38/ Relates to what was then called Tanganyika and which now forms part of Tanzania.
- 40/ Now forms part of Tanzania.
-

Figure 2.1

WORLD CENSUS OF AGRICULTURE – YEAR OF LATEST AGRICULTURAL CENSUS  
 CENSO AGROPECUARIO MUNDIAL – AÑO DEL ÚLTIMO CENSO AGROPECUARIO  
 RECENSEMENT MONDIAL DE L'AGRICULTURE – ANNÉE DU DERNIER RECENSEMENT DE L'AGRICULTURE



CHAPTER III

PREPARATION AND PROMOTION OF THE 1970 PROGRAMME

Consultation at meetings of experts, etc. on the preparation of the 1970 World and Regional Programme

A "Draft Programme for the 1970 World Census of Agriculture" was prepared with the help of a consultant which took into consideration the importance of continuity and comparability with the 1960 and 1950 programmes as well as took into account the new developments in agriculture and in statistical methodology. Various consultations took place to consider the Draft Programme, one set of discussions dealt with changes that could be introduced in the World Programme for a better adaptation to the regional and country conditions, and the other set of consultations dealt with the preparation of the Regional Programmes within the framework of the World Programme. The first set of discussions took place at the following meetings:

1. Seminar on Agricultural Statistics, Addis Ababa, Ethiopia, 17 - 21 August 1964.
2. Second Session of the African Commission on Agricultural Statistics, Addis Ababa, Ethiopia, 24 August - 1 September 1964.
3. Second Session of the Near East Commission on Agricultural Statistics, Baghdad, Iraq, 2 - 7 November 1964.
4. Joint FAO/ECAFE Seminar on the 1970 World Census of Agriculture, Bangkok, Thailand, 9 - 15 December 1964.
5. Sixth Session of the Conference of Asian Statisticians, Bangkok, Thailand, 9 - 22 December 1964.
6. Fourth Session of the Study Group on Food and Agricultural Statistics in Europe, Geneva, 11 - 15 January 1965.

In addition and in order that the technical consideration of the Draft Programme could be completed with the benefit of Latin American experience, the members of the FAO/Inter-American Statistical Institute Sub-Committee on Agricultural Statistics were also consulted. It was estimated that more than 150 census experts from all over the world contributed, at various stages, to the completion of the Programme.

The second set of consultations was for the specific purpose of discussing and finalizing the regional programmes within the framework of the World Programme. The following regional meetings were organized:

1. Near East : Seminar on the 1970 World Census of Agriculture for countries of the Near East Region, Amman (Jordan), 11 - 18 December 1965;
2. Europe : Sixth Session of the FAO/ECE Study Group on Food and Agricultural Statistics in Europe, Geneva (Switzerland), 15 - 19 August 1966;
3. Asia and the Far East : First Session of the Asia and Far East Commission on Agricultural Statistics, Tokyo (Japan), 26 September - 3 October 1966;
4. Africa : Third Session of the African Commission on Agricultural Statistics, Kampala (Uganda), 7 - 23 December 1966;



5. Latin America : Commission on Improvement of National Statistics (COINS) at the Ninth Session of the Inter-American Statistical Institute (IASI), Caracas (Venezuela), 17 - 20 October 1967.

The Voluntary Agricultural Census Fund was established in 1966 with the following aims:

- (a) that developing countries would accumulate over a period of years the financial resources required for a census in order to meet their costs during the census year. The Fund would be intended, first of all, for assisting such countries (called "saving countries") in setting aside resources for their next agricultural census;
- (b) an appeal would be made to developed countries and non-governmental organizations to make voluntary contributions to the Fund so as to reduce the census costs for the saving countries.

The pledges for cash contributions to the Fund were too small to permit their collection and to render financial assistance to the developing countries. The pledged contributions in kind included offers from a few countries of services of experts, training facilities, small equipment and data processing services on electronic computers. Some countries contributed to the Fund by making facilities available for training, holding training centres, providing fellowships, etc. Offers from a few countries could not be effectively utilized due to various limitations. As a result the Census Fund did not achieve its aims.

#### Training Centres, Seminars, Fellowships, etc.

The training programme for the 1970 World Census of Agriculture was the most comprehensive and far reaching of all the censuses conducted so far. The programme was carried out at three different levels. They were:

1. High level training for the main census technicians. At this level it was necessary to enter into the theory behind various census procedures, provide a thorough explanation of all the characteristics of various techniques, point out the conditions under which these techniques are applicable, study the main experiences obtained in the application of these techniques in the past, review the lessons learned, etc.
2. Medium level training. This was conceived for assistants to the main census technicians or for the chiefs of the various basic census operations. The main emphasis at this level was to be put on those aspects of census techniques which were likely to be applicable in a given area so that the participants could get useful suggestions for solving their respective problems. Its duration was fixed at approximately three months and had to be provided on a regional basis.
3. National demonstration centres. These were primarily for the local census personnel in order to give them a chance to observe a demonstration of how to carry out some of the more important activities, such as mapping, listing of holdings, interviewing, measuring, etc. This training was oriented towards the accepted techniques of work in various countries and was therefore restricted to the local personnel who had to carry out these techniques. The duration of the training was fixed at approximately one month.

This training programme was financed through different sources such as the FAO Regular Programme, UNDP, bilateral programmes and Governments which agreed to host the training centres. In addition, the statistical experts of FAO/UNDP to the various countries also carried out training programmes in their respective countries of assignment. Thus they substantially contributed to increasing the number of trained personnel for the census work.

The international training centres were held in Washington and Paris. The one in Washington was conducted under the Joint FAO/US Training Programme and a total of 171 participants was trained and the one in Paris trained 23 participants. Five Regional Training Centres (RTCs) were held and the number of participants trained at these RTCs was 157.

The National Demonstration Centres (NDCs) were first organized in Africa. The experience of these NDCs was so successful that it was extended to other regions as well. In all, 15 NDCs were held in various countries of the world and a total of 559 participants, including a few from the neighbouring countries, received training at these centres.

Fuller details about the training programme can be seen in the Information Bulletin on Training issued by FAO in September 1971.<sup>1/</sup>

The services of approximately 60 agricultural census experts were made available to the countries. They helped the countries to prepare and execute the census. In a few cases census plans were made but could not be executed due to financial and other constraints such as political and natural catastrophes. Besides assisting the countries in planning and taking the census of agriculture, these experts were required to advise countries on the development of current agricultural statistics. They also performed other related duties such as training the nationals in the census and survey techniques. The services of experts provided specifically for other purposes than for census, as far as could be determined, are not included in the estimated number of experts for the census. The regional distribution of census experts and approximate man/months are given below:

Table 3.1 - Estimated number of census experts and man/months by region (1967-1974)

Region	Census Experts	
	Number	Man/months
Latin America	17	465
Near East	6	275
Asia and Far East	5	205
Africa	32	855
Total	60	1 800

Besides the census experts for individual countries under their technical assistance programme, there were regional census advisers who could pay short term visits to various countries of the region, especially those in which there was no census expert. There were one regional adviser for Asia and the Far East region, one for the Latin American region and two for the African region, one for English-speaking and the other for French-speaking countries funded under UNDP/TA. These regional advisers, along with the regional adviser for training in the Near East Region, also funded under UNDP/TA, performed a most valuable function by advising countries on the preparation and planning of agricultural censuses and in organizing a large number of the national demonstration centres.

<sup>1/</sup> FAO Training Programmes for the 1970 World Census of Agriculture, Information Bulletin No. 3, ESS:Misc./71/9, FAO, September 1971.

Publications

The results of the 1960 World Census of Agriculture were published under the title "Report on the 1960 World Census of Agriculture", and made available to the governments. The Report on the 1960 World Census of Agriculture consisted of the following topics: Census results by countries; programme, concepts and scope; methodology; processing and tabulation, and analysis and international comparison of census results.

## CHAPTER IV

### REGIONAL PROGRAMMES FOR THE 1970 WORLD CENSUS OF AGRICULTURE AND COMPARISON OF THE 1970 PROGRAMME WITH THE 1960 PROGRAMME

#### Regional adaptations of the World Programme

Although initially the aim of the world agricultural census was to provide internationally comparable agricultural data, successive censuses tended to be geared more and more closely to meet the national requirements of the data for agricultural development planning. This created a good deal of divergence in the country national programmes and in order to meet the requirements of both the national and international needs, regional programmes were prepared, within the framework of the world programme, for the five regions in which the world is divided for the FAO publication purposes, viz: (i) Africa, (ii) America, (iii) Asia and the Far East, (iv) Europe, and (v) Near East. Essentially the regional programme for any region consisted of two parts:

- I. World Programme
- II. Regional Supplements to the World Programme

The aim of the Supplement was to indicate modifications in the World Programme to adapt it to the conditions and needs prevailing in the particular Region. The Supplements were prepared on the basis of recommendations by various regional meetings such as seminars, study groups, agricultural commissions, etc. These meetings recommended various additions and modifications with a view to obtaining within regions comparability of items where it would not be possible to achieve worldwide comparability. This necessitated the corresponding modifications of the tables recommended on the world programme. A description of such modification for major categories in different regions is given below.

#### Regional Programme for Africa

Attention of the countries in the region was drawn to the need to avoid the practice of spreading the census enumeration over a number of years since it would make it impossible to obtain national estimates for various items.

In the world programme the major item "tenure" in Section 0 was divided into five parts. The first part was the area of the holding which is owned by the holder or is held in ownerlike possession. The regional programme recommended the subdivision of this item into (i) area of the holding owned by the holder and (ii) area of the holding which is owned in ownerlike possession, further subdividing the latter into (a) area of tribal land operated individually by the members of the tribe and (b) area operated under other forms of ownerlike possession.

In Section 2 on crops in the Regional Programme, it was recommended that the total area under a crop should be reported in three columns: (i) crop grown in pure stand, (ii) crops grown mixed or associated, and (iii) single crop equivalent area - thus obtaining "total" area of the crop as equal to the sum of items (i) and (iii). The same was to be done for "Area in compact plantations".

In Section 3 on livestock and poultry, the item 31.4, camels (all ages), was made a short list item. There were no more modifications in the major category items.

#### Regional Programme for America

Here again in Section 0, the group 03.1 "Area of the holding which is owned by the holder or is held in ownerlike possession" was subdivided as in the case of the African Region.

In Section 3 on livestock and poultry, new items covering various animal products were included in the Regional Programme: Quantity of milk was added as new Group 32.3 and was made a short list item; quantities of butter, cheese and other animal products were added on items 32.4, 32.5 and 32.9 respectively. In Section 4 on employment in agriculture there was a transfer of Group 42.1 giving "the number of persons employed in agricultural work on the holding during the census week" from the optional to the short list items, and the categories (b) and (c), for temporary occasional workers respectively, were merged into a single category called non-permanent workers.

In Section 8 on fertilizers and soil dressings, the Major Group 81 was modified and the Group 81.1 subdivided into Groups 81.1 (a) which corresponded to 81.1 of the World Programme, namely "Have any inorganic fertilizers been applied in the holding during the year?" Group 81.1(b) asked the same questions with respect to the organic fertilizers.

#### Regional Programme for Asia and the Far East

Since this Region included a number of countries still not using the metric system, for the countries which measured the area in acres, different size groups for the classification of holdings by size were recommended and the countries were urged to arrange their classification of holdings under those size groups.

In Section 3 on livestock and poultry, it was proposed that data on horses, mules and asses (Major Group 31) be collected by sex. Group 37.3 "Ducks and ducklings (all ages)" was made a short list item. In Section 4 on employment in agriculture, the age grouping "15 to 64 years of age" in the World Programme was further subdivided into "15 to 54 years of age" and "55 to 64 years of age". Corresponding changes were made in item 51.1(b) and 51.2(b) in Section 5 on Farm Population. In Section 9 on Wood and Fishery Products, new Groups 91.5 "Bamboo" and 91.6 "Wood for agricultural implements" were also added.

#### Regional Programme for Europe

In Section 0 on Holding, holder, etc., the Group 02.1 "Name of the holder" was modified to read "Identification of the holder".

In Section 2 on crops, sub-item 23.13(c) "peaches (including nectarines)" was made a short list item. In Section 6 on agricultural power and machinery, etc., the following items were transferred from the optional to the short list items: item 62.2 "electric generators", items 65.4 through 65.9 dealing with harvesting equipment and major item 66 dealing with farmstead equipment.

#### Regional Programme for the Near East

In Section 3, items 34.12 and 35.12 dealing with sheep and goats respectively one year of age and over, were transferred from optional to the short list. Similarly in Section 4 the total number of persons employed in agricultural work in the holding during the census week were made short list items. In Section 6 also the Group 65.4 "Combines (harvesters - threshers)" was transferred to the short list.

#### Comparison of the 1970 Programme with the 1960 Programme

In preparing the 1970 Programme, the importance of continuity and comparability with the previous censuses had been kept in mind while taking into account the new developments in agriculture. Certain items were added and changes were made on the basis of the experience gained from the 1960 Census.

Among the major additions was a whole new Section (10) dealing with association of agricultural holdings with other industries. In view of the necessity of keeping in mind the varying conditions of different regions and countries, most of the new items and additional tables proposed were deliberately made optional to give fullest scope to the countries to choose those items and tabulations which they considered most appropriate to their conditions.



Below are described the major modifications of the 1970 Programme, as compared with that of the 1960, section by section.

In Section 0, a new topic called "type of holding" was introduced which would permit the classification of agricultural holdings according to type, namely, whether they were holdings primarily producing for home consumption or for sale. The latter type was to be further sub-classified into (i) crop holdings; (ii) livestock and poultry holding; (iii) mixed holdings; and (iv) others.

The concept of the holding was further clarified and the restriction that only those separated parcels be included in a holding which are located in a single territorial division, or in adjacent territorial divisions, or if those divisions are very small, in the same neighbourhood, was eliminated. Thus, the holding might consist of one or more separate parcels, located in one or more territorial divisions, provided that all these separate parcels would together constitute the same technical unit.

Clarification was also made that the mode of operating a holding, such as operation by hired managers, was not a form of tenure. Definition of "hired manager" was also added.

In Section 1 there was no major modification.

In Section 2 the scope of the programme was broadened so as to obtain, when feasible, data on area irrigated and area non-irrigated for each temporary crop. Developing countries were advised to collect information on the area treated with inorganic fertilisers separately for each of the major crops. A few crops were introduced in the optional list and new totals were suggested on an optional basis to provide for the tabulation of data on crops by type of holding.

In Section 3 the proposals were essentially the same as for the 1960 Programme. Only a few items were added and the elaborate classification of horses by age was deleted. The classification of cattle by use or purpose was somewhat changed and the items on beehives and colonies were made optional.

The Section 4 on employment in agriculture introduced a new topic concerning the extent to which the agricultural work on the holding was carried on by the holder's household or by persons working for pay (hired workers). New items were added on the number of man-hours worked on the holding by the holder and unpaid members of his household, and on the number of man-hours worked off the holding by these persons.

The age class categories of persons employed in agricultural work was extended to 3 from previously 2 and a suggestion was made to secure, whenever possible, information on the extent to which the households of the holders depend on the holding for their support. However, in view of the fact that this last mentioned information could be collected in only some countries, the countries were cautioned to frame the questions on this subject according to the conditions in the country and they were not included in the proposed census items.

In Section 5 a suggestion was made to classify the farm population into three age groups. Items on major occupation included in the 1960 Programme were deleted. Attention was drawn to the fact that although in many countries a considerable number of holders do not live on agricultural holdings but information about them and members of their households was to be collected. This last mentioned suggestion was simply a caution since the total area of the holding was also to comprise the land occupied by the farm buildings, including the house of the holder, wherever these were located. Thus, according to this definition of the total area of the holding, there could have been no such thing as a holder not living on an agricultural holding.

In Section 6 a more complete inventory of the agricultural machinery and implements on the holding was included as compared to that in the 1960 Programme. It was also proposed to enumerate the number of machines owned by the holder at the date of the census, and questions were proposed on different arrangements under which machinery was used during the year preceding the census. An indication was therefore requested in the Programme as to whether the machine or implement was (a) owned solely by the holder; (b) jointly owned by the holder and others; (c) provided by the landlord; (d) provided by private contractors; (e) provided by a cooperative; or (f) provided under government-sponsored projects. Also a general question was asked on transport facilities.

There was no major modification in Sections 7, 8 and 9.

As mentioned earlier, Section 10 was the introduction of a new concept, namely the association of agricultural holdings with various other industries.

CHAPTER V

CONCEPTS AND DEFINITIONS - COUNTRY PRACTICES

The use of standard concepts and definitions is important in ensuring comparability of the results of national censuses of agriculture. In fact the FAO Programme for the World Census of Agriculture initiated the standardization of concepts and definitions in agricultural statistics.

Holding

The definition of a holding in the 1970 Programme emphasized the use of the land for agricultural production which mainly included the growing of temporary and permanent crops and producing livestock and livestock products. Establishments engaged in the production of only forest products, fish, frogs, dogs, race horses or wild game were not to be considered as holdings.

The following are some basic elements in the concept of holding as recommended in the 1970 Programme:

- a) It consisted of land used wholly or partly for agricultural production
- b) It was operated by one person alone or with others, without regard to title, legal form, size or location
- c) It was operated as one technical unit, i.e., a unit which, under the same management, has the same means of production such as labour force, machinery and draft animals
- d) It included establishments and other units without agricultural land but kept livestock for agricultural purposes.

More than 70 per cent of the countries participating in the World Census of Agriculture used the same concept of holding as given in the 1970 Programme. These countries include those where practical considerations made it necessary to limit the enumeration to those holdings which were above certain lower limits as to the size of a holding in respect of area, number of trees or livestock or volume of output (also 1970 Programme recommendation). Minimum limits when not too many have been shown against a country, otherwise it is indicated that the minimum limits are specified. These limits generally referred to a combination of minimum area size and minimum number of different types of livestock.

A typical example of a variety of criteria was provided by French Antilles where the minimum limits were: (a) area of 25 ares (0.25 ha.), or (b) 10 ares of pineapples or sugarcane or banana for export, or (c) 3 ares of fruit or forest nurseries, or (d) 5 ares of tobacco, or (e) 1 are market gardens or flower cultivation, or (f) 20 scattered fruit trees, or (g) 1 reproducing bull or ox or milk cow or cattle more than 2 years, or (h) 3 pigs for fattening, or (i) 6 goats, or (j) 3 mother goats, or (k) 25 chickens or 300 chicks or 30 other poultry, or (l) 10 mother rabbits, or (m) 10 bee colonies.

Korea included, among its numerous limits, criteria for raising silk-worms, annual gross earnings from mixed farming and number of working days spent by members of holder's household on agriculture. In the United Kingdom, farm size was measured by calculating the standard labour requirements, i.e., the annual requirements of manual labour needed, on average, for the production of crops and livestock with an addition for essential maintenance and other necessary tasks. The requirements were expressed in terms of "standard man-days" (standard man-days per acre of crops or per head of livestock) which represented 8 hours manual work for an adult male worker under average conditions.

There have been a few major departures from the 1970 Programme concept of holding in the national censuses which had the effect of enlarging the concept of holding. One of the main

deviations from this point of view has been the inclusion in the census of agriculture of land used for forestry and forestry products. More than ten countries, mainly in Europe and Latin America, included forestry in the concept of holding. Among other deviations, mention may be made of the following cases:

- (a) Germany, Fed.Rep.of, included also pisciculture in its census of agriculture;
- (b) A few countries included machine cooperatives (e.g., Belgium), equipment pools (Denmark), establishments engaged in agricultural services (Yugoslavia);
- (c) Norway included animals with police, soldiers, zoo, etc.;
- (d) Argentina included establishments engaged in breeding, racing or polo horses;
- (e) A few countries (e.g., Malawi, Togo, Fiji) included all land with holding of the head of the household (as one holding) even though some plots of land were operated independently by persons living in the same household.

The other limitation to the concept of holding (other than the minimum size) related to the exclusion of kitchen gardens from the census. This was the case, for instance, in Italy and Liberia.

Table 5.1

Country practices in the 1970 World Census of Agriculture regarding Holding

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<b>EUROPE</b>		
Austria	1970	Included forestry
Belgium	1970	Included forestry, machine cooperatives and owners of 0.2 ha. of uncultivated land not forming part of a holding
Czechoslovakia	1971	X, minimum size 0.1 ha.
Denmark	1970	Included equipment pools throughout country and commercial poultry stocks in town only; also horses in riding schools
Finland	1969	Included forestry
France	1970-71	X, minimum size 1 ha. of agricultural area or 0.2 ha. of specialised cultivation or a specified minimum number of livestock
Germany, F.R.	1971-73	Included forestry and pisciculture; minimum size of at least 1 ha. or value of annual production less than 4,000 DM.
Greece	1971	X, minimum limits specified
Hungary	1972	X
Ireland	1970	X, minimum size 0.1 ha.
Italy	1970	Included forestry but excluded kitchen gardens for home consumption located in urban areas and places not forming part of a holding but keeping small number of livestock for home consumption
Luxembourg	1970	X, minimum limits specified
Malta	1969	X, minimum size 0.1 ha.
Netherlands	1970	Included machine tool corporations and agrarian enterprises working on commission basis. Minimum limits specified
Norway	1969	Included animals possessed by police, soldiers, zoos, etc.; and tractors for excavating, etc. Min.size 50 sq.metres
Portugal	1968	Included forestry; minimum size 0.05 ha.
Spain	1972	Included forestry; minimum limits specified
Sweden	1971	Included forestry
Switzerland	1969	X, minimum size 0.25 ha. of cultivated land and 0.1 ha. of land under permanent crops
United Kingdom	1970	X, minimum limits specified
Yugoslavia	1969	Included establishments engaged in agricultural services and special institutions established for improvement of agricultural production.

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>NORTH AMERICA</u>		
Canada	1971	X, included experimental farms; minimum size 1 acre with annual agricultural products valued at \$50 or more
USA	1969	X, minimum size 10 acres with annual sales of agricultural products amounting to at least \$50; included places of less than 10 acres if sales amounted to at least \$250.
<u>LATIN AMERICA</u>		
Antigua	1973-74	X, minimum limits specified
Argentina	1969	Included forestry and establishments engaged in breeding, racing or polo horses
Barbados	1971	X, minimum limits specified
Belize	1973-74	X, minimum limits specified
Brazil	1970	Included forestry; excluded residential country estates and kitchen gardens
Colombia	1970	X
Costa Rica	1973	Included forest nurseries
Dominica	1971	X, minimum limits specified
Dominican Rep.	1971	X, minimum limits specified
Ecuador	1974	X
El Salvador	1971	X
French Antilles	1972	X, minimum limits specified
Haiti	1971	X
Honduras	1974	X
Jamaica	1968-69	X, minimum limits specified
Mexico	1970	Included forestry
Montserrat	1972	X, minimum limits specified
Panama	1971	X
Peru	1972	X
Puerto Rico	1970	X
St. Lucia	1973-74	X, minimum limits specified
St. Vincent	1972	X, minimum limits specified
Uruguay	1970	X
Venezuela	1971	X
Virgin Islands(USA)	1970	X, minimum limits specified

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>NEAR EAST</u>		
Iraq	1971-72	X
Kuwait	1969-70	X
Lebanon	1971-72	X
Libyan A.R.	1972-73	X
Saudi Arabia	1972-73	X
Syrian A.R.	1971-72	X
Turkey	1970-71	X
<u>FAR EAST</u>		
India	1971	X
Indonesia	1973	X
Japan	1970	X, minimum size 10 ares (0.1 ha.) of cultivated land in Eastern; 5 ares (0.05 ha.) in Western Japan or annual sales at 50,000 yens
Korea, Rep.of	1970	X, minimum limits specified
Laos	1973	X
Nepal	1972	X, minimum limits specified
Pakistan	1972-73	X
Philippines	1971	X, minimum size 1,000 sq.metres (0.1 ha.) and 20 head of livestock and/or 100 poultry
Singapore	1973	X
Sri Lanka	1973	X
<u>AFRICA</u>		
Algeria	1973	X
Botswana	1969	X
Cameroon	1972	X
Central A.R.	1973	X
Chad	1972	X
Congo	1972	X
Gabon	1973-74	X
Ghana	1970	X
Guinea	1974-75	X
Ivory Coast	1973-74	X
Kenya	1969-70	X
Lesotho	1970	X, separate units with separate farm income of a group of persons living in the same hut were considered separate farm households. Minimum limits specified
Liberia	1971	excluded kitchen gardens

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Malawi	1969	All the land associated with the household generally under the control of the head of household, included land operated by other farmers living in the same household
Nigeria	1974-75	X, minimum limits for livestock holding 2 animals or 5 birds
Sierra Leone	1971	X (limit on livestock implied)
South Africa	1970-71	Included forestry
Swaziland	1972	X
Tanzania	1972	X
Togo	1970	X, all plots of land operated jointly by the household, included those operated independently by same members were considered as constituting one holding under the head of household
Zaire	1971	Limits specified for holding
Zambia	1971	X
<u>OCEANIA</u>		
American Samoa	1970	X, minimum limits specified
Australia	1971	X, minimum size 1 acre
Fiji	1968	X, land operated separately by some members was included with the holding of the head of the household and was not considered a separate holding
Guam	1970	X, minimum limits specified
New Zealand	1972	X included; forestry; minimum size 2 acres
Pacific Islands (Trust Territory)	1970	X, minimum limits specified

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Note: X signifies that national concept has been the same as or similar to the 1970 Programme recommendation



Holder

The main elements in the concept of a holder, as recommended in the 1970 Programme, were:

- (a) He had the responsibility for operation of a holding and exercised technical initiative;
- (b) He exercised technical initiative in its operation and had full economic responsibility or shared it with others;
- (c) In case of partnership in economic and technical responsibility:
  - (i) if partners belonged to different households each partner was considered a holder;
  - (ii) if partners were members of the same household only one of them was considered as holder;
- (d) A hired manager operating a holding was not to be considered as a holder but special provision was to be made to record the fact separately.

Most of the national practices followed the 1970 Programme recommendations. There are, however, some deviations. For instance, France, Switzerland, Saudi Arabia and Guam considered a hired manager as the holder. In Japan, Lesotho and Togo the head of the household was considered as the holder irrespective of whether he took active part in the operation of the holding or not. In Italy a share-cropper who was the head of a farming family and who (with his family) performed all the work on the holding, bearing part of the expenses involved and sharing the produce with the landlord, was not considered as the holder. In Syrian Arab Republic persons who owned or shared in the ownership of agricultural machinery, without planting any land or breeding any livestock, were considered as holders.

Table 5.2

Country practices in the 1970 World Census of Agriculture regarding Holder

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Austria	1970	X
Belgium	1970	X
Denmark	1970	n.a.
Finland	1969	n.a.
France	1970-71	Included hired manager as holder
Ireland	1970	X
Italy	1970	Sharecropper was not considered a holder
Malta	1969	X
Netherlands	1970	n.a.
Norway	1969	n.a.
Portugal	1968	X
Sweden	1971	X, neither an employee nor a farmer's spouse was considered as a farmer
Switzerland	1969	Included hired manager as holder
United Kingdom	1970	X
Yugoslavia	1969	n.a.
<u>NORTH AMERICA</u>		
Canada	1971	X
USA	1969	X
<u>LATIN AMERICA</u>		
Argentina	1969	X
Barbados	1971	X
Brazil	1970	X
Colombia	1970	X
Costa Rica	1973	X
Dominica	1971	X
French Antilles	1972	X
Jamaica	1968-69	X
Mexico	1970	X
Montserrat	1972	X
Panama	1971	X
Peru	1972	X
Puerto Rico	1970	X

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
St. Vincent	1972	X
Uruguay	1970	X
Venezuela	1971	X
Virgin Islands(USA)	1970	X
<u>NEAR EAST</u>		
Iraq	1971-72	X
Kuwait	1969-70	X
Lebanon	1971-72	X
Libyan A.R.	1972-73	X
Saudi Arabia	1972-73	Included hired manager as holder
Syrian A.R.	1971-72	Persons who owned or shared the ownership of agricultural machinery, without land or livestock, were considered holders
Turkey	1970-71	X
<u>FAR EAST</u>		
Japan	1970	Head of household economically responsible for the livelihood of its members was considered as holder
Korea, Rep.of	1970	X
Laos	1973	X
Philippines	1972	X
<u>AFRICA</u>		
Botswana	1968-69	X
Ghana	1970-71	X
Guinea	1970	X
Kenya	1969-70	X
Lesotho	1970	Head of household was considered as holder
Liberia	1971	X
Malawi	1968-69	X
Sierra Leone	1970-71	X
Swaziland	1971-72	X
Tanzania	1971-72	X
Togo	1970	Head of household was considered as holder
Zambia	1970-71	X
<u>OCEANIA</u>		
American Samoa	1970	X
Fiji	1968	X
Guam	1970	Included hired manager as holder

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Note: X signifies that national concept has been the same as or similar to the 1970 Programme recommendation.

## Tenure

The 1970 Programme recommended the following four major categories of tenure (other than the general category: other forms of tenure) which concerned itself with the information on the rights under which the land was operated:

### Area owned or held in ownerlike possession

The ownership concept simply required that the holder or members of his household possessed the title of ownership which consequently gave them the right to determine the nature and extent of its use as well as the right of its transfer. The concept of ownerlike possession implied that the holder legally used the land without interference from others and always kept complete economic responsibility. Three examples of common types of ownerlike possession were:

- (i) Land operated under perpetual lease, hereditary tenure, and under long-term leases usually ranging from 30 to 99 years, and the rent of which is sometimes only nominal;
- (ii) Land which, without legal title of ownership or of a long-term lease, has been peacefully and uninterruptedly operated by the holder for a period of over 30 years without payment of rent; and
- (iii) The system under which a villager receives a plot, rent-free, from tribal, ejidal or other communal land and retains it as long as he keeps it under cultivation by his own labour and that of his family and under which he cannot sell or mortgage his holding.

### Area rented from others

This category was further subdivided to obtain information as to whether the area was rented from others in return for a fixed amount of money, or produce, or a combination of both, or for a share of produce or its equivalent in money, or in exchange for services, or any other form of renting. The last subdivision included area operated gratuitously or rent free under special arrangements for its exclusive use, and also area operated with right of usufructuary mortgage which gave the mortgagee the right to the usufruct of the mortgaged land.

### Area operated on a squatter basis

The land under this category referred to the land occupied by the holder who lacked the title of ownership and paid no rent for operating it and for retaining its total usufruct. The occupancy occurred without consent of the owner of the land though at times tolerated especially when government land is involved, as in the case of refugees.

### Area under tribal or traditional communal forms of tenure

The land under this category was held on a tribal, village or family basis but individuals belonging to the respective social unit had certain usufructuary rights to the use of land.

Country practices for the first two categories, namely area owned and rented, are shown in Table 53 for the countries for which information was available. Most of the countries followed the recommendations in the 1970 Programme. Examples of major variations and/or deviations are given below:

- (a) Sharecropping practice was generally included and the area rented with the exception of Italy. In the case of "mezzadria" which is a kind of sharecropping, the ownership of land belonged to the landlord. At the same time the category of holdings rented from others included those operated under contract, giving the landlord a proportional share of produce;

- (b) Norway made distinction between rented holdings under contract of lease and those not considered as leased but under other rentings bound by written contract. Furthermore, "incidental tenancy" referred to the renting of land without a written contract;
- (c) Canada included land occupied by squatter under area owned category. Moreover, land used under a per head grazing permit or for a fee was not included under the category of area rented by Canada and by USA.

With regard to the national practices in other categories of the forms of land tenure the following observations are made:

Colombia, using the term "colono", Ecuador, Haiti, Mexico, Iraq, Singapore, Liberia, Nigeria, Sierra Leone, Guam applied the 1970 Programme definition of area operated on squatter basis in their national censuses. Jamaica and Philippines considered squatters under other forms of tenure.

The concept of the category, area under tribal or traditional communal forms of tenure was adopted by Liberia, Nigeria, Sierra Leone and Togo.

Some of the examples of national practices under other forms of tenure were:

Argentina included in this category the land operated through a permit or authorisation as well as "occupiers de facto", that is holders occupying land without title or authorisation. Haiti included land entrusted to the holder by a decision in law. Togo included parcels under mixed form of tenure in the other forms of tenure category.

Table 5.3

Country practices in the 1970 World Census of Agriculture regarding Tenure

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Belgium	1970	<ol style="list-style-type: none"> <li>1. All land belonging to the farmer or to members of his household was considered as owned; also farms belonging to the state or others and held by a hired manager were included in this category.</li> <li>2. The sharecropping part of a holding was considered as rented.</li> </ol>
Italy	1970	<ol style="list-style-type: none"> <li>1. "Mezzadria", a type of sharecropping, was considered as ownership to landlord. It included transfer of use and usufruct to holder but not right of property, hereditary tenure, perpetual lease, long-term lease, adjudication of land from Agrarian Reform Institute.</li> <li>2. Areas operated under contract, under mixed lease and gratuitously were considered areas rented from others.</li> </ol>
Netherlands	1970	<ol style="list-style-type: none"> <li>1. Area owned included also hereditary tenure, usufruct and perpetual lease at fixed rent.</li> <li>2. Area rented also included area under sharecropping arrangements.</li> </ol>
Norway	1969	<ol style="list-style-type: none"> <li>1. X</li> <li>2. Distinction is made between renting with written contract and without written contract.</li> </ol>
Portugal	1968	<ol style="list-style-type: none"> <li>1. X</li> <li>2. Area rented with or without a written contract and included sharecropping.</li> </ol>
Spain	1972	<ol style="list-style-type: none"> <li>1. X</li> <li>2. Area rented with or without a written contract.</li> </ol>
United Kingdom	1970	<ol style="list-style-type: none"> <li>1. Included land leased for a term exceeding 30 years or in perpetuity or of which the holder is a tenant for life under Settled Land Act or as a beneficiary under Trustee Acts.</li> <li>2. Area rented included land let or leased for any term not exceeding 30 years of which holder uses free other than common grazing land.</li> </ol>
Yugoslavia	1969	<ol style="list-style-type: none"> <li>1. and 2. X</li> </ol>
<u>NORTH AMERICA</u>		
Canada	1971	<ol style="list-style-type: none"> <li>1. Area owned included: <ol style="list-style-type: none"> <li>(a) Land held by the operator or his wife under title, homestead law, purchase contract or as an heir or trustee of any individual estate;</li> <li>(b) Land which is more or less permanently occupied by a squatter;</li> <li>(c) Land managed by the operator for another person or firm who owns the land.</li> </ol> </li> </ol>

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Canada (cont.)	1971	2. Area rented or leased from others included: (a) Area rented or leased from others on a cash basis; (b) Area rented on a crop share basis from others; (c) Area used rent free; (d) Area used under lease arrangements with Federal, Provincial or Municipal governments; (e) Land managed by the operator for another party who rents or leases the land; (f) Not included land used under a per head grazing permit or for a fee.
USA	1969	1. and 2. X; area rented did not include federal land used on a per head or animal unit basis (grazing permits)
<u>LATIN AMERICA</u>		
Argentina	1969	1. and 2. X
Barbados	1971	1. and 2. X
Colombia	1970	1. and 2. X
Costa Rica	1973	1. and 2. X
Dominica	1971	1. and 2. X
Ecuador	1973-74	1. and 2. X
French Antilles	1972	1. and 2. X
Haiti	1971	1. and 2. X
Honduras	1974	1. and 2. X
Jamaica	1968-69	1. and 2. X
Mexico	1970	1. and 2. X
Montserrat	1972	1. and 2. X
Panama	1971	1. and 2. X
Peru	1972	1. and 2. X
Puerto Rico	1970	1. and 2. X
Uruguay	1970	1. and 2. X
Venezuela	1971	1. and 2. X
Virgin Islands (USA)	1970	1. and 2. X
<u>NEAR EAST</u>		
Iraq	1971-72	1. and 2. X
Kuwait	1969-70	1. and 2. X
Lebanon	1971-72	1. and 2. X
Syrian A.R.	1971-72	1. and 2. X
Turkey	1970-71	1. and 2. X
<u>FAR EAST</u>		
India	1970-71	1. and 2. X
Indonesia	1973	1. and 2. X

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Korea, Rep.of	1970	1. and 2. X
Philippines	1972	1. and 2. X
Singapore	1973	1. and 2. X
Sri Lanka	1973	1. and 2. X
<u>AFRICA</u>		
Algeria	1973-74	1. and 2. X
Ghana	1970-71	1. and . X
Lesotho	1970	1. Each tax payer has usufruct right to the land as long as he continues to cultivate it and is considered as land owned or held in ownerlike possession. 2. X
Sierra Leone	1970-71	1. and 2. X
Tanzania	1971-72	1. and 2. X
Togo	1970	1. and 2. X
Zambia	1970-71	1. and 2. X
<u>OCEANIA</u>		
American Samoa	1970	1. and 2. X
Guam	1970	1. and 2. X
Pacific Islands (Trust Territory)	1970	1. and 2. X

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Note: X signifies that national concept has been the same as or similar to the 1970 Programme recommendation.



## Land Utilization

The 1970 Programme proposed five major groups on the structural composition of the utilisation of the land in a holding and also provided subdivisions of some of the major groups.

### Arable land (X1)

Arable land, in the 1970 Programme, was defined as all land generally under rotation. It could be used as (a) under temporary crops, (b) under temporary meadows, (c) under market and kitchen gardens including under glass, (d) as temporary fallow (i.e. land resting for not more than five years before it is replanted), and (e) all other arable land. In order to obviate the practical difficulty in distinguishing "temporary" meadows and pastures from the "permanent" ones it was suggested that a period of rotation of less than five years be considered as temporary.

### Land under permanent crops (X2)

This major group referred to the land cultivated with crops which occupied land for a long period of time without the need to be replanted for many years after each harvest. Examples of such crops are: fruits and nuts, grapes and dates, tea and coffee, cocoa and rubber. Nurseries other than those of forest trees were covered under this major group.

### Land under permanent meadows and pastures (X3)

If the land in the holding was used permanently, i.e. for five years or more, for herbaceous forage crops, either seeded and cared for or existing naturally, such as wild prairie or grazing land, it was treated as land under this major group. It was subdivided into two groups dealing separately with cultivated and uncultivated meadows and pastures.

### Wood or forest land (X4)

This included all wood lots or tracts of timber, natural or planted, in the holding, which had value as wood, timber or other forest products or for protection. Nurseries of forest trees were considered part of this major group.

### All other land (X5)

This included all other land in the holding not classified elsewhere. It was subdivided into two groups:

- (a) Unused land potentially productive for agriculture or forestry but not yet developed. It included land producing utilisable products such as reeds and rushes for matting and bedding for livestock, wild berries, and land which could be brought into crop production through relatively small effort in addition to that required in common cultivation practices.
- (b) Land in the holding not classified elsewhere. It included land occupied by buildings, parks and ornamental gardens, roads, lanes, wasteland, land under water and any other land in the holding not reported under previous groups.

More than ten countries adopted all the five major groups as given in the 1970 Programme. Examples are provided by Netherlands, Portugal, Yugoslavia, Costa Rica, Haiti, Mexico, Montserrat, Iraq, Kuwait and Philippines. In a few cases, although the grouping is not exactly the same as in the 1970 Programme, the sum of some national sub-groups may give close approximation to the major groups.

A number of variations in the concepts of these groups were observed in many countries. For instance, a concept of agricultural area was adopted by a few countries such as Belgium, Denmark, France. This concept included all or part of arable land, land under permanent

crops and land under permanent meadows and pastures. Cropland was another concept used, e.g., in Canada, USA, Puerto Rico, Virgin Islands, to cover land under both temporary and permanent crops. Finland included nurseries for forest trees under arable land and France included them under permanent crops. Ireland distinguished between permanent meadows and permanent pastures. Land under permanent meadows was included in arable land whereas permanent pastures included also rotation pastures under five years. Jamaica introduced a new term called "food forest" which referred to the frequent cases where a canopy of economic trees (e.g., breadfruit, star apples, mango, avocado, pear) existed in association with a lower canopy of trees, e.g., cocoa, coffee, citrus, etc., and sometimes with a third layer of herbaceous crops such as kale and calaloo grown in spaces where there is light.

About 20 countries adopted a classification different from that recommended in the 1970 Programme. An example of a typical grouping was observed in French Antilles where the three major groups were (a) useful agricultural area, (b) forest land, and (c) non-agricultural land. Useful agricultural area was subdivided into a number of sub-groups (i) agricultural land which included temporary crops, permanent crops, artificial pasture, fallow land, road and productive wasteland, kitchen garden and other culture like forest nurseries; (ii) area under buildings; and (iii) non-productive wasteland and unproductive fallow land for more than one year. Generally, countries in Africa and Oceania did not find the FAO's major groups very much suited to their conditions and therefore they adopted a more commonly used classification in their conditions. For instance, Liberia adopted only two groups, namely crops grown on arable land and permanent crops. Sierra Leone limited its classification to three groups, namely (a) fallow land, (b) virgin forest, and (c) virgin bush. Togo similarly had three groups, namely temporary crops, fallow land and meadows and pastures. New Zealand limited itself to only two major groups, namely stocked area plantation and other land. The stocked area plantation included total area of the plantation plus shelter belts of three or more rows but excluding those of less than three rows, minus the area under roads, landing strips, natural clearings, felled areas and all conservation plantings. The second category, other land, included houses, farm buildings, yards, domestic gardens, orchards, poultry runs, hedges including shelter belts of one or two rows, conservation plantings and all idle or unused land.

Table 5.4

Country practices in the 1970 World Census of Agriculture regarding Land Utilisation

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Austria	1970	X2; X4
Belgium	1970	Agricultural area included part of X1, X2 and X3; X5
Denmark	1970	Agricultural area included part of X1, X2 and X3
Finland	1969	X1 (including nurseries for forest trees); X2; X3; X4 (excl. nurseries); X5
France	1970-71	X1; X2 (incl. forest nurseries, excl. cider trees); X3; X5
Ireland	1970	X1 (incl. permanent meadows but excl. rotation pastures); X2; X3 (permanent pastures only, incl. rotation pastures under five years); X4; X5
Italy	1970	X
Malta	1969	(a) (i) Dry land; (ii) irrigated land; (b) Wasteland; (c) Fallow land
Netherlands	1970	X
Norway	1969	(a) Fully cultivated soil; (b) meadows; (c) greenhouse and forcing frames; (d) fallow land; (e) permanent crops; (f) cultivated pastures; (g) forest land; (h) all other land
Portugal	1968	X
Sweden	1971	(a) Arable land incl. fruit trees; (b) cultivated natural pastures; (c) other grass land; X4; X5
Switzerland	1969	X
United Kingdom	1970	(a) Horticultural crops; (b) temporary grasses; (c) permanent grasses; (d) rough grazing; (e) woodland; (f) other land
Yugoslavia	1969	X
<u>NORTH AMERICA</u>		
Canada	1971	(a) Cropland; (b) improved land; (c) woodland; (d) other unimproved land
USA	1969	(a) Cropland; (b) woodland; (c) pasture land and range land; (d) all other land
<u>LATIN AMERICA</u>		
Argentina	1969	(a) Annual crops; (b) permanent crops; (c) forage crops, annual; (d) forage crops, permanent; (e) natural meadows for grazing; (f) wood or forest land (natural and planted separately); (g) land lying fallow; (h) all other land.
Barbados	1971	X1 (= temporary crops + temporarily fallow); X3 (= cultivated grass + uncultivated grass); X4; X5 (= unused but not suitable for cultivation or grassland + unused but suitable for cultivation + built on and service area).
Brazil	1970	X1 (= land under temporary crops + fallow land); X2; X3 (pasture land, natural and sown separately); X4; X5
Costa Rica	1973	X

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Dominica	1971	(a) Cultivated or sown land under permanent or temporary crops; (b) fallow land; (c) temporary pastures; (d) permanent pastures; (e) forest; (f) other land
French Antilles	1972	(a) Useful agricultural area; (b) forest land; (c) non-agricultural land
Haiti	1971	X
Jamaica	1968-69	(a) Crops (in pure stand + mixed separately); (b) food forest; (c) grassland (improved and natural); (d) rinate used as pasture; (e) woodland; (f) other
Mexico	1970	X
Montserrat	1972	X
Panama	1971	X1 (= temporary crops and fallow land); X3 (cultivated + natural); X4, X5
Peru	1972	X1 (sown land and fallow land); X3, X4; X5
Puerto Rico	1970	Cropland incl. temporary and permanent crops; X3; X4; X5
Uruguay	1970	X1 (natural fields and stubble land); X2; X3; X4; X5
Venezuela	1971	X1
Virgin Islands(U.S.A)	1970	Cropland; X3; X4; X5
<u>NEAR EAST</u>		
Iraq	1971-72	X
Kuwait	1969-70	X
Lebanon	1971-72	X1; X2; X3; X5
Syrian A.R.	1971-72	(a) Arable land; (b) non-arable land
Turkey	1970-71	X1; X3; X5
<u>FAR EAST</u>		
India	1970-71	(a) Net area sown; (b) current fallow; (c) other uncultivated land; (d) fallow land other than current fallow; (e) net available for cultivation; (f) culturable waste
Japan	1970	Cultivated land; X2; X3; X4
Korea, Rep.of	1970	Paddy field; upland; X3; culture
Philippines	1972	X
<u>AFRICA</u>		
Botswana	1968-69	Temporary crops; permanent crops; temporary pastures; permanent pastures; temporary fallow; others
Lesotho	1970	X1; X2
Liberia	1971	(a) Crops grown on arable land; (b) permanent crops
Sierra Leone	1970-71	(a) Fallow land; (b) virgin forest; (c) virgin bush
Swaziland	1971-72	Annual crops; X2; fallow land; X3, X4, X5

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Tanzania	1971-72	Net area sown, area under free crops and groves, area under fallow, X2, X3, X4, X5.
Togo	1970	Temporary crops, fallow land; meadows and pastures.
<u>OCEANIA</u>		
American Samoa	1970	(a) Area in crops; (b) other cropland; (c) pastureland; (d) other land.
Guam	1970	Land in crops; cropland; pastureland; other land.
New Zealand	1972	(a) Stocked area of plantations; (b) other land.
Pacific Islands (Trust Territory)	1970	(a) Area in crops; (b) other cropland; (c) pastureland; (d) other land.

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Note: X signifies that national concept has been the same as or similar to the 1970 Programme recommendations for all the five major groups. Suffixes 1,2,3,4 and 5 refer to each of the five major groups of land utilization in the 1970 Programme.



### Crop Area

The 1970 Programme recommended three types of areas to be investigated in the national census of agriculture as follows:

1. For crops grown alone
  - (a) Area harvested (net) for temporary crops (X1)
  - (b) Area under crop (gross) for permanent crops (X2)
2. For crops cultivated simultaneously (mixed and associated crops)
  - (a) Estimate area which each crop would have covered if it had been grown alone (i.e. single crop equivalent) (X3)
3. For successive crops
  - (a) Count area as many times as the number of successive sowings or plantings (X4)
  - (b) Count area only once in case of successive pickings from the same crop (X5)

Relating to the crops grown alone, the area required was net area harvested for crops grown on arable land and gross area occupied by each of the permanent crops. With regard to crops cultivated simultaneously on the same piece of land it was recommended that an effort should be made to estimate the area which each crop would have covered if it had been grown alone. In order to arrive at a single crop equivalent area different methods of estimation were suggested, such as quantities of seed used, density of plants in crop mixtures as compared with the density in pure stands, early estimates of different areas occupied by component crops, number of trees per unit of area, etc. Two main types of combination of crops were mentioned in the 1970 Programme, namely, mixed crops which referred to either temporary crops grown simultaneously in the same field or to different permanent crops grown together and associated crops which referred to a combination of both temporary and permanent crops. In the case of several crops grown and harvested successively on the same piece of land more than once during an agricultural year, it was recommended that the aggregate area which may result from either successive plantings or successive sowings on the same physical area should be reported. In other words, the same physical area was to be counted as many times as the number of harvests or sowings either of the same crop or of different crops. However, in case of successive pickings from the same crop the area was to be counted only once.

With regard to the recommendation for crops grown alone it was observed that a great number of countries have followed the 1970 Programme recommendation. For several cases, however, distinction between temporary crops and permanent crops is not very clear. These cases have been shown in the table as given by the country. Very few countries asked for both areas sown and harvested, Uruguay providing the rare example.

In the case of crops cultivated simultaneously on the same piece of land, a variety of national practices has been observed. Very few countries were able to follow the 1970 Programme recommendations to estimate the area which each crop would have covered if it had been grown alone; for example, the USA asked for actual area occupied by each of the associated crops. In Canada and India area was apportioned to each of the mixed crops. In the case of Liberia the area was apportioned to the first two important crops only, other mixed crops were ignored. Dominica and St. Vincent, for instance, made it conditional to apportion the area to each crop, if possible, otherwise the total area was assigned to each crop. In Turkey also the area was apportioned to each crop, if feasible, otherwise the total area was reported under "others".

A large number of countries adopted an easy way out by allocating the entire area to each crop in the mixture. The United Kingdom divided the area equally between interplanted crops. Argentina made it conditional in that the total area was to be assigned to each crop if vines and olive trees were grown with other temporary crops, but if the crops were grown

in vineyards or olive groves the total area was reported under "mixed cropping". Virgin Islands also recorded the total area under "associated crops" if the crops were grown in orchards, otherwise the total area was assigned to each of the mixed crops. Other examples where total area was assigned to each mixed or associated crop were provided by Denmark, Dominican Republic, Mexico, Japan, Zambia, American Samoa and Fiji.

The other identifiable national practice related to the entire area being allocated to the most important or the main crop in the mixture. Examples are provided by Belgium, Switzerland, Lebanon and Swaziland. France provided interesting examples in that the total area was assigned to the main crop in the case of mixed temporary crops but in the case of mixed fruit trees area was estimated for each type as if it had been grown alone. Barbados also made it conditional to allocate the total area to the main crop in the mixture provided the crops were planted in a regular manner or at near normal spacing disregarding the presence of the other crops on the same area; alternatively, the area occupied by other crops was also estimated. Italy provided an example of separate practices for mixed temporary crops and for associated crops. The total area assigned to the crop was considered economically more important in the case of associated crops, however in the case of mixed crops (temporary) total area was allocated to each crop in the mixture as if crop was considered as main crop.

Another pattern of national practices was that the total area in the mixed or associated crops was reported under "mixed/associated crops", listing the names of the crops in the mixture. Examples of this practice were observed in Jamaica, Peru, Pakistan, Sri Lanka and Togo. In the case of Portugal the total area was assigned to that tree crop of the associated crops which occupied  $\frac{3}{4}$  of the whole area; if none of them occupied  $\frac{3}{4}$  of the whole area under mixture then the total area was considered under "associated crops". A similar example was observed in French Antilles where half the area was attributed to the tree crops (as if on pure stand) and half to other crops in the case of regularly associated crops; if not regularly associated the total area was reported under "mixed orchards".

The national practices for successive crops were to a large extent in agreement with the FAO recommendation. A large number of countries counted the area as many times as the number of successive sowings or plantings on the same piece of land during the specific period of time. Also the area was counted only once in cases where successive pickings from the same crop were collected or where two or more cuttings of hay were obtained. Panama and Venezuela provided exception to the recommendation of counting area as many times as the number of successive sowings. They counted area only once independent of the number of successive plantings.



Table 5.5

Country practices in the 1970 World Census of Agriculture regarding Crop Areas

<u>Region/Country</u>	<u>Census year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Belgium	1970	2. Entire area allocated to the most important crop
Denmark	1970	1. Area under crop; 2. Total area assigned to each crop; 3. X4
France	1970/71	2. X3 for mixed fruit trees; total area assigned to the main crop in case of mixed temporary crops
Italy	1970	1. Area harvested; 2. Total area assigned to each of mixed crops (temporary). Total area assigned to the economically important crop (permanent); 3. X4
Malta	1969	1. (a) Area sown for temporary crops; (b) area under trees; 3. X4
Netherlands	1970	1. Area under crop
Portugal	1968	2. Total area assigned to the tree crop occupying 3/4 area, otherwise whole area was considered under "associated crops"
Spain	1972	1. Area harvested
Sweden	1971	1. Area under crop
Switzerland	1969	1. Area under crop; 2. Total area assigned to the main crop; 3. X5
United Kingdom	1970	1. Area under crop (gross); 2. Area divided equally between inter-planted crops
Yugoslavia	1969	1. Area harvested
<u>NORTH AMERICA</u>		
Canada	1971	1. Area sown; 2. X3; 3. X4 (for vegetables), X5 (for two or more cuttings of hay)
USA	1969	1. Area harvested; 2. Actual area occupied by each crop in association was requested; 3. X4
<u>LATIN AMERICA</u>		
Argentina	1969	1. Area sown for temporary area harvested for permanent crops; 2. Total area assigned to each crop if vines and olive trees are grown with other crops; but if crops are grown in vineyards or olive groves total area is reported under mixed cropping; 3. X4
Barbados	1971	2. Total area to the main crop of the mixture if planted in a regular manner; otherwise area occupied by other crops was estimated
Brazil	1970	1. Area harvested
Costa Rica	1973	1. Area harvested for temporary and area planted for permanent crops; 2. Area occupied by each crop in mixed crops was estimated. 3. X4
Dominica	1971	2. Area apportioned to each crop, if possible; otherwise total area assigned to each crop
Dominican Rep.	1971	1. Area harvested; 2. Total area assigned to each crop

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
French Antilles	1972	2. Half area to trees and half to other regularly associated crops; if it is not regularly associated, all area to mixed orchard
Haiti	1971	1. Area cultivated; 3. X4
Jamaica	1968-69	2. Total area recorded for "mixed crops"; 3 X4
Mexico	1970	1. Area harvested; 2. Total area assigned to each crop
Panama	1971	1. Area sown; 3. Area counted only once
Peru	1972	1. Area harvested; 2. Total area recorded under "associated crops"
Puerto Rico	1970	2. Total area for each of the mixed crops. In case coffee is mixed with bananas or oranges, total area reported for coffee but estimated area occupied by other crop; 3. X4
St. Vincent	1972	2. Area apportioned to each crop, if possible;
Uruguay	1970	1. Both areas sown and harvested reported; 3. X4
Venezuela	1971	1. Area harvested; 3. Area counted only once
Virgin Islands (USA)	1970	2. Total area assigned to each of the mixed crop. In case of crops grown in orchards total area was reported under "associated crops"

NEAR EAST

Iraq	1971-72	1. Area planted
Kuwait	1969-70	1. Area sown for temporary and area under trees for permanent crops; 2. Total area to the temporary crop if grown with trees; 3. X4
Lebanon	1971-72	1. Area harvested for seasonal crops and area cultivated for permanent crops; 2. Total area assigned to the most important crop; 3. X4, X5
Turkey	1970-71	2. Area apportioned to each crop, if possible; otherwise total area under "others"

FAR EAST

India	1971	1. Area sown; 2. Area apportioned to each crop
Japan	1970	1. Area harvested; 2. Total area to each crop; 3. X5
Korea, Rep. of	1970	1. Area harvested for temporary and area planted for permanent crops
Pakistan	1972-73	1. Area under crop; 2. Total area reported under "mixed area" together with the names of crops in the mixture
Philippines	1971	1. Area planted 2. X3 for mixed crops grown haphazardly or intermixed. Total area to be assigned to both crops grown systematically 3. X4
Sri Lanka	1973	1. Area sown (gross) for temporary crops 2. Total area recorded under "mixed temporary crops"

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>AFRICA</u>		
Botswana	1969	1. Area planted for freehold farms and area under crops for tribal areas 2. X3 (based on density)
Ghana	1970	1. Physical area
Liberia	1971	2. Area apportioned to the first two important crops; other mixed crops were ignored
Swaziland	1972	2. Total area assigned to the most important crop
Togo	1970	2. Total area reported for "mixed crops", mentioning only principal crops in the mixture; 3. X4
Zambia	1971	1. Area planted 2. Total area assigned to each crop
<u>OCEANIA</u>		
American Samoa	1970	1. Area harvested 2. Total area assigned to each of the interplanted crops 3. X4
Fiji	1968	1. Area planted 2. Total area assigned to each crop 3. X4
Guam	1970	1. Area harvested 2. Total area assigned to each crop 3. X4
New Zealand	1972	1. Area sown for specified crops, and area harvested for vegetables, berry fruits, etc. 3. X4
Pacific Islands (Trust Territory)	1970	1. Area harvested 2. Total area assigned to each crop 3. X4

### Livestock and Poultry

The 1970 Programme recommended that agricultural census should include all livestock and poultry used mainly for agricultural purposes and present on each holding, on a specific date (usually the day of enumeration), irrespective of their ownership, plus those owned by the holder but, at the time of enumeration, in transit or temporarily away from the holding to which they belonged but not on another holding (e.g., away on communal grazing land).

Most of the countries had adopted the 1970 Programme recommendations both in limiting the coverage to those animals used mainly for agricultural purposes as well as enumerating them on the holding where found at the time of the enumeration or on the owner's holding if away from the holding.

Denmark and Norway extended their coverage to include animals not used for agricultural purposes, such as for riding, police and military horses.

A few interesting examples of livestock and poultry coverage were observed. The coverage in Finland was in general limited to farmer's own animals and therefore animals owned by cooperatives, workers, etc., and on the holdings were not included unless the farmer himself had a share in these animals. Furthermore, animals purchased but not yet present on the holding on the census day were enumerated whereas animals sold before the census day were not enumerated even though they had not been taken away till then. Denmark and Dominican Republic were among the few countries which excluded livestock for slaughtering or supplied to the slaughter-house on the census day. Panama excluded also those animals which were on the list to be slaughtered. Puerto Rico excluded even those animals which were bought and resold within 30 days.

Table 5.6

Country practices in the 1970 World Census of Agriculture regarding Livestock and Poultry

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Austria	1970	X
Belgium	1970	X
Denmark	1970	X (also included horses in riding school)
Finland	1969	Included: farm's own animals, those in which farmer had a share and were on the farm although owned by cooperatives, workers, etc., animals purchased for the farm but not on the farm on census day. Excluded: animals sold but not taken away from the farm on census day.
Ireland	1970	X
Italy	1970	X
Netherlands	1970	X, including those owned by the holder regardless of the place where they were kept
Norway	1969	X, including horses in zoo, belonging to police and military and stud horses
Sweden	1970	X
Switzerland	1969	X including male animals used for service owned by professional breeders enumerated on the holding where normally stationed
United Kingdom	1970	X
Yugoslavia	1969	Owned by the holder on census date
<u>NORTH AMERICA</u>		
Canada	1971	X
USA	1969	X
<u>LA'TIN AMERICA</u>		
Argentina	1969	X
Barbados	1971	X
Costa Rica	1973	Livestock administered by the holder either on his holding or on other's holding or in transit to public places like slaughter houses or markets were enumerated
Dominica	1971	X
Dominican Rep.	1971	X, excluding livestock for slaughtering

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Ecuador	1974	X
French Antilles	1972	X
Haiti	1971	X
Jamaica	1963-69	X
Mexico	1970	X
Montserrat	1972	X
Panama	1971	X
Peru	1972	X
Puerto Rico	1970	X, excluding animals bought and resold within 30 days
Uruguay	1970	X
Venezuela	1971	X

NEAR EAST

Iraq	1971-72	X
Kuwait	1969-70	X (owned)
Lebanon	1971-72	X (owned)
Syrian Arab Rep.	1971-72	X
Turkey	1970-71	X

FAR EAST

Japan	1970	X
Philippines	1971	X

AFRICA

Botswana	1969	X
Ghana	1970	X
Guinea	1974-75	X
Kenya	1969-70	X
Lesotho	1970	X
Malawi	1969	X
Swaziland	1972	X
Tanzania	1972	X
Togo	1970	X
Zambia	1971	X

Note: X signifies that national coverage has been the same as or similar to the 1970 Programme recommendations.

OCEANIA

American Samoa	1970	X
Fiji	1968	X
Guam	1970	X
New Zealand	1972	X
Pacific Islands (Trust Territory)	1970	X

### Employment in Agriculture

The 1970 Programme recommended that workers on the holding during the census week be classified as permanent, temporary, or occasional workers depending on the amount of time they worked on the same holding during the year adopted as time reference. The 1970 Programme recommendations were as follows:

1. Agricultural work: was defined as any farm work or planning necessary to the operation of the holding (X1)

It included: feeding and caring for livestock and poultry; working in the field; working in the market or kitchen gardens; planning farm work; supervising other agricultural workers; keeping farm records; taking farm products to market; bringing feed, fertilizer or other supplies from town to the holding; repairing fences, farm equipment, machinery, etc.; constructing buildings and fences with farm help, and related activities. Land reclamation and improvements, if carried out by the farmer and his labour force, should be considered as agricultural work.

It excluded: work related to the operation of the home, contract construction work done by persons employed specifically to do such work, labour performed by inmates of institutions, workers employed by a contractor, and handicraft work.

2. Workers who had been employed on the holding for a specific period of the working time during the year were to be classified into three categories. The specific time limits for each category were:
  - (a) at least half the working time during the year for permanent workers (X2)
  - (b) less than half but at least one-third of the working time for temporary workers (X3)
  - (c) less than one-third of the working time for occasional workers (X4)

Practically every country for which information was available adopted the 1970 Programme definition of the agricultural work on the holding. Countries in which forestry was included as part of the census of agriculture obviously included forestry workers as well.

As regards the three categories of workers, a few countries followed the 1970 Programme recommendations, for instance, the Netherlands, Iraq, Lebanon, Philippines and Lesotho. Others adopted modified classifications. A number of them limited their classification to two categories only, e.g., permanent/temporary workers as in Portugal, Sweden, Japan, Algeria and Togo; permanent/non-permanent workers in Austria, Belgium; permanent/casual workers in Norway, New Zealand; permanent/temporary and occasional workers in Italy, Argentina; full-time/part-time workers in France and Malta; and regular workers/seasonal or casual workers in the United Kingdom and Barbados.

Various criteria were adopted by countries to distinguish permanent workers from others. Criterion of employment for at least 6 months in a year was used by Austria, Barbados, Peru, Ghana and Togo. Contract of employment for over seven months was required by Japan. Finland required 150 working days or more; Algeria 200 days or more; France a minimum of 300 working days of 8 hours per day. Italy and Argentina provided examples of criterion for payment on a monthly basis for permanent workers. New Zealand defined permanent workers as those employed indefinitely.

Table 5.7

Country practices in the 1970 World Census of Agriculture regarding  
Employment in Agriculture

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Austria	1970	(a) Permanent workers employed for at least 6 months; (b) Non-permanent workers; (i) seasonal labourers paid according to laid down rules; (ii) others employed for less than 6 months on a daily basis
Belgium	1970	X1; X2 (i.e., 300 days of 8 hours each day); non-permanent workers working partially or occasionally during the year
Finland	1969	X2 (i.e., 150 working days or more)
France	1970-71	X1; (a) full-time work referred to a minimum of 300 working days of 8 hours per day; (b) part-time work was classified into 3 categories: (i) less than $\frac{1}{4}$ of full-time (less than 600 hours a year); (ii) $\frac{1}{4}$ to less than $\frac{1}{2}$ time (or 600 to less than 1,200 hours); (iii) $\frac{1}{2}$ time or more but less than 2,400 hours a year.
Italy	1970	X1; (a) permanent workers were those paid on a monthly basis; (b) temporary and occasional workers were those working for short and intermittent periods, daily and seasonally
Malta	1969	X1; (a) full-time workers were those who worked around 300 days a year; (b) part-time workers worked for less than 300 days a year
Netherlands	1970	X1; (a) permanent workers (15 years and over) who worked for at least 22.5 hours per week; (b) temporary workers who worked between 15 and 22.5 hours per week; (c) occasional workers who worked for less than 15 hours per week. (A year of work referred to 50 working weeks of 45 hours per week, i.e., 2,250 working hours a year)
Norway	1969	Permanent worker (15 years and above) who worked on the holding as his sole work, otherwise he was considered as casual labour. A normal working day referred to 9 hours work per day generally.
Portugal	1968	X1; X2; temporary workers were those working for a day, a week or so.
Spain	1972	X1
Sweden	1971	X1; permanent workers (over 15 years) were those who regularly took part in the work including those employed part-time for, e.g., animal breeding; temporary workers were those temporarily employed
Switzerland	1969	X1; permanent workers (15 years and over) were those whose main occupation was work on the holding during the major part of the year
United Kingdom	1970	X1; (a) regular workers (full-time and part-time) who were normally engaged in work for some part of each month; 40 hours or more work per week referred to full-time and less than 40 hours to part time; (b) seasonal or casual workers who were working at the census date not as regular workers.



<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>NORTH AMERICA</u>		
Canada	1971	Paid year-round agricultural worker was employed on a year round basis
USA	1969	Hired farm worker was the person who did any work necessary to the agricultural operation for which cash payment was made
<u>LATIN AMERICA</u>		
Argentina	1969	(a) Permanent workers were those paid by month; (b) Temporary (occasional) workers were paid daily wages
Barbados	1971	X1; (a) regular paid workers worked for at least 6 months a year and included (i) full-time workers who worked for 3 or more days per week; (ii) part-time workers who worked for less than 3 days a week; (b) seasonal workers (paid) were those who worked for less than 6 months a year and were divided as (i) and (ii) under (a).
Brazil	1970	(a) Permanent workers were those working on a permanent basis or who performed work of a prolonged duration; (b) temporary workers performing occasional work or work of a short duration; (c) other workers who worked under any other conditions, such as "agregados" or "onoradores"
Ecuador	1974	X1
French Antilles	1972	X1; X2 (called permanent salaried workers excluding members of the holder's family)
Grenada		See Barbados
Mexico	1970	X1
Montserrat	1972	X1
Peru	1972	X1; Permanent workers were those who worked for at least 6 months between July 1971-June 1972
St. Lucia	1973-74	See Barbados
St. Vincent	1972	X1
Venezuela	1971	X1
<u>NEAR EAST</u>		
Iraq	1971-72	X1; X2; X3; X4
Lebanon	1971-72	X1; X2; X3; X4
Saudi Arabia	1972-73	X1
<u>FAR EAST</u>		
Japan	1970	(a) Permanent workers were those who had contract of employment for over 7 months; (b) temporary workers were not employed on a permanent basis and included seasonal and daily hired workers
Korea, Rep.of	1970	X1; (a) yearly employed referred to those employed for more than 6 months a year; (b) seasonal employed referred to those employed for 1 to 6 months; (c) daily employed referred to daily labour for paddy and barley only, converted into man-day on the basis of 8 hours per day
Philippines	1971	X1; X2; X3; X4
Singapore	1973	X1

<u>Region/ Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>AFRICA</u>		
Algeria	1973	X1; (a) permanent workers were those remunerated for 200 days or more in a year; (b) temporary workers were those remunerated for less than 200 days in a year
Botswana	1969	Hired workers were subdivided according to whether they worked for more or less than 3 months
Ghana	1970	(a) Permanent labourers were those employed for a total of at least 6 months in a year including managers and caretakers; (b) temporary labourers were those employed for at least one month, but less than 6 months in a year; (c) casual labourers were then hired for short periods, usually a few days
Guinea	1974-75	Permanent worker was the person who performed the major part of the work on holding
Lesotho	1970	X1; X2; X3; X4
Togo	1970	(a) Permanent workers were those employed for at least 6 months during the agricultural year 1970 and all those working on enumeration day (15 December 1970) with a contract for at least 6 months; (b) temporary workers were those working for less than 6 months during 1970
<u>OCEANIA</u>		
Fiji	1968	Permanent paid workers (excluding members of household) were those employed for more than one-half of the working time during the census year
New Zealand	1972	(a) Permanent workers were those employed indefinitely; (b) casual workers were those engaged for seasonal or temporary work

### Farm Population

The 1970 Programme recommended that the following categories of persons be enumerated in the census of agriculture:

- (a) Holder and members of his household;
- (b) All other persons living on the holding or in the holder's household, independent of whether or not they work on the holding;
- (c) Participants in cooperative, collective and communal holdings together with members of their families and unrelated persons living in their households.

It was not necessary for the holder to live on the holding for inclusion in the census. On the contrary, the landless agricultural labourers (and their dependents) not living on the holding were excluded. The information collected would thus relate to the population residing on the holdings and in the holders' households even though some of them would be engaged in non-agricultural activities. It would also include participants in cooperatives, collective and communal holdings and persons (family members and others) living in their households. On account of this residence criteria the population included in the census of agriculture was called farm population or the population living on the farm (or on the holding and in the holders' households).

On the whole countries adopted the residence criteria and included holders, members of the family as well as other unrelated persons living on the holding and/or in the holders' households. Many countries included persons temporarily away from the holding (although normally residing there) on the census day, e.g., Austria, French Antilles, Iraq, Lebanon, Japan, Botswana, Lesotho and Tanzania. A few countries also specified the period of absence. For instance, Jamaica included temporary absentees not exceeding 3 months. Korea also put a limit of less than 3 months absence but included persons who lived in the household for 3 months as on the census date or will live for more than 3 months in future after the census date. Resident domestic servants were generally included in the household. Turkey not only included servants, helpers and gardeners but also shepherds without wages. Temporary or occasional visitors were included by some countries such as Barbados, Montserrat, and Togo, and were excluded by Lebanon, Korea, Lesotho, Tanzania. If a large number of relatives and friends slept on the farm due to special occasions such as weddings, they were excluded but only those members who were normally residing on the holding were enumerated. This was the case, for example, in Kenya, where the general rule was to include all persons who slept on the holding the night preceding the census day. Argentina also included all those who spent the night preceding the census day on the holding. Children who lived away from home during the school terms were included in the census in Jamaica, whereas Philippines excluded college students and those who took their meals in the household but slept elsewhere. Ivory Coast provided an example of countries where only those members of the household were included in the farm population who performed agricultural work on the holding. On the other hand, children temporarily away at school and visiting relatives, although not considered part of the household, were enumerated in Ivory Coast.

Persons generally bound by ties of kinship and normally residing together but not necessarily under the same roof were included by Ghana, Malawi and Swaziland, whereas Guinea mentioned specifically that the members of the household should be living under the same roof.

Table 5.8

Country Practices in the 1970 World Census of Agriculture regarding Farm Population

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Austria	1970	X1; Persons normally living on the holding but absent on census day were included
France	1970-71	X1 (during agricultural year 1969-70). Persons temporarily away were included, also those family members who had worked on the holding during 1969-70 but had not lived there
Malta	1969	X1
Portugal	1968	X1
Yugoslavia	1969	X1
<u>NORTH AMERICA</u>		
Canada	1971	X1
USA	1969	—
<u>LATIN AMERICA</u>		
Argentina	1969	All persons who spent the night preceding the census day on the holding
Barbados	1971	X1, including visitors and servants sleeping on the premises
Dominica	1971	X1
French Antilles	1972	X1, excluding house workers, but including those temporarily absent
Jamaica	1968-69	X1, including temporary (not exceeding 3 months) absentees, children in boarding schools and resident domestic servants; excluding non-family members and visitors
Montserrat	1972	X1, including temporary visitors
Peru	1972	X1
St. Vincent	1972	X1
Uruguay	1970	X1
<u>NEAR EAST</u>		
Iraq	1971-72	X1; temporary absentees were included
Kuwait	1969-70	X1

<u>Region/Country</u>	<u>Census Date</u>	<u>Country Practices</u>
Lebanon	1971-72	X1, including temporary absentees and non-resident family members but excluding temporary visitors
Turkey	1970-71	X1, including servants, helpers, gardeners and shepherds without wages
<u>FAR EAST</u>		
Japan	1970	X1, including temporary absentees such as seasonal emigrants
Korea, Rep. of	1970	Persons who lived or will live in the household for at least 3 months as of census date or thereafter, including absentees for less than 3 months, maid-servants, etc., but excluding occasional visitors and members of quasi-farm
Philippines	1971	X1, including resident domestic helpers, temporary absentees but excl. college students living away from house, temporary visitors and those who took meals at the house but slept elsewhere
<u>AFRICA</u>		
Botswana	1969	X1, including temporary absentees
Ghana	1970	X1, normally residing together but not necessarily under the same roof
Guinea	1974-75	X1, under the same roof
Ivory Coast	1973-74	X1, who perform agricultural work on holding; visiting relatives and children temporarily away were included
Kenya	1969-70	X1, who slept on the farm the night before enumeration; large gatherings such as weddings were excluded
Lesotho	1970	X1, including temporary absentees but excluding visitors
Liberia	1971	X1, living permanently, i.e., for more than six months a year
Malawi	1969	X1, not necessarily under the same roof
Sierra Leone	1971	X1
Swaziland	1972	X1, not necessarily under the same roof
Tanzania	1972	X1, including temporary absentees but excluding casual visitors
Togo	1970	X1, including visitors and domestic servants
Zambia	1971	X1
<u>OCEANIA</u>		
Fiji	1968	X1

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Note: X1 = (a) + (b) and X2 = (c) on page 49.

### Agricultural Machinery and Equipment

The 1970 Programme recommended that (X1) the number of agricultural machinery and equipment owned by the holder on a specific date such as the census day or the day of enumeration, be enumerated on the owner's holding, irrespective of their location. It also suggested that (X2) the use of machinery during the year preceding the census also be investigated. Machinery owned solely by the holder was to be reported as belonging to his holding regardless of where it was located on the day of enumeration. However, jointly owned machinery was to be enumerated at the holding on which it was located on the census day.

The majority of the participating countries in the 1970 World Census of Agriculture followed the 1970 Programme recommendations.

Generally, machines fit for use were covered in the census. Machines under repair were included but those damaged beyond repair or obsolete machines and those used for non-agricultural work were excluded. This fact was specifically mentioned, for instance, by Finland, France, Norway, Sweden, United Kingdom, Canada, USA, Barbados, French Antilles, Virgin Islands and Japan.

A number of countries enumerated machinery and equipment which was present on the holding on the census day regardless of ownership, e.g., France, Canada, USA, Dominican Republic, Montserrat, Puerto Rico, Uruguay, Venezuela, Virgin Islands, Botswana, Guinea, and Swaziland. Some countries, e.g., Denmark, Norway and Sweden, enquired about the extent or fraction of ownership of the machinery, such as  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ .

Jointly owned machinery was recorded on the holding where it was normally resting. This fact was mentioned, for instance, by Barbados, Dominica, Jamaica and St. Vincent.

Table 5.9

Country Practices in the 1970 World Census of Agriculture regarding Agricultural Machinery

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Austria	1970	X1; X2
Belgium	1970	X1; X2
Denmark	1970	X1, in case of jointly owned, extent of the part owned was recorded, e.g., half each if owned by two holders
Finland	1969	X1; X2
France	1970-71	Machinery present on holding and used without regard to ownership was enumerated; animal-operated machines and those for non-agricultural work were excluded
Ireland	1970	X1; X2
Italy	1970	X1; X2
Netherlands	1970	X1
Norway	1969	X1; fractions of ownership such as $\frac{1}{2}$ , $\frac{1}{3}$ were recorded in cases of joint ownership
Sweden	1971	X1; share of ownership, e.g., $\frac{1}{2}$ , $\frac{1}{3}$ , $\frac{1}{4}$ was recorded in cases of joint ownership
Switzerland	1969	X1 (machines owned by machinery stations were excluded); X2
United Kingdom	1970	X1
Yugoslavia	1969	X1
<u>NORTH AMERICA</u>		
Canada	1971	All machines used and located on the holding on June 1971, independent of ownership, were included
USA	1969	All equipment on holding at census date, independent of ownership, were included
<u>LATIN AMERICA</u>		
Argentina	1969	X1; X2
Barbados	1971	X1; (equipment partly owned was recorded on the farm on which it was resting)
Brazil	1970	X1
Costa Rica	1973	X1; X2
Dominica	1971	X1, partly owned equipment was recorded on its normal resting place
Dominican Rep.	1971	Number on holding on census day; X2
French Antilles	1972	X1; X2 although sold by census day
Jamaica	1968-69	X1, partly owned equipment was recorded on its normal resting place
Mexico	1970	X1; X2

<u>Region/Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Montserrat	1972	Equipment and tools on holding on enumeration day were enumerated
Panama	1971	X1; X2
Peru	1972	X1; X2
Puerto Rico	1970	Machines found on holding on census day and used, regardless of ownership, were enumerated
St. Vincent	1972	X1; partly owned equipment was recorded on its normal resting place
Uruguay	1970	Equipment on holding was covered
Venezuela	1971	Equipment on holding, regardless of ownership, was enumerated; X2
Virgin Islands	1970	Equipment on holding, regardless of ownership was enumerated

NEAR EAST

Iraq	1971-72	X2
Kuwait	1969-70	X1; X2
Lebanon	1971-72	X1; X2
Turkey	1970-71	X1; X2

FAR EAST

Japan	1970	X1; X2
Korea, Rep. of	1970	X1; X2
Philippines	1971	X1; X2

AFRICA

Botswana	1969	Machines on holding on census day, regardless of ownership, were enumerated; X2
Guinea	1974-75	Machines on holding were enumerated
Kenya	1969-70	X1
Lesotho	1970	X1
Liberia	1971	X1; X2
Malawi	1969	X1
Swaziland	1972	Machinery on holding on census day were enumerated
Tanzania	1972	X2
Togo	1970	X1
Zambia	1971	X1; X2



### Irrigation and Drainage

In the 1970 Programme irrigation was recommended to denote the practice of purposively providing land with water other than rain but including flooding of land by river water for crop production or pasture improvement. The practice of collecting rain water and later bringing it to the field was also recommended to be considered as irrigation.

It was further recommended that the land actually irrigated during the year should be reported in the census independently of whether irrigated several times or once only. It referred to the largest physical area irrigated only once.

Drainage referred to the practice of removing, through artificial means, excess water for the surface of the land from the upper layers of the soil or subsoil for making non-producing land productive and producing land more productive.

The definition of irrigation adopted by countries is in general the same as recommended in the 1970 Programme except for the differences in the wordings. An example of typical definitions was provided by Algeria where it was defined as follows (translated from the text in French):

"The land was considered irrigated if water was brought to it independently of meteorological conditions and if the water equipment was actually utilised during the reference period."

The definition of drainage was also generally accepted by countries as recommended. In Kenya drainage referred to digging drains to take water out of the field. Zambia defined drainage as "settling of unwanted amount of water".

As regards the recommendation about the coverage of actually irrigated area, i.e., maximum physical area irrigated once during the year, a large number of countries adopted it in the national censuses; among these countries were France, Italy, Malta, Portugal, Canada, USA, Argentina, Jamaica, Puerto Rico, Lebanon, Saudi Arabia, Turkey and New Zealand. The example of countries asking for total area, counting the same area as many times as it was irrigated were provided by Mexico, Iraq and Philippines.

There were variations to the coverage of area actually irrigated. For instance, Finland asked for the average number of hectares irrigated annually with an irrigation system intended primarily for arable farming (excluding irrigation system for gardens). In Malta, area which was regularly irrigated was considered as irrigated land. Norway limited the coverage to the total area expected to be sprayed with the present plant in a period of drought.

A few countries excluded specific irrigated areas. For instance, France excluded kitchen gardens. Canada did not include systems which were used to water home grounds and gardens only.

Brazil limited its coverage to the land irrigated with technical systems not taking into account areas irrigated manually.

A few examples of different sub-divisions of irrigation might also be printed here. Dominican Republic has two sub-divisions, viz., permanent and temporary irrigation (see table for definitions). Indonesia had three categories of irrigations:

- (i) Technical irrigation which referred to an irrigation network where the supply-pipe is separated from the distribution-pipe so that reservoir and distribution irrigation could be fully regulated and measured. Government's Irrigation Service is responsible for construction and the looking after the central and secondary pipes.

- (ii) Semi-technical irrigation was the same as (i) above except that the Irrigation Service only controlled the tapping works to regulate and measure water; further network was not measured and controlled by the Government.
- (iii) Simple irrigation referred to irrigation with an irregular water supply and distribution system.

Table 5.10

Country practices in the 1970 World Census of Agriculture regarding  
Irrigation and Drainage

<u>Region/ Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Finland	1969	Average number of hectares irrigated annually with an irrigation system intended primarily for arable farming was recorded
France	1970-71	Area actually irrigated at least once during the past agricultural year was recorded, together with the area provided with irrigation facilities. Kitchen gardens were excluded
Italy	1970	Land actually irrigated, irrespective of crops, was recorded
Malta	1969	Area which was regularly irrigated, independent of rain water, was considered as irrigated. Area irrigated several times was counted only once
Norway	1969	Total area expected to be sprayed with the existing plant in a period of drought was recorded
Portugal	1968	Two types of area were investigated: (a) area actually irrigated during the agricultural year; (b) area which could be irrigated at the time of the census
Spain	1972	Irrigated land is the land supplied with water by artificial means during 1971/72. Land is considered under <u>permanent irrigation</u> when it has water suppliers sufficient to irrigate crops at the requested frequency and amount. Drainage referred to the draining of the area by easing the elimination of excess water impeding crops growth
<u>NORTH AMERICA</u>		
Canada	1971	Irrigation referred to the application of water to the land by artificial means, excluding systems used to water only home grounds and gardens. Area irrigated was reported only once
USA	1969	All land irrigated during 1969 was reported only once regardless of number of times irrigated or harvested. Also included: (i) land flooded during high water periods only if water was purposely applied for agricultural purposes, particularly rice or cranberry production; (ii) irrigated orchards whether harvested or not; (iii) irrigated wild hayland from which hay was cut. Area treated by more than one system of drainage was reported only once for the most important system. If different parts of holding had different types of drainage systems, information was recorded for all systems.
<u>LATIN AMERICA</u>		
Argentina	1969	Area actually irrigated by artificial means and by source of water was recorded
Antigua	1973-74	Definition of irrigation is same as FAO recommendation
Barbados	1971	Definition of irrigation is same as FAO recommendation
Belize	1973-74	See Antigua
Brazil	1970	Land irrigated with technical systems was recorded but areas irrigated manually were excluded
Costa Rica	1973	Irrigation is a deliberate supply of water to land to improve agricultural production (excluding rain)

<u>Region/ Country</u>	<u>Census Date</u>	<u>Country Practices</u>
Dominica	1971	Definition of irrigation is same as FAO recommendation
Dominican Rep.	1971	(a) Permanent irrigation referred to the area which could be irrigated artificially at any time during the year; (b) temporary irrigation referred to the area that could be irrigated artificially only during some weeks in a year
Ecuador	1974	Irrigation is defined as the practice to provide deliberately the land with water for improving production and pasture, including the voluntary inundation of fields with water from rivers or from rain water stored
French Antilles	1972	Irrigation is the supply of water to plants to satisfy their needs, when rain has not been sufficient, and in order to obtain more yield, etc. Drainage is removal of excess water by means of ditches
Jamaica	1968-69	Irrigated land was defined as the land watered for agricultural purposes by artificial means, including land flooded for rice cultivation and land flooded during high water periods if purposely applied for agricultural purposes by dams, canals or other works. Area irrigated at any time during 1968 was covered.
Mexico	1970	Area actually irrigated during Winter crop and Spring-Summer seasons was covered and was counted as many times as the harvests were reaped. Land provided with irrigation facilities during one or all of the last 5 years was also asked
Panama	1971	Irrigated land referred to the land on which water was applied artificially during 1970 for agricultural production purposes, independent of means of irrigation
Puerto Rico	1970	Total area irrigated at any time during 1969 was recorded only once, independent of number of times irrigated or number of crops harvested.
St. Lucia	1973-74	See Antigua
St. Vincent	1972	See Dominica
Uruguay	1970	Area irrigated during last 12 months, by crop, was asked
Venezuela	1971	Deliberate supply of water to the land for agricultural production purposes was defined as irrigation
<u>NEAR EAST</u>		
Iraq	1971-72	All area actually irrigated during 1970-71 was asked
Kuwait	1969-70	Source of irrigation and number of wells were recorded
Lebanon	1971-72	Irrigation referred to the operation of supplying land with water (other than rain) to produce crop or improve pastures, including rain water if transported to the field later on. Land actually irrigated during 1969, whether irrigated once or several times was recorded. Drainage: process of removing excess water from land in order to convert it from unproductive to productive and productive land into more productive
Saudi Arabia	1972-73	Irrigation is defined as FAO recommendation. Land irrigated is land irrigated during census year whether several times or only once. Physical area is reported
Turkey	1970-71	Area irrigated during 1970 crop year was asked. Area irrigated several times was counted only once

<u>Region/ Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>FAR EAST</u>		
Indonesia	1973	Technical, semi-technical, simple irrigation, pump and windmill methods of irrigation were required
Korea, Rep.of	1970	Only irrigation facilities regarding paddy fields were asked
Philippines	1971	Irrigation is the practice of artificially providing land with water to increase agricultural production. It included rain water accumulated in natural or man-made holes on the ground or in water tanks and later used to irrigate the fields. Coverage: (a) Actual physical area, i.e., the largest area irrigated at any one time during the crop year; (b) Total crop area, i.e., total area supplied with water during all cropping seasons Drainage is the removal of excess water from the surface of land by artificial means (canals, channels, etc.). Actual physical area provided with drainage facilities was reported

AFRICA

Algeria	1973	The land is considered irrigated if water is conveyed to it independently of meteorological conditions and the water equipment has been actually utilised during the reference time
Kenya	1969-70	Drainage referred to digging drains to take water out of the field
Liberia	1971	Irrigation referred to water other than rain supplied to the farm by pumps, ditches, etc. It included flooding by river water
Tanzania	1972	Irrigation referred to the provision of water, other than rain, by artificial means for crop production, field by field
Zambia	1971	Irrigation referred to the transfer of water from some source to crops, excluding rain and natural flooding when no human effort was involved. Drainage referred to the "settling of unwanted amount of water" during the crop year 1969-70

OCEANIA

New Zealand	1972	Area irrigated more than once during the year was recorded only once. Area actually irrigated was reported
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### Fertilizers

It was recommended, in the 1970 Programme to cover areas treated with chemical inorganic fertilizers and the quantity of fertilizers applied. It was further suggested that the area treated more than once with the inorganic fertilizers should be enumerated only once in reporting total area treated with fertilizers and again under each type of fertilizers applied. The total area treated would thus be less than the sum total of the areas reported under each kind of fertilizers separately.

Country practices in this respect are shown in Table 5.11. A number of countries enquired about the area treated with chemical fertilizers, e.g., Greece, Canada, USA, Argentina, Barbados, Ecuador, Panama, Peru, Surinam, Uruguay, Venezuela, Iraq, Kuwait, Lebanon, Saudi Arabia, Turkey, Philippines, Sri Lanka, Nigeria, Zambia, Australia, and New Zealand. A few countries did not ask for area treated but other information relating to fertilizers. Some countries such as Malta, Dominica, El Salvador and Botswana asked for quantities of fertilizers imported or applied on the farm. Korea inquired about the amount applied to rice and barley crops only. A few countries such as Portugal, Brazil, Lesotho asked if the fertilizers were used during the agricultural year. Brazil also enquired about the expenses and Puerto Rico about the value of commercial fertilizers purchased.

Table 5.11

Country practices in the 1970 World Census of Agriculture regarding Fertilizers

<u>Region/ Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>EUROPE</u>		
Greece	1971	Area treated with chemical fertilizer
Luxembourg	1970	Only if organic manure was used
Malta	1969	Quantity of artificial manure (chemical inorganic imported during 30 September 1968 to 28 September 1969 was reported)
Portugal	1968	The use of fertilizers on sale in granular or powder form during agricultural year was investigated
<u>NORTH AMERICA</u>		
Canada	1971	Area fertilized with commercial fertilizers during fall 1970 up to September 1971 was investigated for each crop. Areas of home grounds and gardens fertilized were excluded. Also areas with barnyard or ground manure only were excluded
USA	1969	Area fertilized for crops and pasture land was reported only once, regardless of the number of times fertilizers were applied
<u>LATIN AMERICA</u>		
Argentina	1969	Area treated with fertilizers, weed killers and pesticides was investigated. Area treated with fertilizers was reported only once regardless of the number of applications of the fertilizers to the successive crops
Barbados	1971	Area treated with inorganic fertilizers during 12 months as well as quantities applied were asked
Belize	1973-74	See Barbados
Brazil	1970	The use of organic chemical fertilizers was asked, also the expenses for the fertilizers during the census year, but neither area treated nor quantity applied were enquired
Dominica	1971	Quantity of inorganic fertilizers by kind, applied to the farm during the last 12 months was asked
Ecuador	1974	Area and amount by crop harvested during census year, if applied more than once, was reported only once; same for mixed crops. For successive crops it was reported for each crop whenever applied
El Savador	1971	Amount of organic and inorganic fertilizer used during census year
French Antilles	1972	Amount of organic or inorganic fertilizer used during the last 12 months
Grenada	1971	Amount used during census year by kinds of fertilizer
Honduras	1974	Value of fertilizers used during agricultural year (also value of pesticides). Coverage: Total amount of any chemical, commercial or artificial fertilizer applied during 1968. Names of crops fertilized were also asked. Excluded farmyard manure, crop residue or lime.

<u>Region/ Country</u>	<u>Census Year</u>	<u>Country Practices</u>
Montserrat	1972	Coverage: Any chemical or commercial fertilizer applied on the farm. Excluded farmyard manure, crop residue
Panama	1971	Area fertilized more than once was counted only once
Peru	1972	Area and amount of fertilizer by kind and by crop - period July-June 1971/72
Puerto Rico	1970	Value of commercial fertilizers purchased was asked
St. Lucia	1973-74	See Dominica
St. Vincent	1972	See Dominica
Surinam	1969	Area fertilized with organic or inorganic
Uruguay	1970	Area treated with fertilizers and quantity applied during last 12 months were asked
Venezuela	1971	Area treated with fertilizers and quantity applied during census year was asked. Area treated with fertilizers more than once was considered only once
<u>NEAR EAST</u>		
Iraq	1971-72	Area treated and quantity of organic and chemical fertilizer used during previous years
Kuwait	1969-70	Area treated with fertilizers (separately for organic manure and for chemical inorganic fertilizers) and actual amount applied during 1969-70 were asked
Lebanon	1971-72	Area treated with organic and inorganic chemical fertilizers by kind, and amount applied were asked
Saudi Arabia	1972-73	Area and amount used by kind of fertilizer during census year
Turkey	1970-71	Area treated with fertilizers, by type, was asked. Area treated more than once with the same kind of fertilizer was reported only once; if it was applied to different crops grown successively on the same land during the year, the area was reported for each crop separately. Area treated with two kinds of fertilizers was reported under each kind separately
<u>FAR EAST</u>		
Korea, Rep. of	1970	The amount of chemical inorganic fertilizers applied to the area under rice and barley was asked
Philippines	1971	Actual physical area and the total crop area treated with organic and chemical inorganic fertilizers separately, soil dressings and pesticides were asked; also quantity of each was asked
Singapore	1973	For some crops it was asked whether fertilizers were applied and what kind (organic or inorganic)
Sri Lanka	1973	Area treated and amount used of fishmeal, chemical pesticides, 1972/73



<u>Region/ Country</u>	<u>Census Year</u>	<u>Country Practices</u>
<u>AFRICA</u>		
Botswana	1969	Use (not area and quantity) of organic and chemical fertilizers was asked for tribal areas. For freehold farms, quantities of fertilizers and pesticides applied during last 12 months were asked
Cameroon	1972	Only if organic or inorganic fertilizers were used or not
Central African Rep.	1973	Only if organic or inorganic fertilizers were used or not
Chad	1972	Only if organic or inorganic fertilizers were used or not
Congo	1972	Only if organic or inorganic fertilizers were used or not
Gabon	1973-74	Only if organic or inorganic fertilizers were used or not
Lesotho	1970	Application of pesticides applied to different crops and to different fields was asked
Nigeria	1974-75	Area treated with: chemical fertilizers, manure or compost, lime, other
Zambia	1971	Area fertilized with manure and with chemical fertilizers and the quantity applied during October 1969-September 1970 were asked. Quantity proposed to be used during October 1970-September 1971 was also asked

OCEANIA

Australia	1971	Area treated and amount of artificial fertilizer used by kind and main crops and pastures
Fiji	1968	Use (not area or quantity) of fertilizers was enquired
New Zealand	1972	Area fertilized was asked. Area treated with fertilizer more than once during the year was recorded only once

### Wood and Fishery Products

The 1970 Programme suggested that production of wood and fishery products (excluding bark and the part of the catch retained for breeding and restocking) obtained from within the boundaries of the holding, should be investigated, irrespective of whether for home consumption or for sale.

As these products were infrequently obtainable from within the agricultural holdings, very few countries (about 10) investigated these two subjects in their censuses of agriculture. Those who did enquire about them had a variety of practices. Brazil, Mexico and Philippines were amongst those who enquired about quantity of all wood products. Canada limited itself to forest products sold, Argentina to timber production, by kind of trees, and New Zealand to production of roundwood only. Finland enquired about the quantity of fuelwood used on the holding and Germany and Mexico asked also about area of woodland.

### Association of Agricultural Holdings with Other Industries

The concept of association of agricultural holdings with other industries was introduced for the first time in the FAO Programme for the 1970 World Census of Agriculture.

The 1970 Programme listed various types of industries as an indication of those most likely to have holdings integrated with them. It also listed major crop and livestock products which were most likely to be produced under contract (usually written) specifying obligations of parties concerned (including agencies providing agricultural services).

A few countries tried to investigate this topic through their census and in varying forms. Brazil investigated the type of industry (extent of processing and transformation of agricultural products) and contract operations separately for planting, harvesting, etc. Portugal considered as association with others if at least three-quarters of the production was for sale or if three-quarters of the services were given to other holdings on remuneration. In Yugoslavia an agricultural holding was considered as reporting integration with industry if it was part of an establishment which was engaged in activity other than farming and if all parts of the establishment were organised as separate units with independent accounts. A few countries investigated about legal contracts. For instance, France enquired about written contracts for selling livestock, fruits and vegetables. Italy and Canada investigated reciprocal agreements between holding and commercial firms, specifying mutual obligations. Canada also included (a) contracts involving mainly sales arrangements with no financing by purchaser or processor; (b) rental contracts with landlord involved in sharing farm production; and (c) contracts with other farmers. Livestock and poultry contracts were considered contracts between the operator and the feed-dealers, processors (such as poultry eviscerating plants and meat packers), hatcheries, retailers and cooperatives. USA also investigated contract agreements between producer and persons or cooperatives or others who bought or used farm products, specifying terms and conditions. Sales and marketing contracts with marketing associations and cooperatives were also investigated in the USA. Philippines also investigated both association and contracts between large holdings and non-farm enterprises such as food-dealers, meat packers, canning factories, retailers, business cooperatives or those providing agricultural services such as consultant services, credit, storage, marketing services, supplying farm equipment, application of fertilisers and pesticides. Austria listed those products which the holder had contracted (to produce) with a cooperative or trading or industrial enterprise to guarantee prices and sales. Norway investigated (a) joint enterprises to produce milk; (b) joint grazing enterprises; (c) machine cooperation; and (d) land owning companies conserving and utilising rights of hunting and fishing on the land of group members.

CHAPTER VI

SCOPE OF NATIONAL AGRICULTURAL CENSUSES

Distribution of census items

The total number of items in the whole 1970 Programme was 562 out of which 97 items were in the Short List. The distribution of items by section is given below:

Items by Type and by Section in the 1970 Programme

Section	Items in the Short List	Other items	Total items in the Expanded List
0	20	15	35
1	5	9	14
2	37	188	225
3	22	64	86
4	3	16	19
5	2	6	8
6	6	95	101
7	1	17	18
8	1	12	13
9	-	10	10
10	-	33	33
Total	97	465	562

Explanatory Note

In the tables that follow the participation of a country in an item is indicated by a cross (x) and non-participation by a dash (-). A cross indicates that a question about the item was included in the national census questionnaire. Even when an item in the national census did not correspond exactly with the item proposed in the Programme, if it provided, in essence, substantial basic information related to the Programme item it was considered a census item within the framework of the Programme and has thus been marked with a cross in these tables. A dash in the tables against a country indicates that either a country did not include a question in the national census questionnaire or it was substantially different from that proposed in the Programme. For instance, if a country limited its enquiry to the irrigation facilities available in the country it was not considered as participation in the Programme which required area irrigated. On the other hand, if a country had not asked specifically whether inorganic fertilizers were applied on the holding during the year (Item 81-1 of the Programme) but had enquired about the area treated with specific chemical inorganic fertilizers or the amount applied or the expenditure on the purchase of the fertilizers, this information has been considered sufficient to indicate the use of inorganic fertilizers on the holding and therefore a cross against Item 81.1 was considered Justified. It may be possible that the synoptic tables contained in this Chapter giving details by items may not show a cross against a country for which a cross is indicated in the table by section. The reason is simply that the synoptic detailed tables cover only the items in the Short List whereas the table by section takes into account all items in the Expanded List.

The names of the countries listed in these tables refer to those used at the time of taking the census of agriculture. Changes occurring thereafter have been mentioned, wherever applicable, in the footnotes of Table 2.1 - Countries participating, with year of participation, in the World Censuses of Agriculture: 1970, 1960, 1950 and 1930.

Country participation, by section

Table 6.1 presents the extent of participation of countries in each Section of the 1970 Programme. It shows that 98 countries participated in Section 0 and 3 relating to Holding, Holder, Tenure and Type of Holding, and Livestock and Poultry, respectively. Other Sections that were covered by most of the countries in each region were Sections relating to Land Utilization, Crops, Employment in Agriculture and Agricultural Power and Machinery. On the other hand, the Section on Wood and Fishery Products was the only Section in which the least number of countries (19) participated.

Country participation, by items in the Short List

The tables included in this section indicate the participation of countries in the items given in the Short List only. These tables have been arranged according to the Sections of the Programme.

Section 0

The number of items in the Short List in Section 0 - Holding, Holder, Tenure and Type of Holding were 20. Participation in these items has been shown in two tables: Table 6.2 which includes items relating to holder and Table 6.3 which shows the items relating to holding and tenure. The two tables show that almost all the participating countries enquired about the name of the holder, location of the holding and total area of the holding. Some countries (e.g. USA, New Zealand) did not provide for the name of the holder in their questionnaires but were considered as having participated due to the fact that they had a list of the names of holders to whom the questionnaires were mailed. In a few countries, total area of the holding had not been specifically shown in their national census questionnaires. However, the total area could be obtained by the summation of different components of the total area. The item relating to the name and address of the hired manager was investigated the least. Similarly, the legal status of the holder was enquired by a lesser number of countries than those enquiring about the land tenure. The information on items relating to area owned and rented was asked by almost all countries in the Near East and Far East regions.

Table 6.1 - Extent of participation in the FAO Programme, by Section

Item and Number Region and Country	0. Holding, holder, tenure & type of holding	1. Land utilization	2. Crops	3. Live-stock and poultry	4. Employ-ment in agricul-ture	5. Farm popula-tion	6. Agricultural power and machinery & general transport facilities	7. Irriga-tion and drainage	8. Fertiliz-ers and soil dressings	9. Wood & fishery products	10. Associa-tion of agricul-tural holdings with other industries
Participating countries in each section	98	86	94	98	88	66	91	59	66	19	25
<u>EUROPE (22)</u>	22	22	20	22	20	14	22	11	9	3	9
Austria	x	x	x	x	x	x	x	-	-	x	x
Belgium	x	x	x	x	x	x	x	-	-	-	x
Czechoslovakia	x	x	x	x	x	-	x	x	x	-	-
Denmark	x	x	x	x	x	-	x	-	-	-	-
Finland	x	x	x	x	x	x	x	x	x	x	-
France	x	x	x	x	x	x	x	x	-	-	x
Germany, Fed. Rep. of	x	x	x	x	x	-	x	x	-	-	x
Greece	x	x	x	x	-	x	x	-	x	-	-
Hungary	x	x	-	x	x	x	x	-	-	-	-
Ireland	x	x	x	x	x	-	x	-	-	-	-
Italy	x	x	x	x	x	x	x	x	-	-	x
Luxembourg	x	x	x	x	x	x	x	-	x	-	-
Malta	x	x	x	x	x	x	x	-	x	-	-
Netherlands	x	x	x	x	x	-	x	-	-	-	-
Norway	x	x	x	x	x	x	x	x	x	-	x
Poland	x	x	-	x	-	x	x	-	-	-	-
Portugal	x	x	x	x	x	x	x	x	x	-	x
Spain	x	x	x	x	x	x	x	x	x	-	x
Sweden	x	x	x	x	x	-	x	-	-	-	-
Switzerland	x	x	x	x	x	-	x	-	-	-	-
United Kingdom	x	x	x	x	x	-	x	x	-	-	-
Yugoslavia	x	x	x	x	x	x	x	x	x	x	x
<u>NORTH AMERICA (2)</u>	2	2	2	2	2	0	2	2	2	2	2
Canada	x	x	x	x	x	-	x	x	x	x	x
United States of America	x	x	x	x	x	-	x	x	x	x	x



Table 6.1 (cont.)

Number and Item Region and Country	0. Holding, holder, tenure & type of holding	1. Land utilization	2. Crops	3. Live-stock and poultry	4. Employment in agriculture	5. Farm population	6. Agricultural power and machinery & general transport facilities	7. Irrigation and drainage	8. Fertilizers and soil dressings	9. Wood & fishery products	10. Association of agricultural holdings with other industries
<b>NEAR EAST (9)</b>	9	9	9	9	8	8	8	8	7	1	1
Bahrain	x	x	x	x	x	x	x	x	x	-	-
Iraq	x	x	x	x	x	x	x	x	x	-	-
Israel	x	x	x	x	x	x	x	x	-	x	x
Kuwait	x	x	x	x	x	x	x	x	-	-	-
Lebanon	x	x	x	x	x	x	x	x	-	-	-
Libyan Arab Republic	x	x	x	x	-	x	-	x	-	-	-
Saudi Arabia	x	x	x	x	x	x	x	x	x	-	-
Syrian Arab Republic	x	x	x	x	x	-	x	x	x	-	-
Turkey	x	x	x	x	x	x	x	x	x	-	-
<b>FAR EAST (10)</b>	10	8	10	10	8	8	9	7	5	4	1
India	x	x	x	x	x	x	x	x	x	-	-
Indonesia	x	x	x	x	-	x	x	x	-	x	-
Japan	x	x	x	x	x	x	x	x	-	-	-
Korea, Rep. of	x	x	x	x	x	x	x	-	x	-	-
Laos	-	-	-	-	-	-	-	-	-	-	-
Nepal	x	x	x	x	x	x	x	x	x	-	-
Pakistan	x	x	x	x	x	x	x	x	-	x	-
Philippines	x	x	x	x	x	x	x	x	-	x	-
Singapore	x	x	x	x	x	x	x	-	-	-	-
Sri Lanka	x	x	x	x	x	x	x	x	-	-	-
<b>AFRICA (22)</b>	22	12	22	22	21	20	21	7	17	1	4
Algeria	x	x	x	x	x	x	-	x	-	-	-
Botswana	x	x	x	x	x	x	x	x	x	-	-
Cameroon	x	-	x	x	x	x	x	-	-	-	-
Central African Republic	x	-	x	x	x	x	x	-	-	-	-
Chad	x	-	x	x	x	x	x	-	-	-	-
Congo	x	-	x	x	x	x	x	-	-	-	-
Gabon	x	-	x	x	x	x	x	-	-	-	-
Ghana	x	-	x	x	x	x	x	-	-	-	-
Guinea	x	x	x	x	x	x	x	-	-	-	-
Ivory Coast	x	x	x	x	-	x	x	-	-	-	x

Table 6.1 (cont.)

Number and Item	0. Holding, holder, tenure & type of holding	1. Land utilization	2. Crops	3. Live-stock and poultry	4. Employment in agriculture	5. Farm population	6. Agricultural power and machinery & general transport facilities	7. Irrigation and drainage	8. Fertilizers and soil dressings	9. Wood & fishery products	10. Association of agricultural holdings with other industries
<u>AFRICA (cont.)</u>											
Kenya	x	x	x	x	x	x	x	-	x	-	-
Lesotho	x	x	x	x	x	x	x	-	x	-	-
Liberia	x	x	x	x	x	x	x	-	x	-	-
Malawi	x	x	x	x	x	x	x	-	x	-	-
Nigeria	x	-	x	x	x	x	x	x	x	-	-
Sierra Leone	x	-	x	x	x	x	x	-	x	-	x
South Africa	x	-	x	x	x	-	x	-	-	-	-
Swaziland	x	x	x	x	x	x	x	x	x	-	x
Tanzania	x	x	x	x	x	x	x	-	-	-	-
Togo	x	x	x	x	x	x	x	-	-	-	-
Zaire	x	x	x	x	x	x	x	-	-	-	-
Zambia	x	-	x	x	x	-	x	x	x	-	-
<u>OCEANIA (6)</u>	6	6	6	6	6	2	4	2	2	1	0
American Samoa	x	x	x	x	x	-	x	-	-	-	-
Australia	x	x	x	x	x	x	x	x	x	-	-
Fiji	x	x	x	x	x	x	-	-	-	-	-
Guam	x	x	x	x	x	-	x	-	-	-	-
New Zealand	x	x	x	x	x	-	-	-	x	-	-
Pacific Islands (Trust Territory)	x	x	x	x	x	-	x	-	-	-	-



Table 6.2 - Extent of participation in Section 0 relating to Holder

Item and Number	Region and Country	Name	Age	02.1	02.2	02.4	02.5	02.6	02.7	02.8 Legal status					
										02.81	02.82	02.83	02.84	02.85	02.89
Total number of countries asking question		98	63	55	39	15	18	53	36	37	6	42			
EUROPE (22)		22	13	13	6	2	3	11	6	6	0	9			
Austria		X	-	-	-	-	-	X	X	X	-	X			
Belgium		X	X	X	X	X	X	X	X	X	-	X			
Czechoslovakia		X	X	X	X	X	X	X	X	X	-	X			
Denmark		X	-	-	-	-	-	X	X	X	-	X			
Finland		X	-	-	-	-	-	X	X	X	-	X			
France		X	X	X	X	X	X	X	X	X	-	X			
Germany, Fed. Rep. of		X	X	X	X	X	X	X	X	X	-	X			
Greece		X	X	X	X	X	X	X	X	X	-	X			
Hungary		X	X	X	X	X	X	X	X	X	-	X			
Ireland		X	-	-	-	-	-	X	X	X	-	X			
Italy		X	X	X	X	X	X	X	X	X	-	X			
Luxembourg		X	X	X	X	X	X	X	X	X	-	X			
Malta		X	X	X	X	X	X	X	X	X	-	X			
Netherlands		X	X	X	X	X	X	X	X	X	-	X			
Norway		X	X	X	X	X	X	X	X	X	-	X			
Poland		X	X	X	X	X	X	X	X	X	-	X			
Portugal		X	X	X	X	X	X	X	X	X	-	X			
Spain		X	X	X	X	X	X	X	X	X	-	X			
Sweden		X	X	X	X	X	X	X	X	X	-	X			
Switzerland		X	X	X	X	X	X	X	X	X	-	X			
United Kingdom		X	X	X	X	X	X	X	X	X	-	X			
Yugoslavia		X	X	X	X	X	X	X	X	X	-	X			
<u>NORTH AMERICA (2)</u>		2	2	2	0	0	0	1	0	0	0	1			
Canada		X	X	X	-	-	-	-	-	-	-	-			
United States of America		X	X	X	-	-	-	-	-	-	-	-			

1/ The item refers to "Juridical person".

Table 6.2 (Cont.)

Item and Number Region and Country	Name 02.1	Age 02.2	Address if he does not live on the holding 02.4	Indication as to whether holding is managed entirely by holder or whether holder has a hired manager 02.5	Name of hired manager and his address if he does not live on the holding. 02.6	Is the holding operat ed jointly by two or more households? 02.7	02.8 Legal status					
							Civil person 02.81	Corporation 02.82	Cooperative or consciously planned collective 02.83	Government 02.84	Tribe and/or clan 02.85	Other 02.89
LATIN AMERICA (27)	27	16	21	16	4	1	18	16	15	13	2	13
Antigua	X	X	X	X	-	-	X	X	X	X	-	X
Argentina	X	-	X	X	-	-	X	X	X	X	-	X
Barbados	X	-	X	X	-	-	X	X	X	X	-	X
Belize	X	X	X	X	X	-	X	X	X	X	-	X
Brazil	X	-	X	X	X	-	X	X	X	X	-	X
Colombia	X	-	X	X	X	-	X	X	X	X	-	X
Costa Rica	X	X	X	X	X	-	X	X	X	X	-	X
Dominica	X	X	X	X	X	-	X	X	X	X	-	X
Dominican Republic	X	X	X	X	X	-	X	X	X	X	-	X
Ecuador	X	-	X	X	X	-	X	X	X	X	-	X
El Salvador	X	-	X	X	X	-	X	X	X	X	-	X
French Antilles	X	-	X	X	X	-	X	X	X	X	-	X
Haiti	X	X	X	X	X	-	X	X	X	X	-	X
Honduras	X	X	X	X	X	-	X	X	X	X	-	X
Jamaica	X	X	X	X	X	-	X	X	X	X	-	X
Mexico	X	-	X	X	X	-	X	X	X	X	-	X
Montserrat	X	-	X	X	X	-	X	X	X	X	-	X
Nicaragua	X	X	X	X	X	-	X	X	X	X	-	X
Panama	X	X	X	X	X	-	X	X	X	X	-	X
Peru	X	X	X	X	X	-	X	X	X	X	-	X
Puerto Rico	X	X	X	X	X	-	X	X	X	X	-	X
St. Lucia	X	X	X	X	X	-	X	X	X	X	-	X
St. Vincent	X	X	X	X	X	-	X	X	X	X	-	X
Surinam	X	X	X	X	X	-	X	X	X	X	-	X
Uruguay	X	-	X	X	X	-	X	X	X	X	-	X
Venezuela	X	X	X	X	X	-	X	X	X	X	-	X
Virgin Islands (U.S.)	X	X	X	X	X	-	X	X	X	X	-	X

Table 6.2 (cont.)

Region and Country	Item and Number	Name	Age	02.4	02.5	02.6	02.7	02.8 Legal status					
								02.81	02.82	02.83	02.84	02.85	02.89
				Address if he does not live on the holding	Indication as to whether holding is managed entirely by holder or whether holder has a hired manager	Name of hired manager and his address if he does not live on the holding.	Is the holding operated jointly by two or more householders?	Civil person	Corporation	Cooperative or consciously planned collective	Government	Tribe and/or clan	Other
		02.1	02.2	02.4	02.5	02.6	02.7	02.81	02.82	02.83	02.84	02.85	02.89
<b>AFRICA (22)</b>		22	13	6	10	3	5	7	3	5	7	1	4
Algeria		x	-	-	-	-	-	x	-	-	x	-	x
Botswana		x	x	-	-	-	x	-	-	-	-	-	-
Cameroon		x	-	-	x	-	-	-	-	-	-	-	-
Central African Rep.		x	-	-	x	-	-	-	-	-	-	-	-
Chad		x	-	-	x	-	-	-	-	-	-	-	-
Congo		x	-	-	x	-	-	-	-	-	-	-	-
Gabon		x	x	-	x	-	-	x	-	-	-	-	-
Ghana		x	x	-	x	-	-	x	-	-	x	-	-
Guinea		x	x	-	-	-	-	x	x	x	-	-	-
Ivory Coast		x	x	-	x	-	-	x	-	-	-	-	-
Kenya		x	-	-	-	-	-	-	-	-	-	-	-
Lesotho		x	x	-	-	-	x	-	-	-	-	-	-
Liberia		x	x	x	-	-	-	x	-	-	-	-	-
Malawi		x	x	-	-	-	-	-	x	-	-	-	-
Nigeria		x	x	-	-	-	-	-	-	-	-	-	-
Sierra Leone		x	x	-	x	-	-	-	-	-	-	-	-
South Africa		x	-	x	-	-	-	-	-	-	-	-	-
Swaziland		x	-	x	-	-	x	-	-	-	-	-	-
Tanzania		x	-	x	-	-	-	-	-	x	-	-	-
Togo		x	x	x	-	-	-	-	-	-	-	-	-
Zaire		x	x	-	x	-	-	-	-	-	-	-	-
Zambia		x	x	-	-	-	-	-	-	x	-	-	-



Table 6.3- Extent of participation in Section O relating to Holding and Tenure

Item and Number  Region and Country	0.1 Holding			0.3 Tenure				
	Location	Number of parcels	Total area	Area owned	Area rented	Area operated on squatter basis	Area operated on tribal or traditional communal forms of tenure	Other forms of tenure
	01.1	01.2	01.3	03.1	03.2	03.3	03.4	03.9
Total number of countries asking question	98	67	98	79	66	24	23	43
<u>EUROPE</u> (22)	22	11	22	18	16	1	2	7
Austria	x	x	x	x	x	-	-	-
Belgium	x	x	x	x	x	-	-	-
Czechoslovakia	x	-	x	-	-	-	-	-
Denmark	x	-	x	x	x	-	-	-
Finland	x	-	x	x	x	-	-	-
France	x	-	x	x	x	-	-	-
Germany, Fed. Rep. of	x	x	x	x	x	-	-	x
Greece	x	x	x	x	-	-	-	-
Hungary	x	-	x	x	x	x	x	x
Ireland	x	-	x	-	-	-	-	-
Italy	x	x	x	x	x	-	-	x
Luxembourg	x	-	x	x	x	-	-	x
Malta	x	x	x	x	-	-	-	x
Netherlands	x	x	x	x	x	-	-	-
Norway	x	x	x	x	x	-	-	-
Poland	x	-	x	x	x	-	-	-
Portugal	x	x	x	x	x	-	-	-
Spain	x	x	x	x	x	-	x	x
Sweden	x	-	x	-	-	-	-	-
Switzerland	x	-	x	-	-	-	-	-
United Kingdom	x	-	x	x	x	-	-	-
Yugoslavia	x	x	x	x	x	-	-	x
<u>NORTH AMERICA</u> (2)	2	0	2	2	2	0	0	1
Canada	x	-	x	x	x	-	-	x
United States of America	x	-	x	x	x	-	-	-
<u>LATIN AMERICA</u> (27)	27	21	27	15	11	9	9	10
Antigua	x	x	x	x	-	-	-	x
Argentina	x	-	x	-	-	-	-	-
Barbados	x	x	x	x	x	x	x	x
Belize	x	x	x	x	-	-	-	-
Brazil	x	-	x	-	-	x	x	x
Colombia	x	x	x	-	-	-	-	-
Costa Rica	x	x	x	-	-	-	-	-
Dominica	x	x	x	-	-	-	-	-
Dominican Republic	x	x	x	-	-	-	-	-
Ecuador	x	-	x	-	-	-	-	-



Table 6.3 (cont.)

Item and Number  Region and Country	0.1 Holding			0.3 Tenure				
	Location	Number of parcels	Total area	Area owned	Area rented	Area operated on squatter basis	Area operated on tribal or traditional communal forms of tenure	Other forms of tenure
	01.1	01.2	01.3	03.1	03.2	03.3	03.4	03.9
<u>AFRICA</u> (22)	22	18	22	19	13	9	10	10
Algeria	x	x	x	x	x	-	-	-
Botswana	x	x	x	x	x	-	-	-
Cameroon	x	x	x	x	-	x	x	x
Central African Republic	x	x	x	x	-	x	x	x
Chad	x	x	x	x	x	x	x	x
Congo	x	x	x	x	-	x	x	x
Gabon	x	x	x	x	x	x	x	-
Ghana	x	x	x	x	x	-	-	x
Guinea	x	x	x	-	-	-	-	-
Ivory Coast	x	-	x	x	x	-	-	x
Kenya	x	x	x	-	-	-	-	-
Lesotho	x	x	x	x	x	-	-	-
Liberia	x	x	x	x	x	-	x	-
Malawi	x	x	x	-	-	-	-	-
Nigeria	x	-	x	x	x	x	x	x
Sierra Leone	x	-	x	x	x	x	x	x
South Africa	x	-	x	x	-	-	-	-
Swaziland	x	x	x	x	x	-	-	-
Tanzania	x	x	x	x	x	-	-	-
Togo	x	x	x	x	x	x	x	x
Zaire	x	x	x	x	-	x	x	x
Zambia	x	x	x	x	-	-	-	-
<u>OCEANIA</u> (6)	6	4	6	6	5	2	0	4
American Samoa	x	x	x	x	x	-	-	x
Australia	x	-	x	x	x	-	-	-
Fiji	x	x	x	x	-	x	-	x
Guam	x	x	x	x	x	x	-	x
New Zealand	x	-	x	x	x	-	-	x
Pacific Islands (Trust Territory)	x	x	x	x	x	-	-	-

## Section 1

The extent of participation in the items given in Section 1 of the Programme relating to land utilization is shown in Table 6.4. Almost all countries in all the regions except Africa included, in their national censuses, questions about land utilization. In Africa only 13 countries out of 22 enquired about it.

The first item in the Short List of this Section related to major group 11 - "Arable land". This major group had five sub-divisions, as follows:

- 11.1 Land under temporary crops (except market and kitchen gardens and cultivation under glass)
- 11.2 Land under temporary meadows (for mowing or pasture)
- 11.3 Land under market and kitchen gardens, including cultivation under glass
- 11.4 Land temporarily fallow
- 11.5 All other arable land.

Very few countries asked one question about area under arable land as such. The majority of them preferred to include separate questions which corresponded more or less to those sub-divisions given above. For instance, Portugal and Pacific Islands (Trust Territory) included five questions about all these sub-divisions. Other countries have asked less than these five questions or have used different terminologies to those included in the Programme. In addition to the arable land, other terminologies have also been adopted. For instance, the term "cropland" has been used to indicate area under arable land together with land under permanent crops in a few countries such as Netherlands, Canada, U.S.A., Puerto Rico and Guam. Other terms used to indicate the combination of these two major groups, namely "arable land" and "land under permanent crops" were: "land under crops" (American Samoa), "land under cultivation" or "total cultivated area" (Malta, Pakistan), "total field and garden area" (Norway). A broader terminology, namely "agricultural land", was used by Denmark to indicate the areas under arable land plus under permanent crops plus under permanent meadows and pastures. The term "cropland" used by some countries such as St. Vincent, Saudi Arabia and Turkey does not include land under permanent crops.

Almost all countries included a question concerning the land under permanent crops. A few countries, as already mentioned, had included this category of land utilization in a broader term such as cropland or agricultural land, etc. Some countries have termed it as tree-crop (e.g. Luxembourg, Montserrat), a few have called it fruit trees (e.g. Iraq, Kuwait, Syrian Arab Republic); in Finland it was called gardens (including nurseries) and Austria has indicated it as vineyards, orchards, nurseries excluding forest nurseries.

The major group 13. "Permanent meadows and pastures" in the Programme had two separate sub-divisions, namely "cultivated meadows and pastures" and "uncultivated meadows and pastures". A large number of countries included two separate questions for each of these sub-divisions in their national census questionnaires. Different terminologies have been given under this item, for example, pasture for grazing land (Virgin Islands), natural pastures (Israel), permanent fodder (Kuwait). The United Kingdom included area under permanent grass in the category of arable land but had a separate question for rough grazing which relates to "permanent meadows and pastures".

The item "wood or forest land" has also been extensively investigated in most of the countries in the regions except those in Africa and Oceania. Apparently the agricultural holdings in these regions do not have significant wood or forest land.

The last major group in the Land Utilization Section referring to "all other land" also was sub-divided into two items, namely "unused land" and "land in the holding not classified elsewhere". A large number of countries included two separate questions which approximated to these two sub-divisions. Different terminologies were also given, for example, uncultivated area (Hungary), other cultivated land (Luxembourg), total uncultivated area (Pakistan), unproductive land (Australia).



Table 6.4 - Extent of participation in Section 1 relating to Land Utilization

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
Total number of countries asking question		15	71	74	61	75
<u>EUROPE (22)</u>		10	16	19	17	20
Austria		X	X	X	X	X
Belgium	Separate questions for: (i) temporary grassland (1) for mowing, (2) for pasture; and (ii) fallow land.		X	X	X	X
Czechoslovakia		X	X	X	X	X
Denmark	← Agricultural land →					
Finland		X	X	X	X	X
France		X	X	X	X	X
Germany, Fed. Rep. of	Separate questions for land under temporary crops and under market and kitchen gardens.		X	X	X	X
Greece	Separate questions for land under temporary crops, grassland for cutting hay and for fallow land (up to 5 years).		X			
Hungary		X	X	X	X	X (Uncultivated area).
Ireland	Separate questions for: (i) corn crop, root and green crops, vegetables, rye grass for seed; (ii) first year's grassland for hay. Rotation pasture under 5 years old; and (iii) horticultural bulbs, flowers and bushes incl. ornamental trees and nurseries of fruit trees.		X	X	Woods and plantations (excl. shelter-belts and hedgerow timber).	X

Table 6.4 (cont.)

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
<u>EUROPE (cont.d)</u>						
Italy	Four separate questions for: (i) land under temporary crops; (ii) temporary meadows; (iii) market and kitchen gardens; and (iv) temporarily fallow.		X	X	X	X
Luxembourg		X	X	X	X	X
Malta	← Land under cultivation or cropland →			-	-	X (Wasteland).
Netherlands	← Cropland →			X (Permanent Grass).	X	X
Norway	← Total field and garden area →			X	X	X
Poland	Separate questions for: (i) arable and horticultural land; and (ii) nurseries.		-	X	X	X
Portugal	Five separate questions.		X	X	X	X
Spain	Six separate questions: (i) temporary crops alone or associated; (ii) olive trees alone or associated with temporary crops; (iii) vines alone or associated with temporary crops; (iv) orchards alone or associated; (v) orchards, olive trees and vines; and (vi) temporary crops associated with forest trees.			X	X	X
Sweden		X	X	X	X	X
Switzerland		X	X	X	-	X
United Kingdom	(Including permanent grass).	X	X	X (Rough grazing).	X	X
Yugoslavia		X	X	X	X	X

Table 6.4 (Cont.)

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
<b>NORTH AMERICA (2)</b>						
Canada		—	—	2	2	2
		← Cropland for harvest	→	X	X	X
United States of America		← Cropland harvested	→	X	X	X
<b>LATIN AMERICA (27)</b>						
Antigua	Four separate questions for: (i) land under temporary crops; (ii) temporary meadows; (iii) temporarily fallow; and (iv) all other arable land.	—	25	27	25	26
Argentina	Four separate questions for: (i) land under temporary crops; (ii) temporary meadows; (iii) market and kitchen gardens; and (iv) temporarily fallow.	—	X	X	X	X
Barbados	Two separate questions for: (i) land under temporary crops; and (ii) temporarily fallow.	—	X	X	X	X
Belize	Four separate questions for: (i) land under temporary crops; (ii) temporary meadows; (iii) temporarily fallow; and (iv) all other arable land.	—	X	X	X	X
Brazil	Three separate questions for: (i) land under temporary crops; (ii) temporarily fallow; and (iii) all other arable land.	—	X	X	X	X
Colombia	One question for temporarily fallow land.	—	X	X	X	X
Costa Rica	Four separate questions for: (i) land under temporary crops; (ii) market and kitchen gardens; (iii) temporarily fallow; and (iv) all other arable land.	—	X	X	X	X

Table 6. 4 (cont.)

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
LATIN AMERICA (cont.d)						
Dominica	One question for land under temporary crops.		X	X	X	X
Dominican Rep.	← ————— Cultivated and sown land ————— →			X	X	X
Ecuador	Two separate questions for: (i) land under temporary crops; and (ii) temporarily fallow.		X	X	X	X
El Salvador	One question for temporarily fallow.		X	X	X	X
French Antilles	Three separate questions for: (i) land under temporary crops; (ii) market and kitchen gardens; and (iii) temporarily fallow.		X	X	X	X
Haiti	Three separate questions for: (i) land under temporary crops; (ii) temporarily fallow; and (iii) all other arable land.		X	X	X (With or without pasture).	X
Honduras	Two separate questions for: (i) land under temporary crops; and (ii) temporarily fallow.		X	X	X	X
Jamaica	Two separate questions for: (i) land under temporary crops; and (ii) temporarily fallow.		X	X	X	X
Mexico	One question for land under temporary crops.		X	X	X	X
Montserrat	Two separate questions for: (i) land under temporary crops; and (ii) temporarily fallow.		X	X	X	X

Table 6.4 (cont.)

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
<b>LATIN AMERICA (cont.d)</b>						
Nicaragua	Four separate questions for: (i) temporary crops; (ii) temporary meadows; (iii) temporarily fallow; and (iv) other land.		X	X	X	X
Panama	Two separate questions for: (i) land under temporary crops; and (ii) temporarily fallow.		X	X	X	X
Peru	Two separate questions for: (i) temporarily fallow; and (ii) all other arable land.		X	X	X	X
Puerto Rico	← ————— Cropland harvested ————— →			X	X (With or without pasture).	X
St. Lucia	Four separate questions for: (i) land under temporary crops; (ii) temporary meadows; (iii) temporarily fallow; and (iv) all other arable land.		X	X	X	X
St. Vincent	Cropland.		X	X	X	X
Surinam	One question for land under temporary crops.		X	X	-	X (Incl. yard and yard crops).
Uruguay	Four separate questions for: (i) land under temporary crops; (ii) annual forage crops; (iii) horticultural land; and (iv) land idle for not more than 2 years.		X	X	X	X
Venezuela	Four separate questions for: (i) land under temporary crops; (ii) temporary meadows; (iii) temporarily fallow for less than 2 years; and (iv) all other arable land.		X	X	X	X

Table 6.4 (cont.)

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
<u>LATIN AMERICA (cont.d)</u>						
Virgin Islands (U.S.)		Four separate questions for: (i) land under temporary crops; (ii) temporary meadows; (iii) temporarily fallow; and (iv) all other arable land.	X	X	X	X
<u>NEAR EAST (9)</u>						
Bahrain	2	Two separate questions for: (i) land under temporary meadows; and (ii) land under market and kitchen gardens.	9 X	7 -	6 -	9 X
Iraq		Three separate questions for: (i) land under temporary crops; (ii) temporary meadows; and (iii) temporarily fallow.	X	X	X	X
Israel	X		X	X	-	X
Kuwait		Three separate questions for: (i) under rotation; (ii) temporarily fallow; and (iii) total under rotation.	X	X	X (Incl. ornamental trees).	X
Lebanon		Seasonal crops.	X	X	X	X
Libyan Arab Rep.		<b>Five separate questions.</b>	X	X	X	X
Saudi Arabia		Two separate questions for: (i) cropland; and (ii) temporarily fallow.	X	-	-	X
Syrian Arab Rep.	X		X	X	X	X
Turkey		Four separate questions for: (i) cropland; (ii) temporary fodder crops; (iii) vegetable gardens (incl. greenhouses); and (iv) temporarily fallow.	X	X	X	X

Table 6.4 (Cont.)

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
FAR EAST (8)		2	7	7	6	6
India	(Net area sown).	X	X	X	-	X
Indonesia	Separate questions for: rice field, dry fields, land for yearly crops.		X	X	X	X
Japan	Four separate questions for: (i) paddy field; (ii) temporary meadows; (iii) market and kitchen gardens; and (iv) temporarily fallow.		X	X	X	-
Korea, Rep. of	Three separate questions for: (i) land for agriculture; (ii) paddy field upland; and (iii) market and kitchen gardens.		X	X	-	-
Nepal		X	X	X	X	X
Pakistan	← Total cultivated area →			-	X	X
Philippines	Three separate questions for: (i) land under temporary crops; (ii) lying idle (temporary pastures); and (iii) lying idle (temporarily fallow).		X	X	X	X
Sri Lanka	One question for land under temporary crops.		X	X	X	X
AFRICA (13)		1	12	8	4	8
Algeria	Three separate questions for: (i) temporary crops; (ii) temporary meadows; and (iii) temporarily fallow.		X	X	X	X
Botswana	Three separate questions for: (i) land under temporary crops; (ii) temporary meadows; and (iii) temporarily fallow.		X	X	-	X
Guinea		X	X	-	-	-

Table 6.4 (Cont.)

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
<b>AFRICA (cont.d)</b>						
Ivory Coast		Three separate questions for: (i) land under temporary crops; (ii) temporarily fallow; and (iii) all other arable land.	X	X	X	X
Kenya		Three separate questions for: (i) land under temporary crops; (ii) temporary meadows; and (iii) temporarily fallow.	X	X	-	X
Lesotho		Three separate questions for: (i) land under temporary crops; (ii) market and kitchen gardens; and (iii) temporarily fallow.	X	-	-	-
Liberia		One question for crops in pure stand.	X	-	-	-
Malawi		Four separate questions for: (i) same crop; (ii) different crop or crop mixture; (iii) temporarily fallow; and (iv) new land.	-	-	-	-
Swaziland		Two separate questions for: (i) land under temporary crops; and (ii) temporarily fallow.	X	X	X	X
Tanzania		Two separate questions for: (i) net area sown; and (ii) temporarily fallow.	X	X	X	X
Togo		Two separate questions for: (i) land under temporary crops; and (ii) temporarily fallow.	X	X	-	X
Zaire		One question for land under temporary crops.	X	-	-	-
Zambia		Two separate questions for: (i) gross cropped area; and (ii) temporarily fallow.	X	X	-	X



Table 6.4 (concluded)

Region and Country	Item and Number	11. Arable land	12. Land under permanent crops	13. Permanent meadows and pastures	14. Wood or forest land	15. All other land
<b>OCEANIA (5)</b>						
American Samoa	←	-	2	4	1	4
		Land under crops	→	X	-	X
Australia	←	Area used for crops.	X	X	-	X
Guam	←	→	→	X	-	X
		Cropland				
New Zealand	←	Land in or prepared for fruit, grain, nursery, vegetables or fodder crops.	→	X	X	X
Pacific Islands (Trust Territory)		Five separate questions.	X	-	-	-

## Section 2

The participation of countries in the items relating to crops is shown in three tables. Table 6.5 relates to cereals harvested for grain, Table 6.6 relates to temporary crops other than cereals and Table 6.7 relates to permanent crops.

A few countries asked for area but did not mention the names of the crops in the questionnaires. These crops were expected to be listed by the enumerators according to what was grown or harvested on the holding. These countries (e.g. Kuwait, Lebanon, Libyan Arab Republic, Syrian Arab Republic, Turkey, Ghana, Togo and Fiji) are not shown in Tables 6.5 and 6.6. Similarly, a few countries (e.g. Portugal, Malawi) did not ask for area or production of crops but enquired whether the farmer had grown or harvested any of the crops mentioned on the census questionnaire. Such countries are also not shown in the tables. Sierra Leone enquired about the quantity and value of crops sold or traded and therefore is shown in these tables.

With reference to Table 6.7. relating to specified permanent crops the Programme in the Short List, recommended the collection of total area and total number of trees in compact plantations and number of scattered trees as against total area for temporary crops. Collection of data on production was optional for both temporary and permanent crops but this information has also been included in the three tables on crops. Some countries asked for total area only or total number of trees only. Several countries, instead of asking total area and total number of trees, asked two separate questions relating to area and number of trees of productive age and of non-productive age. The presence of these two questions indicates the participation in the total area and the total number of trees. The first column of Table 6.7 indicates information enquired against each country. Not all the information indicated in the first column is collected for all the items for which a cross has been placed in the table. While, in general, it may be true for most of the items, it may not apply for some items in a few countries for which either area or number of trees only may be appropriate.

## Section 3

The extent of national participation in the items relating to livestock and poultry is shown in Table 6.8 for horses, mules, asses, cattle and buffaloes and in Table 6.9 for sheep, goats, pigs and poultry. A few countries (e.g. Austria, Finland, New Zealand) did not include in their census questionnaires a specific question for total cattle. However, from the breakdown variety of questions included therein it was apparent that the total for cattle could be obtained which indicated their participation.

Those countries which did not ask a specific question for pigs but where it was evident that the total could be obtained from the summation of the information through other questions, were included under the item on total pigs.

While most countries asked for many of the items shown in the two tables, a few items were not investigated at all in almost all countries in some regions. For instance, only four countries in Europe enquired about buffaloes, none in North America, only two in Latin America and only one in Africa. Information on pigs was not collected by any country in the Near East region, except Israel, and by only two countries in Oceania.

Table 6.5- Extent of participation in Section 2 relating to cereals harvested for grain

Region and Country	Item and Number	Information asked for: Area = A Production = P	Wheat	Rye	Rice	21.14 Millet and sorghum		Maize	Barley	Oats	
			21.11	21.12	21.13	Total	Millet	Sorghum	21.15	21.16	21.17
						21.14	(a)	(b)			
Total number of countries asking question			49	21	48	6	14	25	66	38	26
<u>EUROPE</u> (19)			18	15	4	0	1	1	11	16	14
Austria	A	x	x	-	-	-	-	x	x	x	
Belgium	A	-	x	-	-	-	-	x	x	x	
Czechoslovakia	A P	x	x	-	-	-	-	x	x	-	
Denmark	A	x	x	-	-	-	-	-	x	x	
Finland	A	x	x	-	-	-	-	-	x	x	
France	A	x	x	x	-	-	x	x	x	x	
Germany, Fed. Rep. of	A	x	x	-	-	-	-	x	-	x	
Greece	A	x	-	-	-	-	-	x	-	-	
Ireland	A	x	x	-	-	-	-	-	x	x	
Italy	A	x	-	x	-	-	-	x	-	-	
Luxembourg	A	x	x	-	-	-	-	-	x	x	
Malta	A P	x	-	-	-	-	-	-	x	-	
Netherlands	A	x	x	-	-	-	-	-	x	x	
Norway	A	x	x	-	-	-	-	-	x	x	
Spain	A	x	-	x	-	-	-	x	x	-	
Sweden	A	x	x	-	-	-	-	-	x	x	
Switzerland	A	x	x	-	-	-	-	x	x	x	
United Kingdom	A	x	x	-	-	-	-	x	x	x	
Yugoslavia	A P	x	x	x	-	x	-	x	x	x	
<u>NORTH AMERICA</u> (2)			2	2	1	0	0	1	2	2	2
Canada	A	x	x	-	-	-	-	x	x	x	
United States of America	A P	x	x	x	-	-	x	x	x	x	
<u>LATIN AMERICA</u> (22)			6	1	17	0	1	6	20	5	3
Antigua	A P	-	-	x	-	-	-	x	-	-	
Argentina	A P	x	x	x	-	x	x	x	x	x	
Barbados	A P	-	-	-	-	-	-	x	-	-	
Belize	A P	-	-	x	-	-	-	x	-	-	
Brazil	A P	-	-	x	-	-	-	x	-	-	
Costa Rica	A P	-	-	x	-	-	x	x	-	-	
Dominican Republic	A P	-	-	x	-	-	-	x	-	-	
Ecuador	A P	x	-	x	-	-	-	x	-	-	
El Salvador	A P	x	-	x	-	-	-	-	-	-	
French Antilles	A	-	-	-	-	-	-	x	-	-	
Honduras	A P	-	-	-	-	-	-	x	-	-	
Mexico	A P	x	-	x	-	-	x	x	x	x	
Nicaragua	A P	-	-	x	-	-	x	x	-	-	
Panama	A P	-	-	x	-	-	-	x	-	-	
Peru	A P	x	x	x	-	-	-	x	x	-	
Puerto Rico	A P	-	-	-	-	-	-	xx	x	-	
St. Lucia	A P	-	-	x	-	-	-	x	-	-	
St. Vincent	A	-	-	-	-	-	-	x	-	-	
Surinam	A P	-	-	x	-	-	-	x	-	-	

Table 6.5 (Cont.)

Region and Country	Item and Number	Information asked for: Area= A Production = P	Wheat	Rye	Rice	21.14 Millet and sorghum		Maize	Barley	Oats	
			21.11	21.12	21.13	Total 21.14	Millet (a)	Sorghum (b)	21.15	21.16	21.17
<u>LATIN AMERICA</u> (cont.d)											
Uruguay		A P	x	-	x	-	-	-	x	x	x
Venezuela		A P	-	-	x	-	-	x	x	-	-
Virgin Islands (U.S.)		A P	-	-	-	-	-	x	-	-	-
<u>NEAR EAST</u> (4)											
Bahrain		A	-	-	-	-	-	-	x	-	-
Iraq		A	x	-	x	-	x	x	x	x	-
Israel		A	x	-	-	-	-	x	x	x	-
Saudi Arabia		A P	x	-	x	-	x	x	x	x	-
<u>FAR EAST</u> (9)											
India		A P	x	-	x	-	x	x	x	x	-
Indonesia		A	-	-	x	-	-	-	-	-	-
Japan		A	x	-	x	-	-	-	-	x	-
Korea, Rep. of		A	x	x	x	-	1/x	1/x	x	x	-
Laos		A	-	-	x	-	-	-	x	-	-
Nepal		A	x	-	x	-	x	-	x	2/x	2/x
Pakistan		A	x	-	x	-	x	x	x	x	-
Philippines		A P	-	-	x	-	-	-	x	-	-
Sri Lanka		A	-	-	x	-	-	x	x	-	-
<u>AFRICA</u> (19)											
Algeria		A	x	x	x	-	-	x	x	x	x
Botswana		A P	x	-	-	-	x	x	x	-	-
Cameroon		A	x	-	x	x	-	-	x	-	-
Central African Rep.		A	x	-	x	x	-	-	x	-	-
Chad		A	x	-	x	x	-	-	x	-	-
Congo		A	x	-	x	x	-	-	x	-	-
Gabon		A	x	-	x	x	-	-	x	-	-
Guinea		A P	-	-	x	-	-	-	x	-	-
Ivory Coast		A	-	-	-	-	-	-	x	-	-
Kenya		A	x	-	x	-	x	x	x	x	x
Lesotho		A	x	-	-	-	-	x	x	x	x
Liberia		A	-	-	x	-	-	-	x	-	-
Nigeria		A P	x	-	x	-	x	x	x	-	-
Sierra Leone		3/P	-	-	x	-	x	x	x	-	-
South Africa		A P	x	-	-	x	-	-	x	x	x
Swaziland		A	-	-	x	-	-	x	x	-	-
Tanzania		A P	x	-	x	-	x	x	x	x	-
Zaire		A P	x	-	-	-	-	-	-	-	-
Zambia		A P	-	-	-	-	x	x	x	-	-
<u>OCEANIA</u> (4)											
Australia		A P	x	x	x	-	-	x	x	x	x
Guam		P	-	-	-	-	-	-	x	-	-
New Zealand		A P	x	-	-	-	-	-	x	x	x
Pacific Islands (Trust Territory)		A P	-	-	x	-	-	-	x	-	-

1/ Sorghum, maize and buckwheat together. 2/ Barley and oats together.  
 3/ Quantity and value of crop sold or traded.

Table 6.6 - Extent of participation in Section 2 relating to specified temporary crops

Region and Country	Item and Number	Information asked for: Area = A Production = P	Edible dry beans	Edible dry peas	Pota- toes	Manioc (cassa- va)	Sweet pota- toes	Coco- yams and yams	Dry onions	Sugar- cane	Sugar- beets	Cotton	Jute	Ground- nuts	Soy- beans	Tobac- co
			21.22	21.25	21.31	21.32	21.33	21.35	21.36	21.41 (a)	21.41 (b)	21.42 (a)	21.42 (b)	21.42 (c)	21.42 (d)	21.43 (a)
Total number of countries asking question																
<u>EUROPE (19)</u>																
	Austria	A	-	20	66	41	44	29	34	46	25	46	2	42	18	49
	Belgium	A	x	11	19	0	0	0	5	0	15	-	0	1	1	8
	Czechoslovakia	A P	-	x	x	-	-	-	-	-	x	-	-	-	-	-
	Denmark	A	-	x	x	-	-	-	-	-	x	-	-	-	-	-
	Finland	A	-	x	x	-	-	-	x	-	x	-	-	-	-	-
	France	A	x	-	x	-	-	-	-	-	x	-	-	-	-	x
	Germany, Fed. Rep. of	A	x	x	x	-	-	-	-	-	x	-	-	-	-	x
	Greece	A	-	x	x	-	-	-	-	-	-	x	-	-	-	x
	Ireland	A	x	-	x	-	-	-	-	-	x	-	-	-	-	x
	Italy	A	-	-	x	-	-	-	-	-	x	-	-	-	-	-
	Luxembourg	A	x	x	x	-	-	-	-	-	x	-	-	-	-	-
	Malta	A	x	-	x	-	-	-	-	-	-	-	-	-	-	-
	Netherlands	A	x	x	x	-	-	-	-	-	-	-	-	-	-	-
	Norway	A	x	x	x	-	-	-	-	-	-	-	-	-	-	-
	Spain	A	-	-	x	-	-	-	-	-	-	-	-	-	-	-
	Sweden	A	-	x	x	-	-	-	-	-	-	-	-	-	-	-
	Switzerland	A	-	-	x	-	-	-	-	-	-	-	-	-	-	-
	United Kingdom	A	x	x	x	-	-	-	-	-	-	-	-	-	-	-
	Yugoslavia	A P	x	x	x	-	-	-	-	-	-	-	-	-	-	-
<u>NORTH AMERICA (2)</u>																
	Canada	A	1	1	2	0	1	0	2	1	2	1	0	1	2	2
	United States of America	A P	x	x	x	-	x	-	x	x	x	x	-	x	x	x
<u>LATIN AMERICA (25)</u>																
	Antigua	A P	8	5	15	21	20	13	7	22	4	16	0	14	5	11
	Argentina	A P	-	x	-	x	x	x	-	x	-	x	-	x	-	-
	Barbados	A P	-	-	x	x	x	-	x	x	-	x	-	x	-	-
	Belize	A P	-	-	x	x	x	x	-	x	-	x	-	x	-	-
	Brazil	A P	-	-	-	x	x	-	-	x	-	x	-	x	-	x



Table 6.6 - (Concluded)

Region and country	Item and Number	Information asked for: Area = A Production = P	21.22	21.25	21.31	21.32	21.33	21.35	21.36	21.41 (a)	21.41 (b)	21.42 (a)	21.42 (d)	21.43 (a)	21.43 (b)	21.49 (a)
			Edible dry beans	Edible dry peas	Pota- toes	Manioc (cassa- va)	Sweet pota- toes	Coco- yams and yams	Dry onions	Sugar- cane	Sugar- beets	Cotton	Jute	Ground- nuts	Soy- beans	Tobac- co
<b>FAR EAST (cont.d)</b>																
Pakistan		A	-	-	X	-	X	-	X	X	X	X	-	X	-	X
Philippines		A P	X	X	X	X	X	X	X	X	X	X	-	X	X	X
Singapore		A	-	-	-	-	-	-	-	-	-	-	-	-	-	X
Sri Lanka		A	-	X	X	X	X	X	X	X	X	X	-	X	X	X
<b>AFRICA (20)</b>																
Algeria		A	6	2	17	14	12	11	11	13	1	17	0	17	5	14
Botswana		A P	X	X	X	X	X	X	X	X	X	X	-	X	-	X
Cameroon		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Central African Republic		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Chad		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Congo		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Gabon		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Guinea		A P	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Ivory Coast		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Kenya		A	X	-	X	X	X	X	X	X	-	X	-	X	-	X
Lesotho		A	X	X	X	X	X	X	X	X	-	X	-	X	-	X
Liberia		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Malawi		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Nigeria		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Sierra Leone		2/P	-	-	X	X	X	X	X	X	-	X	-	X	-	X
South Africa		A P	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Swaziland		A	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Tanzania		A P	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Zaire		A P	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Zambia		A P	X	-	X	X	X	X	X	X	-	X	-	X	-	X
<b>OCEANIA (5)</b>																
American Samoa		A P	1	0	2	3	3	3	1	2	0	2	0	1	0	3
Australia		A P	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Guam		A P	-	-	X	X	X	X	X	X	-	X	-	X	-	X
New Zealand		A P	-	-	X	X	X	X	X	X	-	X	-	X	-	X
Pacific Islands (Trust Territory)		A P	-	-	X	X	X	X	X	X	-	X	-	X	-	X

1/ Not specified whether dry or green.

2/ Quantity and value of crop sold or traded.





Table 6.7 - (Cont.)

Region and Country	Item and Number	Information asked for: At* Nt* S* P*	Oranges 23.11 (a)	Mandarines and tangerines 23.11 (b)	Lemons 23.11 (c)	Apples 23.12 (a)	Dates 23.14 (a)	Bananas 23.14 (k)	Plantains 23.14 (l)	Grapes 23.17	Coffee 23.31 (a)	Cocoa 23.31 (b)	Tea 23.31 (c)	Coco-nut 23.32 (a)	Olive 23.32 (c)	Rubber 23.34 (a)
<b>LATIN AMERICA (cont.d)</b>																
French Antilles		At P	X	X	-	-	-	X	X	-	X	X	X	-	-	-
Honduras		At S P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Jamaica		At	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Mexico		At Nt S P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Montserrat		At S P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Nicaragua		At Nt S P	X	X	-	-	-	X	X	-	X	X	-	X	-	-
Panama		Nt P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Peru		At P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Puerto Rico		At P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
St. Lucia		At Nt S P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
St. Vincent		At	-	X	-	-	-	X	X	-	X	X	-	X	-	-
Surinam		At P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Uruguay		Nt P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Venezuela		At P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
Virgin Islands (U.S.)		Nt P	X	-	-	-	-	X	X	-	X	X	-	X	-	-
<b>NEAR EAST (5)</b>																
Bahrain		Nt P	2	2	1	2	3	4	0	2	0	0	1	0	2	0
Iraq		Nt	-	-	-	-	-	X	-	X	-	-	-	-	X	-
Kuwait		At Nt	-	-	-	-	-	X	-	X	-	-	-	-	-	-
Saudi Arabia		At Nt S P	-	-	-	-	-	X	-	X	-	-	-	-	-	-
Turkey		At Nt S P	-	-	-	-	-	X	-	X	-	-	-	-	-	-
<b>FAR EAST (8)</b>																
India		At	4	2	1	4	2	4	1	3	3	2	5	3	0	3
Japan		At	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Korea, Rep. of		At Nt	X	X	-	X	-	-	-	X	-	-	X	-	-	-
Nepal		At Nt	X	-	-	X	-	-	-	X	-	-	X	-	-	-
Pakistan		Nt S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Philippines		At Nt S P	-	-	-	X	X	X	-	X	-	-	X	-	-	X
Singapore		At	-	-	-	-	-	X	-	X	-	-	X	-	-	X
Sri Lanka		At Nt S	X	-	-	-	-	X	-	X	-	-	X	-	-	X

Table 6.7 - (Concluded)

Item and Number	Information asked for:	Oranges	Mandarines and tangerines	Lemons	Apples	Dates	Bananas	Plantains	Grapes	Coffee	Cocoa	Tea	Coco-nut	Olive	Rubber
Region and Country	At* Nt* S* P*	23.11 (a)	23.11 (b)	23.11 (c)	23.12 (a)	23.14 (a)	23.14 (k)	23.14 (l)	23.17	23.31 (a)	23.31 (b)	23.31 (c)	23.32 (a)	23.32 (c)	23.34 (a)
<b>AFRICA (17)</b>		13	4	8	4	2	15	10	2	12	10	6	10	1	5
Algeria	At	x	x	-	x	x	-	-	x	-	-	-	-	x	-
Cameroon	At	-	-	x	-	-	x	x	-	-	-	-	-	-	-
Central African Republic	At	x	-	-	-	-	x	x	-	x	x	x	x	-	-
Chad	At	x	-	-	-	-	x	x	-	x	x	x	x	-	-
Congo	At	x	-	-	-	-	x	x	-	x	x	x	x	-	-
Gabon	At	x	-	-	-	-	x	x	-	x	x	x	x	-	-
Guinea	At Nt	-	-	-	-	-	x	x	-	x	x	x	x	-	-
Ivory Coast	At Nt	x	-	x	-	-	x	x	-	x	x	-	x	-	x
Kenya	At	x	-	x	-	-	x	x	-	x	x	-	x	-	-
Lesotho	At Nt S	x	-	x	x	-	-	-	x	-	-	-	-	-	-
Liberia	At S	x	x	x	-	-	x	x	-	x	x	-	x	-	x
Nigeria	At Nt P	x	x	x	x	-	x	x	-	x	x	-	x	-	x
Sierra Leone	Nt	x	x	x	-	-	x	x	-	x	x	-	x	-	-
Swaziland	At Nt P	x	-	-	-	-	x	1/x	-	-	-	-	-	-	-
Tanzania	At P	x	-	-	x	x	1/x	-	-	x	x	-	x	-	x
Zaire	At P	-	-	-	-	-	x	-	-	x	x	-	-	-	x
Zambia	Nt P	-	-	-	-	-	x	-	-	-	-	-	-	-	-
<b>OCEANIA (6)</b>		4	4	3	2	0	5	0	2	2	3	0	4	0	0
American Samoa	Nt P	x	-	x	-	-	x	-	-	x	x	-	x	-	-
Australia	At Nt P	x	x	x	x	-	x	-	x	-	-	-	-	-	-
Fiji	Nt	-	-	-	-	-	x	-	-	-	x	-	-	-	-
Guam	At P	x	-	x	-	-	x	-	-	-	-	-	x	-	-
New Zealand	At P	x	x	-	x	-	-	-	x	-	-	-	-	-	-
Pacific Islands (Trust Territory)	At Nt P	-	x	-	-	-	x	-	-	x	-	-	x	-	-

\* Abbreviations:  
 At = total area  
 Nt = total number of trees in compact plantation  
 S = number of scattered trees  
 P = production.

1/ Bananas and plantains together.

Table 6.8- Extent of participation in Section 3 relating to specified livestock

Item and Number Region and Country	Horses 31.1	Mules 31.2	Asses 31.3	32. Cattle			33. Buffaloes			Intended primarily as draft animals 33.29 (a)
				Total 32.1	Under 2 years 32.11	2 years and over 32.12	Total 33.1	Under 3 years 33.11	3 years and over 33.12	
Total number of countries asking question	75	45	54	94	75	52	19	9	9	4
<u>EUROPE</u> (22)	19	9	10	21	22	10	4	0	0	0
Austria	-	-	x	x	x	-	-	-	-	-
Belgium	x	-	x	x	x	-	-	-	-	-
Czechoslovakia	x	-	-	x	x	x	-	-	-	-
Denmark	x	-	-	x	x	-	-	-	-	-
Finland	-	-	-	x	x	-	-	-	-	-
France	x	x	x	x	x	x	-	-	-	-
Germany, Fed. Rep. of	x	-	-	x	x	-	-	-	-	-
Greece	x	x	x	x	x	x	x	-	-	-
Hungary	x	x	x	x	x	-	x	-	-	-
Ireland	x	-	-	x	x	x	-	-	-	-
Italy	x	x	x	x	x	x	x	-	-	-
Luxembourg	x	-	-	x	x	-	-	-	-	-
Malta	x	x	x	-	x	-	-	-	-	-
Netherlands	x	-	-	x	x	x	-	-	-	-
Norway	-	-	-	x	x	-	-	-	-	-
Poland	x	-	-	x	x	x	-	-	-	-
Portugal	x	x	x	x	x	x	-	-	-	-
Spain	x	x	x	x	x	x	x	-	-	-
Sweden	x	-	-	x	x	-	-	-	-	-
Switzerland	x	x	-	x	x	-	-	-	-	-
United Kingdom	x	-	-	x	x	x	-	-	-	-
Yugoslavia	x	x	x	x	x	-	-	-	-	-
<u>NORTH AMERICA</u> (2)	2	1	0	2	1	1	0	0	0	0
Canada	x	-	-	x	x	x	-	-	-	-
United States of America	x	x	-	x	-	-	-	-	-	-
<u>LATIN AMERICA</u> (27)	24	23	21	25	21	15	2	0	0	0
Antigua	x	x	x	x	x	x	-	-	-	-
Argentina	x	x	x	x	x	x	-	-	-	-
Barbados	x	x	x	x	x	x	-	-	-	-
Belize	x	x	x	x	x	x	-	-	-	-
Brazil	x	x	x	x	x	-	x	-	-	-
Colombia	-	-	-	x	-	-	-	-	-	-
Costa Rica	-	x	x	x	x	x	-	-	-	-
Dominica	-	-	-	x	x	x	-	-	-	-
Dominican Republic	x	x	x	x	x	-	-	-	-	-
Ecuador	x	x	x	x	x	x	-	-	-	-

Table 6.8 (Cont.)

Item and Number Region and Country	Horses 31.1	Mules 31.2	Asses 31.3	32. Cattle			33. Buffaloes			Intended primarily as draft animals 33.29 (a)
				Total 32.1	Under 2 years 32.11	2 years and over 32.12	Total 33.1	Under 3 years 33.11	3 years and over 33.12	
				<b>LATIN AMERICA (cont.d)</b>						
El Salvador	x	x	x	x	x	x	-	-	-	-
French Antilles	x	-	-	x	x	x	-	-	-	-
Haiti	x	x	x	-	-	-	-	-	-	-
Honduras	x	x	x	x	x	-	-	-	-	-
Jamaica	x	1/x	1/x	-	-	-	-	-	-	-
Mexico	x	x	x	x	x	x	-	-	-	-
Montserrat	x	x	-	x	x	-	-	-	-	-
Nicaragua	x	x	x	x	x	x	-	-	-	-
Panama	x	1/x	1/x	x	x	x	-	-	-	-
Peru	x	x	x	x	x	-	-	-	-	-
Puerto Rico	x	x	-	x	-	-	-	-	-	-
St. Lucia	x	x	x	x	x	x	-	-	-	-
St. Vincent	x	x	x	x	-	-	-	-	-	-
Surinam	x	x	x	x	x	-	x	-	-	-
Uruguay	x	-	-	x	x	x	-	-	-	-
Venezuela	x	x	x	x	-	x	-	-	-	-
Virgin Islands (U.S.)	x	1/x	1/x	x	x	-	-	-	-	-
<b>NEAR EAST (9)</b>										
	7	5	8	8	7	7	3	3	3	0
Bahrain	x	-	x	x	x	x	-	-	-	-
Iraq	x	x	x	x	x	x	x	x	x	-
Israel	2/x	2/x	2/x	x	-	-	-	-	-	-
Kuwait	x	-	x	x	x	x	-	-	-	-
Lebanon	-	-	x	x	x	x	-	-	-	-
Libyan Arab Republic	x	x	-	-	-	-	-	-	-	-
Saudi Arabia	x	-	x	x	x	x	-	-	-	-
Syrian Arab Republic	x	1/x	1/x	x	x	x	x	x	x	-
Turkey	-	x	x	x	x	x	x	x	x	-
<b>FAR EAST (10)</b>										
	7	3	2	10	7	5	6	5	5	4
India	x	x	x	x	x	x	x	x	x	x
Indonesia	x	-	-	x	x	x	x	-	-	-
Japan	x	-	-	x	x	-	-	-	-	-
Korea, Rep. of	-	-	-	x	x	x	-	-	-	-
Laos	x	-	-	x	-	-	-	-	-	-
Nepal	3/x	3/x	-	x	x	x	x	x	x	x
Pakistan	x	x	x	x	-	-	x	x	x	x
Philippines	x	-	-	x	x	x	x	x	x	x
Singapore	-	-	-	x	-	-	-	-	-	-
Sri Lanka	-	-	-	x	x	-	x	x	x	-

Table 6.8 (concluded)

Item and Number Region and Country	Horses 31.1	Mules 31.2	Asses 31.3	32. Cattle			33. Buffaloes			Intended primarily as draft animals 33.29 (a)
				Total 32.1	Under 2 years 32.11	2 years and over 32.12	Total 33.1	Under 3 years 33.11	3 years and over 33.12	
<b>AFRICA (22)</b>	10	3	13	22	15	13	1	0	0	0
Algeria	x	-	-	x	-	-	-	-	-	-
Botswana	x	x	x	x	x	-	-	-	-	-
Cameroon	x	-	x	x	x	x	-	-	-	-
Central Africa Republic	x	-	x	x	x	x	-	-	-	-
Chad	x	-	x	x	x	x	-	-	-	-
Congo	x	-	x	x	x	x	-	-	-	-
Gabon	x	-	x	x	x	x	-	-	-	-
Ghana	-	-	-	x	x	-	-	-	-	-
Guinea	-	-	-	x	x	x	-	-	-	-
Ivory Coast	-	-	-	x	-	-	-	-	-	-
Kenya	-	-	x	x	x	x	-	-	-	-
Lesotho	x	x	x	x	x	x	-	-	-	-
Liberia	-	-	-	x	x	x	-	-	-	-
Malawi	-	-	-	x	-	-	-	-	-	-
Nigeria	-	-	x	x	-	-	-	-	-	-
Sierra Leone	-	-	-	x	x	x	-	-	-	-
South Africa	-	-	-	x	-	-	-	-	-	-
Swaziland	x	x	x	x	x	x	-	-	-	-
Tanzania	-	-	x	x	-	-	-	-	-	-
Togo	x	-	x	x	x	x	-	-	-	-
Zaire	-	-	-	x	-	-	x	-	-	-
Zambia	-	-	x	x	x	x	-	-	-	-
<b>OCEANIA (6)</b>	6	1	0	6	2	1	3	1	1	0
American Samoa	x	-	-	x	-	-	-	-	-	-
Australia	x	-	-	x	-	-	x	x	x	-
Fiji	x	-	-	x	x	x	-	-	-	-
Guam	3/x	3/x	-	x	-	-	x	-	-	-
New Zealand	x	-	-	x	x	-	-	-	-	-
Pacific Islands (Trust Territory)	x	x	-	x	-	-	x	-	-	-

1/ Mules and asses together.

2/ Horses, mules, asses and camels together.

3/ Horses and mules together.

Table 6.9 - Extent of participation in Section 3 relating to specified livestock and poultry

Item and Number Region and Country	34. Sheep			35. Goats			36. Pigs					Hens, cocks, pullets and chicks 37.1
	Total 34.1	Lambs under 1 year 34.11	Sheep 1 year and over 34.12	Total 35.1	Under 1 year 35.11	1 year and over 35.12	Total 36.1	Under 6 months 36.11	Six months and over			
									Total 36.12	Sows and gilts for breeding 36.12(a)	All other pigs 36.12(b)	
Total number of countries asking question	84	48	31	78	36	23	86	56	63	48	34	97
<b>EUROPE (22)</b>	22	13	9	14	6	5	22	19	21	20	15	22
Austria	x	-	-	x	-	-	x	x	x	x	x	x
Belgium	x	x	x	-	-	-	x	x	x	x	x	x
Czechoslovakia	x	x	x	x	x	x	x	-	x	x	x	x
Denmark	x	-	-	-	-	-	x	x	x	x	x	x
Finland	x	x	x	-	-	-	x	x	x	-	-	x
France	x	-	-	x	-	-	x	x	x	x	x	x
Germany, Fed.Rep.of	x	-	-	-	-	-	x	x	x	x	-	x
Greece	x	-	-	x	-	-	x	-	x	x	x	x
Hungary	x	x	-	x	-	-	x	x	-	x	-	x
Ireland	x	x	x	-	-	-	x	-	x	x	x	x
Italy	x	-	-	x	-	-	x	x	x	x	x	x
Luxembourg	x	-	-	-	-	-	x	x	x	x	x	x
Malta	x	x	-	x	x	-	x	x	x	x	x	x
Netherlands	x	x	x	x	x	x	x	x	x	x	x	x
Norway	x	x	x	x	x	x	x	x	x	x	-	x
Poland	x	-	-	-	-	-	x	x	x	-	-	x
Portugal	x	x	x	x	x	x	x	x	x	x	-	x
Spain	x	x	x	x	x	x	x	x	x	x	x	x
Sweden	x	x	-	-	-	-	x	x	x	x	-	x
Switzerland	x	-	-	x	-	-	x	x	x	x	x	x
United Kingdom	x	x	x	x	-	-	x	x	x	x	x	x
Yugoslavia	x	x	-	x	-	-	x	x	x	x	x	x
<b>NORTH AMERICA (2)</b>	2	2	2	2	0	0	2	1	2	1	1	2
Canada	x	x	x	x	-	-	x	x	x	-	-	x
United States of America	x	x	x	x	-	-	x	-	x	x	x	x
<b>LATIN AMERICA (27)</b>	22	6	2	21	5	2	27	14	20	15	11	27
Antigua	x	-	-	x	-	-	x	-	x	-	-	x
Argentina	x	x	-	x	-	-	x	x	x	x	x	x
Barbados	x	x	x	x	x	x	x	x	-	x	-	x
Belize	x	-	-	x	-	-	x	-	x	-	-	x
Brazil	x	x	-	x	-	-	x	x	x	x	x	x
Colombia	x	-	-	-	-	-	x	-	-	-	-	x
Costa Rica	-	-	-	-	-	-	x	x	x	-	-	x
Dominica	x	x	-	x	x	-	x	-	x	-	-	x
Dominican Rep.	x	-	-	x	-	-	x	-	x	-	-	x
Ecuador	x	-	-	x	-	-	x	-	-	-	-	x

Table 6.9 - (cont.)

Item and Number  Region and Country	34. Sheep			35. Goats)			36. Pigs					Hens, cocks, pullets and chicks  37.1
	Total 34.1	Lambs under 1 year 34.11	Sheep 1 year and over 34.12	Total 35.1	Under 1 year 35.11	1 year and over 35.12	Total 36.1	Under 6 months 36.11	Six months and over			
									Total 36.12	Sows and gilts for breeding 36.12(a)	All other pigs 36.12(b)	
<b>LATIN AMERICA (cont.d)</b>												
El Salvador	x	-	-	x	-	-	x	x	x	-	-	x
French Antilles	x	-	-	x	-	-	x	x	x	x	x	x
Haiti	-	-	-	-	x	-	x	x	x	x	x	x
Honduras	x	-	-	x	-	-	x	x	x	x	x	x
Jamaica	x	-	-	x	-	-	x	-	x	x	x	x
Mexico	-	x	-	-	x	-	x	x	x	x	x	x
Montserrat	x	-	-	x	-	-	x	-	-	x	-	x
Nicaragua	-	-	-	x	x	x	x	x	x	x	-	x
Panama	-	-	-	-	-	-	x	x	x	x	x	x
Peru	x	-	-	x	-	-	x	-	-	x	-	x
Puerto Rico	x	-	-	x	-	-	x	x	x	-	-	x
St. Lucia	x	-	-	x	-	-	x	-	x	-	-	x
St. Vincent	x	-	-	x	-	-	x	-	-	x	-	x
Surinam	x	-	-	x	-	-	x	-	-	-	-	x
Uruguay	x	x	x	-	-	-	x	x	x	x	x	x
Venezuela	x	-	-	x	-	-	x	-	x	x	x	x
Virgin Islands (U.S.)	x	-	-	x	-	-	x	x	x	-	-	x
<b>NEAR EAST (9)</b>	8	7	4	8	6	3	1	0	0	0	0	9
Bahrain	x	x	x	x	x	x	-	-	-	-	-	x
Iraq	x	x	x	x	x	x	-	-	-	-	-	x
Israel	x	-	-	x	-	-	x	-	-	-	-	x
Kuwait	x	x	-	x	x	-	-	-	-	-	-	x
Lebanon	x	x	-	x	x	-	-	-	-	-	-	x
Libyan Arab Rep.	x	-	-	x	-	-	-	-	-	-	-	x
Saudi Arabia	x	x	x	x	x	x	-	-	-	-	-	x
Syrian Arab Rep.	x	x	x	x	-	-	-	-	-	-	-	x
Turkey	-	x	-	-	x	-	-	-	-	-	-	x
<b>FAR EAST (10)</b>	8	5	3	9	4	2	8	6	6	2	2	10
India	x	x	x	x	x	x	x	x	x	-	-	x
Indonesia	x	-	-	x	-	-	x	-	-	-	-	x
Japan	x	-	-	x	-	-	x	x	x	x	x	x
Korea, Rep. of	x	-	-	x	-	-	x	x	x	x	x	x
Laos	-	-	-	-	-	-	x	-	-	-	-	x
Nepal	x	x	-	x	x	-	x	x	x	-	-	x
Pakistan	x	x	-	x	x	-	-	-	-	-	-	x
Philippines	x	x	x	x	-	-	x	x	x	-	-	x
Singapore	-	-	-	x	-	-	x	x	x	-	-	x
Sri Lanka	x	x	x	x	x	x	-	-	-	-	-	x

Table 6.9 - (concluded)

Item and Region and Country Number	34. Sheep			35. Goats			36. Pigs					Hens, cocks, pullets and chicks 37.1
	Total 34.1	Lambs under 1 year 34.11	Sheep 1 year and over 34.12	Total 35.1	Under 1 year 35.11	1 year and over 35.12	Total 36.1	Under 6 months 36.11	Six months and over			
									Total 36.12	Sows and gilts for breeding 36.12(a)	All other pigs 36.12(b)	
<b>AFRICA (22)</b>	21	13	10	20	14	11	20	14	14	9	4	21
Algeria	x	-	-	x	-	-	-	-	-	-	-	x
Botswana	x	-	-	x	-	-	-	-	-	-	-	x
Cameroon	x	x	x	x	x	x	x	x	x	x	-	x
Central African Rep.	x	x	x	x	x	x	x	x	x	x	-	x
Chad	x	x	x	x	x	x	x	x	x	x	-	x
Congo	x	x	x	x	x	x	x	x	x	x	-	x
Gabon	x	x	-	x	x	x	x	x	x	x	-	x
Ghana	x	-	-	x	x	-	x	x	x	-	-	x
Guinea	x	-	-	x	-	-	-	-	-	-	-	-
Ivory Coast	x	-	-	x	-	-	x	-	-	-	-	x
Kenya	x	x	-	-	x	-	x	x	x	x	x	x
Lesotho	x	x	x	x	x	x	x	-	-	-	-	x
Liberia	x	x	x	x	x	x	x	x	x	x	x	x
Malawi	x	-	-	x	-	-	x	-	-	-	-	x
Nigeria	x	-	-	x	-	-	x	-	-	-	-	x
Sierra Leone	x	x	x	x	x	x	x	x	x	x	x	x
South Africa	x	-	-	x	-	-	x	-	-	-	-	x
Swaziland	-	x	-	-	x	-	x	x	x	-	-	x
Tanzania	x	-	-	x	-	-	x	x	x	-	-	x
Togo	x	x	x	x	x	x	x	x	x	-	-	x
Zaire	x	x	x	x	x	x	x	x	x	-	-	x
Zambia	x	x	x	x	x	x	x	x	x	x	x	x
<b>OCEANIA (6)</b>	1	2	1	4	1	0	6	2	1	1	1	6
American Samoa	-	-	-	-	-	-	x	-	-	-	-	x
Australia	x	x	x	-	-	-	x	x	x	x	x	x
Fiji	-	-	-	x	x	-	x	-	-	-	-	x
Guam	-	-	-	x	-	-	x	-	-	-	-	x
New Zealand	-	x	-	x	-	-	x	x	-	-	-	x
Pacific Islands (Trust Territory)	-	-	-	x	-	-	x	-	-	-	-	x



#### Section 4

The extent of participation in the three items relating to employment in agriculture is shown in Table 6.10. Only 23 out of 98 participating countries enquired about at least one of these three items. As a matter of fact more countries had participated in the enquiry of the other items on employment in agricultural work on the holding than in the Short List items.

#### Section 5

The extent of participation in the two items relating to farm population is shown in Table 6.11. Minor variations of coverage in the item relating to holder and members of the holder's household have been observed. In Hungary, for instance, the number of persons in this item related to those belonging to the farm; Poland described them as persons living permanently in the household; Malawi enquired about persons taking their food in the house; Montserrat referred to the number of persons living with the farm operator and, for the second item, i.e. other persons living on the holding, the information referred to the number of persons depending on the farm operator. Most of the participating countries enquired about the sex of the farm population.

#### Section 6

The extent of national participation in items relating to agricultural power and machinery is shown in Tables 6.12 and 6.13. The items relating to the source of power and its use on the holding, internal combustion engines and electric motors are shown in Table 6.12. Only one item relating to tractors was included under agricultural machinery in the Short List. The Expanded List of items included also items relating to tracklaying tractors, wheel tractors and power tillers. All these four items are shown in Table 6.13 to give an overall picture of the information collected in the national census questionnaires relating to tractors of all kinds.

The tables show that not many participating countries (about 25 percent) asked for the use and source of mechanical and animal power on the holding. Most of the countries in almost all regions included in their national questionnaires at least one item for tractors.

Some countries did not specifically ask if the machinery was owned or used according to the provisions in the FAO Programme. However, they asked if the machinery was on the holding regardless of its ownership. A few countries, e.g. Turkey, are not included in the tables because they did not specify in their national census questionnaire the names of the various machines.

#### Sections 7 and 8

There was one item each for irrigation and for fertilizers. The national participation in these two items is shown in Table 6.14.

Some countries indicate the way to use inorganic fertilizers even when a specific question to that effect was not included in the national census questionnaires because the use of fertilizers was apparent from other questions. For example, the questions relating to expenditure on fertilizers, area fertilized, quantity used, method of application, etc.

#### Sections 9 and 10

There was no item in Section 9 - Wood and Fishery Products, and Section 10 - Association of Agricultural Holdings with Other Industries. However, countries' participation in any of the items of these Sections is shown in Table 6.1 relating to the extent of participation by Section of the Programme in the 1970 World Census of Agriculture.

Table 6.10- Extent of participation in Section 4 relating to employment in agriculture

Item and Number  Region and Country	41. Extent of agricultural work done by household or persons working for pay		
	All work done by members of the household 41.1	Bulk of work done by members of the household 41.2	Bulk of work done by persons working for pay 41.3
Total number of countries asking question	23	19	21
<u>EUROPE</u> (2)	2	2	2
Czechoslovakia	x	x	x
Portugal	x	x	x
<u>LATIN AMERICA</u> (6)	6	5	6
Barbados	x	x	x
Dominican Republic	x	-	x
Haiti	x	x	x
Montserrat	x	x	x
Panama	x	x	x
Venezuela	x	x	x
<u>NEAR EAST</u> (6)	6	5	5
Iraq	x	x	x
Kuwait	x	x	x
Lebanon	x	x	x
Saudi Arabias	x	x	x
Syrian Arab Republic	x	x	x
Turkey	x	-	-
<u>FAR EAST</u> (3)	3	3	3
Japan	x	x	x
Nepal	x	x	x
Philippines	x	x	x
<u>AFRICA</u> (4)	4	3	4
Liberia	x	-	x
Swaziland	x	x	x
Zaire	x	x	x
Zambia	x	x	x
<u>OCEANIA</u> (2)	2	1	1
Australia	x	x	x
Fiji	x	-	-

Table 6.11 - Extent of participation in Section 5 relating to farm population

Item and Number Region and Country	Information asked for: Total = T Male = M Female = F	Holder and members of the holder's household 51.1	Other persons living on the holding 51.2
Total number of countries asking question		63	38
<u>EUROPE</u> (11)		11	4
Finland	T	x	-
France	M F	x	-
Greece	M F	x	-
Hungary	M F	x	x
Luxembourg	T M F	x	-
Malta	M F	x	-
Norway	M F	x	-
Poland	T	x	x
Portugal	T M F	x	x
Spain	M F	x	x
Yugoslavia	T M F	x	-
<u>LATIN AMERICA</u> (14)		14	9
Antigua	M F	x	-
Argentina	M F	x	x
Barbados	T M F	x	x
Belize	M F	x	-
Costa Rica	T M F	x	x
El Salvador	T M F	x	x
French Antilles	M F	x	-
Jamaica	T M F	x	x
Montserrat	T	x	x
Panama	M F	x	x
St. Lucia	M F	x	-
St. Vincent	M F	x	-
Surinam	T M F	x	x
Uruguay	M F	x	x
<u>NEAR EAST</u> (8)		8	5
Bahrain	T M F	x	x
Iraq	T M F	x	x
Israel	T	x	-
Kuwait	T M F	x	x
Lebanon	T M F	x	x
Libyan Arab Republic	T	x	-
Saudi Arabia	T M F	x	x
Turkey	M F	x	-

Table 6.11 - (Cont.)

Item and Number Region and Country	Information asked for: Total = T Male = M Female = F	Holder and members of the holder's household 51.1	Other persons living on the holding 51.2
<b><u>FAR EAST</u> (8)</b>			
India	T M F	x	x
Japan	M F	x	x
Korea, Rep. of	M F	x	x
Nepal	M F	x	-
Pakistan	T M F	x	-
Philippines	T M F	x	x
Singapore	M F	x	x
Sri Lanka	M F	x	x
<b><u>AFRICA</u> (20)</b>			
Algeria	M F	x	x
Botswana	T M F	x	-
Cameroon	M F	x	x
Central African Republic	M F	x	x
Chad	M F	x	x
Congo	M F	x	x
Gabon	M F	x	x
Ghana	M F	x	-
Guinea	T	x	x
Ivory Coast	T M F	x	x
Kenya	M F	x	-
Lesotho	M F	x	-
Liberia	M F	x	-
Malawi	T	x	-
Nigeria	M F	x	x
Sierra Leone	M F	x	-
Swaziland	M F	x	x
Tanzania	T	x	x
Togo	M F	x	x
Zaire	T M F	x	x
<b><u>OCEANIA</u> (2)</b>			
Australia	M F	x	x
Fiji	T M F	x	-

Table 6.12- Extent of participation in Section 6 relating to agricultural power and power producing machinery

Item and Number Region and Country	Information asked for items 62.11 and 62.3: Owned = O Used = U Used and provided by: Holder solely = Os Holder jointly = Oj Landlord = L Priv. contractors = Pc Co-operative = C Government = G	Mechanical power	Animal power	Internal combustion engines	Electric motors
		61.1	61.2	62.11	62.3
Total number of countries asking question		25	26	31	36
<u>EUROPE</u> (10)		2	1	8	9
Czechoslovakia	O	-	-	x	x
Finland	O U Os Oj	-	-	x	x
Hungary	O	-	-	x	x
Italy	-	x	-	-	-
Netherlands	O U Os Oj	-	-	x	x
Poland	Os C	-	-	x	x
Portugal	O U Os Oj	x	x	x	x
Spain	U	-	-	-	x
United Kingdom	O Os Oj C	-	-	x	x
Yugoslavia	O Os	-	-	x	x
<u>NORTH AMERICA</u> (1)		0	0	0	1
Canada	U	-	-	-	x
<u>LATIN AMERICA</u> (20)		11	12	16	15
Antigua	O U	-	-	x	x
Argentina	O U Os	x	x	x	x
Barbados	O U	-	-	x	x
Belize	O U	-	-	x	x
Costa Rica	O Os Oj	x	x	-	-
Dominican Republic	Os Pc	-	x	x	x
Ecuador	-	x	x	-	-
El Salvador	O	x	x	x	x
Haiti	-	x	x	-	-
Honduras	O	-	-	x	x
Mexico	O U	x	x	x	x
Montserrat	-	x	x	-	-
Nicaragua	O U	x	x	x	x
Panama	O U Os	x	x	x	x
Peru	U	x	x	x	x
St. Lucia	O U	-	-	x	x
St. Vincent	O	-	-	x	x
Uruguay	O U	-	-	x	x
Venezuela	O U	-	-	x	x
Virgin Islands (U.S.)	Os L Pc G	x	x	x	-

Table 6.12 - (concluded)

Item and Number  Region and Country	Information asked for items 62.11 and 62.3: Owned = O Used = U Used and provided by: Holder solely = Os Holder jointly = Oj Landlord = L Priv. contractors = Pc Co-operative = C Government = G	Mechanical power	Animal power	Internal combustion engines	Electric motors
		61.1	61.2	62.11	62.3
<u>NEAR EAST</u> (6)		5	6	3	3
Bahrain	-	x	x	-	-
Iraq	-	-	x	-	-
Kuwait	U Os Oj G L Pc C	x	x	x	x
Lebanon	O Os Oj G C	x	x	x	x
Saudi Arabia	O Os Oj L Pc C G	x	x	x	x
Turkey	-	x	x	-	-
<u>FAR EAST</u> (3)		2	2	2	2
Korea, Rep. of	O Os Oj L	-	-	x	x
Nepal	-	x	x	-	-
Philippines	O U Os Oj L Pc	x	x	x	x
<u>AFRICA</u> (6)		2	2	2	6
Botswana	O U	-	-	x	x
Ivory Coast	U	-	-	x	x
Liberia	O U Os Oj Pc G	x	x	-	x
Sierra Leone	O Os Oj Pc C G	x	-	-	x
South Africa	U	-	-	-	x
Tanzania	U Os Pc G	-	x	-	x
<u>OCEANIA</u> (3)		3	3	0	0
American Samoa	-	x	x	-	-
Guam	-	x	x	-	-
Pacific Islands (Trust Territory)	-	x	x	-	-

Table 6.13 - Extent of participation in Section 6 relating to tractors

Item and Number  Region and Country	Information asked for: Owned = O Used = U Used and provided by: Holder solely = Os Holder jointly = Oj Landlord = L Priv. contractors = Pc Co-operative = C Government = G	Tractors  63.	Track- laying tractors  63.1	Wheel tractors  63.2	Power tillers and other single-axle traction power units  63.3
Total number of countries asking question		73	34	41	30
<u>EUROPE</u> (22)		19	11	15	13
Austria	O Os Oj	x	x	x	x
Belgium	O Os Oj	x	-	-	-
Czechoslovakia	O	x	x	x	x
Denmark	U	x	-	x	x
Finland	O U Os Oj	-	-	x	-
France	U Os Oj C	x	-	-	x
Germany, Fed. Rep. of	O U Os Oj Pc C	-	-	x	x
Greece	U Os Oj	x	x	x	-
Hungary	O Os	x	x	x	-
Ireland	O	x	-	x	x
Italy	O U Os Oj L	x	x	x	x
Luxembourg	Os Oj	-	-	x	x
Malta	U	x	x	x	x
Netherlands	O U Os Oj	x	x	x	x
Norway	U Os Oj	x	x	x	x
Poland	Os C	x	-	-	-
Portugal	O U Os Oj	x	x	x	x
Spain	O U Os Oj Pc C	x	-	-	-
Sweden	Os Oj	x	-	-	-
Switzerland	U Os Oj	x	-	-	x
United Kingdom	O Os Oj C	x	x	x	-
Yugoslavia	O Os	x	x	-	-
<u>NORTH AMERICA</u> (2)		2	1	1	1
Canada	O	x	-	-	-
United States of America	U	x	x	x	x
<u>LATIN AMERICA</u> (24)		23	12	14	9
Antigua	O U	-	-	x	x
Argentina	O U Os	x	x	x	x
Barbados	O U	x	x	x	x
Belize	O U	x	x	x	x
Brazil	O U	x	-	-	x
Costa Rica	O Os Oj	x	-	-	-
Dominican Republic	Os Pc	x	x	x	-
Ecuador	Os Oj L Pc C G	x	x	x	-
El Salvador	O	x	-	-	-
French Antilles	Os Oj Pc C	x	-	-	-
Honduras	O	x	-	-	-
Jamaica	U	x	-	-	-
Mexico	O	x	-	-	-
Montserrat	O U	x	-	-	-
Nicaragua	O U	x	x	x	x

Table 6.13 - (cont.)

Item and Number Region and Country	Information asked for: Owned = O Used = U Used and provided by: Holder solely = Os Holder jointly = Oj Landlord = L Priv. contractors = Pc Co-operative = C Government = G	Tractors	Track-laying tractors	Wheel tractors	Power tillers and other single-axle traction power units
		63.	63.1	63.2	63.3
<b>LATIN AMERICA (cont.d)</b>					
Panama	O U Os	x	x	x	-
Peru	U Os	x	x	x	-
Puerto Rico	U	x	x	x	-
St. Lucia	O U	x	-	x	x
St. Vincent	O	x	x	x	x
Surinam	O Os Oj Pc	x	x	x	-
Uruguay	O U	x	-	-	-
Venezuela	O U	x	x	x	x
Virgin Islands (U.S.)	Os L Pc G	x	-	-	-
<b>NEAR EAST (6)</b>		6	3	3	1
Iraq	O U Os Oj L Pc C G	x	-	-	-
Israel	O Os Oj	x	x	x	-
Kuwait	U Os Oj L Pc C G	x	-	-	-
Lebanon	O U Os Oj C G	x	x	x	-
Saudi Arabia	O Os Oj L Pc C G	x	x	x	x
Syrian Arab Republic	O	x	-	-	-
<b>FAR EAST (8)</b>		6	1	2	3
India	Os Oj	x	-	-	-
Indonesia	U Os Oj Pc G	x	-	-	-
Japan	O U Os Oj L	x	-	-	-
Korea, Rep. of	O Os Oj L	x	-	-	x
Pakistan	O U	x	-	-	-
Philippines	O U Os Oj L Pc	x	x	x	x
Singapore	O	-	-	-	x
Sri Lanka	Os Oj L Pc G	-	-	x	-
<b>AFRICA (13)</b>		13	5	5	3
Botswana	O U	x	x	x	-
Ghana	U	x	-	-	-
Guinea	U	x	-	-	-
Ivory Coast	U	x	x	x	-
Lesotho	O	x	-	-	-
Liberia	O U Os Oj Pc G	x	-	-	-
Sierra Leone	O Os Oj Pc C G	x	-	-	-
South Africa	U	x	-	-	x
Swaziland	O	x	x	x	-
Tanzania	U Os Pc G	x	x	x	x
Togo	O Os Oj	x	-	-	x
Zaire	O U	x	x	x	-
Zambia	O Os Oj C G	x	-	-	-
<b>OCEANIA (4)</b>		4	1	1	0
American Samoa	U	x	-	-	-
Australia	U	x	x	x	-
Guam	U Os Oj L Pc G	x	-	-	-
Pacific Islands (Trust Territory)	U Os Oj L Pc G	x	-	-	-



Table 6.14 - Extent of participation in Sections 7 and 8 relating to irrigation and fertilizers

Item and Number	Area actually irrigated during the year	Indication of the use of inorganic fertilizers during the year
Region and Country	71.2	81.1
Total number of countries asking question	50	65
<u>EUROPE</u> (9)	6	8
Czechoslovakia	x	x
Finland	-	x
Greece	x	x
Italy	x	-
Malta	-	x
Norway	-	x
Portugal	x	x
Spain	x	x
Yugoslavia	x	x
<u>NORTH AMERICA</u> (2)	2	2
Canada	x	x
United States of America	x	x
<u>LATIN AMERICA</u> (24)	21	24
Antigua	x	x
Argentina	x	x
Barbados	x	x
Belize	x	x
Brazil	x	x
Costa Rica	x	x
Ecuador	x	x
El Salvador	x	x
French Antilles	x	x
Haiti	x	x
Honduras	x	x
Jamaica	x	x
Mexico	-	x
Montserrat	-	x
Nicaragua	x	x
Panama	x	x
Peru	x	x
Puerto Rico	x	x
St. Lucia	x	x
St. Vincent	x	x
Surinam	x	x
Uruguay	x	x
Venezuela	x	x
Virgin Islands (U.S.)	-	x

Table 6.14 - (concluded)

Item and Number Region and Country	Area actually irrigated during the year 71.2	Indication of the use of inorganic fertilizers during the year 81.1
<u>NEAR EAST</u> (7)	7	7
Bahrain	x	x
Iraq	x	x
Kuwait	x	x
Lebanon	x	x
Saudi Arabia	x	x
Syrian Arab Republic	x	x
Turkey	x	x
<u>FAR EAST</u> (6)	5	5
India	x	x
Korea, Rep. of	-	x
Nepal	x	x
Pakistan	x	-
Philippines	x	x
Sri Lanka	x	x
<u>AFRICA</u> (18)	7	17
Algeria	x	-
Botswana	x	-
Cameroon	-	x
Central African Republic	-	x
Chad	-	x
Congo	-	x
Gabon	-	x
Ivory Coast	x	x
Kenya	-	x
Lesotho	-	x
Liberia	-	x
Malawi	-	x
Nigeria	x	x
Sierra Leone	-	x
Swaziland	x	x
Tanzania	x	x
Togo	-	x
Zambia	x	x
<u>OCEANIA</u> (2)	2	2
Australia	x	x
New Zealand	x	x

CHAPTER VII

NATIONAL AGRICULTURAL CENSUS LEGISLATIONS

Ever since the first World Census of Agriculture undertaken in 1930 under the auspices of the International Institute of Agriculture and the World Census of Agriculture in 1950 under the auspices of the Food and Agriculture Organization of the United Nations (FAO), the need for a better knowledge of juridical basis for taking censuses of agriculture at the international level has been felt. This need has grown with the increasing number of countries participating in the succeeding decennial World Censuses of Agriculture sponsored by FAO in 1960 and 1970.

The Programme for the 1970 World Census of Agriculture emphasized the importance of an adequate census legislation as a milestone for the good preparation and execution of the agricultural census and states that: "The creation of a legal basis for an agricultural census is one of the first items to be considered in a census plan. Legal authority for the census is required for fixing primary administrative responsibility, obtaining the necessary funds, determining the general scope and timing of the census, and placing upon the public a legal obligation to cooperate. In countries lacking permanent legal authority for the taking of periodic censuses, it is important to act early in establishing one-time legal authority or, preferably, legislation calling for a system of periodic censuses. In the census legislation the confidentiality of the individual information should be strongly and clearly established and guaranteed by adequate sanctions so as to form a basis for confident cooperation of the public."

In the present Chapter the current national census legislations available at FAO Statistics Division will be described. The principles involved in the formulation of these legislations in selected countries and their differences will be underlined. The basic material used for this report concerns legislative aspects of undertaking agricultural censuses derived from the census documents sent to FAO by a limited number of countries in connection with the 1970 World Census of Agriculture. The relevant law or decree promulgated in a country to undertake a national agricultural census is shown in the following table:

Country	Law or decree and Date <sup>1/</sup>
Belgium	Decree of 22 May 1970
Columbia	Decree No. 1755 of 19 September 1970
Finland	Decree of 13 January 1950
Honduras	Decree No. 50 of 21 June 1973 (same Decree for Population and Housing Censuses)
Hungary	Decree No. 2-1972/I.25
Italy	Decree No. 1392 of 9 December 1970
Korea, Rep. of	Ordinance No. 387 of 16 August 1969
Liberia	Sole Act
Luxembourg	Ministerial Regulation of 10 March 1970
Mexico	Decree on the 1970 National Censuses (same Decree for Population and Ejidal Censuses)
Pakistan	Agricultural Census Act 1958
Panama	Decree of 11 February 1971
Togo	Decree No. 2/Ministère des Finances, de l'Economie et du Plan/Ministère de l'Economie Rurale

<sup>1/</sup>Material available in FAO. The other sources are given in footnotes as they arise.

## Juridical Aspects of the Census of Agriculture

A description is made of some major characteristics of national decrees of a selection of countries which participated in the 1970 World Census of Agriculture. The following ten topics have been selected as a basis for the presentation of the national census legislation.

1. Identification and juridical basis of the agricultural census decree
2. Authority for the promulgation of the decree
3. Census executing authority
4. Periodicity in carrying out the census
5. Number of articles
6. Scope of the census
7. Persons or institutions requested to furnish information
8. Obligatory participation
9. Confidentiality of information
10. Penalties for transgression of confidentiality and for not giving information or for giving false information.

### 1. Identification and juridical basis of the agricultural census decree

The decree promulgated for the carrying out of the agricultural census is often issued on the basis of a previous law and taking into account other directives. The Belgian decree is a representative case. The decree of 22 May 1970 was promulgated not only on the basis of the law of 4 July 1962 which authorized the Government to proceed with statistical investigations on the demographic, economic and social situation of the country, but also taking into account the directive No. 69/400 of 28 October 1969, concerning the Resolution No. 3/65 of 9 December 1965 adopted by the FAO Conference, the Treaty of Rome and the Communal law. In the case of Finland the law and the decree were issued on the same date. For Hungary, Pakistan and Liberia their agricultural census was based on a single act. However, Hungary differs from the other two because a special decree was issued by the Government after consultation with the Ministry of Agriculture and Food, the Planning Office, National Water Authority, Institute for Research in Agriculture and the University of Agricultural Sciences. This was done to make it possible to meet the requests of the FAO Programme for the 1970 World Census of Agriculture to include small holdings which were excluded in the coverage of holdings for the collection of statistical data. In the Republic of Korea the purpose of the ordinance No. 387 of 16 August 1969 was to ordain necessary articles of the agricultural census according to Paragraph 2, Article 9, of the Operational Ordinance of Statistical Law.

In Italy the Decree No. 1392 of 9 December 1970 establishing the second census of agriculture was issued under Law No. 14 of 31 January 1969 which set up the financial basis for carrying out the censuses of agriculture, population, industry and commerce.

The case of UDEAC<sup>1/</sup> countries is an example of international collaboration, in fact the four States of the Union, namely, Cameroon, Central African Empire, Congo and Gabon decided, after the meeting of 21 June 1967, to carry out the agricultural census jointly. This Resolution (No. 3/67-CD-516) appointed a Study Group for the purpose. This Resolution was followed by another consisting of 6 articles setting the financial basis for the census operation. (Appendix 7.4B)

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<sup>1/</sup>

UDEAC : Union Douanière et Economique de l'Afrique Centrale

## 2. Authority for the promulgation of the decree

In Honduras, Hungary, India,<sup>1/</sup> Pakistan and Panama the authority for the promulgation of the decree is the Government itself. In Finland and Korea it is the Ministry of Agriculture. In Togo the authority is the Ministry of Finance and Economic Affairs and Planning and the Ministry of Rural Economy. In Colombia as well as in Mexico and Italy the decree was promulgated by the President of the Republic and in the United States<sup>2/</sup> by the Congress. The Virgin Islands, Guam and the Commonwealth of Puerto Rico, as well as other areas are under the jurisdiction or control of the United States. In Australia<sup>3/</sup> and Liberia the census was promulgated by the Senate and House of Representatives and in Luxembourg by the Ministry of National Economy. In Belgium the promulgation of the general census of agriculture was made by Royal Decree. For the UDEAC countries the decision was taken by the Council of Head of States.

## 3. Census executing authority

While the authority in charge of technical work is generally the National Statistical Office, or other similar office, the census executing authority varies considerably from country to country. In Belgium, Italy and Luxembourg the executing authority were the mayors, in Hungary, India and Korea, the Ministry of Agriculture but in all these six countries the National Statistical Office was in charge of the technical work.

In Finland the local authorities, and in Liberia the Department of Planning and Economic Affairs, in cooperation with the Department of Agriculture and the College of Agriculture and Forestry of the University of Liberia, nominate an Agricultural Census Committee for the execution of the agricultural census. An Agricultural Census Committee was also established in Togo composed of the Director of Agricultural Services, the Director of Statistics, the FAO expert on agricultural statistics and the Chief of the Division of Economic Statistics.

In Pakistan, the Census Commissioner was the executing authority in Collaboration with the Agricultural Census Advisory Committee which included official representatives from the Ministries and Departments of the Central and Provincial Governments, which are concerned with statistics, planning and agriculture as well as one representative of the farmers from each province.

In Iraq<sup>4/</sup> a Census Advisory Committee was formed under the chairmanship of the President of the Central Statistical Organization. The Committee consisted of eleven officials representing the Higher Agricultural Council, Ministries of Agriculture, Agrarian Reform, Irrigation, Economy and the Central Statistical Organization. In Colombia, Honduras, Mexico and Panama the National Statistical Offices were both the census executing authority and the authority in charge of technical work.

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<sup>1/</sup> Government of India: All India Report on Agricultural Census 1970-71, 1975

<sup>2/</sup> U.S.A. : U.S. Bureau of the Census, Census of Agriculture 1969, Vol. V, Part 14

<sup>3/</sup> Australia: Census and Statistics Act 1905 - 1949.

<sup>4/</sup> The Agricultural Census in Iraq 1971, Regional Institute for Research and Training in Statistics for the Near East.

#### 4. Periodicity in carrying out the census

Periodicity in carrying out the census does not exist in the legislation of countries such as Italy, Liberia, Pakistan, Philippines<sup>1/</sup> and Honduras where the agricultural censuses are promulgated on a time to time basis. In Belgium the agricultural census is carried out annually as stated in the Royal Decree of 6 May 1965.

In Hungary, where the census of State farms, cooperatives and institutions is undertaken annually, the participation in the 1970 World Census of Agriculture was established by a special decree.

In the United States, the Bureau of the Census conducts agricultural censuses covering the years ending in 4 and 9 as stated under title 13 of the U.S. Code. In Uruguay<sup>2/</sup> Law No. 4294 of 7 January 1913 fixes the time lapse between each agricultural census to five years. Article I of the Law of 13 January 1950 on agricultural statistics in Finland, declares: "A general agricultural census covering the whole country should be taken every 10 years, for the first time in 1950, and annual statistics are drawn up yearly in accordance with this law. An account of harvest prospects during the summer months is also made annually in a way determined in detail by the Ministry of Agriculture". In Colombia the Law No. 2 of 1962 stated that the agricultural census should be carried out every ten years starting with 1970. In Finland and Colombia the same time interval was indicated but with the possibility of a shorter lapse. "The National Census of Agriculture must be held at least once every ten years", is stated in Decree No. 7 of 25 February 1960 which set up the basis of Panama's National Statistics. In Korea the census will be carried out in the years ending with zero (Art. 4) and may be integrated with other smaller agricultural surveys after 5 years, if deemed necessary by the Minister of Agriculture and Forestry."

#### 5. Number of articles

A decree may consist of several articles or sections containing directives. It may be broad or concise but does not necessarily affect the quality or clearness of the decree. The difference in the number of articles included in a decree between the countries under study are described below.

Three classes of decrees according to the number of articles may be formed as follows: less than 11 articles, from 11 to 20 articles and 21 articles or more. In the first class are Liberia with an Act composed of 6 articles; Hungary where the decree is composed of 8 articles; Finland and Honduras with 10 articles. The second group includes Luxembourg and Sweden<sup>3/</sup> having 11 articles, Pakistan 14, Belgium 17 and Korea 18. The third class includes Panama with a decree consisting of 23 articles, Italy with 24, Colombia with 27 and Mexico with a total of 33 articles.

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<sup>1/</sup> Philippines: Commonwealth Act No. 591, 19 August 1940.

<sup>2/</sup> Uruguay: Censo General Agropecuario 1970, March 1973.

<sup>3/</sup> Sweden: Svensk Författningssamling 1968, No. 111, 29 March 1969.

## 6. Scope of the census

The analysis of the various decrees shows that the legislative authority who drew up the decrees may have a great influence in the formulation of the census scope and coverage. In some cases decrees include detailed questions to be inserted in the questionnaire, in others, only general directives are given. In other cases the legislative authority does not intervene at all, thus allowing full liberty of interpretation by the census executing authorities.

The Finnish Decree on execution of the law on agricultural statistics is an example of detailed census scope. The first three articles which give a complete picture of the questions to be asked in the census questionnaire are shown below:

Article I : The general agricultural census comprises statistical investigation of the conditions of cultivation, forestry units, ownership and tenancy, properties, utilization and yields of cultivated land, drainage, soil, use of fertilizers and substances to improve the soil, handling and storage of fertilizer, AIV silos, arrangements promoting labour effectiveness, garden cultivation and yields, the number of livestock according to type of animal and their production, number and use of most important machines and tools, use of labour in the household, fishing and its yields, fur farming and the most important home crafts. In connection with the agricultural census, information is also obtained on the indebtedness of the agricultural industry and on the division of the produce of the farm between that for sale and that consumed on the farm. The Ministry of Agriculture may either increase or reduce the number of questions to be asked.

Article II : The annual agricultural statistics should be drawn up, both with regard to weather conditions, growth in productivity, areas of arable land and yields, garden cultivation, livestock and slaughtering, fishing, dairying and, if it seems necessary, wages of agricultural workers. Statistics should also be drawn up on the activity of dairy cattle testing societies and information should be sought about harvest prospects and associated details during the summer months. The Ministry of Agriculture may either increase or reduce the number of questions to be asked.

Article III : The general agricultural census comprises all holdings with an arable area of at least 2 ha. and also smaller holdings or other properties on which any reasonably intensive form of production connected with agriculture is practiced, such as commercial gardening or poultry keeping, rearing of fur animals or bees or on which home crafts or fishing for sale are practiced. In a limited way, the census also affects other agricultural properties, insofar as information concerning them is not obtained in connection with the population census, and forest properties or parts of them."

Almost the same approach as Finland was followed by Pakistan. In Article 4 of the Pakistan Census Act a list of information to be collected is shown, namely:

- "(a) Land ownership and land tenure
- (b) Land unit and sub-division of land
- (c) Land utilization
- (d) Crop acreage and production
- (e) Livestock and poultry
- (f) Employment in agriculture
- (g) Agricultural population
- (h) Agricultural power and machinery
- (i) Irrigation and drainage
- (j) Fertilizers and soil dressings
- (k) Wood and fishery products
- (l) Agricultural credit
- (m) Agriculture and silviculture

- (n) Fruit and vegetable products
- (o) Such other matters as the Central Government may, by notification in the official Gazette, specify."

The case of Belgium is partly different because the scope of the census is not shown in any article of the decree but in an annex forming part of the decree itself. The annex is indeed a very detailed questionnaire covering all aspects of Belgian agriculture.

On the other hand, Sweden gives an example of general indications giving short directives on the information to be collected during the census. The Article 4 of the Swedish Decree No. 111 of 1968 states:

"Directives for persons engaging in activities mentioned in para. 1 are responsible for providing information on:

1. Register category, area and land use concerning property, or part of property, where the activity is carried out;
2. buildings and other structures;
3. machines;
4. livestock and poultry;
5. manufactured products and their use in the activity;
6. manpower used.

Individual persons shall also provide information on age, year of access, education and previous activity, as well as on the type and extent of his own labour input in this and other activities. "

The Mexican Decree is very laconic asking information on "physical, technical and economical" characteristics of all agricultural and ejidal holdings (Art.s 8 and 9).

The case where the legislative authority did not intervene at all in the scope and coverage of the agricultural census in the formulation of the census legislation is in Colombia, Hungary, Honduras, Liberia, Panama and Togo.

#### 7. Persons or institutions requested to furnish information

In all the countries selected for this Chapter, all civil and juridical persons were asked, by their national legislations on agricultural censuses to furnish information on the state of their agricultural activities.

With the exception of Belgium and Luxembourg where the articles concerning the range of questions also define the census scope, there are only minor differences amongst the others, on this subject. In these two countries there is a merging of the two concepts, i.e. the census scope and the information requested.

In Finland, Article 2 of the law on agricultural statistics (not the decree) states "Every private person, estate, company cooperative, association, society, institution or other combine and establishment, as also government departments and establishments of the state, municipality or parish are liable to render the information deemed necessary for the agricultural census ...".

In Pakistan the same problem has been solved by a short statement which is, at the same time, very comprehensive. In fact in Article 2 of their census legislation we find: "For the purpose of collecting information, the Central Government may require any persons within its jurisdiction to give answers to such questionnaire ....."



Also in Liberia the topic has been solved very concisely. Article 2 of the Census Act states: "The Census shall cover the whole country and shall include individual farm households, farms operated by public or private organizations and farms used for experimental purposes by school and Government Agencies".

In the Latin American countries namely, Colombia, Honduras, Mexico and Panama the directives are similar and with the exception of Panama, all include in their articles, the characteristic of the obligatoriness of information. Article 3 of the Colombian Decree No.1755 is a representative example: "Shall give information all natural or juridical persons having, under whatever title, agricultural holdings situated within the national territory".

#### 8. Obligatory participation

The legal obligation to cooperate for the taking of a census is a common denominator of all countries selected for this Chapter. The reason is that the undertaking of an agricultural census is considered a recognized task of national interest with which all the citizens of the State have to collaborate. The necessity of an active participation of all persons and institutions involved in census operations, apart from the "civic" side of the matter, is rather technical. In fact, a refusal of collaboration, in terms of refusal to give information or giving false information, will endanger all the census work whether in the case of a complete enumeration or in a census conducted on a sampling basis.

The legal obligation to cooperate in the census does not concern only farmers or other juridical persons but, in some countries as in Mexico and Panama all literate persons may be compelled to collaborate in the census as enumerators, supervisors, etc. Article 5 of the Mexican Constitution underlines the civic importance of the participation in the census operations stressing its obligatory and gratuitous character. This is a case of participation without remuneration encountered in this report.

In other countries generally the census operation does not need the obligatory collaboration of the population because it is conducted by the staff of the National Statistical Offices or other census committees. An example is the Article 2 of the Norwegian Decree which states: "The census is to be administered by the Central Statistical Office with the assistance of the municipalities. In the individual municipalities, the census will be administered by the local councils or by the mayor in municipalities where no local council is established. The census is to be carried out by persons whom the local council or mayors consider suitable for the purpose".

#### 9. Confidentiality of information

One of the most important points for the success of a census is the absolute confidentiality of the information provided by the respondents. This is the main reason for which the need of confidentiality of the individual information in the census legislation, with the assurance of its use for statistical purposes only, should be firmly and clearly stated. The validity of this need has been confirmed by all legislators who have introduced it with different degrees of emphasis in their national census legislation. Five countries, namely Colombia, Hungary, Pakistan, Panama and the Philippines, have been chosen to illustrate the different approaches to resolve this delicate point.

Colombia - Article 6 : "In conformity with Art. 75 of the Decree 1633 of 1960 the data .... (...) have a strictly confidential character and cannot be divulged either to the public or to official entities except in a global form or in the form of numerical summaries which make it impossible to deduct any individual information which might be used for fiscal or criminal purposes or any purpose other than the statistical investigation of the National Agricultural Census. Thus it is forbidden to census civil servants to divulge any information in their possession; on the contrary they will be submitted to the punishment provided for in the penal code."

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<sup>1/</sup>Norway : Ministry of Finance and Custom Duties, Ministry Case No. 43 of 13 December 1968.

Hungary - Article 4. : "The census and the data of the questionnaires concerning small farms are to be used only for statistical purposes."

Pakistan - Article 11. : "No person shall have a right to inspect any book, register or record made by a census officer in the discharge of his duties as such, and notwithstanding anything to the contrary in the Evidence Act, 1872, no entry in any such book, register or record shall be admissible as evidence in any civil proceeding whatsoever, or in any criminal proceedings, other than a prosecution under this Act or under any other law for any act or omission under this Act which constitutes an offence under such other law."

Panama - Article 10. : "The individual data obtained from the Census are strictly confidential. Data may be published only in a group of at least three persons."

Article 11. : "The individual data obtained from the Census cannot be used as evidence in any civil proceedings or in fiscal investigations or any purpose other than statistical enquiries."

Philippines - Section 4 : "Data furnished to the Bureau of the Census and Statistics by an individual, corporation, partnership, institution or business enterprise shall not be used as evidence in any court or in any public office either as evidence for or against the individual, corporation, association, partnership, institution or business enterprise from whom such data emanate; nor shall such data or information be divulged to any person except authorized employees of the Bureau of the Census and Statistics, acting in the performance of their duties; nor shall such data be published, except in the form of summaries or statistical tables in which no reference to an individual, corporation, association, partnership, institution or business enterprise shall appear ....."

10. Penalties for transgression of confidentiality and for not giving information or for giving false information

Penalties are enforced on two kinds of contraventions: in the case of respondents, for non-participation or for giving false information, and transgression of confidentiality on the part of enumerators and authorities concerned. The affinity of the subjects and the ascertainment that several countries deal with both items in the same article, brings us to deal with them together. The penalties may be clearly stated in the decree itself or submitted to the judgement of a court or to the administrative authorities. Such penalties are of an economic order, expressed in fines of different values, or of penal and administrative order or of a combination of these three cases.

In Finland the census law deals only with the penalties for not giving information or for giving false information disregarding the penalties concerning the transgression of confidentiality. Point A of the Finnish Census Law on agricultural statistics states that "Any person who without valid reason fails to render information in accordance with this law is punished by a maximum of 50 days". If any one who is liable to render information or a false report, or if anyone violates the provisions of Paras. 3, Article 3, is punished, insofar as heavier penalties for the act are not laid down elsewhere, by a maximum of 100 days".

No fines are foreseen in Finland, while in Malta<sup>1/</sup> fines are foreseen as shown in the Notice quoted below: "Any person who without lawful excuse (the proof whereof shall lie on him) fails or neglects to furnish the information required by this Notice may, under the Act referred to above, be liable to a fine (multa) not exceeding M£50 and, in the case of a continued offence, to a further fine not exceeding M£2 for each day during which the offence continues".

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<sup>1/</sup> Malta : Notice on the basis of Statistics Act 1955.

In Luxembourg two articles deal with the matter of penalties. Article 9 deals with the individual who refuses to give information or gives false information submitting the case to Article 7 of the Law of 9 July 1962. Article 10 deals with confidentiality and states that "It is firmly forbidden to the civil servants and all other persons collaborating with the census work to reveal the information in their possession, the Article 458 of the Penal Code will be applied without prejudice of eventual disciplinary sanctions".

In the Philippines, Section 4 of the Commonwealth Act states "Any person violating the provisions of this section shall, upon conviction, be punished by a fine of not more than six hundred pesos or by imprisonment for not more than six months, or by both".

In Panama fines from 5 to 100 balboas are charged to individuals not giving information or giving false information. Enumerators or other census staff are liable to the same fine for transgression of secrecy. If the transgressor is an employee of the Bureau of Statistics and Census he may also be dismissed from Office according to Article 14 of Decree No. 7 of 1960.

Finally, in Italy, the confidentiality of information and the penalties for transgression or for giving false information were both regulated by the law No. 2238 of 21 December 1969 and not by the Census Decree itself.

APPENDIX 7.1 - LIBERIA

AN ACT TO PROVIDE FOR THE CONDUCT OF A CENSUS  
OF AGRICULTURE OF LIBERIA

It is enacted by the Senate and House of Representatives of the Republic of Liberia, in Legislature Assembled:

Section 1. The Department of Planning and Economic Affairs in cooperation with the Department of Agriculture and the College of Agriculture and Forestry of the University of Liberia is hereby authorized and empowered to undertake and conduct a Census of Agriculture of the Republic.

Section 2. The Census shall cover the whole Country and shall include individual farm-households, farms operated by public or private organizations and farms used for experimental purposes by Schools and Government Agencies.

Section 3. The Census shall be conducted in accordance with direct enumeration (inquiry) method.

Section 4. The President is hereby authorized to appoint a Committee on Agriculture Census to assist and advise in the planning, publicity, supervision, enumeration, processing, analysis and publication of the Census results. This Committee shall be composed of a representative from each of the following Departments: Department of Planning and Economic Affairs, Department of Agriculture, Department of Commerce and Industry, the Department of Internal Affairs and Department of Information and Cultural Affairs and the Dean of the College of Agriculture and Forestry of the University of Liberia. The representative of the Department of Planning and Economic Affairs on this Committee shall be Chairman and shall be known as the Census Commissioner. The Committee may form sub-committees as may be appropriate.

Section 5. All Agencies of Government, the heads of all political sub-divisions within the Country, Concessionaires and the public in general shall give fullest cooperation to the Departments concerned for the full implementation of this Act.

Section 6. This Act shall take effect immediately upon publication in hand-bills.

Any law to the contrary notwithstanding.

APPENDIX 7.2 - PAKISTAN

THE AGRICULTURAL CENSUS ACT 1958 <sup>1/</sup>

'ACT NO. KLI OF 1958'

(23 September 1958)

An Act to provide for certain matters for the purpose of taking an agricultural census.

WHEREAS IN A GENERAL meeting of the Food and Agriculture Organization of the United Nations a decision has been taken urging the member countries to take an agricultural census;

AND WHEREAS it is expedient to take agricultural census in pursuance of the said decision and to provide for certain matters for that purpose;

AND WHEREAS in pursuance of the proviso to Article 108 of the Constitution, the Governors of the Provinces of East Pakistan and West Pakistan have been consulted.

It is hereby enacted as follows:-

- 1.- (1) This Act may be called the Agricultural Census Act. 1958      Short title  
(2) It extends to the whole of Pakistan.      extent and  
(3) It shall come into force on such date as the Central      commencement  
Government may, by notification in the Official  
Gazette, appoint.
- 2.- In this Act, unless there is anything repugnant in the      Definitions  
subject of context:-
- (a) "census" means agricultural census;
- (b) "Census Officer" means an officer appointed for the  
purpose of carrying out the provisions of this Act.
- 3.- (1) The Central Government may appoint:-      Census Officers
- (i) A Census Commissioner to supervise the taking of the  
census throughout Pakistan;
- (ii) Joint Census Commissioners, Deputy Census Commissioners  
and Assistant Census Commissioners to supervise the  
taking of census within the Provinces and the Federal  
Capital; and
- (iii) other census officers to take, aid in or supervise the  
taking of, the census within any specified area.
- (2) The Central Government may, by order, delegate the powers  
conferred upon it by clause (iii) of sub-section 3.1 to the  
Provincial Government or to such officer or authority subordinate  
to the Provincial Government as may be specified in the order.

<sup>1/</sup> The 1958 Agricultural Census Act still provides the legal basis for the 1970 Census of Agriculture.

(3) A declaration in writing signed by any authority authorized by the Central Government in this behalf, that a person has been duly appointed as census officer shall be conclusive proof of such appointment.

4.- (f) For the purpose of taking census, information shall be collected on or with respect to the following matters, namely;- Collection of information for census.

- (a) land ownership and land tenure;
- (b) land unit and subdivision of land;
- (c) land utilization;
- (d) crop acreage and production;
- (e) livestock and poultry;
- (f) employment in agriculture;
- (g) agricultural population;
- (h) agricultural power and machinery;
- (i) irrigation and drainage;
- (j) fertilizers and soil dressing;
- (k) wood and fishery products;
- (l) agricultural credit;
- (m) agriculture and selviculture;
- (n) fruit and vegetable products; and
- (o) such other matters as the Central Government may, by notification in the Official Gazette, specify.

(2) For the purpose of collecting information referred to in sub-section 4.1 the Central Government may, by notification in the Official Gazette, prepare such questionnaire as it thinks fit and a census officer may require any person within his jurisdiction to give answers to such questionnaire and to such other questions relevant to the questionnaire as he may think fit to ask.

(3) Any person who is required to give answers to the questionnaire and other relevant questions under sub-section 4.2 shall be legally bound to give answers to the best of his knowledge or belief.

5.- (1) For the purpose of collecting information referred to in sub-section 4.1, crop-cutting experiments may be conducted, and for such experiments any land in any area may be selected. Crop-cutting experiments

(2) The owners or occupiers of lands or their agents or servants shall allow such access to the census officers and other persons assisting them, to their lands as may be necessary for the conduct of crop-cutting experiments.

(3) The owner or other person entitled to the crop shall be paid such compensation for any loss or damage caused to him by the conduct of crop-cutting experiments as the Central Government may prescribe.

6.- Every person owning or occupying any house, premises or lands shall allow the census officers such access thereto as they may require for the purposes of the census and shall allow them to paint on, affix to, or dig in, the house, premises or lands such letters, mark or objects as may be necessary for the said purpose. Access to census officers to premises and land.

7.- (a) Any census officer or any person lawfully required to give assistance towards the taking of a census who refuses or neglects to use reasonable diligence in performing any duty imposed upon him or in obeying any order issued to him in accordance with this Act or any rule made thereunder, or any person who hinders or obstructs another person in performing any such duty or in obeying Penalties

any such order, or

(b) any census officer who knowingly makes any false return or, without the previous sanction of the Central Government or the Provincial Government, discloses any information which he has received by means of, or for the purposes of, a census return, or

(c) any person who intentionally gives a false answer to or refuses to answer to the best of his knowledge or belief, the questionnaire or other relevant question asked of him by a census officer which he is legally bound to answer, or

(d) any person occupying any house, premises or land who refuses to allow a census officer such reasonable access thereto as he is required under section 6 to allow, or

(e) any person who removes, obliterates, alters or damages without proper authority or before the completion of the census any letters, marks or objects which have been painted, affixed or dug for the purposes of the census, shall be punishable with fine which may extend to five hundred rupees.

- 8.- No prosecution under this Act shall be instituted except with the previous sanction of the Provincial Government or of an authority authorized in this behalf by the Provincial Government. Sanction for prosecution under this Act.
- 9.- Nothing in this Act shall be deemed to prevent any persons from being prosecuted under any other law for any act or omission under this Act which constitutes an offence under such other law; Prosecution under other Laws.
- Provided that no such prosecution shall be instituted except with the previous sanction referred to in section 8.
- 10.- No Court inferior to that of a Magistrate of the second class shall try an offence under this Act. Jurisdiction
- 11.- No person shall have a right to inspect any book, register or record made by a census officer in the discharge of his duties as such, and notwithstanding anything to the contrary in the Evidence Act, 1872, no entry in any such book, register or record shall be admissible as evidence in any civil proceeding whatsoever, or in any criminal proceedings, other than a prosecution under this Act or under any other law for any act or omission under this Act which constitutes an offence under such other law. Census records not open to inspection.
- 12.- The Census Commissioner or any Joint Census Commissioner, Deputy Census Commissioner or Assistant Census Commissioner or such person as the Central Government may authorize in this behalf may, if he thinks fit, at the request and cost (to be determined by him) of any local authority or person, cause abstracts to be prepared and supplied containing any such statistical information as can be derived from the census returns being information which is not contained in any published report and which, in his opinion, it is reasonable for that authority or person to require. Preparation of Statistical Abstracts.
- 13.- All census officers shall be deemed to be public servants within the meaning of section 21 of the Pakistan Penal Code. Act XLV of 1860
- 14.- The Central Government may make rules for carrying out the purposes of this Act. Power to make rules.

ANEXO II.

(de 11 de febrero de 1971)

LA JUNTA PROVISIONAL DE GOBIERNO,

en uso de sus facultades legales,

CONSIDERANDO:

Que el Tercer Censo Nacional Agropecuario será realizado en la segunda quincena de mayo de 1971;

Que es preciso dictar las disposiciones reglamentarias que aseguren el empadronamiento eficiente en todo el territorio nacional; y

Que el Decreto-Ley No. 7 de 25 de Febrero de 1960, en su Artículo 39 dispone que para "asegurar el empadronamiento eficiente relacionado con un censo, el Ejecutivo dictará por Decreto las medidas que se consideren convenientes",

APPENDIX 7.3 - PANAMA

DECRETA:

CAPITULO I

FECHA Y ORGANIZACION DEL CENSO

ARTICULO 1o. - Fijase el domingo 16 de mayo de 1971 para que se inicie en todo el país el levantamiento del Tercer Censo Nacional Agropecuario, el cual podrá extenderse a varios días en los lugares donde sea necesario.



**ARTICULO 2o.** - El levantamiento del Censo Nacional Agropecuario se realizará de conformidad con los procedimientos técnicos y los instrumentos de trabajo que establezca la Dirección de Estadística y Censo de la Contraloría General de la República.

**ARTICULO 3o.** - La organización del empadronamiento tendrá el siguiente personal en orden ascendente de jerarquía, bajo la coordinación y dirección de la Dirección de Estadística y Censo de la Contraloría General de la República:

1. El empadronador, a cuyo cargo estará el empadronamiento en el segmento censal o área de enumeración directa.
2. El supervisor, quien es el responsable inmediato de la ejecución del empadronamiento en la zona de supervisión.
3. El Inspector Auxiliar, quien desempeñará funciones de asistente del Inspector Regional y será conjuntamente responsable con éste en las labores de organización y ejecución de los censos en la región respectiva.
4. El Inspector Regional, quien es el representante directo de la Dirección de Estadística y Censo de la Contraloría General en la Región Censal donde asumirá la dirección de las labores de organización y ejecución del empadronamiento.

**PARAGRAFO:** Queda a discreción de la Dirección de Estadística y Censo de la Contraloría General la designación de otro personal auxiliar cuando se considere necesario.

**ARTICULO 4o.** - En cada distrito de la República se constituirá, además, una Junta Municipal Pro-Censos, la cual colaborará con los funcionarios censales en la organización, divulgación, transporte, en relación con los censos, en el respectivo distrito. Tales Juntas estarán integradas por autoridades civiles, militares y eclesiásticas, maestros, profesores, empresarios, profesionales, representantes de agrupaciones cívicas y otros miembros destacados de la comunidad, bajo la coordinación del representante de la Dirección de Estadística y Censo de la Contraloría General.

**ARTICULO 5o.** - El Censo Agropecuario será realizado mediante la entrevista directa con el productor. Para evitar omisiones, el día del censo, en cada vivienda de la República deberá permanecer una persona responsable y con capacidad para responder al cuestionario sobre las actividades agropecuarias que realicen el jefe de la vivienda o algún otro miembro de la misma. Se exceptúan las ciudades de Panamá y Colón para cuyo empadronamiento se empleará el procedimiento que se establece en el Artículo 6o.

**ARTICULO 6o.** - El productor agropecuario residente en las ciudades de Panamá y Colón deberá concurrir personalmente, o por intermedio de persona autorizada, a las oficinas locales del Censo con el fin de suministrar los informes que se requieren, en un término de cinco (5) días a partir del 16 de mayo de 1971. Para facilitar el empadronamiento la Dirección de Estadística y Censo de la Contraloría General de la República podrá hacer entrega previa de la boleta censal a fin de que el interesado la devuelva debidamente llenada.

## CAPITULO II

### OBLIGATORIEDAD Y CONFIDENCIALIDAD

**ARTICULO 7o.** - El Censo Agropecuario empadronará a todos los productores agropecuarios que operan en el territorio bajo la jurisdicción panameña.

**PARAGRAFO:** Productor Agropecuario, para los efectos del Censo, es la persona natural o jurídica que tiene la iniciativa económica y técnica y la responsabilidad principal del manejo de una unidad de explotación agropecuaria. Unidad de explotación es toda extensión de tierra que se utiliza total o parcialmente para actividades agrícolas, ganaderas o avícolas.

**ARTICULO 8o.** - Todas las personas naturales o jurídicas establecidas en el territorio nacional a la fecha del empadronamiento están en la obligación de suministrar los informes cuyas preguntas están contenidas en las boletas censales. Cada una de esas personas o su representante legal, se considerará como informador directo y responsable.

CAPITULO III

OTRAS DISPOSICIONES  
RESPECTO AL CENSO

**ARTICULO 9o.** - Incurrirán en multa de cinco (B/5.00) a cien (B/100.00) Balboas, según la gravedad de la falta, las personas que no suministren los datos de que trata el Artículo 8o., o que suministren informaciones falsas cuando dicha falsedad se hiciera con malicia o se debiere a extrema negligencia. La reincidencia acarreará una pena no menor del doble de la impuesta por la primera infracción. El pago de la multa no exime al multado de la obligación de suministrar los datos solicitados en forma verídica.

Para los efectos de este Artículo se considerará que un dato no ha sido suministrado cuando el obligado a suministrarlo tratare de evadir al empadronador; o se negare a responder; o diere respuestas evasivas o poco precisas con el propósito ostensible de eludirlas.

**PARAGRAFO:** Serán competentes para conocer de las infracciones al presente Artículo, los Alcaldes Municipales, los cuales procederán a base de las denuncias y pruebas que presente el funcionario del Censo en el respectivo distrito. Las multas ingresarán al Tesoro Nacional.

**ARTICULO 10o.** - Los datos individuales que se obtengan en el censo, son estrictamente confidenciales. Sólo podrán publicarse datos que correspondan a la información agrupada de por lo menos tres (3) personas.

**ARTICULO 11o.** - Los datos individuales que se obtengan en el censo, no harán fe en juicio, ni podrán utilizarse para fines de tributación fiscal, ni para investigaciones judiciales, ni para cualquier otro propósito que no sea de carácter estadístico.

**ARTICULO 12o.** - El empadronador u otro funcionario del Censo que divulgare un dato considerado confidencial será castigado, de acuerdo con el Artículo 166 del Código Penal, con multa de cinco (B/5.00) a cien (B/100.00) Balboas. Si el infractor es empleado de la Dirección de Estadística y Censo de la Contraloría General de la República, será además, destituido de su cargo según lo dispone el Artículo 14 del Decreto Ley No. 7 de 1960.

**ARTICULO 13o.** - Todos los habitantes de la República que saben leer y escribir, especialmente los empleados públicos nacionales o municipales, están obligados a prestar sus servicios para el levantamiento del Censo Agropecuario.

**PARAGRAFO:** Se exceptúan de la obligación anterior los que padecen enfermedad, incapacidad física o mental, o trabajan en servicios públicos especiales (médicos, enfermeras, bomberos permanentes u otros similares).

**ARTICULO 14o.** - Los jefes de las dependencias oficiales nacionales o municipales, de las entidades autónomas o semi-autónomas, y los patronos de las empresas privadas, deberán permitir a los trabajadores a su cargo que cumplan las labores relacionadas con el empadronamiento que les encomiende la Dirección de Estadística y Censo de la Contraloría General. El tiempo durante el cual presten ese servicio no implica discontinuidad en el trabajo para los efectos de remuneración y las demás relaciones obrero-patronales contenidas en el Código de Trabajo y leyes vigentes.

**ARTICULO 15o.** - El personal que sea seleccionado para prestar servicios en las actividades censales deberá recibir el adiestramiento que corresponda. Los patronos deberán permitir a sus empleados la asistencia a los cursos de adiestramiento, de acuerdo con el horario que para tal efecto se establezca.

**ARTICULO 16o.** - Los empadronadores están obligados a visitar personalmente todas las viviendas en el área cuyo empadronamiento se les ha encomendado y a cumplir estrictamente las instrucciones que para tal fin se les impartan. A quien se le compruebe que no ha visitado personalmente una vivienda, sino que ha inventado los datos o ha obtenido éstos por referencias de terceras personas, deberá devolver el dinero que se le hubiere adelantado por el trabajo; será multado conforme al Artículo 12 del presente Decreto y si es empleado público, será destituido de su cargo.

**ARTICULO 17o.** - El que sea nombrado para desempeñar un cargo en la organización del empadronamiento y no cumpla con las labores que le encomienden, será sancionado con multa de cinco (B/5.00) a cincuenta (B/50.00) Balboas, según la gravedad de la falta.

La multa será impuesta por el Alcalde Municipal ante el cual el funcionario del Censo presente la denuncia y las pruebas.

El valor de las multas ingresará al Tesoro Nacional.

**ARTICULO 18o.** - Tendrá prioridad, durante el levantamiento de los censos, la utilización de los vehículos oficiales para la movilización del personal censal cuando así lo requiera la Dirección de Estadística y Censo de la Contraloría General de la República.

**ARTICULO 19o.** - Los servicios postales, telefónicos y telegráficos necesarios para el levantamiento de los Censos Nacionales, serán libre de costo para las personas que se identifiquen como miembros de la organización censal.

**ARTICULO 20o.** - Siempre que sea necesario, las autoridades y funcionarios nacionales y municipales deben proporcionar local y dar todas las facilidades del caso en sus oficinas para la ejecución de los trabajos relacionados con el Censo. También deberán cooperar en la consecución de los medios de transporte para los supervisores y empadronadores, especialmente en aquellas regiones donde se dificulte su obtención.

**ARTICULO 21o.** - Las empresas de transporte terrestre, marítimo y aéreo, así como los dueños de caballos, darán preferencia al personal censal para el uso de los medios de transporte que se requieran durante el empadronamiento, sin recargo alguno sobre los precios corrientes.

**ARTICULO 22o.** - Las personas naturales o jurídicas que hagan donaciones o presten sus servicios a los Censos en forma gratuita recibirán de la Dirección de Estadística y Censo de la Contraloría General de la República, un certificado de cooperación. Si se trata de un empleado público, dicho certificado deberá tenerse en cuenta para la evaluación de su trabajo regular.

**ARTICULO 23o.** - Este Decreto comenzará a regir a partir de su promulgación.

**COMUNIQUESE Y PUBLIQUESE:**

Dado en la Ciudad de Panamá, a los once días del mes de febrero de mil novecientos setenta y uno.

Ing. Demetrio B. Lakas  
Presidente de la Junta  
Provisional de Gobierno

Lic. Arturo Sucre P.  
Miembro de la Junta  
Provisional de Gobierno

El Ministro de Gobierno y Justicia  
Lic. Alejandro J. Ferrer S.

APPENDIX 7.4 A - UNION DOUANIÈRE ET ÉCONOMIQUE DE L'AFRIQUE CENTRALE (UDEAC)

COMITE DE DIRECTION

DECISION No. 3/67-CD-516

Le Comité de Direction de l'Union Douanière et Economique de l'Afrique Centrale,

Vu le Traité instituant une Union Douanière et Economique de l'Afrique Centrale, signé le 8 décembre 1964 à Brazzaville, et notamment les Articles 17 et 47 de ce Traité,

En sa séance du 21 juin 1967,

D E C I D E :

ARTICLE 1er:- Est créée une Commission d'études composée de deux Experts par Etat membre.

ARTICLE 2 :- La Commission visée à l'Article précédent a pour mission d'examiner les problèmes soulevés par l'organisation d'un recensement agricole de l'Union, tel qu'il est préconisé par l'ONU pour les années 1969-70.

Elle étudiera plus précisément:

- les expériences acquises à l'intérieur de l'Union au cours de ces dernières années en matière de statistiques agricoles;
- le problème du financement d'un recensement.

ARTICLE 3 :- Le Président du Comité de Direction fixera en temps voulu le lieu et la date de réunion de la Commission ad hoc visée à l'Article premier.

ARTICLE 4 :- La présente décision sera enregistrée, publiée au Journal Officiel de l'Union et communiquée partout où besoin sera.

Pointe-Noire, le 21 juin 1967.

Le Président,

Lieutenant-Colonel A. Banza

APPENDIX 7.4 B - UNION DOUANIÈRE ET ÉCONOMIQUE DE L'AFRIQUE CENTRALE (UDEAC)

Conseil des Chefs d'Etat

LE CONSEIL DES CHEFS D'ÉTAT DE L'UNION DOUANIÈRE ET ÉCONOMIQUE DE L'AFRIQUE CENTRALE,

VU le Traité instituant une Union Douanière et Économique de l'Afrique Centrale, signé le 8 décembre 1964 à Brazzaville;

VU la décision du Comité de Direction No. 3/67-CD-516, en date du 21 juin 1967 créant une Commission d'études chargée d'examiner les problèmes soulevés par l'organisation d'un recensement agricole de l'Union qui s'insère dans le cadre d'un Recensement Mondial;

VU les conclusions des travaux de cette Commission et notamment le document définitif transmis officiellement au PNUD par chacun des États;

D E C I D E :

Article 1er:- Le Secrétariat Général de l'UDEAC est l'hôte du Bureau Régional de Direction du projet.

Article 2 :- La contribution des États au budget annuel du Bureau Régional de Direction du projet se répartit de la façon suivante :

CAMEROUN	=	2 620 000 Fr CFA
R.C.A.	=	1 310 000 Fr CFA
CONGO (B)	=	1 310 000 Fr CFA
GABON	=	873 334 Fr CFA

Article 3 :- Toute modification éventuelle du budget du Bureau Régional de Direction du projet devra maintenir la règle de proportionnalité dans les contributions des États, telle qu'elle se définit dans l'Article 2.

Article 4 :- Les contributions seront affectées à partir du 1er janvier 1971 à un compte spécial du budget du Secrétariat Général de l'UDEAC.

Article 5 :- Dans le cas où le projet démarrerait dès le mois de septembre 1970, un dépassement budgétaire de 2 300 000 francs CFA est autorisé.

Article 6 :- La présente décision sera enregistrée, publiée au Journal Officiel de l'Union et communiquée partout où besoin sera.

APPENDIX 7.5 - REPUBLIC OF KOREA

Ministry of Agriculture and Forestry

Ordinance No. 387 - Promulgated 16 August 1969

REVISED OPERATIONAL REGULATIONS OF AGRICULTURAL CENSUS

Operational Regulations of the Agricultural Census, as revised are the following:

Article 1 (purpose)

The purpose of this ordinance is to ordain necessary articles of the agricultural census according to Paragraph '2' Article 9 of the Operational Ordinance of Statistical Law.

Article 2 (definition)

Definition of the various terms used in this ordinance shall be the following:

1. Agricultural census shall refer to a survey which will be conducted in order to understand the structure of agricultural holdings by means of data on the different characteristics of holdings.

2. Agricultural holding shall be defined as an operational unit of land which one or several persons use in whole or part for agricultural production under the same management regardless of type, size and location of land.

3. Agricultural products shall refer to the following:

- a) Crops and flowers
- b) Products of nursery gardens, mulberry fields and orchards
- c) Livestock, poultry and their products
- d) Bee-keeping, silk cocoon and their products
- e) Other products, related to agriculture and determined by the Minister of Agriculture and Forestry.

Article 3 (scope of census)

All the agricultural holdings having more than a minimum size, which is determined by the Minister of Agriculture and Forestry, among the existing holdings in the territory of the Republic of Korea, and based on the survey date fixed under Article 5, shall come under the scope of the Agricultural Census (hereinafter referred to as the "Survey").

Article 4 (survey year)

1. The survey shall be carried out regularly in the year for which the last number of Arabian figure will be zero.

2. If and when deemed necessary by the Minister of Agriculture and Forestry, a simplified survey may be carried quinquennially, after the survey is conducted as laid down under the preceding paragraph.

Article 5 (date of survey)

The Survey shall be taken as of the zero hour, a.m. of 1st December. But it may be changed in such cases which the Minister of Agriculture and Forestry considers necessary.

Article 6 (survey items)

1. The data on the following items will be collected through the survey. But these may be changed when deemed necessary by the Minister of Agriculture and Forestry.

- a) Type of agricultural holding and operator
- b) Land utilization
- c) Crops
- d) Livestock and poultry
- e) Employment in agriculture
- f) Farm population
- g) Agricultural machinery and farm implements
- h) Irrigation and drainage
- i) Fertilizers and soil dressings
- j) Products of forestry and fishery
- k) Association of agricultural holdings with other industries.

2. Details of the preceding paragraphs shall be laid down separately by the Minister of Agriculture and Forestry.

Article 7 (survey method)

The survey shall be carried out by the interview method according to a questionnaire.

Article 8 (questionnaire)

The Minister of Agriculture and Forestry shall design and draw up a questionnaire according to the survey items of the Article 6.

Article 9 (establishment of enumeration districts E.D's)

In accordance with the decision of the Minister of Agriculture and Forestry, the Mayor of Seoul Special City, the Mayor of Pusan City and the Governor of each province (hereinafter referred to as "Governor") shall set up enumeration districts which shall divide the districts under their jurisdiction and results should immediately be communicated to the Mayors and the Governors (hereinafter the Mayors of Seoul and Pusan Cities referred to as heads of KU) or the Chief of Eup and Myon as well as to the Minister of Agriculture and Forestry.

Article 10 (official announcement of enumeration districts)

Those heads of city and chiefs of Eup and Myon who get information as laid down in the preceding Article, have to assign district numbers to the enumeration districts and announce this information continuously for 10 days to the public, commencing from 20 days before the census.

Article 11 (official announcement of the survey period)

1. The Minister of Agriculture and Forestry has to announce necessary particulars concerning the survey and its period, more than two times in the daily newspapers published in Seoul.

2. The Governor of Province has to announce the survey period and other particulars laid down by the Minister of Agriculture and Forestry, according to the preceding paragraph.

Article 12 (supervision authority)

The provincial Governor by the order of the Minister of Agriculture and Forestry; the City Mayor or Gun Chief, by the order of the province Mayor; and Eup or Myon Chief, by the order of the City Mayor or Gun Chief, (hereinafter it refers to a Dong Chief in Seoul City and Pusan City), shall direct and supervise the survey under their jurisdiction.

Article 13 (supervisor)

The provincial Governor or City Mayor, Gun Chief and Chief of Eup or Myon should nominate the supervisors among their staff members who will work in the field of survey, in accordance with the arrangements of the Minister of Agriculture and Forestry.

Article 14 (enumerator)

1. There shall be enumerator in the enumeration district.

2. Suitability, selection and other relevant particulars of the enumerators shall be laid down separately by the Minister of Agriculture and Forestry.

Article 15 (submission of questionnaires)

Provincial Governors should submit the questionnaires which are completed by the enumerators to the Minister of Agriculture and Forestry by the predetermined date fixed by the Minister of Agriculture and Forestry and before submitting it, the Governor should examine them carefully.

Article 16 (tabulation of data)

The method of tabulation of the data survey should be determined by the tabulation programme provided by the Minister of Agriculture and Forestry, separately.

Article 17 (preservation of questionnaires)

The Minister of Agriculture and Forestry should keep the questionnaires completed until the next period of survey and preserve the results of the survey permanently.

Article 18 (action in the case of accident)

1. When the survey is impossible within the specified period, owing to natural disaster and other unavoidable reasons, the Provincial Governors should report it to the Minister of Agriculture and Forestry without delay.

2. If the reasons under the preceding paragraph are considered valid, the Minister of Agriculture and Forestry has to determine some other period for the conduct of the survey.

Supplementary provision

This ordinance shall enter into force on and after the date of promulgation.



CHAPTER VIII  
THE QUESTIONNAIRES

Comparison of 1970 and 1960 questionnaires

A comparison with the questionnaires used in the 1960 World Census of Agriculture showed that generally speaking, countries participating in the 1970 World Census of Agriculture exercised much greater care in the design of the questionnaires. Questionnaires were usually printed rather than mimeographed. In most of the countries they were thoroughly tested and revised several times before the final version was made. In the great majority of countries the census returns were processed by computer. The input of data to the computer was organized by use of punch cards (in some cases by key-to-tape machines) and this fact influenced, in many cases, the design of the questionnaires.

Individual and group questionnaires

Like in previous decennial censuses, most countries used the individual questionnaire in lieu of the group questionnaire. By individual questionnaire is meant that each holding is enumerated on a separate questionnaire whereas on a group questionnaire several holdings can be enumerated on a single questionnaire.

An advantage of separate individual questionnaires for each holding was in the easy separation of data for any desired unit from the rest of the census material. Such a questionnaire could be removed from the rest of the lot if the need arose for the completion of the information, check of data, returning the questionnaire to the field staff for correction, etc.

Whilst an advantage of the group questionnaire was that it facilitated manual editing of data as a whole. Data for different holdings referring to the same characteristic were next to each other and a quick visual check made possible easy detection of unusual deviations. Also, such questionnaires normally took less space for handling and storing.

Since the number of questions in an agricultural census was usually very large and the questions were often broken into sub-questions, group questionnaires were very seldom used in the agricultural censuses. Ireland was an example of a country which used a group questionnaire in its 1970 census. The questionnaire consisted of six forms. Form A/1 at the beginning of each Enumeration Book dealt with the total area of the enumeration district (ED) and the names and areas of the several townlands which fell within that ED. The holdings in which one part was located in one ED and another part in a different ED were called "Divided Holdings" and such holdings were listed in Form A/2. There were four other forms on which information from each holding falling entirely within an ED was noted.

- Form A. Return of Tillage and Distribution of Land, 1970
- Form B. Return of Livestock as at 1 June 1970.
- Form C. Return of Males engaged in Farm Work and Special Enquiries, 1970
- Form D. Return of Machines, Implements, etc., 1970.

The questions in these forms were listed as headings of various columns and there were twenty lines, one for each holding. Serial numbers assigned to a holding in Form A continued to be the same assigned to that holding in Forms B, C, and D. Thus, information on the items listed in the headings in each form were noted on one page of that form for any number of holdings up to twenty.

Design of questionnaires

A successful questionnaire design included many factors one of these being the method of enumeration. The person who fills in the questionnaire is referred to as the enumerator and the person who provides the information to be filled in is referred to as the respondent.

In case the enumerator and the respondent are the same person, the method is called self-enumeration. The self-enumeration method was employed in some developed countries where the holders were literate and were used to filling out statistical forms. The questionnaires used in self-enumeration included instructions on how to complete the questionnaire and/or there was an instruction leaflet accompanying the questionnaire. Definitions of various terms, concepts, and instructions had to be given in order to enable the respondent to answer the questions correctly (see Appendix I : United States Census Questionnaire for Hawaii, pp.3). Since there was no enumerator present for explanations, the questionnaires and/or the accompanying instruction leaflet had to be very carefully constructed. On the contrary, the questions on a questionnaire to be filled out by enumerators were usually short and simple since the enumerators had gone through an extensive training and were familiar with the terms used and had practice in filling out sample questionnaires.

New Zealand was another example of a country who used self-enumeration. The questionnaire consisted of a booklet of twenty pages with questions and items on which the information was to be obtained printed on the right hand side and instructions corresponding to each page printed on the page opposite to it. It was also fully self coded. (Refer to the example in Appendix II).

As examples of the questionnaires used when filled by enumerators interviewing respondents, Appendices III and IV are given showing questionnaires used in the 1970 Census of Agriculture in American Samoa and the 1973 Census of Agriculture in Costa Rica, respectively. These examples illustrate simplicity in wording and questionnaire design. Not many instructions were entered into the questionnaires since they were provided to the enumerator from a separate manual and through training.

The questionnaire's actual physical size, shape and colour varied greatly by country. To a great extent the method of enumeration and means of summarization had a great influence on these physical characteristics. For example, in Ecuador the questionnaires were in a notebook form with a woven wire binding on the left hand side. Each of these questionnaire books are approximately 32 cm. by 22 cm. and contain 25 individual questionnaires composed of 8 pages each. This questionnaire book provided a convenient writing support in itself for the enumerators and the individual questionnaires could be removed if desired.

In St. Lucia the Census of Agriculture was processed using peg bars and desk calculators and accordingly the questionnaires were designed to accommodate this method of summarization.

Many different methods were used to increase the efficiency of the questionnaires, increase the ease in filling out the questionnaires and in turn to reduce the possible errors in reporting. Some of these examples are as follows:

Short forms: A short form questionnaire is a questionnaire which contains fewer questions than the regular questionnaire. Some advance information is needed to determine if a certain holding is below a given size level and could satisfactorily respond using a shorter version of the regular questionnaire. In some cases pre-survey work was done in constructing a list to determine the identities of a certain segment of the sample population which was below a predetermined size level. These holdings in turn were asked to respond on the short form questionnaire.

In another example the enumerators in Puerto Rico identified farm holdings with 3 cuerdas (1.2 ha) of land or more that had an annual gross sale amounting to less than \$1,200 in 1969, and agriculture properties of less than 3 cuerdas with sales of \$100 to less than \$1,200. After identifying holdings of this type the enumerators completed an enumeration of the farm operation using the short form. Enumerators also identified holdings that had annual gross sales of \$1,200 or more in 1969. In this larger type of holding they left with the farm operator the regular questionnaire with an instruction booklet and a mailing envelope addressed to the Central Office. By using the short form questionnaire, the questionnaire size was reduced from 8 to 4 pages. The regular form was applied for 23 percent of holdings only.

Key Questions: A key question is a question asked usually at the beginning of a new section or question grouping. The answer to this question decides which question to proceed with next. For example, "Does this household have any cattle?". A "No" answer to this question would direct the enumerator or respondent to skip the remaining questions on cattle and proceed to the next section. A "Yes" answer would lead into the cattle questions. As an example, refer to Appendix V. This is a copy of page 7 of the census questionnaire used in Pakistan. Questions numbered 60, 69, 78, 82 and 87 are key questions. "No" answers will lead to the next sections and save time for the respondent and the enumerator.

Different Coloured Answer Areas: In Canada the regular census questionnaire was a light green colour with all of the answer areas left white. This made a contrast between the answers and the questions or instructions. Also, this helped the readability of the questionnaires and persuaded the respondents and/or enumerators to place the answer in the correct area.

Another example was the questionnaire used in the United States. The answer areas were a different colour and two colour printing was used. Most of the questionnaires used regular black print but in some cases red print was used to emphasize a point, question or instruction.

Special questionnaires: Generally a basic questionnaire is prepared which contains a minimum programme in which all the holdings included in the census are expected to participate. In addition to this regular programme there are many aspects of agricultural activities on which it is not necessary to ask questions from every holding. Specialized questionnaires may be prepared for these holdings which tend to specialize, depending upon the location, climate, special agricultural and/or marketing situations, etc. Thus holdings may specialize in livestock, plant production, flower growing, fruit production, cultivation of olives, etc. These specialized questionnaires were not filled out for all the holdings but only for a certain number of them. The answers to certain questions (termed "key questions") determined whether a specialized questionnaire was to be filled out for that holding. Thus a large amount of statistical data on all holdings was obtained without burdening individual holders with an unnecessarily large questionnaire, many questions of which did not have any significance in the case of a particular set of holdings. For example, a holding may have had a large number of fruit trees and this fact is determined by means of a key question "How many fruit trees are there on this holding?" If this number was larger than a certain minimum level a special questionnaire was filled out along with the basic questionnaire. Another special questionnaire was filled out for a holding on which there was a large number of livestock, a fact determined by a question on the number of livestock asked in the basic questionnaire. This saved much time since asking a number of detailed questions having relevance to fruit-tree production would not be necessary when asked for a holding specializing in livestock and vice versa.

The 1969 Census of Agriculture in Norway is an example of the use of specialized questionnaires. Four types of questionnaires were prepared as follows:

- Form 1 - A basic questionnaire for holdings with 0.5 hectares of agricultural land or more;
- Form 2 - A basic questionnaire for holdings with less than 0.5 hectares of agricultural land;
- Form 3 - Additional questionnaire for holdings with agriculture and horticulture of a certain extent;
- Form 4 - Additional form for holdings with fur-bearing animals.

The special questionnaire for horticultural holdings was to be filled out if the holding conformed to one or more of the requirements as follows:

1. At least 100 sq. metres of hot-house and/or forcing frame area;
2. At least 1,000 sq. metres of out-door vegetables;
3. At least 1,000 sq. metres of nursery land (not afforestation nursery);
4. At least 50 berry-bearing shrubs;
5. At least 500 sq. metres of raspberries;
6. At least 500 sq. metres of strawberries;
7. At least 50 fruit trees.

The additional questionnaire for fur-bearing animals (Form 4) was to be filled out if a holding possessed foxes, mink or chinchilla and was outside the scope of the census of agriculture.

Sometimes in a country different regions specialize in different types of agricultural activities. In such cases the advantages of specialized questionnaires can be obtained by what may be called regionalization of the census programme. This means that the census programme is modified for individual regions and different questionnaires can be prepared containing questions more relevant to the agricultural conditions within individual regions. In this connection mention may be made of the 1970-71 Census of Agriculture in Australia. There a census is conducted every year by mail and self-enumeration. The Australian system provides an example of departmental centralization with geographical decentralization. Separate questionnaires were prepared by each State organization and each State Office is responsible for this collection, compilation and publication of statistics in that State. With a programme like this, special problems of each region were reflected in the questionnaires prepared for each State.

Question Grouping: Questions pertaining to a group of items such as livestock, crop areas, farm population, etc., should be put together in individual groups or sections. This aspect of the questionnaire design has become almost the rule of the agricultural census questionnaires. Usually questions related to identification were always the first and then followed by the various other sections. For example, Malawi, in its 1968-69 sample census based on the household questionnaire used sections in the following order:

- I. - Identification
- II. - Land tenure
- III. - Farm plan
- IV. - Crop sold or traded and value of sales
- V. - Livestock and poultry
- VI. - Cash income from employment
- VII. - Farm equipment and expenditures

These were the only sections which had some questions on agriculture and the remaining six sections dealt with non-agricultural questions from the households.

Kuwait arranged its 1970 census of agriculture questionnaire in seven sections as follows:

- I. - General information
- II. - Land utilization
- III. - Livestock
- IV. - Employment, wages and farm population
- V. - Power and machinery in the holding
- VI. - Irrigation
- VII. - Fertilizers

Questions dealing with livestock were arranged thus: (1) Cattle, (2) Sheep, (3) Goats, (4) Poultry and other farm animals, and those within each of these sub-items were also systematically arranged. For example there were three questions under the sub-item for goats as follows: (3-a) Total population; (3-b) Milk production, and (3-c) Hair production.

Special problems regarding the question grouping were encountered by countries in which (i) detailed information was requested about farm population and (ii) area under crops had to be measured.

Countries which requested detailed information about farm population did not only ask for total number of people living on the holding classified by sex, age, occupation, etc. as suggested in the FAO Programme, but collected separate information for every person living on the holding. In such cases the part of the questionnaire dealing with farm population was usually made in a form of table in which questions were listed in the heading of the table and data on individual persons were entered below starting with the holder and each person given one line.

In countries in which area measurements had to be performed the census questionnaire usually included a special form, one for each field, which was used for entering the results of measurements and data about crops grown.

An example of such a form can be found in the questionnaire used in the 1972-73 Census of Agriculture which was organized by the Special Fund/FAO Project in five African countries: Cameroon, Congo, Gabon, Central African Empire and Chad. This questionnaire consisted of three parts: Part A - General Data; Part B - Parcel Form and Part C - Field Form. Part A was, in fact, the main census questionnaire by which the following groups of data were collected: General characteristics, farm population, equipment and use of machinery, and livestock. One form, Part B - Parcel Form (see Appendix 8.4) was completed for each parcel of land operated by the holding. A parcel may consist of several fields (pieces of land where the same crop or the same association of crops was found) and for every field one Field Form (see Appendix VII) was completed.

Redundant questions: In order to secure better quality of response, particularly in connection with the most important census items, many countries included in the census questionnaire some questions which were not intended for tabulation. Such questions are, strictly speaking, redundant and they represent a burden for the already long census questionnaires, but experience has shown that they can greatly improve the quality of collected data not only because they guide the enumerator (and respondent) how to give the correct answer, but also because they provide supplementary information which can be used for correction of inconsistencies detected during manual and computer editing.

Several examples of redundant questions can be seen in the questionnaire used for the 1973 Census of Agriculture in Costa Rica (see Appendix 8.4). Item 5 on the first page of the questionnaire (codes 209-212) refers to the land owned by the holder but given to others. This item was not tabulated, but nevertheless not only was the total requested but also the breakdown into three groups. Such detailed questioning on various forms of land tenure is a very useful guide to enumerators to arrive at correct total area of operational holding (item 6) which should exclude land owned but given to others for use. On the same page of the Costa Rica questionnaire, total area of holding appears twice: item 6. and item 13. These two totals are arrived at in two different ways, once by adding up land tenure categories and the second time by adding up land use categories. In practice enumerators have to make some adjustments to make these two totals agree and for this reason it is useful to have space provided for both entries. It should be noted, however, that such redundant questions call for extra work in the phase of data editing. They are therefore not used for items for which response errors are not expected. Thus in the Costa Rica questionnaire it can be noted that for livestock (see Appendix 8.4) Section only data broken down by sex and age were requested. The totals can be, of course, easily obtained in the tabulation phase.

Question pre-coding: Many of the countries which summarized their agricultural census by automatic data processing methods used a pre-coded questionnaire. These questionnaires were specifically designed to enable easy and accurate keypunching. Using the pre-coded questionnaire also saved much time in the summary stages. Different examples of pre-coded questionnaires can be seen in Appendices attached to this Chapter. In the United States Agricultural Census questionnaire used in the State of Hawaii (see Appendix 8.1) the answers were requested to be placed in a definite space or box. In this box, in the upper left hand corner, is a three digit code. In most other cases the code was preprinted in a special box either preceding the data entries (see Appendices 8.2 and 8.4) or following the data entries (see Appendix 8.5). A different kind of pre-coding can be seen in the questionnaire used in the 1972/73 Censuses of Agriculture in Cameroon, Congo, Gabon, Central African Republic and Chad (see Appendix 8.6). In this questionnaire boxes were provided for every digit of data entries. Numbers indicating the position of individual digits on punch cards were preprinted next to the boxes. In this way the questionnaire contained the instructions for punching.

#### Confidentiality

One of the most important considerations in obtaining reliable data is to ensure the confidential nature of the data obtained from individual holdings. Confidence of the respondents in the secrecy and confidentiality of the information is necessary to obtain reliable basic data. Therefore, it is important that the questionnaires have, at some prominent place on the form, a clear statement that the data obtained are confidential, are to be used for statistical purposes only, and will be published only in statistical tables in such a way that the individual identity would not be revealed. Further, it should be emphasized that the data on the questionnaire would not be used for taxation or other assessment purposes, nor could be demanded by the courts of law. The statement should be suitably worded depending upon the conditions in a country, giving reference to legal provisions, if any, for providing the data and of guaranteeing its confidential nature.

An examination of the questionnaires used by countries that participated in the 1970 World Census of Agriculture shows that most but not all of the questionnaire forms mentioned explicitly the confidential nature of the data, except in Africa where very few countries made reference to confidentiality on the form itself. However, some (but not all) explained this fact in the instruction manual to the enumerators. Some of the statements used on the questionnaire guaranteeing the confidentiality of data are as follows:

1. "Confidential, Statistical Law, Cap. 368"--(1968 Census of Agriculture, Jamaica)
2. "Returns are confidential and used solely for statistical purposes. Under no circumstances whatsoever will information from individual returns be disclosed" - (1970-71 Census of Agriculture, Australia)
3. "Information supplied in individual returns is CONFIDENTIAL AND FOR STATISTICAL PURPOSES ONLY and will not be disclosed to any person or to any other government authority" (another example from the 1970-71 Census of Agriculture, Australia)
4. "Response to this enquiry is required by law (Title 13, U.S. Code). By the same law your report to the Census Bureau is confidential. It may be seen only by sworn and census employees and may be used only for statistical purposes" - (1970 Census of Agriculture, American Samoa)
5. "Confidential according to article (7) of the Statistical Law No. 27 of 1963" - (1970 Census of Agriculture, Kuwait)
6. "The information required in this return is collected under the provisions of the Statistics Act 1955 and will be used strictly for statistical purposes only by the Department of Statistics. No other government department, company or private individual will have access to the completed form. All personal details given will be kept strictly confidential" - (1972 Census of Agriculture, New Zealand)

7. "The information requested is strictly confidential, only totals will be published and in no case whatsoever will individual information be revealed". - (1974 Census of Agriculture, Ecuador).
8. "This inquiry is authorized by the Statistics Act of 1965. Your report is accorded confidential treatment, subject to provisions of the Act. Your Census report will be used for statistical purposes only" - (1969/70 Census of Agriculture, Lesotho).

**APPENDIX 8.1 - UNITED STATES CENSUS QUESTIONNAIRE FOR HAWAII, page 3.**

**Section 5 - Is any LAND in this place ARTIFICIALLY DRAINED?** (Include ditches, underground drains, grading for drainage, dikes, or pumping to control water. Exclude drainage solely for the removal of irrigation waste water. See Leaflet, section 5.)

070

Yes - Complete this section

No - Go to Section 6

Please estimate the acres drained by each of the following systems but do not include the same acreage as drained by more than one system.

1. A farm system which is independent of an organized drainage district or other public agency . . . . .
2. A farm system which drains into the system of an organized drainage district or other public agency . . . . .
3. A system installed entirely by an organized drainage district or other public agency . . . . .

Acres artificially drained	
Total	By systems installed since January 1, 1969
071	072
073	074
075	076

**Section 6 - Was any commercial FERTILIZER applied on PASTURELAND in 1969?** (Do not include land from which crops were harvested or hay cut.)

Yes - Complete this section

No - Go to Section 7

1. Cropland used only for pasture (reported in section 3, item 1b) fertilized . . . . .
2. Other pastureland (reported in section 3, item 3a) fertilized . . . . .

Acres fertilized	Fertilizer used			
	Dry		Liquid or gas	
	Whole tons	Tenths	Whole tons	Tenths
077	078		10	10
080	081		10	10

**Section 7 - Was CONTOUR PLANTING, STRIPCROPPING, or TERRACING in use on this place in 1969?**

Yes - Complete this section

No - See below

1. Grain or row crops farmed on the contour . . . . .
2. Stripcropping systems to control erosion . . . . .
3. Cropland and pastureland having terraces . . . . .

083	Acres
084	Acres
085	Acres

**Please read...**

Space is provided in the next 3 pages for reporting almost all crops grown in Hawaii. You will find it easier to report your crops if you first read the material on this page, then look at pages 4 to 6 of this reporting form and read pages 10 and 11 of the Leaflet.

If you did not harvest any of the crops in a section, you can mark (X) the "No" box for the first question and skip to the next section.

Please report only whole acres and whole units of production except where space is provided for reporting tenths.

Do not report any crops for land that in 1969 was rented or leased to others or worked on shares by others. Your report should cover only the crops on the "acres in this place," as reported in item 4 of section 1.

Similar crops, such as root crops, hay, tree crops, vegetables, etc. are grouped in sections. Report in each section only the crops called for there. For example, taro is to be reported in section 12, fruit in section 16, and vegetables for sale in section 21. Section 23 is the place to report any crop not asked for in sections 12-22.

**EXAMPLE - HOW TO REPORT CROPS HARVESTED**

a. In 1969 a farmer had 185 acres of sugarcane. He harvested 95 acres.

b. 90 acres were for future harvest.

c. Quantity harvested was 9,370 tons.

d. The entire sugarcane acreage was irrigated and fertilized. (95 acres for item 1 and 90 acres for item 2.)

e. 92 tons of dry fertilizer were used on the acres harvested.

f. 47-6/10 tons of dry fertilizer were used on the acres for future harvest. (47 in the space for whole tons and 6 in the space for tenths.)

**Section 13 - Was any SUGARCANE or PINEAPPLES harvested or growing on this place in 1969?**

Yes - Complete this section

No - Go to Section 14

	Acres harvested or for future harvest	Quantity harvested	Acres irrigated	Commercial fertilizers used				
				Acres fertilized	Dry		Liquid or gas	
					Whole tons	Tenths	Whole tons	Tenths
1. Sugarcane harvested in 1969 . . . . .	95	9370 Tons	95	95	92	10	10	
2. Sugarcane not harvested in 1969 . . . . .	90		90	90	47	6	10	
3. Pineapples harvested . . . . .								

Sections numbered 8, 9, 10, 11, 15, 17, 18, 19, and 20 have been omitted from your reporting form since Hawaii requires fewer sections for reporting crops than the version used for the other 49 States.

The materials in the last paragraph of page 8 and on page 9 of the Leaflet do not apply to Hawaii. However, pages 10, 11, and 12 of the Leaflet provide useful general information about the reporting of crops and a discussion of some special crop reporting problems.

Pages 13 and 14 contain information about specific crop sections, and Table 1, at the end of the Leaflet, provides a list of weight-per-unit conversion factors for the crops most commonly grown in the United States. Much of this information is pertinent to Hawaii, but the section number for the crop may be different for Hawaii than for the other States. For example, section 23, "Other crops," on page 14 of the Leaflet, shows the 12-month growing season for sugarcane; but on the Hawaii reporting form sugarcane is to be reported in section 13.



APPENDIX 8.2 - SECTION III OF THE QUESTIONNAIRE USED FOR THE 1972 CENSUS OF AGRICULTURE IN NEW ZEALAND

**SECTION 3—EMPLOYMENT**

**EMPLOYMENT, SALARIES AND WAGES, AND NON-MONETARY BENEFITS:**

- A. Working owners, leaseholders, and sharemilkers on 15 June 1972
- B. Unpaid members of the family assisting in farm work—On 15 June 1972  
In peak month (specify month):
- C. Paid farm employees—  
Number employed on the 15th of—July—1971  
August  
September  
October  
November  
December  
January—1972  
February  
March  
April  
May  
June
- D. Average weekly hours worked by paid employees during full week—  
Nearest to 15 June 1972  
In peak month
- E. Salaries and wages paid, including bonuses, during the year ended 30 June 1972
- F. Non-monetary benefits provided during the year ended 30 June 1972  
Specify type:

	Males		Females	
	Permanent	Casual	Permanent	Casual
	Number		Number	
051				
052				
053				
054				
055				
056				
057				
058				
059				
060				
061				
062				
063				
064				
065				
Hours 066				
Hours 067				
Dollars 068	\$	\$	\$	\$
Number				
Number				
Number				
Number				

## INSTRUCTIONS Page 5

- (1) Regard as permanent any person whom you intend to employ indefinitely.
- (2) Regard as casual any person who is/was engaged on seasonal or temporary work, but exclude farm contractors and their employees hired for contract work.

**Item A.** Include only those working owners, leaseholders, and sharemilkers who normally work an average of at least 30 hours per week on the farm and have a financial or managing interest in the farm. Working owners, etc., on holiday are to be included but wives who do not have a financial interest in the farm are to be excluded.

**Item B.** Include any members of the family, or relatives, of the persons listed in A who assist unpaid in actual farm work as against ordinary household tasks.

**Item C.** Include paid relatives or members of family; workers employed under piece rate or bonus schemes but exclude working owners, leaseholders, and sharemilkers; contractors and their employees.

**Item D.** Show for the weeks requested the total hours for all paid employees averaged to equal one man week, e.g. If you have 3 employees working 50, 40, and 36 hours per week respectively, the average weekly hours will be  $50 + 40 + 36 \div 3$  or 42.

**Item E.** All money paid to employees as salaries or wages, sick pay, holiday pay, and bonuses before tax and other deductions. Do not include contributions to superannuation funds by employer, payments to contractors, or an allowance for board, rations, firewood, and the like where these are provided free.

**Item F.** Show the number of employees in receipt of each type of benefit specified.

**NOTE**—Employees engaged on picking, sorting, grading, packing, etc., of fruit, tobacco, vegetables on the **HOLDING** are to be included in this section.



APPENDIX 8.4 - QUESTIONNAIRE USED FOR THE 1973 CENSUS OF AGRICULTURE OF COSTA RICA

REPUBLICA DE COSTA RICA		DIRECCION GENERAL DE ESTADISTICA Y CENSOS											
<b>IV CENSO NACIONAL AGROPECUARIO</b>													
<b>MAYO DE 1973</b>													
C - 2													
RESIDENCIA DEL PRODUCTOR		LOCALIZACION DE LA FINCA											
PROVINCIA _____ CANTON _____ DISTRITO _____ SEGMENTO Nº _____ ZONA Nº _____ SECCION Nº _____ VIVIENDA Nº (orden de visita) _____ BARRIO O CASERIO _____ AVENIDAS _____ CALLES _____ CARRETERA O CAMINO _____		PROVINCIA _____ CANTON _____ DISTRITO _____ SEGMENTO Nº _____ REGION AGRICOLA Nº _____ BARRIO O CASERIO _____ CARRETERA O CAMINO _____ NOMBRE DE LA FINCA _____ Finca Nº <table border="1" style="display: inline-table; width: 50px; height: 20px; vertical-align: middle;"> <tr><td> </td><td> </td><td> </td></tr> </table>											
<b>I. PRODUCTOR Y UNIDAD DE EXPLOTACION</b>													
1.- Nombre del Productor o Razón Social: _____ 2.- Condición Jurídica del Productor (Marque sólo un círculo) <table style="display: inline-table; margin-left: 20px;"> <tr> <td><input type="radio"/> 1</td> <td><input type="radio"/> 2</td> <td><input type="radio"/> 3</td> <td><input type="radio"/> 4</td> <td><input type="radio"/> 5</td> </tr> <tr> <td>Individual</td> <td>Cooperativa</td> <td>Sociedad de hecho</td> <td>Sociedad de derecho</td> <td>Otra</td> </tr> </table> 3.- Tiene Administrador? Si <input type="radio"/> 1 No <input type="radio"/> 2 4.- Nombre del Administrador _____ Dirección Domiciliaria si no Reside en la Finca: _____ 5.- Nombre del informante: _____ 6.- Cuántas parcelas o lotes separados forman la finca censal? (No incluya parcelas arrendadas o cedidas a otras personas, u ocupadas por otras personas) _____				<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	Individual	Cooperativa	Sociedad de hecho	Sociedad de derecho	Otra
<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5									
Individual	Cooperativa	Sociedad de hecho	Sociedad de derecho	Otra									
Número													
7.- <table border="1" style="display: inline-table; width: 50px; height: 20px; vertical-align: middle;"> <tr><td> </td></tr> </table>			LOS DATOS SOBRE EXTENSION EN ESTE CUESTIONARIO ESTAN DADOS EN: MANZANAS <input type="radio"/> 1      HECTAREAS <input type="radio"/> 2										
<b>II. REGIMEN DE TENENCIA</b> (Todos los datos se refieren al día de la entrevista)		<b>III. USO DE LA TIERRA</b> (Todos los datos se refieren al día de la entrevista)											
1.- Qué extensión de terreno posee propia o tiene a modo de propietario? (Incluya la extensión arrendada o cedida a otras personas u ocupada por otras personas)	Código	Extensión											
		Parciales Columna 1	Totales Columna 2										
201													
2.- Qué extensión de terreno tiene de otras personas en forma de arrendamiento? (Total)	202												
(a) En alquiler	203												
(b) En esquilmo	204												
(c) Gratuitamente	205												
(d) Otras formas	206												
3.- Qué extensión de terreno tiene bajo otras formas de tenencia?	207												
4.- Suma de Totales (1) + (2) + (3)	208												
5.- Qué extensión de terreno propio y del que posee a modo de propietario está en manos de otros? (Total)	209												
(a) Dada en arrendamiento	210												
(b) Ocupada por precaristas	211												
(c) En otras formas de tenencia	212												
6.- Extensión total de la finca (4) menos (5) (igual a preg. 13 de 'USO DE LA TIERRA')	213												
		Código	Extensión Columna 1										
		TIERRAS DE LABRANZA											
1.- Cultivos anuales o transitorios (excepto huertas comerciales y caseras y cultivos de invernadero)		301											
2.- Huertas comerciales y caseras y cultivos de invernadero		302											
3.- Tierras en descanso (Rastrojo)		303											
4.- Toda otra clase de tierras de labranza		304											
5.- Cultivos permanentes		305											
		PASTOS											
6.- Pastos cultivados o mejorados para corte		306											
7.- Pastos cultivados o mejorados no para corte		307											
8.- Potreros		309											
		BOSQUES Y MONTES											
9.- En explotación (Para sacar madera)		310											
10.- No en explotación		311											
11.- Charrales y tacotales		313											
12.- Toda otra clase de tierras		314											
13.- Extensión total de la finca (suma preg. 1 a 12) (igual a preg. 6 de 'REGIMEN DE TENENCIA')		315											



APPENDIX 8.4 - (Cont.)

<p><b>V. ANIMALES</b></p> <p>Deben anotarse todos los animales propios y ajenos que ESTAN BAJO LA ADMINISTRACION DEL PRODUCTOR el día de la visita del enumerador y que comprenden:</p> <p>a) Los que están en esta finca censal y (o) en otras fincas censales.                  b) Los que se encuentren o estén en camino (tránsito) a sitios públicos, mataderos, plazas de ganado o a esta finca.</p> <p>NO SE ANOTAN los animales de esta finca censal que se encuentran pastando en otras fincas censales o en camino a ellas y QUE ESTAN BAJO LA ADMINISTRACION DE OTRO PRODUCTOR</p>					<p><b>VI. USO DE ENERGIA ELECTRICA Y FUERZA MOTRIZ</b></p> <p>(Los datos solicitados se refieren al año agrícola pasado, o sea, del 1ero. de mayo de 1972 al 30 de abril de 1973).</p> <p>1.- Utilizó energía eléctrica en las labores de la finca? Código <input type="text" value="601"/> SI <input type="radio"/> 1 X NO <input type="radio"/> 2 X</p> <p>2.- Qué clase de fuerza motriz utilizó para realizar los trabajos agropecuarios de la finca (marque con 'X' sólo un círculo)</p> <p>a) Mecánica ..... <input type="radio"/> 1 X                  b) Animal ..... <input type="radio"/> 2 X                  c) Animal y mecánica .... <input type="radio"/> 3 X                  d) Humana solamente. .... <input type="radio"/> 4 X</p> <p>Código <input type="text" value="602"/></p>				
<p><b>A. GANADO VACUNO</b></p>									
Edad y sexo	Código	Total	Propósito						
			Carne	Leche	Doble propósito				
		Columna 1	Columna 2	Columna 3	Columna 4				
<b>HEMBRAS</b>									
1.- Menores de 1 año .....	501								
2.- 1 a menos de 2 años .....	502								
3.- 2 años y más .....	503								
<b>MACHOS</b>									
4.- Menores de 1 año .....	505								
5.- 1 a menos de 2 años .....	506								
6.- 2 años y más(excluye toros reproductores en servicio y bueyes) .....	507								
7.- Toros reproductores en servicio .....	508								
8.- Bueyes .....	509								
<b>B. GANADO PORCINO</b>									
Edad y sexo	Código	Cantidad							
		Columna 1							
1.- Cerdos y cerdas menores de 6 meses .....	521								
2.- Cerdos de 6 meses y más .....	522								
3.- Cerdas de 6 meses a menos de 1 año:									
a) Para reproducción .....	523								
b) Para carne .....	524								
4.- Cerdas de 1 año y más:									
a) Para reproducción .....	526								
b) Para carne .....	527								
<b>C. GANADO CABALLAR, MULAR Y ASNAL Y AVES DE CORRAL</b>									
Edad y clase	Código	Cantidad							
		Columna 1							
1.- Caballos y yeguas menores de 3 años .....	531								
2.- Caballos y yeguas mayores de 3 años .....	532								
3.- Mulares y asnales todas las edades y sexos .....	534								
<b>AVES DE CORRAL</b>									
4.- Pollos y pollas (menores de 6 meses) .....	535								
5.- Gallos (de 6 meses y más) .....	536								
6.- Gallinas (de 6 meses y más) .....	537								
7.- Patos, carracos, gansos (todas las edades y sexos) .....	538								
8.- Chompipes (Pavos) todas las edades y sexos .....	539								
<b>D. COLMENAS Y PRODUCTOS DE ORIGEN ANIMAL</b>									
Producto	Código	Cantidad							
		Columna 1							
1.- Número de colmenas (cajas) al día de la visita	541								
2.- Galones de miel producidos el último año agrícola .....	542								
3.- Libras de queso producidas la semana anterior .....	543								
4.- Libras de mantequilla producidas la semana anterior .....	544								
5.- Botellas de leche producidas ayer .....	545								
6.- Huevos recogidos ayer .....	546								
<b>VII. PROPIEDAD Y USO DE LA MAQUINARIA AGRICOLA</b>									
Los datos solicitados sobre propiedad se refieren al día de la visita del enumerador y los de uso al año agrícola pasado o sea, del 1ero. de mayo de 1972 al 30 de abril de 1973.									
Clase	Código	Propiedad del productor el día de la visita (cantidad)	Uso en la Finca durante el año agrícola pasado						
		Columna 1	Sólo propia	Sólo ajena	Propia y ajena				
		Columna 2	Columna 3	Columna 4	Columna 5				
1.- Tractores (chapulín) .....	701		<input type="radio"/> X	<input type="radio"/> X	<input type="radio"/> X				
2.- Arados de tiro animal .....	702		<input type="radio"/> X	<input type="radio"/> X	<input type="radio"/> X				
3.- Arados de tractor .....	703		<input type="radio"/> X	<input type="radio"/> X	<input type="radio"/> X				
4.- Rastras .....	704		<input type="radio"/> X	<input type="radio"/> X	<input type="radio"/> X				
5.- Sembradoras .....	705		<input type="radio"/> X	<input type="radio"/> X	<input type="radio"/> X				
6.- Cosechadoras .....	706		<input type="radio"/> X	<input type="radio"/> X	<input type="radio"/> X				
7.- Atomizadores .....	707		<input type="radio"/> X	<input type="radio"/> X	<input type="radio"/> X				
8.- Espolvoreadores .....	708		<input type="radio"/> X	<input type="radio"/> X	<input type="radio"/> X				
<b>VIII. RIEGO Y ABONO</b>									
(Los datos solicitados se refieren al año agrícola pasado, o sea, del 1ero. de mayo de 1972 al 30 de abril de 1973).									
Cultivo	Código	Extensión regada	Abono Químico						
			Extensión abonada	Cantidad de abono	Unidad de medida				
		Columna 1	Columna 2	Columna 3	Columna 4				
1.- Café .....	801								
2.- Caña de azúcar .....	802								
3.- Banano .....	803								
4.- Pastos .....	804								
5.- Arroz 1era. Siembra .....	805								
6.- Arroz 2da. Siembra .....	806								
7.- Maíz 1era. Siembra .....	808								
8.- Maíz 2da. Siembra .....	809								
9.- Papas 1era. Siembra .....	811								
10.- Papas 2da. Siembra .....	812								
11.- Tabaco .....	814								
12.- Tomate .....	815								
13.- Cebolla .....	816								
14.- Lechuga .....	817								
15.- Remolacha .....	818								
16.- Repollo .....	819								
OBSERVACIONES: .....									
(Si falta espacio utilice el reverso de la hoja)									

APPENDIX 8.5 - PART VII OF THE QUESTIONNAIRE USED FOR THE 1972/73 CENSUS OF AGRICULTURE  
IN PAKISTAN

(Questionnaire used in the field was in Urdu language)

Part VII - Livestock and Poultry											
60. Does this household have any cattle? No <input type="checkbox"/> Yes <input type="checkbox"/> If the answer is 'No' go to 69.				69. Does this household have any buffaloes? No <input type="checkbox"/> Yes <input type="checkbox"/> If 'No' go to 78.				VI			
		None	Number	Code			None			Number	CODE
		1	2				1	2			
61. Bulls 3 years and over for breeding only						09		70. Buffalo bulls 3 years and over for breeding only			
62. Bullocks 3 years and over for work						10		71. Male buffaloes 3 years and over for work			
63. Cows 3 years and over in milk						11		72. Buffaloes 3 years and over in milk			
64. Cows 3 years and over dry and not calved						12		73. Buffaloes 3 years and over dry and not calved			
65. Male cattle under 3 years						13		74. Male buffaloes under 3 years			
66. Female cattle under 3 years						14		75. Female buffaloes under 3 years			
67. Total cattle = (61+62+63+64+65+66)						15		76. Total buffaloes * (70+71+72+73+74+75)			
68. How many cows of 3 years and over included in 63 and 64 above are also used for work?						16		77. How many female buffaloes of 3 years and over included in 72 and 73 above are also used for work?			
78. Does this household have any poultry birds? No <input type="checkbox"/> Yes <input type="checkbox"/> If 'No' go to 82.								82. Does this household have any camels, horses, mules or donkeys? No <input type="checkbox"/> Yes <input type="checkbox"/> If 'No' go to 87.			
		None	Number	Code			None		Number		
		1	2				1		2		
79. Total poultry birds						21		83. Camels			
80. Of total how many are layers?						22		84. Horses			
81. Remaining poultry birds						23		85. Mules			
87. Does this household have any goats or sheep? No <input type="checkbox"/> Yes <input type="checkbox"/> If 'No' go to 90.								86. Donkeys			
		None	Number	Code			None		Number		
		1	2				1		2		
88. Total goats						28		92. Total sheep			
89. Males one year and over						29		93. Males one year and over			
90. Females one year and over						30		94. Females one year and over			
91. Youngstock under one year						31		95. Youngstock under one year			

APPENDIX 8.6 - PART B OF THE QUESTIONNAIRE USED FOR THE 1972/73 CENSUS OF AGRICULTURE IN CAMEROON, CONGO, GABON, CENTRAL AFRICAN EMPIRE AND CHAD

Recensement de l'agriculture 1972-1973

**B FICHE DE CHAMP**

Lieu-dit où est situé le champ

[ ]

**Le Champ**

2 A déjà été visité lors d'un passage précédent

1 Est visité pour la première fois

1 - Mode de faire valoir

- 1 Propriété avec titre foncier
- 2 Location avec redevance en espèces
- 3 Location avec redevance en nature
- 4 Location avec redevance mixte
- 5 Location gratuite
- 6 Attribution coutumière permanente
- 7 Attribution coutumière temporaire
- 8 Occupation sans contrat, ni titre, ni attribution (squatter)

16 [ ]

2 - Le champ est-il situé dans le territoire du village ?

- 1 oui    2 non

17 [ ]

3 - Durée du trajet à pied entre l'habitation et le champ (en minutes)

18 [ ] [ ] [ ] [ ]

4 - Le champ est-il irrigué ?

- 1 oui    2 non

21 [ ]

5 - En combien de parcelles le champ est-il divisé ?

22 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

6 - Superficie du champ (en ares avec une décimale)

- au premier passage 23 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]
- au deuxième passage 28 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]
- au troisième passage 33 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

7 - Contrôle de série dernier champ

- 1 oui    2 non

38 [ ]

Identification de l'exploitation  
 1 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] 9 [ 9 ] 10 [ 5 ]  
 P R SR S V NE

Champ numéro 11 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Passage numéro 13 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

14 [ 0 ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

15 [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

A LA DEUXIEME VISITE ET A LA TROISIEME VISITE

Si le découpage du champ en parcelles est le même qu'au passage précédent et les cultures identiques

NE PAS REMESURER LES PARCELLES

Si le découpage du champ en parcelles est le même qu'au passage précédent et les cultures différentes

REMESURER TOUTES LES PARCELLES

Si le découpage en parcelles est modifié ou si le champ a été agrandi ou diminué

MESURER TOUTES LES PARCELLES EN CONSTITUANT SI POSSIBLE EN PARCELLES LES AGRANDISSEMENTS

Si l'enquêteur n'est pas le même qu'au passage précédent

REMESURER TOUTES LES PARCELLES

Si le champ est abandonné depuis le passage précédent

CONSIDERER LE CHAMP EN JACHÈRE



**APPENDIX 8.7 - PART C OF THE QUESTIONNAIRE USED FOR THE 1972/73 CENSUS OF AGRICULTURE IN CAMEROON, CONGO, GABON, CENTRAL AFRICAN EMPIRE AND CHAD**

Recensement de l'agriculture 1972-1973

<b>C</b>	<b>FICHE DE PARCELLE</b>
----------	--------------------------

Identification de l'exploitation 

--	--	--	--	--	--	--	--	--	--

Champ numéro 

--	--	--	--	--	--	--	--	--	--

Parcelle numéro 

--	--	--	--	--	--	--	--	--	--

Passage numéro 

--	--	--	--	--	--	--	--	--	--

**1 Relevé de la parcelle**

I.C.C. OFFSET - 2-1972

Côté	Direction (degrés)	Longueur (mètres)	Pour les terrains en pente forte seulement			Longueur à l'échelle	Cote	Direction (degrés)	Longueur (mètres)	Pour les terrains en pente forte seulement			Longueur à l'échelle
			Visée verticale	Cosinus	Longueur projetée					Visée verticale	Cosinus	Longueur projetée	
1							Report	Totaux					
2							26						
3							27						
4							28						
5							29						
6							30						
7							31						
8							32						
9							33						
10							34						
11							35						
12							36						
13							37						
14							38						
15							39						
16							40						
17							41						
18							42						
19							43						
20							44						
21							45						
22							46						
23							47						
24							48						
25							49						
Totaux							Totaux						

**2 - Choix de l'échelle pour le croquis de la parcelle**

- 1 Si le périmètre est inférieur à 150 mètres, choisir l'échelle 1/200 1 mètre correspond à 1/2 centimètre
- 2 Si le périmètre est compris entre 150 et 1 000 mètres, choisir l'échelle 1/1000 1 mètre correspond à 1 millimètre
- 3 Si le périmètre est supérieur à 1 000 mètres, choisir l'échelle 1/5000 5 mètres correspondent à 1 millimètre

Longueur du périmètre 



 Echelle retenue 



 Soit 1

3 - Surface planimétrée 







  
(ares)

**4 - Mise en place du carré de densité**

Périmètre de la parcelle

Nombre de pas à parcourir sur le pourtour

Largeur de la parcelle à l'endroit où l'on s'arrête 



 (pas)

Nombre de pas à parcourir à l'intérieur de la parcelle avant de poser le carré de densité

**Contrôles**

Planchette       Planimétrie       Calcul de la surface       Report sur fiche de champ

## CHAPTER IX

### METHODS OF DATA COLLECTION

The methods used in collecting data in the 1970 World Census of Agriculture varied with each individual country. In general, the methods to be used depend on the statistical development of the country and also factors such as literacy rate, road systems, postal service, languages, and countless other things. Some of the commonly used methods of data collection in the 1970 World Census of Agriculture are - 1. Postal enquiry, 2. Personal interview, 3. Observation or measurement, and 4. Re-tabulation from administrative records. In some cases a combination of the above-mentioned methods was used to increase the efficiency of the census.

#### Postal enquiry

In a postal enquiry, data are collected through questionnaires filled in by respondents. The questionnaires are sent to the respondent and collected back by the central office through the postal system in the country. For the description of the type of questionnaires used in postal enquiry, see the chapter on The Questionnaire of the Report. In Yugoslavia the census of socialist holdings was conducted on a complete enumeration basis by use of mailed questionnaires. In the United Kingdom, almost all information was obtained by postal questionnaires; specifically in England and Wales data were obtained by post from three sample censuses held in 1970, covering one third of parishes (about 80,000 holdings). In Scotland, information was obtained by interview from the annual stratified sample of about 3,000 holdings. In Northern Ireland most of the data was derived from the June 1970 postal census, but data such as on machinery and equipment, agricultural workers, etc. were obtained from the December 1969 postal census. Thus, as a result of improvement in the collection of agricultural statistics, no special enquiries were necessary (as was the case for the 1960 census of agriculture) to obtain the data for the 1960 census of agriculture) to obtain the data for the 1970 census of agriculture. In the 1972 census of agriculture in New Zealand, information was collected through mailed questionnaires from all persons involved in farming activities during the year ending 30 June 1972. The 1969 U.S.A. census of agriculture was conducted for the first time by mail. The census was preceded by extensive preparation which included a number of pre-tests. Test mailings of preliminary census questionnaires conducted in Colorado and South Carolina early in 1968 achieved a high response rate in both States. Five mail follow-ups were used, after which a response rate of 95 percent in Colorado and 90 percent in South Carolina were reached. This test also permitted the study of the effect of certain variations in wording and format of some of the questions. A nation-wide test conducted in the period January-March 1969 further confirmed the practicability of taking the census by mail. The census included:

- (i) All holdings with an expected volume of sales of agricultural products in 1969 of \$2 500 or more. To these holdings a regular questionnaire (12 pages) was mailed.
- (ii) A 50 percent sample of holdings with an expected sale in 1969 of less than \$2 500. To these holdings a short questionnaire (4 pages) was mailed.

The starting point for enumeration was a mailing list assembled primarily from the records of various Government agencies and from the 1964 census of agriculture lists of addresses. This list was amended by a pre canvass conducted early in 1969 covering about 100 000 of the larger holdings. The pre canvass identified separate holdings of multifarm operations, holdings with significant area in more than one county, and holdings of a special kind such as Indian reservations and holdings operated by institutions. The list contained also an indication of the size of operation of each holding. This information was used to determine which one of the two versions of the questionnaire had to be sent. During the last week of December 1969 the questionnaires were mailed to all addressed on the mailing list. The follow-up procedures included the mailing of a reminder card to all recipients of the regular questionnaire, and four follow-up letters which were mailed to all non-respondents in the period March-June 1970. A response over the 90 percent level was achieved by 1 July 1970. After the mailing of the fourth follow-up letter, data collection efforts continued on a selective basis. Field enumeration by personal interview was used to

APPENDIX 8.7 - PART C OF THE QUESTIONNAIRE USED FOR THE 1972/73 CENSUS OF AGRICULTURE IN CAMEROON, CONGO, GABON, CENTRAL AFRICAN EMPIRE AND CHAD

Recensement de l'agriculture 1972-1973

<b>C</b>	<b>FICHE DE PARCELLE</b>
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Identification de l'exploitation

Champ numéro

Parcelle numéro

Passage numéro

1 Relevé de la parcelle

I.C.C. OFFSET - 2-1972

Côté	Direction (degrés)	Longueur (mètres)	Pour les terrains en pente forte seulement			Longueur à l'échelle	Cote	Direction (degrés)	Longueur (mètres)	Pour les terrains en pente forte seulement			Longueur à l'échelle
			Visée verticale	Cosinus	Longueur projetée					Visée verticale	Cosinus	Longueur projetée	
1							Report	Totaux					
2							26						
3							27						
4							28						
5							29						
6							30						
7							31						
8							32						
9							33						
10							34						
11							35						
12							36						
13							37						
14							38						
15							39						
16							40						
17							41						
18							42						
19							43						
20							44						
21							45						
22							46						
23							47						
24							48						
25							49						
Totaux							Totaux						

2 - Choix de l'échelle pour le croquis de la parcelle

- 1 Si le périmètre est inférieur à 150 mètres, choisir l'échelle 1/200 1 mètre correspond à 1/2 centimètre
- 2 Si le périmètre est compris entre 150 et 1.000 mètres, choisir l'échelle 1/1000 1 mètre correspond à 1 millimètre
- 3 Si le périmètre est supérieur à 1.000 mètres, choisir l'échelle 1/5000 5 mètres correspondent à 1 millimètre

Longueur du périmètre  Echelle retenue  Soit 1

3 - Surface planimétrée           (ares)

4 - Mise en place du carré de densité

Périmètre de la parcelle

Nombre de pas à parcourir sur le pourtour

Largeur de la parcelle à l'endroit où l'on s'arrête  (pas)

Nombre de pas à parcourir à l'intérieur de la parcelle avant de poser le carré de densité

Contrôles

Planchette  Planimétrie  Calcul de la surface  Report sur fiche de champ

## CHAPTER IX

### METHODS OF DATA COLLECTION

The methods used in collecting data in the 1970 World Census of Agriculture varied with each individual country. In general, the methods to be used depend on the statistical development of the country and also factors such as literacy rate, road systems, postal service, languages, and countless other things. Some of the commonly used methods of data collection in the 1970 World Census of Agriculture are - 1. Postal enquiry, 2. Personal interview, 3. Observation or measurement, and 4. Re-tabulation from administrative records. In some cases a combination of the above-mentioned methods was used to increase the efficiency of the census.

#### Postal enquiry

In a postal enquiry, data are collected through questionnaires filled in by respondents. The questionnaires are sent to the respondent and collected back by the central office through the postal system in the country. For the description of the type of questionnaires used in postal enquiry, see the chapter on The Questionnaire of the Report. In Yugoslavia the census of socialist holdings was conducted on a complete enumeration basis by use of mailed questionnaires. In the United Kingdom, almost all information was obtained by postal questionnaires; specifically in England and Wales data were obtained by post from three sample censuses held in 1970, covering one third of parishes (about 80,000 holdings). In Scotland, information was obtained by interview from the annual stratified sample of about 3,000 holdings. In Northern Ireland most of the data was derived from the June 1970 postal census, but data such as on machinery and equipment, agricultural workers, etc. were obtained from the December 1969 postal census. Thus, as a result of improvement in the collection of agricultural statistics, no special enquiries were necessary (as was the case for the 1960 census of agriculture) to obtain the data for the 1960 census of agriculture) to obtain the data for the 1970 census of agriculture. In the 1972 census of agriculture in New Zealand, information was collected through mailed questionnaires from all persons involved in farming activities during the year ending 30 June 1972. The 1969 U.S.A. census of agriculture was conducted for the first time by mail. The census was preceded by extensive preparation which included a number of pre-tests. Test mailings of preliminary census questionnaires conducted in Colorado and South Carolina early in 1968 achieved a high response rate in both States. Five mail follow-ups were used, after which a response rate of 95 percent in Colorado and 90 percent in South Carolina were reached. This test also permitted the study of the effect of certain variations in wording and format of some of the questions. A nation-wide test conducted in the period January-March 1969 further confirmed the practicability of taking the census by mail. The census included:

- (i) All holdings with an expected volume of sales of agricultural products in 1969 of \$2 500 or more. To these holdings a regular questionnaire (12 pages) was mailed.
- (ii) A 50 percent sample of holdings with an expected sale in 1969 of less than \$2 500. To these holdings a short questionnaire (4 pages) was mailed.

The starting point for enumeration was a mailing list assembled primarily from the records of various Government agencies and from the 1964 census of agriculture lists of addresses. This list was amended by a prec canvass conducted early in 1969 covering about 100 000 of the larger holdings. The prec canvass identified separate holdings of multifarm operations, holdings with significant area in more than one county, and holdings of a special kind such as Indian reservations and holdings operated by institutions. The list contained also an indication of the size of operation of each holding. This information was used to determine which one of the two versions of the questionnaire had to be sent. During the last week of December 1969 the questionnaires were mailed to all addressed on the mailing list. The follow-up procedures included the mailing of a reminder card to all recipients of the regular questionnaire, and four follow-up letters which were mailed to all non-respondents in the period March-June 1970. A response over the 90 percent level was achieved by 1 July 1970. After the mailing of the fourth follow-up letter, data collection efforts continued on a selective basis. Field enumeration by personal interview was used to

collect the data from non-respondents in 371 (out of 3 077) counties where response rates were below the acceptable limits.

Two of the major problems encountered in using postal enquiry were non-response and incompleteness of the coverage. Non-response arose due to absence of personal contact with the respondent obtained through the use of enumerators. In order to reduce non-response publicity campaigns were conducted before and during the census enumeration period. Other measures used were to mail a reminder card to the non-respondents or to make a telephone call to the holder by a special telephone enumerator. Incompleteness existed in the census coverage largely because list frames did not originally contain all the holders' names or the frames were out of date.

#### Telephone calls

In some developed countries, census information was obtained through telephone calls. For example, in Denmark the local councils collected the required census information in the most appropriate manner using the prepared questionnaires usually by telephone interview. In some developing countries census information from special types of holdings was obtained by postal enquiry. In the 1970/71 census of agriculture in Zambia all holdings under "Commercial Sector" were completely enumerated through mailed census questionnaires. Data on holdings under "Traditional Sector" were collected through a random sample of holdings using interviewers. In the 1971/72 census of agriculture in Swaziland the census of the "Modern Sector" was conducted on a complete enumeration basis by mailed questionnaire. The non-response rate was reduced to less than 2 percent by mailing reminders to the holders and through the threat of legal prosecution for failure to reply. For those holdings which did not respond, estimates were obtained using previous census returns and other information obtained through field visits.

#### Personal interview

While a small number of countries used postal enquiry, most of the countries that participated in the 1970 World Census of Agriculture used personal interviews by enumerators with the aid of a questionnaire to collect the basic data. The main purpose of using enumerators in large-scale surveys such as censuses is to make sure that the information is obtained as conceived in the programme of the census. The meaning of some concepts and terms used in censuses is not always clear to the respondents. This is particularly true in those areas where part of the agricultural population is still illiterate. To that difficulty one has to add the problem of the units. Even in the developed countries there are many holders who do not have a clear idea of the meaning of the various units they are requested to use to express their response to census questions. In the developing countries the situation in this respect is of course much worse. The utilization of enumerators is therefore considered essential to reduce difficulties arising on this ground. The enumerators get in touch with the holders, explain various terms, help holders in their efforts to find a correct reply, help them in find out the meaning of various units, etc. In this way it is believed that in some cases censuses would be impossible without the enumerators. In other cases it is believed that without the enumerators the quality of census results would not be at a satisfactory level. The enumerators are also used with a view to standardizing the response. If holders are left to themselves to provide replies to census questionnaires they are likely to interpret various questions in their own way which might sometimes be very much different from the real meaning of these questions. As the enumerators explain the meaning of various questions when they see that the holders have some doubts it is believed that through this activity the enumerators again contribute to the improvement of data.

#### Manual of instructions

Enumerators need to be very well informed on the survey procedures and the questions which they will ask. Therefore, after the selection of the enumerators has been made, they should be given thorough training and should receive a manual of instructions. The instructions in this manual should be clear and precise and as full and detailed as possible. As little as possible should be left to the discretion of the enumerators since then each enumerator will tend to interpret the questions in his own way and introduce bias in the data they collect. This bias cannot be entirely eliminated but attempts should be made to reduce it to a minimum. Clear, concise and detailed instructions go a long way in achieving this goal.

Even though written instructions seem to duplicate the oral training, they are necessary as reference material for the use of the enumerators and other field workers. In an agricultural census there is a large number of questions and a very large number of concepts is involved with which it is not easy to become familiar. Thus, detailed written instructions are prepared to meet this need.

Although long and detailed, these instructions should be simple and easy to understand and follow. The general content of the instruction manuals used in the 1970 censuses of agriculture was:

- (1) general information about the census;
- (2) duties and responsibilities of enumerators;
- (3) concepts and definitions;
- (4) enumeration techniques; and
- (5) how to fill in the questionnaire.

The part of instructions dealing with general information explains various items which everybody interested in the censuses should be familiar. The typical items of this part of the instructions are: what is a census of agriculture; why is the agricultural census taken; legal basis, if any, for the census; the confidential nature of the data collected; what use will be made of the census data; and so on. As illustrations it is reproduced in Appendix 9.1 the part under reference from the Enumerator's Manual for the 1971 Censuses of Agriculture and Fisheries of the Philippines, and in Appendix 9.2 the General Instructions from the Enumerator's Manual for the 1968 Census of Agriculture in Jamaica.

The part dealing with the duties and responsibilities of enumerators varies greatly from country to country. Some countries include this as part of General Information, others give it separately, whereas still others merely mention it from place to place without putting all the instructions together in one place. Broadly speaking the enumerators are strictly enjoined to respect the confidentiality of the data obtained and in most cases they are administered oaths to this effect. It is a practice that is very good to follow as the fact that all census employees are under oath tends to increase the confidence of the farmers and of the public at large in census work and helps to provide much needed cooperation to the enumerators. Usually each census of agriculture is based on some law and the citizens are obliged to cooperate and provide the needed information. However, there is no law which creates interest, patience and a sincere wish to help and cooperate. This can be achieved by the enumerators by their manner of approaching the holders to obtain information. The census enumerators are advised to make sure that they create a good impression on the holders they are going to interview. To this effect they are asked to be polite and courteous, dress properly and according to the locally accepted custom, and in countries where immediately starting business is not considered polite behaviour, start with some general conversation, a little pep talk so as to put the holder at ease. They are instructed, however, not to waste too much time before getting down to business. There is no single pattern to fit the needs of all situations in all countries and enumerators should adapt themselves to various types of holders they are going to interview. As an illustration, the instructions on "Introducing yourself to the farmer" and what to do in case of "Refusals", from the instructions for enumerators for the 1969 small farms sample census in Kenya are reproduced below.

#### "7. Introducing yourself to the Farmer

On your arrival at the farm introduce yourself politely to the farmer or to anybody else who may be in charge of the farm. Tell him you are working for the Ministry of Economic Planning and Development to gather information on small farms so that the Government will know how to plan the development of small farms in the district. Luckily his farm has been selected as a representative example of small farms in the districts and you expect him to co-operate in providing this very important information to the Government. Also make it clear to him that the information gathered is strictly confidential and cannot be shown to anybody else apart from

officers at this Ministry; again the survey has nothing to do with taxation or land consolidation, but is purely intended for the purposes of planning economy (Uchumi) of the country.

## 8. Refusals

Provided you approach the farmer in a gentle and respectful manner, there should be no problem of the farmer refusing to provide the information. Past experience has revealed that if properly approached the farmers very willingly co-operate in answering all the questions, and therefore we expect all your farmers to co-operate with you. In case one refuses to co-operate then inform your Field Supervisor immediately who will arrange to talk to the farmer with the sub-chief or the Chief or the District Officer of the area, and the farmer will eventually be persuaded to co-operate."

An example of a more business-like method of introduction is provided by the following instructions from the Enumerator's Manual for the 1971 Censuses of Agriculture and Fisheries, Philippines, under the item "Making your Visit":

"During the actual enumeration, start each interview by introducing yourself and explaining the purpose of your visit. A good introduction would be: 'Good morning, Sir. I am a census enumerator from the Bureau of the Census and Statistics. My name is \_\_\_\_\_ . (If necessary, show your I.D. card.) Perhaps you already know that we are taking the Census of Agriculture and Fisheries. I should like to ask you some questions regarding your farm (and/or your fishing) activities'.

Unless you are asked some questions regarding the censuses, proceed immediately with the enumeration. Be courteous and friendly in your manner. After you have completed the interview, thank the respondent and proceed to the next farm or fishing operator in your list."

There is a fairly detailed discussion in survey literature on how to interview and ask questions from the respondents. There is no set pattern and any reasonable method would be acceptable so long as the data are obtained with a sufficient degree of reliability. As an illustration the following is quoted below from the Enumerator's Handbook for the 1970 Census of Puerto Rico:

### "How to Ask the Census Questions

Ask the questions in a straightforward manner. Do not be apologetic. Remember, you are authorized by law to obtain census information. Follow the information below as guidelines in asking census questions.

- a. Ask the questions in the exact order in which they appear on the questionnaire.
- b. Ask the questions as worded. If the respondent does not understand what is meant, it may be necessary to ask additional questions or give explanations.
- c. Never ask a "Leading Question", such as: "Your family is the only one occupying the house, isn't it?" This approach may seem easier, but very often a respondent may say "Yes" to a question without taking the trouble to give a correct answer or admit that he is not sure.
- d. Never assume you know an answer. Ask the question and help the respondent figure out an answer if necessary.
- e. Ask all questions in a neutral tone. Do not display surprise, approval or disapproval at the respondent's replies, by the tone of your voice or facial expression.
- f. Listen carefully. The respondent may answer several questions at once.

- g. Emphasize the importance of census information if the respondent seems reluctant to answer the questions. Remind him that the information is confidential and that it cannot be used for purposes of investigation or taxation.
- h. Complete all questions needed during the interview. If you wait till you get home to make some entries you may forget them."

The enumerator has to go from holding to holding, and during the course of the field work would have covered all the holdings assigned to him. He should, therefore, make a plan for his visits. In the case of small enumeration districts (EDs), say not more than 20 holdings, the problem is easy. With a large number of holdings the problem is more difficult and if maps are provided for this purpose, it would help the enumerator a great deal in "canvassing" the whole district completely.

Sometimes it is the duty of an enumerator also to list the holdings. In countries where lists have been prepared as part of the "pre-census" work, the aim is simply to up-date the information and make sure that there is no omission or duplication. In countries taking their census for the first time or where previous lists are completely out of date, fresh lists may have to be prepared.

As an illustration of the instructions on canvassing and listing, in Appendix II the corresponding pages from the Enumerator's Handbook for the 1970 Census of Puerto Rico are reproduced.

Almost all the instructions prepared for the 1970 World Census of Agriculture have explained the various concepts used in the census. Many terms in agricultural censuses do not mean the same thing to a lay man. For example, the concept of a holding in an agricultural census is very specifically defined. For a lay man it may mean just the land owned by him, including, including the houses, apartments etc. By legal status of a holder one may mean whether he is a citizen, a registered voter, or an alien, but what is implied in agricultural census programmes is whether his status is that of a civil person or a juridical person. Then again one needs to explain the mean of a civil person and a juridical person. Is hired manager a holder? The answer may be different in different countries. Thus a significant part of an instruction manual has to be devoted to the explanation of the various concepts.

Questions may be clear so far as they go, yet too general. A question may ask for "Occupation", let us say. Again this item, which appears to be quite commonplace, needs specification - not just what constitutes the definition of occupation for the purposes of agricultural census but an amplification as to the nature of the actual work done, where it is performed, under what circumstances, etc. Even common terms, when they are pertinent to the subject of enquiry in a census, acquire different meanings to different people. For more details on this topic and instances of cultural differences affecting the definition of common questionnaire items, the reader may refer to an article on this subject by Dedrick. <sup>1/</sup>

Along with an explanation of the various concepts and terms used in an agricultural census, detailed instructions have to be given to enumerators to explain the manner in which the answers to various questions have to be written in the questionnaires. These instructions are necessary in order to standardize the procedure and for convenience in the future handling of the questionnaires for editing, coding and other activities in data processing. Thus instructions are necessary to indicate whether the areas and quantity of production are to be given in local units, or whether they have to be converted to standard units. Within a country a number of local units is used and if enumerators were asked to write the data in local units, space was immediately provided to write the equivalent of the local units in standard units. In Philippines the areas were to be recorded in hectares and

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<sup>1/</sup> Dedrick, Calvert L., "Cultural Differences and Census Concepts", Problems in the Collection and Comparability of International Statistics, (New York: Milbank Memorial Fund, 1949), pp. 63-70.



square metres whereas for production, the entry could be in terms of the local units and/or standard units specified in the questionnaire. There are different standard units of measure for the various types of crops grown in Philippines. For example cavan for cereals, metric tons for sugarcane, kilos for vegetables, fruits, oil seeds and tobacco and pole for bamboo. The instructions stated: "Conversion into standard units should be done at home so as not to take too much of the respondents' time during the interview".

Sometimes the instructions go into detail in explaining some point which may appear to be straightforward to another person. A case in point is the instructions for the unit used for reporting area of holdings in Philippines census of agriculture mentioned above. To illustrate the details given in the instructions, the paragraph dealing with this particular instruction in the Enumerator's Manual for the 1971 Censuses of Agriculture and Fisheries, Philippines, is reproduced below:

"Report the area of the holding in hectares. Fraction of a hectare should be reported in square meters. Thus, if the area reported is  $2\frac{1}{4}$  hectares, enter '2' under hectares and '2500' under square meters in the questionnaire. There are 10,000 square meters in 1 hectare; hence  $\frac{1}{4}$  hectare is equal to 2500 sq.m. If the area reported for one parcel is only 400 sq.m., put a dash (-) in the column for 'hectares' and enter '400' under square meters."

The instructions dealing with concepts and definitions, enumeration techniques and how to fill in the questionnaires are sometimes given separately in different sections of the instructions manual and sometimes they are given together throughout the instructions manual. Both methods of presentation have some advantages. In case they are given in separate sections, it is convenient for reference purposes. On the other hand if they are given together, the enumerator has to keep in mind the particular concept and definition every time he writes the answer to a question. As examples of these two different methods of presentation in Appendix IV the table of contents from the Enumerator's Manual for the 1968 Census of Agriculture in Jamaica and in Appendix V the table of contents from the Enumerator's Manual for the 1971 Censuses of Agriculture and Fisheries in Philippines are reproduced.

As mentioned earlier, instructions are given both orally as well as written for reference purposes. The preparation of written instructions is a very important task. The instructions should be clear and detailed (they can never be complete), and adequate describe the census programme, concepts, field procedures and the duties and responsibilities of the various field staff. The preparation of instructions requires a thorough knowledge of the various phases of census operations, of the local conditions in a country, the customs and general psychology of both the respondents and the enumerators.

The written instructions are put together in different forms, and are commonly referred to as instruction manuals. The manuals vary in form and size from country to country. They are printed or mimeographed. Those countries which conducted their 1970 agricultural censuses in conjunction with other censuses such as those of fisheries, housing, forestry, etc., issued either separate manuals or combined all instructions in one manual. The size of a manual also depends on the extent of the details given in the instructions. They were issued in various forms such as one or more pamphlets, booklets, handbooks, loose sheets, printed books, etc. They were sometimes bound together in one volume or sometimes issued in several publications.

In order to provide a more detailed picture of the characteristics of the instruction manuals issued in the 1970 Census of Agriculture, Table 1 is presented below to give a rough idea of their variety. It is sometimes difficult to decide whether a publication should be listed as a book or a pamphlet and much of the classification is based on subjective judgement.

Table 9.1 - Some Characteristics of the Instruction Manuals for the 1970 World Census of Agriculture in Selected Countries

Country	Book	Pamphlet	Printed	Mimeo-graphed	How many books or pamphlets?	Number of pages in individual books or pamphlets	Total number of pages	Remarks
<u>EUROPE</u>								
Austria		X	X		1	4	4	
Belgium		X	X		1	4	4	
Finland		X		X	1	44	44	
France	X		X	X	2	59,114	173	<u>1/</u>
Italy	X		X		1	201	201	
Netherlands	X		X		1	40	40	
Norway		X	X		1	8	8	
Switzerland		X	X		2	6,1	7	
<u>AFRICA</u>								
Botswana		X		X	3	24,20,4	48	
Ghana		X		X	1	17	17	
Guinea		X		X	1	41	41	
Kenya		X		X	3	22,18,5	45	
Lesotho		X		X	1	22	22	
Liberia		X		X	2	55,44	99	
Malawi		X		X	2	82,24	106	
Sierra Leone		X		X	1	116	116	
Swaziland	X		X		1	36	36	
Tanzania		X		X	4	21,4,5,5	35	
Zambia		X		X	6	5,15,5,3,2,3	33	
<u>ASIA AND FAR EAST</u>								
Fiji		X		X	1	25	25	
Japan	X	X		X	2	60,62	122	
Korea							99	<u>2/</u>
Nepal	X		X		1	53	53	
Philippines	X		X		1	135	135	
Guam		X		X	2	26,18	44	
Samoa (American)		X		X	2	34,20	54	<u>3/</u>

Table 9.1 - Cont'd

Country	Book	Pamphlet	Printed	Mimeo-graphed	How many books or pamphlets?	Number of pages in individual books or pamphlets	Total number of pages	Remarks
<u>LATIN AMERICA</u>								
Antilles (French)	X		X		1	73	73	
Brazil	X		X		1	87	87	
Dominican Rep.	X		X		1	52	52	
Haiti	X		X		3	73,77,16	166	
Jamaica		X	X		1	29	29	
Mexico	X	X	X	X	6	32,2,32,8,8,6	88	
Panama	X		X		1	85	85	
Puerto Rico	X	X	X	X	4	159,56,39,22	276	
Surinam		X	X		1	14	14	
Uruguay	X		X		1	20	20	
Venezuela	X		X		1	77	77	
Virgin Islands		X		X	2	56,43	99	
<u>NEAR EAST</u>								
Kuwait		X		X	1	19	19	
Pakistan	X		X		1	51	51	

- 1/ One printed book for instructions to enumerators and other mimeographed book for filling questionnaires.
- 2/ English translation.
- 3/ One called enumerators reference manual, other guide for training enumerators in agricultural census.

Pre-testing of questionnaires and instructions

No matter how carefully the instructions are prepared, they must be pretested under field conditions likely to be met. At the time of the experimental or pilot census for pretesting the questionnaire and instructions, one comes face to face with the inadequacies of the concepts and as a result of discussion gets better understanding of the various terms used in the census programme. Also one gets the practical experience in deciding on the possible ambiguous cases that may arise later on during the course of the actual field work. This subject is more intimately concerned with pretesting and the role of experimental censuses, but at this stage it would be well to recognize that a great amount of time, labour and thought goes into the preparation of the instruction manuals. Thus, irrespective of the skill and experience of the enumerators, the instruction manuals tend to be large, particularly when they explain in detail the concepts used, give examples to illustrate them and finally exercises to check the understanding of the instructions by the field workers.

Training programmes in different countries differ, depending upon the availability of the field personnel, the census programme and other resources to carry out adequately the programme. In a typical training programme, during the first part of the training the enumerators are expected to read the instruction manuals prepared for them and are encouraged to raise points not clear to them. These questions are then discussed and more difficult problems thrashed out. In some cases, after this preliminary part, there may be a test to eliminate those would-be enumerators whose understanding is not up to the desired level, depending on whether there is enough supply of such personnel. In any case those who are accepted as enumerators are given more thorough training and are taken to the field to study the conditions likely to be encountered and carry out an experimental census. In case the experimental census would be too large, they are nevertheless given "practical" experience by enumerating one or two localities. Sometimes the enumerators are given training by some of them posing as respondents and raising difficult questions or trying purposely to confuse the enumerator to judge his understanding of the situation. Once the training is completed, they are given identification badges, oaths of secrecy (if not ~~not~~ already administered) and are sent out for the actual work of an enumerator.

The method of personal interview is the most commonly used method of data collection in the 1970 World Census of Agriculture, since in this case the enumerators personally contact the holders and can obtain the required information fairly accurately. The enumerators can clearly explain to the holders the purpose of the census, the nature of the data to be collected, and can persuade them to provide the data required, thus the possibility of non-response arising from non-cooperation, indifference, etc., is reduced. This method is most suitable for agricultural censuses because of the difficult concepts on many items that need to be clarified by the enumerators.

#### Physical measurements

In some of the censuses of agriculture taken around 1970, data were collected by physical measurement and often in combination with the interview method. Data collected by physical measurement consists in using a measuring instrument by the enumerators. For example the 1970 census of agriculture in Lesotho was conducted on a sample basis and data was collected by personal interview and physical measurements. All crop fields of the selected holdings were measured. Crop-cutting experiments for crop yield estimates were undertaken on a sample of five fields for each crop for the five major crops at the rate of one crop-cutting plot of 33 feet by 33 feet per field. In the agricultural census in Bahrain, actual measurement and counting were performed by the enumerators whenever possible. Total area of the holding was determined by direct physical measurement when the shape of the holding was regular. For holdings of irregular shape, the total area was determined through the use of aerial maps and planimeter. In the 1971/72 agricultural census in Swaziland, the information on the holdings in the "subsistence sector" was obtained on a sample of holdings basis using field enumerators. The field operations consisted of two phases, namely: The first phase involving field area measurements and collection of data on other aspects of holding characteristics was completed by the end of April 1972. The second phase consisted of crop-cutting surveys and was completed by the middle of June 1972.

Census data obtained by direct physical measurements or counting are likely to be more accurate than those obtained by other methods although it may involve greater effort and cost. Thus, before using this method, the cost and efforts involved and the possible improvement in the quality of data are to be considered.

#### Re-tabulation from administrative records

The method of re-tabulation from administrative records is used when the census information is already available in records maintained by the authorities concerned. In this case it is not necessary to collect the census data direct from the holders. Some countries maintain such records or farm registers containing information on the characteristics of individual holdings. The quality of the data obtained by re-tabulation of the census information contained in these records can at least be the quality of the original data collected from the holders. Some of the countries that used this method are given below.

In the 1970/71 census of agriculture of India, the methodology used for the assimilation of census information at the State/Union Territory level broadly fell into two categories: (1) In 18 States/Union Territories there existed reliable land records containing the information required by the census. This information was re-tabulated and presented in standardized form; (2) For 12 States/Union Territories the land records did not exist or gave insufficient census information. In each of these States/Union Territories a sample survey was conducted to obtain the required information. In the 1970/71 agricultural census in France the Communal Farm Register formed the basis for the enumeration. This register classifies the holdings by alphabetical order, place, area and cadastral identification number. The enumerators also used a card-index of all holdings in a commune which was up-dated<sup>1</sup>/<sub>2</sub> by the departmental statistical services in collaboration with the communal committees during the period June 1969-April 1970. Here the farm register was used for preparing the lists frames of holdings. A similar procedure was used in the agricultural census in Finland. The census of agriculture was conducted in two stages, namely: The 1969 complete enumeration census of all holdings with at least one hectare of arable land, and the 1970 sample census, intended for broadening the scope of the 1969 census. The enumeration was performed by Census Committees set up in the rural communes with the aid of enumerators. In communes in which the parcels had been measured by air photography, the completeness of the coverage was ensured by use of tax classification cards which included also the information on arable area according to the tax survey measurement. In communes for which there was no tax classification card index, the lists of holdings were based on other available information on holdings such as lists of tax payers, land registers, etc.

In Sweden the basis for the agricultural statistics (as well as for the compulsory National Crop Insurance System) is the Farm Register established in 1968. The Register contains data on the holder, land use, land tenure, crop areas, livestock and employment for holdings with more than 2 ha of arable land. These data are collected annually. Other data for these holdings and data for holdings with 2 ha of arable land or less are collected and included in the Register at intervals of a few years. The 1971 Census was a complete enumeration survey taken by the Central Bureau of Statistics on the basis of the Farm Register. The census forms were sent to all those who were under a liability to provide information. Data that could be generally assumed to have remained unchanged from the previous year were printed by computer on the forms before mailing. This form, a brochure with census information and a stamped addressed envelope (to return the form) were sent to all the holders included in the census. The holder who failed to return the form in time received reminders.

#### Other methods

Other methods used in data collection in the 1970 World Census of Agriculture are described below:

The 1969 agricultural census in Norway was carried out on a complete enumeration basis. The census was organized and directed by the Central Bureau of Statistics while the collection of data in individual municipalities was entrusted to the local boards of agriculture. Each municipality was divided into census areas, and an enumerator was assigned to each area to either fill in the questionnaire himself or to let the holders fill it if he so wished. The local boards of agriculture were responsible for checking the census material and sending it to the Central Bureau of Statistics before the middle of August 1969. The 1970 agricultural census in Luxembourg was similarly carried out on a complete enumeration basis. The census frame was based on the Commune which was made responsible for carrying out the agricultural census on a local basis. The Commune nominated the enumerators who distributed the census questionnaires to the holders and collected them back after verification on the holding. The communal administration after checking the questionnaire, prepared a summary list showing the results of every communal section as well as those of the entire Commune. The 1968/69 census of agriculture in Malta was an interview survey taken on a complete enumeration basis. Holders were called by post, at a specific time and place, for registration and interview. The non-respondents (about 6 percent) to the first notice were contacted again with a second notice sent out by registered mail. This time the holders' attention was drawn to the penalties contemplated in the Statistics Acts. This follow-up action reduced the non-response to about one percent. The frame used was based on "locality lists" showing the names of holders who were originally extracted from the

cadastral records and updated from time to time. In the 1970 census of agriculture in Porto Rico the enumerators, upon having located an agricultural holding, decided which questionnaire had to be completed by asking whether the gross value of sales of agricultural products from the holding during 1969 was less than US\$1200 or US\$1 200 or more. If the gross sales amounted to less than US\$1 200, the short questionnaire had to be completed and this was done by the enumerator himself. If the gross sales amounted to US\$1 200 or more, the enumerator left the holder with a copy of the regular questionnaire and an instruction booklet, and the holder had to complete the questionnaire and mail it to the census office. The first phase of the collection was followed by an extensive mail and enumerator follow-up operation. The results of the 1970 census of agriculture in Czechoslovakia were based on the results of the following surveys: Current Surveys, (i) Land use by sectors, (ii) Employment in agriculture, (iii) Fruit trees, (iv) Livestock, (v) Harvest in 1970; Special Surveys carried out to provide additional information requested in the FAO Programme, (i) Supplementary survey of socialist holdings, (ii) Supplementary survey of private holdings. All surveys were carried out under the guidance of the Federal Statistical Office. Data relating to the survey of land use were collected by the Office of Geodesy and Cartography. Data relating to other surveys were collected in two ways: (a) In case of large holdings of the socialist sector the questionnaires were completed by their administration and sent direct to the Statistical Office, (b) In case of all other holdings the surveys were carried out by the Communal local authorities. They were responsible for subdividing the commune into enumeration areas, appointing the enumerators for enumeration of holdings located in their assigned commune, ensuring the accuracy and completeness of the data, and for transmitting the results for the commune to the Statistical Office.

APPENDIX 9.1 - 1971 CENSUSES OF AGRICULTURE AND FISHERIES - PHILIPPINES<sup>1/</sup>

"GENERAL INFORMATION

What the Censuses of Agriculture and Fisheries are

The Census of Agriculture is a count of farm holdings in the country and it covers all agricultural operations carried on in such holdings or farms during the crop year July 1970 to June 1971. Important facts to be provided by the census include:

1. Number, size, and type of agricultural holdings;
2. Area under crops, types of crops grown, and amount of production;
3. The number and kinds of livestock and poultry raised;
4. Number and characteristics of the farm population and of persons employed in agriculture;
5. Number and kinds of agricultural equipment used and the availability of transport facilities;
6. Area of land under irrigation and drainage;
7. Use of fertilizers and soil dressings, etc.; and
8. Association of agriculture with other industries.

The Census of Fisheries is the first to be undertaken in the country which includes in its scope fishing households. It aims to determine the number and distribution of such households as well as enterprises engaged in fishing, i.e., the catching, gathering and culturing of fish, crustaceans, mollusks and all other aquatic animals and plants in marine, brackish water and freshwater.

Other information to be provided by the census include the following:

For fishing households -

1. Type of fishing engaged in and extent of occupation in fishing;
2. Household size and number of members engaged in fishing;
3. Fishing boats and fishing gear used; and
4. Catch by type of fishing operation.

For fishing enterprises including fishpond operation -

1. Form of organization, extent of activity in fishing, and type of fishing engaged in;
2. Number of persons engaged in fishing;
3. Tonnage, gear used and purchase price of commercial fishing vessels (more than 3 tons);
4. Kind, number and purchase price of fishing gear used;
5. New expenditures for vessels and gears;
6. Operating costs including salaries and wages;
7. Total catch and value of catch; and
8. Ownership, area, and initial investments on fishponds.

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<sup>1/</sup> Taken from: Enumerator's Manual - 1971 Censuses of Agriculture and Fisheries - Philippines

Commonwealth Act 591 - Authority for Taking the Census

The Censuses are undertaken under the provisions of Commonwealth Act 591, to provide comprehensive information on the structure of our agricultural and fishing industries.

Uses of Census Data

Our Government needs this information for planning agricultural and fishery development programs designed to improve the productivity of our farms and of our fishery units; business needs these data in determining investments; farmers and those in the fishing industry use the census data in planning their production and the marketing of their agricultural and fishery products; research organizations, students and the general public are interested in the census data for information about our farms and fishery units and the people dependent on them.

The last Census of Agriculture was undertaken in 1960. Since then, as a result of continuing progress in agriculture technology, the use of more improved farm practices, the introduction of improved seed varieties, more extensive use of fertilizers, etc., many changes have taken place which have affected the number and size of farms, average yields, and total production of various crops. Only a census can measure and assess these changes. It is therefore important that a census of agriculture shall be conducted, not only at periodic intervals, but as completely and as efficiently as possible."



APPENDIX 9.2 - 1968 CENSUS OF AGRICULTURE - JAMAICA <sup>1/</sup>

PART I - GENERAL INSTRUCTIONS

Purpose of the Census :

1. The project on which you will be engaged is a census of farmers and their farms. The object is to get information about farm holders, their farms, and their farming practices which will be useful to the Government, and to the country as a whole, in the nation's development planning. Most countries take such censuses from time to time, in some cases every five or ten years, but for several reasons the last one in Jamaica was held in 1943, nearly 25 years ago. Since 1943 several sample surveys have been taken, the latest in 1961/62. In a sample survey only a proportion of the total number of farms is included, whereas in a census all farms are included.

2. Although the census will be given very wide publicity in the newspaper, on radio, on television, on the cinema screens and by other means, you should be prepared to give to everyone who asks, a brief explanation of the purpose of your work. You should remember the following points :

- ( i ) The information which you obtain will reveal the condition of farmers and of farming practices in each constituency, parish and in the island as a whole.
- ( ii ) Such information is essential to meet the needs of modern planning for economic development and for the drafting of policies to improve social conditions.
- ( iii ) The work of many Government departments, the University and several other institutions has been handicapped by the long period over which no agricultural census has been held. This census will provide very useful information to these institutions.
- ( iv ) The Food and Agricultural Organisation (F. A. O. ) of the United Nations has called upon its members; of which Jamaica is one; to hold agricultural censuses around this time. There is a great deal of international interest in the census.
- ( v ) All information given by farmers is held by the Department of Statistics, in the strictest confidence under the Statistics Law Chap. 368, and under special Legislation governing the census. Heavy penalties are prescribed for breaches of secrecy by enumerators and all others engaged in the census and all workers have to be sworn to secrecy under the law. The Department is prohibited from giving individual information to anyone without that individual's permission to do so in writing. Only general totals can and will be published.
- ( vi ) The questionnaires will be seen and handled only by persons actually engaged in census work. Names of persons and properties will never appear in the reports and it will be impossible to find the answers given by any individual farmer because the figures published in the report will be for the parishes and the island.
- ( vii ) Under the Statistics Law, any officer who reveals the business of the farmer to the Income Tax or any other department or person outside of the Department of Statistics is liable to a heavy fine or imprisonment.

Legal Status of the Census :

3. In order to carry out the census special legislation had to be passed by the Government which has appeared in the Jamaica Gazette. (You should be familiar with the number and date of the Gazette and will have a copy to take around with you). In accordance with the Statistics Law Chap. 368, it is legally binding on the farmers to give the information which you will ask for in the questionnaire, but enumerators are expected to obtain information by friendly approach and persuasion without bringing the law into the matter. Indeed your success will depend primarily upon your friendliness and resourcefulness and the farmer's faith in you and your work.

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<sup>1/</sup> Department of Statistics, Jamaica: World Agricultural Census Programme, Enumerator's Manual, 1968.

APPENDIX 9.2 - Cont.

You and Your Supervisor :

4. You will work under the control and guidance of the Department of Statistics. This control and guidance will be exercised through your Area Supervisor. You will approach him for solution of any difficulties, hand over completed work to him, and abide by whatever instructions you receive either from him or from any other authorised person from the Head Office of the Department of Statistics in Kingston. You will work in accordance with pre-arranged plans so that the Area Supervisor is able to meet you and inspect your work without great difficulty or delay, at the place of your field work. During the course of a week you are expected, on the average, to complete questionnaires for about fifty farmers. Depending upon the facility of movement and of contact with farmers within your areas, the supervisors will, where necessary, indicate to you any adjustment in the amount of work expected. Your payment will depend upon satisfactory completion of the work allotted to you. Quality of work is as important as quantity. You should bear in mind that the information which is revealed to you by the farmers must be treated as confidential and you are not expected to disclose it to anyone except to the Authorised Area Supervisor. Any violation of this will be liable to prosecution. You have already taken an oath of this.

APPENDIX 9.3 - 1970 CENSUS OF AGRICULTURE - PUERTO RICO<sup>1/</sup>

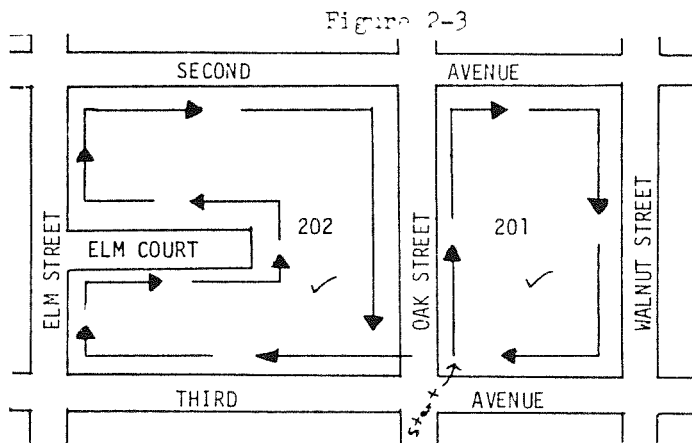
2.2 Canvassing

Canvassing is that part of enumeration that consist of traveling through the ED in a systematic manner looking for every place where people live or could live and all farm operations. Canvassing will be combined with interviewing.

As you canvass your area, follow these simple rules:

- a. Study your ED map before beginning your canvass and develop a systematic plan.
- b. Stay inside the ED.
- c. Cover only one side of boundary roads, the side within the ED.
- d. In rural areas, cover both sides of interior roads.
- e. In block areas, canvass one block at a time in a clockwise manner.
- f. Cover all streets, roads, lanes, and alleys whether originally shown on the map or not.
- g. Look for concealed living quarters in nonresidential buildings, such as over and behind stores and in garages. Also search for them and for agriculture operations in wooded areas, down paths, etc.
- h. Look for farm operations without housing units. List those that you find on Form A4 PR, which is in the front part of the Address Register.
- i. Look for unusual living quarters such as old buses, houseboats, lean-to's, etc.
- j. Look for evidence of more than one living quarters in a building, such as two or more mailboxes or meters.
- k. Follow electric powerlines to their end. This may lead you to a house you might not otherwise find.

1. Begin canvassing each day at the place where you stopped the day before.



The arrows in the illustration show the route to follow in canvassing blocks 201 and 202. However, on your ED map enter the arrow only at the beginning of each block.

Two typical city blocks

### 2.3 Listing

This is a procedure for making an accurate list of the households and farms in the Enumeration District. Proceed in the following manner:

- a. Use the Address Register, Form D-130 PR. It contains listing pages for housing units; for Special Places; and for farm properties.
- b. When you arrive at an address, you must identify each separate living quarters and list each on a separate line of the Listing Page. Initially, complete all required columns, except Column 10 ("Number of Persons"), for that living quarters. Use the first available blank line.
- c. "Number of Persons" will be entered in Column 10, after a questionnaire for that household has been completed. At that time, the number of persons will be known.
- d. Listing includes making out a Census Identification Label (described below in section 2.31) for each separate living quarters that cannot be identified unmistakably by street name, house number, and (if applicable) apartment number or letter, and attaching this label to the outside of the unit near the principal door. In areas that are not built up, spot the location of such housing units on the ED map.
- e. If the property is a farm, the Short Farm Questionnaire must also be completed or the Regular Farm Questionnaire must be left with the farm operator to complete and mail to the Census Office, before you fill the "Completed" box of the Census Identification Label.

- f. The information that you enter in Columns 11 through 13 will determine whether the property, on which the living quarters is located, should also be listed and enumerated as a farm (see example of Listing Page on page 31).
- g. If the property is a farm, the information that you enter in Column 14 will determine the type of farm questionnaire to use for the interview. You must enter "X" in column 16 when you complete a short farm questionnaire or record the date you leave the Regular Farm questionnaire. (See page 10 for definition of farm.)
- h. A farm that does not have a housing unit will be initially listed on the "List of Agriculture Operations Without Housing Units". This is a separate page in the Address Register. After appropriate action has been taken to enumerate the farm, the "Action Taken on Enumeration" column will be completed. (See page 25 for detailed explanation.)
- i. If the living quarters is a Special Place (see page 10) review the list of Special Places that you received during training and see if this one has been included. If it has not, list it on the Special Place Listing Sheet. Do not conduct an interview but notify your Crew Leader immediately. (See page 23 for Special Place Listing procedures.)
- j. When the listing has been completed, interview a member of the household, using the appropriate Population and Housing Questionnaire. If the property is a farm, continue the interview by filling a Short Farm Questionnaire or leaving the Regular Farm Questionnaire, in accordance with column 15 of the listing page.

APPENDIX 9.4 - 1968 CENSUS OF AGRICULTURE - JAMAICA <sup>1/</sup>

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<sup>1/</sup> Op. Cit.

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<sup>1/</sup>Op. Cit.



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## CHAPTER X

### USE OF SAMPLING METHODS

Sampling techniques have found an extensive and diversified use in the 1970 censuses of agriculture in both developed and developing countries. While in developed countries the use of sampling either to substitute or to supplement the complete enumeration census had as scope the better use of available resources to meet the increasing demand for statistical data, in developing countries it was often the only feasible way of organizing the census within the resources available.

The extent of use of sampling to substitute the complete enumeration was determined by different factors. On the one hand, the increased knowledge of census takers about possibilities of sampling and the further development of sampling theory called for an increased use of sampling. On the other hand, increased demand for data by small administrative units which are not satisfied with sampling estimates, called for complete enumeration. As a result, it appears that globally speaking the use of sampling as substitute for the complete enumeration in the 1970 censuses was of the same importance as in the 1960 censuses.

The new trend observed in the 1970 censuses is the use of very large samples by a number of countries and increased application of sampling in other aspects of census work such as tabulation of advanced results and checking the quality of data. It was also observed that the census reports contain much more information on sampling error than was the case in the 1960 round of censuses.

#### Use of sampling as a substitute for complete enumeration

##### Size of sample

The size of sample varied considerably from one country to another. Particularly small samples were reported from a number of African countries as in this region the absence of knowledge of standard measurement units for area and crop production on the side of indigenous agricultural holders made often necessary the recourse to objective measurements. Under such circumstances the cost of enumeration per holding is so high that the only possible approach is to base the census on a very small sample.

The sampling size is reported for 20 countries in Table 10.1. It can be seen that sampling fraction varied from 0.5 to 81.8 percent.

##### Auxiliary sample censuses

In the case of the two countries shown in Table 10.1, Brazil and the United States of America (USA), it can be noted that the sampling fraction was exceptionally high: 59.0 and 81.8 percent. In these two countries the special census design was implemented which consisted of a combination of a complete enumeration of all holdings of middle or large size and a sample survey of small holdings. In this way the bulk of data on agricultural production was obtained through a complete enumeration while the data on small holdings were obtained through an auxiliary sample survey. Such procedure can be described as a stratified random sampling with all holdings divided into two strata. The more important stratum is completely enumerated while the other is covered by sampling. In Brazil the small holdings were defined as those with an area of less than 10 ha. Twenty percent of such holdings were enumerated. In USA the holdings with less than US\$2 500 of sales during the agricultural year were classified as small holdings and were sampled with a rate of 50 percent. The relative importance of the two strata can be seen in Table 10.2.

Table 10.1 - Number of sample holdings, estimated total number of holdings and sampling fraction for some selected countries

Country	Number of holdings		Sampling fraction (percent)
	Enumerated	Estimated total	
1. Yugoslavia	644 376	2 600 140	24.8
2. USA	2 231 960	2 730 250	81.8
3. Brazil	2 912 216	4 932 202	59.0
4. Dominican Republic	15 295	253 300	6.0
5. Botswana	1 159	48 014	2.4
6. Cameroon <sup>1/</sup>	7 000	926 000	0.8
7. Central African Empire	2 560	280 635	0.9
8. Chad <sup>1/</sup>	3 508	344 250	1.0
9. Congo <sup>1/</sup>	3 600	137 883	2.6
10. Ghana	58 370	805 200	7.2
11. Lesotho <sup>1/</sup>	2 560	187 421	1.4
12. Liberia	4 602	121 745	3.8
13. Malawi <sup>1/</sup>	5 340	885 000	0.6
14. Sierra Leone <sup>1/</sup>	1 575	286 137	0.6
15. Swaziland	1 499	39 377	3.8
16. Tanzania	16 245	1 800 000	0.9
17. Togo <sup>1/</sup>	3 793	232 657	1.6
18. Zambia	9 890	767 990	1.3
19. Zaire <sup>1/</sup>	15 000	2 941 294	0.5
20. Fiji	16 769	33 521	50.0

<sup>1/</sup> Excluding modern holdings.

Table 10.2 - Number and area of holdings completely enumerated and of holdings covered by the sample census, in percent in USA and Brazil

Country	Stratum of large holdings (complete enumeration)		Stratum of small holdings (sample census)	
	Number	Area	Number	Area
..... Percent .....				
1. USA	63.5	86.4	36.5	13.6
2. Brazil	48.8	96.9	51.2	3.1

The reason for applying sampling enumeration of small holdings is, needless to say, reduction of cost of enumeration and processing of data which are of a relatively low importance. In the USA census a further reduction of costs was made possible by reducing the number of questions in the questionnaire for small farms. Two versions of the questionnaire were used. The standard questionnaire was completed for larger holdings and a simplified, three times shorter questionnaire was completed for small holdings. Tabulations and publications showed some data for all holdings and the more detailed information only for larger holdings.

Stratification

Stratification was applied by virtually all countries which conducted the census on sampling basis with two different aims: (i) to increase the precision of sampling estimates; and (ii) to keep under control the sampling error for administrative subdivisions for which the census estimates were required.

Most of the countries taking a sample census have applied a two-stage sampling design with villages or enumeration areas as primary sampling units and agricultural holdings in selected villages as secondary sampling units.

A number of countries has stratified all agricultural holdings into two strata: one consisting of large holdings to be enumerated completely and another to be covered by a sample census. Such two examples (Brazil and USA) have already been mentioned. In these two cases, however, the much more important stratum was the one consisting of large holdings. In many other countries only a small number of very large holdings were enumerated completely. Examples of such holdings are the modern plantations in African countries and cooperatives and government holdings in socialist countries.

Table 10.3 - Number and area of holdings completely enumerated and of holdings covered by the sample census in selected countries

Country	Stratum of large holdings (complete enumeration)		Stratum of small holdings (sample census)	
	Number	Area (ha)	Number	Area (ha)
1. Yugoslavia	2 155	2 081 223	2 599 552	10 096 150
2. Botswana	260	...	47 754	216 740
3. Liberia	836	...	121 000	...
4. Swaziland	569	660 378	38 808	106 397 <sup>1/</sup>
5. Tanzania	4 498	...	1 800 000	...
6. Zambia	1 090	1 147 082	766 900	...

<sup>1/</sup> Land under temporary crops only.

Table 10.3 shows number and area of holdings for each of the two strata in selected countries. Complete enumeration of large holdings was easy in countries where their lists already existed although even in such cases considerable effort was usually required to up-date the lists. In some other countries such lists were prepared for the purpose of the census.

In the 1971 sample census of Liberia villages were used as a primary sampling unit. However, as even an up-to-date list did not exist it was necessary to canvass the whole country, clan by clan. During the canvassing a list of large holdings was

prepared mostly on the basis of information obtained from clan chiefs. Large holdings were defined as holdings having 40 ha. or more under rubber, or those having 6 ha. or more under any other single crop. These holdings were later enumerated completely.

In the 1972/73 sample census of Pakistan a list of large holdings and government farms to be enumerated completely was prepared through the assistance of the Revenue Department.

In the 1973 census of Sri Lanka the list of all holdings in the country was prepared at the time of the 1971 Population Census, and up-dated to reflect the position in 1973. The holdings in each of almost 200 geographical strata were further substratified into three substrata:

1. Estates defined as agricultural holdings with a resident population of 10 or more labourers and an area of 20 acres or more.
2. Small holdings operated by a single operator working on his own account.
3. Other small holdings (operated jointly by several holders or operated for others)

Stratification of small holdings in Sri Lanka is shown in Table 10.4.

Substratum 1 (estates) was completely enumerated by using a special mailed questionnaire. Substratum 3 was also completely enumerated except in geographical strata where the number of holdings was excessive. In such cases a 20 percent systematic sample was taken.

Substratum 2 was further substratified by size of holding and different sampling fraction was applied for different substrata. A systematic sample with two independent starts was selected from each stratum.

Table 10.4 - Stratification of small holdings in Sri Lanka

Substratum	Size of holding	Sampling fraction (percent)
1	Less than 1/8 acre, less than minimum livestock	0
2	Less than 1/8 acre, at least minimum livestock	5
3	1/8 acre and less than 1	5
4	1 acre and less than 5	10
5	5 acres and less than 10	10
6	10 acres and less than 25	20
7	25 acres and less than 50	50
8	50 acres and more	100

In the 1968 census of agriculture in Fiji the census frame was based on the list of all heads of households in the country, obtained from the 1966 census of population, and included heads of households engaged in one of the six following categories of occupation:

- Village or subsistence agriculture
- Commercial copra production
- Sugarcane farming
- Mixed farming (including dairy farming)
- Agricultural labouring or other agricultural employment
- Other occupations likely to permit operation of a holding.

Two-way stratification was applied according to the 35 geographic regions and according to the six categories of occupation listed above. In total there were 210 possible strata but 53 of these strata contained no heads of households. A simple random sample of clusters consisting of 10 to 15 neighbouring heads of households was drawn from each of the remaining 157 strata. The total number of holdings included in the sample varied from stratum to stratum over the range of 10 to 100 percent depending on the number of heads of households in the stratum, the probable variability between units within the stratum, and the relative importance of the stratum in the agricultural sector. Altogether 50 percent of holdings were enumerated.

Use of sampling for tabulation of census data

A number of countries which participated in the 1970 World Census of Agriculture by enumerating all holdings, reported the use of sampling for tabulating the census returns. The most common use of sampling referred to preparation of advanced estimates. The complete tabulation of all census data is a lengthy operation which involves scrutiny of all questionnaires and punching of millions of cards. This work may take several years. The necessity to meet urgent needs for census data has induced many countries to undertake the sampling tabulation.

In the 1971 census of Panama the sample for advanced estimates consisted of: (i) all the holdings in a 20 percent sample of enumeration areas; and (ii) all the "large holdings" in the country. The advanced estimates were published thirteen months after the completion of the field work, and eleven months before the first final results became available.

The dates of issuing various census reports are shown in Table 10.5.

Table 10.5 - List of reports on the census of agriculture in Panama (May 1971)

Title	Issued
Preliminary results (sampling tabulation)	June 1972
Vol. I - Agricultural Production	June 1974
Vol. II - Livestock Production	August 1974
Vol. III - Characteristics of Agricultural holdings	To be issued in 1975 or later
Vol. IV - General Report	" "
Vol. V - Agricultural Regions	" "
Methodological Information	" "

The comparison between the preliminary and final data on number and area of holdings, by size of holding, is shown in Table 10.6.

The advanced results of the 1971 census of the Dominican Republic were also based on a sample of holdings enumerated. The sampling fraction was much smaller than in the case of Panama.

Sampling design consisted in stratification of all holdings into three strata:

1. Large holdings defined as those having either 62.8 ha. (1 000 tareas) of total area, or 12.6 ha. (200 tareas) of cultivated land, or 100 heads of cattle, or poultry for commercial purposes.
2. Medium holdings defined as all other holdings having total area of at least 0.5 ha. (8 tareas).
3. Small holdings defined as all other holdings.

Table 10.6 - 1971 Census of Panama - Preliminary and final data on number and area of holdings classified by size of holding

Size class	Preliminary data		Final data	
	Number of holdings	Area (ha)	Number of holdings	Area (ha)
Under 0.5 ha	12 689	1/	13 211	1 372
0.5 - 0.9 ha	6 665	1 855	6 821	3 871
1.0 - 1.9 ha	14 763	17 784	14 859	16 717
2.0 - 2.9 ha	9 682	19 578	9 355	19 488
3.0 - 3.9 ha	5 738	17 956	5 653	17 353
4.0 - 4.9 ha	4 459	17 937	4 501	18 294
5.0 - 9.9 ha	14 116	91 270	13 937	89 971
10.0 - 19.9 ha	13 641	174 770	14 179	182 521
20.0 - 49.9 ha	13 388	395 979	14 138	415 008
50.0 - 99.9 ha	5 497	361 768	5 526	363 439
100.0 - 199.9 ha	1 887	247 557	1 920	252 262
200.0 - 499.9 ha	816	229 135	853	238 270
500.0 - 999.9 ha	188	123 845	211	138 360
1 000.0 - 2 499.9 ha	73	104 000	75	105 940
2 500.0 ha and over	29	215.934	33	235 196
Total	103 631	2 019 368	105 272	2 098 062

1/ Data not tabulated.

Sample included all large holdings (9 490) and 7/42 fraction of medium holdings (5 805). Small holdings with number and area which accounted for about 6 and 0.1 percent of all holdings respectively, were excluded from the sample.

In the 1968 complete enumeration census of Portugal, provisional results were prepared by use of a 5 percent sample of census questionnaires. During the preparations for tabulation of final results it was decided to use the census returns from the district Beja, where the collection of questionnaires was first completed, for testing the data processing procedures and computer programmes. "During this test it was verified that the processing of data contained in all questionnaires would not have been possible within a reasonable time. To mention only punch cards, it would have been necessary to punch and process more than 18 million of them." 1/ It was decided, therefore, to apply sampling techniques to sample questionnaires for tabulation of final results as well. An exception was made for the data on livestock which were tabulated for all holdings reporting livestock.

1/ Portugal, Instituto Nacional de Estatística, Inquérito às Explorações Agrícolas do Continente, 1968, Explorações de menos de 20 hectares, Estimativa a 20%, Continente, page X.

The tabulation of all other data was based on: (i) all questionnaires for holdings with an area of 20 ha, and more; and (ii) 20 percent sample of other questionnaires. The number of questionnaires completely processed was reduced in this way from 812 000 to 187 000 (30 000 for large holdings and 157 000 for small holdings).

A different example of application of sampling was found in Japan. The 1970 census of agriculture and forestry in Japan was taken on a complete enumeration and most of the tables were obtained by processing all the questionnaires. In order to broaden the scope of tabulation at relatively small cost, a group of tables was tabulated on a sample of holdings. These tables were needed for analysis of structures of agricultural holdings which produced major crops such as paddy rice and fruit trees as well as those that raised livestock, and were not to be prepared for small administrative units.

A sample of holdings was selected from the magnetic tapes containing the data for all the holding. All the work from the selection of the sample up to the production of final tables was performed by the computer. Also in this case the sample was designed in such a way to include more larger holdings than smaller ones. Large holdings were all included in the sample, while the sampling fraction for small holdings ranged from 5 to 50 percent.

Some information on sampling error was given in most of the reports which presented the results of sample tabulation. The amount of information given and the way of presentation differed very much from country to country.

In the report on sample tabulation for Panama it was merely stated that the sampling error for the most important characteristics was not more than 1 percent on the country level and not more than 5 percent for the estimates on the level of a province. The Dominican Republic reported the estimated values of sampling errors for more than 50 of the most important characteristics.

Greece also prepared the sample tabulations of the 1971 complete enumeration census. The sample consisted of 5 percent of all questionnaires. The sampling error was calculated and presented in the report for 14 most important characteristics for the whole of Greece and for 10 geographic regions for which estimates were prepared. These sample errors presented in the form of coefficients of variation are reproduced in Table 10.7.



Table 10.7 - 1971 Census of Greece - Coefficients of variation in percent of the estimates for characteristics for the whole of Greece and geographic regions

Selected characteristics	Greece	Region of Athens	Central Greece	Peloponesus	Islands of Ionian Sea	Epirus	Thessalia	Macedonia	Thrace	Islands of Aegean Sea	Crete
Area under temporary crops	0.4	12.5	1.9	2.4	4.8	2.4	2.0	1.2	1.9	3.3	2.6
Area under vine trees	1.2	22.8	3.9	1.8	3.9	5.8	4.8	2.6	4.2	4.2	2.2
Area under orchards (total)	1.0	12.0	2.7	1.7	3.6	4.4	5.2	3.4	8.3	3.4	2.0
Area under olive trees	1.2	13.2	2.8	2.0	3.8	5.9	7.3	8.9	22.6	3.7	2.2
Area under citrus trees	2.7	20.6	11.3	3.7	9.9	6.6	24.7	35.4	-	8.9	5.9
Area irrigated	1.0	18.9	2.5	2.5	7.6	3.6	2.7	1.7	4.8	4.1	3.0
Number of citrus trees	0.3	19.5	4.1	0.7	9.3	1.2	23.1	45.6	36.7	7.6	3.1
Number of olive trees	0.1	4.6	0.9	0.1	0.9	1.3	1.9	2.3	19.1	0.6	0.3
Number of fruit trees	0.2	24.0	2.2	1.4	5.1	6.9	1.6	0.4	6.7	1.3	2.0
Number of parcels	0.5	6.1	1.3	1.7	2.4	1.5	1.3	0.9	1.5	2.0	1.3
Number of cattle (total)	1.3	35.6	6.5	6.6	7.6	7.8	3.1	1.8	2.3	4.6	5.7
Number of cattle under 2 years	1.7	54.1	7.8	7.1	9.3	15.7	4.6	2.5	3.1	5.2	7.5
Number of cattle 2 years and over	1.3	39.6	8.2	8.6	8.5	5.8	3.1	1.7	2.1	4.9	6.5
Number of sheep	0.9	36.1	3.5	3.4	12.9	4.0	4.1	4.0	6.8	6.7	6.5
Number of goats	0.8	65.4	5.0	5.2	15.9	7.2	6.7	7.2	10.1	8.2	8.5
Number of pigs	4.5	78.9	11.3	7.7	26.7	16.6	7.3	7.6	31.3	10.8	12.1

For the 20 percent sample tabulation of agricultural holdings with less than 20 ha. in Portugal sampling error was not calculated. Nevertheless, the users of data were given some idea about the size of sampling error in two different ways.

The following table was presented:

If the estimated number of holdings having certain characteristics is equal to ...	... there are two chances out of three that the true value will differ from the estimate for less than ...
50	15
100	20
500	45
1 000	65
2 000	90
5 000	140
7 000	165
10 000	200
20 000	280
50 000	445
100 000	640
300 000	1 100

The above figures represent an approximation of the estimate of sampling error for any simple random sample design with sampling fraction of 20 percent. In a different sample design with the same sampling fraction the sampling error may differ considerably. In the report of Portugal no information on sampling design was given.

Another view on the possible sampling error was provided by showing the comparative figures obtained by complete tabulation and 20 percent sample tabulation obtained for the district of Beja. Some selected data are reproduced in Table 10.8.

Table 10.8 - 1968 Census of Portugal - Selected census data for district of Beja

Selected characteristics	Complete tabulation		Sample tabulation (20 percent)	
	Number of holdings reporting	Area (ha)	Number of holdings reporting	Area (ha)
All holdings	16 622	83 942	16 605	83 896
Holdings producing mainly for sale	9 333	49 274	9 335	49 656
Holdings producing mainly for home consumption	7 329	34 668	7 270	34 240
Arable land	16 598	80 475	16 520	78 566
Land under temporary crops	15 216	55 495	15 045	54 552
Temporary meadows and pastures	906	2 955	830	2 549
Land temporarily fallow	6 565	19 719	6 605	19 184

Sampling design

Almost all countries that took a sample census, for which information was available, have used a stratified multistage design. The most commonly used design consisted of selecting the villages or enumeration areas as primary sampling units (PSU) with probability proportionate to a measure of size, and selecting a sample of a fixed number of agricultural holdings as secondary sampling units (SSU) from each selected PSU. The number of PSUs in the sample and the number of sample holdings in each selected PSU are given in Table 11.9.

Table 10.9 - Number of PSUs and SSUs (holdings in the sample for countries applying the sampling design with PSU selected proportionately to a measure of size and a fixed number of SSUs

Country	Number of PSUs in the sample	Number of holdings in selected PSU	Total number of holdings in the sample
Botswana	83	10	830
Cameroon	1 400	5	7 000
Central African Empire	500	5	2 500
Chad	800	6	4 800
Congo	600	6	3 600
Gabon	300	6	1 800
Lesotho	320	8	2 560
Malawi	410	10, 15	5 340
Sierra Leone	105	15	1 575
Swaziland	31	30	930
Tanzania	1 083	15	16 245
Togo	457	8	3 840

Stratification of primary sampling units was applied by all countries, the number of strata ranging from 4 in Sierra Leone and Swaziland to 380 in Tanzania.

The number of holdings selected per PSU varied from 5 in Cameroon and the Central African Empire to 30 in Swaziland. In Malawi 10 holdings were selected in 4 strata (162 sample PSUs) and 15 holdings in another 3 strata (248 sample PSUs). The measure of size used for selection of PSUs was total population in all countries except in Sierra Leone, where number of adults (10 years of age and over) working in agriculture was used. In Botswana and Malawi there was one more stage of sampling. What we call for convenience the PSU was in these two countries sampled in two stages. In Botswana, the villages were selected in the first stage and parts of villages in the second stage. In the third stage a sample of 10 holdings was selected in each part of villages included in the sample. In Malawi, the groups of villages were selected in the first stage and single villages in the second stage.

Agricultural holdings in PSUs were selected in almost all countries by systematic sampling or simple random sampling. Stratification of holdings prior to selection was not considered practical in most of the countries. Yet, in Sierra Leone and Tanzania stratification was applied. In Sierra Leone holdings were stratified according to the cropping pattern. In Tanzania in each PSU 5 holdings were selected from the stratum of holdings operating less than 5 acres of land and 10 holdings from the other stratum.

Among countries which applied a different sampling design we find Ghana, Fiji, Liberia and Yugoslavia.

In Ghana and Yugoslavia a part of census data was collected from all agricultural holdings in selected PSUs. Other data were collected on a subsample of holdings.

In Ghana a stratified systematic sample of PSUs was drawn with equal probabilities. Subsample consisted of 10 percent of holdings in selected PSUs.

In Yugoslavia, PSUs were selected with probability proportionate to the number of households. Subsample of holdings was selected with sampling fractions which were different for PSUs of different sizes. The subsampling fractions were determined in such a way as to produce subsamples of about 8 holdings per PSU.

A design similar to the one applied in Yugoslavia was applied in Liberia, with the difference that measure of size of PSUs was the number of structures, and the selection of PSUs was not performed strictly speaking with probabilities proportionate to size. Instead, PSUs were stratified in 7 size groups and sampling fraction in each stratum was approximately proportionate to the average size of PSU. The secondary sampling fractions were chosen in such a way that on the average about 5 holdings were to be selected in each sample locality. Primary and secondary sampling fractions were varied in such a way that the overall sampling fraction was  $\frac{1}{48}$  for the largest countries,  $\frac{1}{24}$  for medium sized countries and  $\frac{1}{12}$  for smallest countries and territories. PSUs with 250 or more structures were all included in the sample. The secondary sampling fraction was  $\frac{1}{10}$  or  $\frac{1}{20}$ .

A completely different sampling design was used in Fiji based on the lists of heads of households for the whole country. The design consisted of the stratified one-stage simple random sample of clusters consisting of 10 to 15 neighbouring heads of households. Altogether 50 percent of all holdings were included in the sample. The sample clusters of holdings were enumerated in a random order over a census period of one year. This approach was adopted because of the absence of a distinct cropping season in Fiji (some crops are planted and harvested throughout the year). The estimates of the annual area under crop were obtained as a ratio of the sampling estimate of the total area under a crop (actually on the holding at the time of enumeration) to the length of the period between planting and harvesting of the crop expressed as a fraction of the census period.

Table 10.10 Average size of PSUs and average sampling fractions for selected countries

Country	Average number of holdings per PSU	Average sampling fraction (percent)		
		PSU $f_1$	SSU $f_2$	Overall $f=f_1 \cdot f_2$
Ghana <sup>1/</sup>	79	6.9	10.0	0.7
Lesotho	178	30.0	4.7	1.4
Malawi	218	10.1	5.9	0.6
Sierra Leone	103	28.4	2.1	0.6
Swaziland <sup>2/</sup>	340	27.2	8.8	2.4
Tanzania	109	6.6	13.6	0.9
Togo	72	14.4	11.1	1.6
Yugoslavia <sup>1/ 2/</sup>	58	17.3	14.5	2.5

1/ Sampling fractions refer to the subsample of holdings enumerated by use of a detailed questionnaire.

2/ Excluding completely enumerated large farms.

CHAPTER XI

DATA PROCESSING

Availability of electronic computers has induced the vast majority of countries to process their 1970 national censuses by computer. Thus, out of 82 countries and territories participating in the 1970 World Census of Agriculture for which the information was available only nine did not use the computer. Out of these nine countries Gabon and Togo undertook the census on the basis of a small sample while the other seven in which agricultural holdings were enumerated completely, are very small. As can be seen from Table 12.1, the total number of holdings enumerated in these nine countries is only about 25,000.

Table 11.1 - Countries and territories in which the computer was not used for processing the 1970 Census of Agriculture and number of holdings enumerated.

Country and Territory	Number of agricultural holdings enumerated
Malta	10 803
Virgin Islands (U.S.)	212
Bahrain	855
Kuwait	449
Gabon	1 800
Togo	3 840
American Samoa	1 923
Guam	1 121
Pacific Islands (Trust Territory)	3 857
<u>TOTAL</u>	<u>24 860</u>

It can be said that the most significant feature of data processing of the 1970 World Census of Agriculture was the shift to computer data processing. While in the 1960 World Census of Agriculture only 30 percent of the countries used the computer, in the 1970 World Census of Agriculture the number approached 90 percent.

Manual versus computer processing

In countries reporting use of the computer, automatic processing was combined with manual processing in different ways and to very different degrees. An exceptional case in this respect was reported by India. This country, though reporting use of computers, actually used the computers only in three States (Orissa, Tamil Nadu and Assam). In the remaining fifteen States tabulation of data was done by manual process.

It might be added that in spite of the apparent progress achieved in the field of electronic data processing and inspite of the fact that the majority of countries have used the computer, surprisingly enough the delay in the publication of census results was very long, perhaps longer than in the 1960 censuses. This was true also for countries with relatively long computer experience.

There is the impression that a number of countries which undertook computer processing would have been able to produce faster the final census results if they organized manual

processing. This may be particularly true for countries that enumerated only a small sample of agricultural holdings, since a considerable part of preparations for computer processing, such as write-up of computer programmes remains the same, no matter how many data have to be processed. It must be added, however that in countries that enumerated only a small number of holdings, the clerks qualified to undertake manual processing were also often lacking. For example, when the preparations for the 1971 sample census of agriculture in Liberia were under way, it was decided to use the computer although the sample consisted of 4,500 agricultural holdings only. This decision was taken because the Ministry of Planning, the office organizing the census was able to assign two qualified computer programmers for the work, while it was doubtful that sufficient number of qualified clerks could be found for manual processing. As another example, it can be reported that the census questionnaires from Virgin Islands (U.S.) American Samoa, Guam and Pacific Islands (Trust Territory) were shipped to the United States for manual processing.

Computer processing abroad

A number of countries arranged for computer processing of their agricultural census data in a foreign country (see Table 11.2). This was done either because the computer services were not locally available or because of the lack of computer programmers.

Table 11.2 - Countries which sent census data for computer processing abroad

Country or Territory	Number of agricultural holdings enumerated	Processing organized in:
Guadeloupe (French Antilles)	22 577	France
Puerto Rico	32 687	United States
Surinam	16 078	Netherlands
Botswana	1 159	United Kingdom
Central African Rep.	2 560	Cameroon
Chad	3 508	Cameroon
Congo	3 600	Cameroon
Lesotho	2 560	South Africa

Processing of census data abroad required in most cases the shipping of the census questionnaires. This was done not only to enable the punching of data at the computer centre abroad but also to make possible a quick reference to the census questionnaires for correcting errors discovered in data by the computer.

The processing of the 1970 Census of Agriculture in Lesotho was organized by an ICL computer firm in South Africa. The census questionnaires were scrutinized and coded manually before they were sent to the firm for punching. The questionnaires for every district were despatched as soon as they were completed so that punching could start as early as possible. The FAO Statistician in charge of the census designed the card layout. A list of tabulations to be produced by the computer was also submitted to the firm, along with detailed instructions indicating what questions in the questionnaire would provide information for each tabulation. Before punching and programming was undertaken, the card layout, codes, the list of tabulation and accompanying instructions were all discussed with the firm's representative.

A different approach was used for data processing of censuses in Central African Republic, Chad and Congo. These three countries together with Gabon and Cameroon organized jointly their respective censuses. All five countries were using the same census questionnaires and were planning to produce identical census tables. Although the computers were available in several of the five countries, it was decided that all the computer processing be undertaken in Yaoundé, Cameroon, in order to be able to use the same computer programmes for all five countries. Data were all punched in individual countries and transferred to tapes which were sent to Yaoundé. Before the computer tabulation, data were checked by the computer and errors detected were listed and mailed back to individual countries for checking against the census questionnaires, correction and repunching. This process, which was repeated several times delayed considerably data processing. Thus while all tables for Cameroon were produced in the first half of 1975, two years after the field work was completed, the tabulation for other countries had not yet been started at the beginning of 1976. In the case of Gabon the idea of computer processing was completely abandoned, because due to the difficulties experienced in the field work incomplete data were collected, so that it was decided to tabulate manually the most important data.

#### Data input

In almost all countries using the computer for census processing, the data from the questionnaires were keyed manually. Modern automatic reading devices, such as optical readers (which are successfully substituting manual punching in many other areas) did not find much application in the processing of censuses of agriculture. In fact, very few countries applied them in agricultural censuses. The complexity of the census questionnaire, the fact that the census is a one time job, and the requirement that figures be written by specially trained staff are probably the main reasons that automatic reading devices did not appear useful. This is particularly true of sample censuses in which the normal keying of census data is only a minor part of processing operations.

In the 1972 census of agriculture in Hungary the use of the optical character reader was reported. It was not considered possible, however, to read the data directly from the questionnaire, so prior to automatic reading all data were copied from the questionnaires on the special coding sheets. Use of optical readers was also reported by Norway and by France (for reading some information only).

The great majority of countries were using 80 columns punch cards for input of data to the computer. A few countries were using paper tape (Australia, Czechoslovakia, Northern Ireland) and a few used key-edit electronic encoders for keying in data directly from the questionnaires to magnetic tapes (Canada).

Some information on the use of punch cards is shown in Table 11.3, for 21 countries for which information was available. It can be seen that number of cards punched per agricultural holding vary from two cards reported in Poland and in Ghana, up to 18 reported in Argentina. The number of cards per holding depended upon the length of the census questionnaire and also upon the efficiency of the punch card design.

From Table 11.3 it can be seen that in the majority of countries 100 percent verification was undertaken. In other countries a high percentage of cards was verified with the exception of Mexico where verification was done for 10 percent of punch cards only. The percent of cards that had to be corrected varied from one percent in Finland, Fiji and Panama to 15 percent in Luxembourg and Jamaica.

Number of different punch card designs varied greatly: from one reported in Panama up to as many as 84 reported by Yugoslavia. In the case of Yugoslavia four different questionnaires were used; one short and one long for individual agricultural holdings and two very long questionnaires, one for cooperatives and the other for agricultural enterprises.

In most of the countries punch cards were used only as input to the computer. Data were subsequently stored on magnetic tapes, discs or drums for further processing. This factor had a great influence not only on punch card design but also on the design of the census questionnaire as in such organization of processing it is not necessary that all data to be cross-classified be punched on the same card. Data from different punch cards for the same agricultural holdings were often rearranged on tapes in logical records of length different than 80 positions. The basic information for this operation was the holding identification code which occupied usually 5 to 15 positions.

Table 11. 3 - Information on use of punch cards for selected countries

Country or territory	Number of agricultural holdings enumerated	Number of punch cards used:		Percent of cards verified	Percent of cards corrected	Number of different punch card designs
		Total (000)	Average per holding			
Austria	396 530	3 675	9	100	2	17
Belgium	118 297	1 800	15	100	9	24
Denmark	140 197	n.a.	n. a.	100	5	2
Finland	297 257	3 500	12	99	1	32
France	1 587 643	20 300	13	100	6	14
Italy	3 620 799	29 000	8	100	3	7
Luxembourg	7 608	100	13	100	15	13
Netherlands	184 613	1 200	6	60	8	2
Poland	3 591 947	7 600	2	100	2	2
Sweden	161 946	2 000	12	82	5	10
Yugoslavia	462 000	2 500	5	99	2	84
Argentina	549 177	10 000	18	100	3	8
Botswana	1 159	5	5	100	n.a.	5
Ghana	58 000	100	2	100	n.a.	4
Malawi	5 337	47	9	100	n.a.	10
Fiji	16 769	200	12	100	1	6
Jamaica	193 359	900	5	100	15	13
Mexico	1 016 569	10 962	11	10	2	2
Panama	105 272	600	6	100	n.a.	1
Uruguay	77 163	600	8	100	n.a.	2
Japan	5 354 074	27 500	5	100	n.a.	2



When reviewing the organization of punching as implemented by different countries, one can distinguish two approaches:

1. A questionnaire is punched by several punching operators responsible for one punch card type each.
2. A whole questionnaire is punched by one punching operator.

The advantage of the first approach was considered to be a greater speed of punching as every operator becomes specialized in one section of the questionnaire. Also the questionnaires need not be burdened with instructions or hints for punching. A disadvantage was that the identification code was to be punched manually for every card type, which not only increased the time for punching but also created difficulties in matching different cards for the same holding in the case of undetected punching errors.

The second approach which is historically newer was also used by many countries participating in the 1970 World Census of Agriculture, many more than in the 1960 World Census of Agriculture. The advantage of this approach was that the holding identification code was punched manually only once on the first card for every holding and then reproduced automatically on other punch cards. Also the organization of punching was simpler because of less routing of questionnaires. The important disadvantage was that each punching operator had to be familiar with all sections of the questionnaire and since the duties of each punching operator were more diversified there was a danger that punching speed was lower and number of punching errors larger. To overcome these problems countries tried to design the questionnaires and punch card layout in such a way as to simplify the work of punching operators as much as possible. In doing so countries followed two different directions: (i) application of fully coded questionnaires and (ii) provision of distinct spaces for all digits in the questionnaire with indications in which positions of the punch card various entries were to be punched. The first method is illustrated here by the example of Mexico and the second by the example of Yugoslavia.

In the 1970 Census of Agriculture, Livestock and Ejidos in Mexico, several very long questionnaires were used. All possible entries were precoded in the questionnaires with 3 or 4 digit codes. In all, two different punch card designs were used: Master Card and Data Card:

Master Card Design:

<u>Columns</u>	<u>Entry</u>
1 - 8	File Number
9 - 14	Blank
15 - 17	Number of holders
18	Type of questionnaire (1,2, 3 or 4)
19 - 20	District Code
21 - 23	Municipality Code
24 - 27	Control Number
28 - 30	Total number of questionnaires
31 - 37	Total area of all holdings in the file

One master card was punched for each file.

Data card design:

<u>Columns</u>	<u>Description</u>
1 - 8	File number - same for all questionnaires in the file
9 - 10	Questionnaire number
11 - 20	Field 1
11 - 14	Code
15 - 20	Data
21 - 30	Field 2
21 - 24	Code
25 - 30	Data
31 - 40	Field 3
31 - 34	Code
35 - 40	Data
41 - 50	Field 4
41 - 44	Code
45 - 50	Data
51 - 60	Field 5
51 - 54	Code
55 - 60	Data
61 - 70	Field 6
61 - 64	Code
65 - 70	Data
71 - 80	Field 7
71 - 74	Code
75 - 80	Data

As shown, every data card had seven fields and every field was used for punching one entry from the questionnaire. For each entry, code was punched in the first sub-field and entry in the second sub-field. Only entries existing in the questionnaires were to be punched. Questions without answer were to be ignored. Data sub-fields contained 6 positions. Data with more than 6 digits were to be punched in two consecutive fields so that the code was punched in the first code sub-field, followed by six most significant digits. In the second field code, zero was punched in the code sub-field and remaining data digits in the data sub-field.

The punching method applied in Mexico is particularly suitable for agricultural censuses because an average agricultural holding reports only a few of the main characteristics investigated. For example, the census questionnaire often asks for more than fifty crops, while not many holdings grow more than 5 or 10. So the disadvantage of having to punch each time is largely compensated by savings in punch cards whenever the number of existing entries in a questionnaire is much below 50 percent of possible entries.

An example of the other direction followed by countries wanting to simplify the punching and thus make possible that one punching operator punches all punch cards for one agricultural holding is found in Yugoslavia (see Appendix 11.1 showing first page of a completed questionnaire). The approach followed was to provide, in the questionnaire, boxes for each digit to be punched. The punching operator had just to punch digits or blanks in the order as they appeared. The first 10 digits represent the identification code which was punched manually only for the first card and reproduced automatically on others. Eleventh digit is the precoded card code 1. Punching positions for some boxes are indicated with small numbers printed immediately after the box (punching positions 10, 11, 13, 31, 35, 44, 48, 58, 60, 65 and 68) in order to permit the punching operator to check occasionally

whether the punching sequence is properly followed. In case of multiple answers, e.g. yes with code 1 and no with code 2 (see item 15. in the attached questionnaire) enumerators were instructed to encircle the correct code while the punching operators were instructed to punch encircled digit (it can be noted that the punching positions related to boxes adjacent to encircled code are both shown in order to provide additional guidance for punching).

Further economy with space and the manual punching of identification code were possible when key to tape machines were used. Since there is no danger than punch cards will be mixed, the identification code for the group of questionnaires which represent the working unit can be recorded only once. For individual questionnaires it was sufficient to record the serial number of the questionnaire within the working unit.

The key to tape machines which were used in the 1971 Census of Canada created 80 column card images on tapes. This method was selected as a result of the various studies made during the 1968 and 1969 test censuses. The census questionnaires were grouped in batches of about 100 questionnaires each. For each batch there was one master record (card image) containing identification code for the batch (codes for province, county, municipality) and some additional information - 23 positions in all. All other 80 column records contained the serial number of the questionnaire in the first three positions and data in all other positions. Data were string keyed in free form with "&" sign used as a field separator. All items in the questionnaire were precoded. If space to complete a field was not available in the record that was being keyed, the whole field had to be keyed in the following record. For every entry in the questionnaires one data field was keyed in. A data field consisted of a three digit code followed by the answer as it appeared, without leaving blanks or zeros, and a "&" sign to separate fields. For example, the code 142 in the questionnaire stood for the total number of pigs. If no pigs were reported nothing was keyed in. If three pigs were reported the operator had to key in the following: "1423&".

Most of the work of the keying operators was thus straight forward. For some parts of the questionnaire, some special instructions had to be given. They are illustrated below:

1. Answers given in tenths:

Area (acres)			
073		10	Do not key
074	16	10	Key in 074160&
075	17	3	
		10	Key in 075173&
076		3	
		10	Key in 0763&

2. Answers given by marking boxes:

If the answer box is marked the operator had to key in the code and "1" for the answer.

Office use			
241	<input type="checkbox"/>	Inst.	Do not key
242	<input checked="" type="checkbox"/>	Spec.	Key in 2421&
243	<input type="checkbox"/>	Arp.	Do not key

If there are more possible answers associated with the same code for each marked answer, the number which appears on the left side of the box had to be keyed in:

Which of the following were produced under contract during the past 12 months?														
1	<input type="checkbox"/>	Cattle	2	<input checked="" type="checkbox"/>	Pigs	3	<input type="checkbox"/>	Chickens	4	<input type="checkbox"/>	Turkeys	5	<input type="checkbox"/>	Eggs 164

In the above example the operator had to key in 16424&.

In the case of key tape machines, the verification of keyed in data was done in a way similar to the one used for verifying punch cards. Correction of errors found was organized; however, in a different way because it is not possible to insert a record on the tape unless the whole tape is re-written. For illustration of correction procedures with key to tape machines the instruction for correction as applied in the 1971 Census of Agriculture in Canada are reproduced below:

" Correction procedure during verification -

1. If a field (code and answer) is omitted, the field is coded on a sheet which include - Farm number, the code and answer and will be entered at the end of the batch.
2. If an error is detected where only one character was entered incorrectly then insert correct character and continue.
3. If the field contains:

should be           &1231769& and it should read   &123176& the correction  
                       &123176&& or if field contained  
                       &1531769& and it should be       &123176& then re-enter field  
 to read             &123176&&

If the correct field can be contained within the field separators then insert correction and add "&"'s to fill the field.

4. If the error involves insufficient space between field separators for the correct data then the field is to be cancelled and correct data to be handled as in (1) re-enter at the end of batch

e.g. field contains        &123176&  
      should be             &1231769&

To cancel a field enter a "-" eleven punch in the last position of the field which precedes the field separator

e.g.    &12317-&.

#### Computers and programming languages used

Information on computers used for data processing of the 1970 World Census of Agriculture is shown in Table 11.4, for those countries for which this information was available. It can be seen that in general fairly large computers were used. It should be noted, however, that information available refers mostly to developed countries. Developing countries were generally using smaller computers.

A number of countries were using more than one computer. In the case of the Federal Republic of Germany and Japan, most of the data processing was decentralized. In the Federal Republic of Germany the statistical offices of each of the 11 Laenders (administrative subdivisions) and the Federal Statistical Office were using identical models of the IBM 360 Computer. In Japan, the bulk of processing was performed by 17 private computer centres, each one having the identical computer as the central statistical office.

The amount of work on computer programming and system analysis expressed in man-months is also shown in Table 11.4. It ranges from 2 man-months reported by Luxembourg and England and Wales up to 225 man-months reported by the Republic of Korea. The estimates of the programming labour input were made in majority of cases before the work was completed and refer to the time planned rather than to the time actually spent.

The programming languages generally used were COBOL and ASSEMBLER. Out of 32 countries for which information was available, 11 reported COBOL as the main programming language, 9 reported ASSEMBLER, 4 reported PL1, 3 reported RPG and 2 FORTRAN. Another three countries reported use of languages similar to ASSEMBLER but for computers other than IBM.

A significant feature of the 1970 World Census of Agriculture was the appearance of computer packages and general computer programmes for processing of census and survey data. Some of these packages were used only by countries which developed them (Canada) while some others found international use.

The most successful packages used in the 1970 World Census of Agriculture were CENTS and COCENTS. The packages have been developed by the Computer Methods Laboratory of the International Statistical Program Centre (ISPC) at the U.S. Bureau of the Census, Washington. The approach was developed in the late 1960's with the specific intention of processing results from the population and housing census. The technique is one that reserves sufficient core memory (called tally blocks) for each table desired. The entire data file (sequenced by desired area breakdown) is passed through the computer and tallies are made. At each area break, the values in the tally blocks are written out on a tape (or disk) for a later consolidation run. Stub and heading information are added and the table is printed. The package uses as input specific control or parameter cards for each tabulation. These parameter cards are simplified instructions that can be written in a few hours for virtually any tabulation.

The first package was written in the ASSEMBLER language for the IBM-860 computers with a minimum of 32K core storage.

Table 11.4 - Computers used and man-months needed for preparation of computer programmes for census data processing for selected countries

Country	Computers used			Computer Programming man-months
	Make and model	High speed storage (bytes)	Number of tapes	
Austria	IBM 360/40	128K	-	60
Belgium	GE 425	32K	5	125
	IBM 360/40	256K	4	
Czechoslovakia <sup>1/</sup>	IBM 370	512K	6	n.a.
	MINSK 22	8192 words <sup>2/</sup>	16	
Denmark	IBM 360/50	256K	8	20
Finland	IBM 360/50	256K	10	35
France	IBM 360/65	512K	12	150
	GE 437	64K	8	
	GE 415	32K	8	
Germany <sup>3/</sup> Fed. Rep. of	IBM 360	64K	6	n.a.
Greece	UNIVAC 9400	64K	5	n.a.
Italy	IBM 360/40	256K	6	30
	IBM 360/25	32K	-	
Luxembourg	IBM 1620	20K	-	2
Netherlands	X-1	16K	-	60
Norway	IBM 360/40	64K	6	46
	IBM 1401	4K	1	
	IBM 360/40	128K	n.a.	
Poland	ICT-1905	32K words	8	32
	ICT-1902A	32K words	2	
	ODRA-1304	32K words	8	
Sweden	IBM 360/50	512K	8	n.a.
United Kingdom:				
England & Wales	ICL 1907	2,359,000 bits	9	2
Scotland	IBM 360/40	256K	8	n.a.
Northern Ireland	ICL 1904A	64K	6	15
	ICL 1905	32K	9	
Yugoslavia	IBM 360/50	128K	8	150
Canada	IBM 370/165	n.a.	16	110
	IBM 360/65	n.a.	12	
Argentina	IBM 360/40	256K	8	30
Colombia	IBM 360/50	256K	6	4
Jamaica	IBM 360/30	64K	4	24
Mexico	IBM 360/40	128K	2	n.a.
Panama	IBM 360/25	24K	4	50
Uruguay	IBM 360	128K	5	n.a.
Syria	NCR Century 100	32K	2	8
Ghana	IBM 360/20	8K	-	6
Japan <sup>4/</sup>	HITAC-3010	20KC	6	24
Korea, Rep. of	UNIVAC 1106	131KW	8	225
Philippines	IBM 360	32K	4	n.a.
Australia	CD 3600	3,145,000 bits	8	144
Fiji	IBM 1401	n.a.	4	20

<sup>1/</sup> Use of eight computers reported  
<sup>3/</sup> Use of twelve identical computers reported.

<sup>2/</sup> 1 word = 36 bits.  
<sup>4/</sup> Use of eighteen identical computers reported.

After receiving several enquiries from countries which did not have IBM 360 equipment, the UN Statistical Office requested ISPC to develop a more general package that would have wider applicability. Until then, CENTS (Census Tabulation System) had been run only on the IBM 360 and the UNIVAC 9400, which had an ASSEMBLER language almost identical to that of the IBM 360.

The Computer Methods Laboratory began work in the summer of 1972 on developing a COBOL generator package that would have the ease of use and flexibility of CENTS, but would operate on small capacity computers (16K), including those computers produced by manufacturers other than IBM. This new COBOL CENTS, called COCENTS, was completed in March 1973 and installed first at the Statistics and Census Office in Costa Rica on an IBM 1401 computer.

The packages are oriented to the fast tabulation of data and the presentation of tables ready for publication. COCENTS offers no possibilities for editing and automatic correction of data. CENTS can perform the following editing function. The value of any variable can be checked against the specified minimum and maximum permissible value. The values outside the range can be replaced by a predetermined value. There are certain limitations related to the structure of the input data records and, in the case of CENTS, limitation related to the maximum value of input variables ( $2^{15}-1$ ). Good detailed manuals are available as well as specially designed programme forms.

By April 1975 the package had been installed in more than 40 countries and this number is continuously increasing. In addition to its use in processing of population censuses it has been used to tabulate family planning statistics, municipal surveys, labour force surveys and price surveys. It has been also used for the tabulation of agricultural censuses in the following countries: Costa Rica, Mexico, Nicaragua, Panama, Cameroon (the censuses of the following countries are tabulated in Cameroon: Cameroon, Central African Republic, Chad and Congo), Ivory Coast and Philippines.

By the middle of 1973, a total of 12 workshops had been held for 200 participants from 60 countries.

Requirements for use of the package include: (i) the training of programmers (about 4 weeks for inexperienced person, much less for experienced programmer); (ii) installation of the packages. The latter requirement is due to the difference between computers even if they are of the same model, or in case of COCENTS due to different versions of COBOL used by different computers. In practice an experienced programmer, very familiar with the package, has to visit the computer (presumably for several days) and after testing the package the programmer has to make the necessary modifications. The programmer may also make other modifications in order to satisfy particular users' needs.

Considerable efforts were also made to develop packages for computer editing and validation of data. These efforts were not quite successful because the different requirements for editing of data in different countries made it difficult to generalize the editing procedures.

#### Data validation and editing

In addition to manual editing of data all countries that used the computer for processing their national censuses arranged for detection by computer of at least some types of errors in data. In more than half of the cases for which information is available (see Table 11.5) the automatic correction of inconsistencies and/or imputation of figures for missing entries were also included.

The automatic detection of errors included in all countries the detection of impossible codes or entries. This referred to simple checking whether all crop codes belong to the list of existing codes, whether code for yes or no are 1 or 2, etc. Many countries also

checked whether certain entries are within likely ranges. For example: age of holder should be more than 15, number of scattered trees should be below 100, etc.

Table 11.5 - Use of the computer in automatic data correction in selected countries

Country	Automatic correction of inconsistencies	Automatic imputation for missing and wrong entries
Austria	x	x
Belgium	x	x
Czechoslovakia	-	-
Denmark	-	-
Finland	x	-
France	-	-
Germany, Fed. Rep. of	x	x
Italy	x	-
Luxembourg	-	x
Netherlands	-	x
Norway	x	x
Poland	-	-
Sweden	x	x
Yugoslavia	x	x
Canada	x	x
Argentina	-	-
Colombia	x	-
Jamaica	-	-
Mexico	x	-
Panama	x	x
Uruguay	-	x
Syria	-	-
Botswana	-	-
Ghana	-	-
Malawi	-	-
Japan	x	x
Korea, Rep. of	x	-
Australia	x	x
Fiji	-	-

Almost all countries applied also at least some consistency checks between data. While some countries limited such checks to verification of totals within an agricultural holding, some others went much further and used the Decision Tables (Costa Rica) to deal with complicated consistency checks involving several entries.

Several major problems were met by countries which used the computer for error detection.

In countries in which the computer was used for the first time for agricultural census data processing the responsible officers were often surprised by the number of errors detected by computers which was much larger than they expected on the basis of the former experience with normal processing. This was because in manual processing the operators tend to correct many errors during the processing. The large number of error messages referred to data that were not actually wrong. A typical case when it happened was the chacking of the yield for individual crops (ratio between production and area)



against specified expected maximum yield. It often happened that for some crops in certain parts of the country much higher yield than expected actually was found. Another example of the same kind was found in the First Census of Agriculture of Liberia, held in 1971. The computer was instructed to report as errors all holdings of size less than 1 acre which report the agricultural production mainly for sale. This was done believing that very small farms must be subsistence farms. It was found later that there were many families with other occupations which were growing less than 1 acre of coffee, exclusively for sale. Such mistakes can be avoided only if data processing operations are timely planned and properly tested.

A simple way of reducing the number of errors in the pre-computer phase, which was applied by some countries which enumerated only a small sample of holdings, was to copy all data from the questionnaires on special work sheets, one for each part of the questionnaire. Data from each questionnaire were copied in one line. This permitted an easy eye detection of all missing entries and many other kinds of errors. The work sheets were also more suitable for punching than the census questionnaire. This method was used, for example, in the 1970 census of Malawi.

Major problems in computer editing were met in correcting the errors detected by computers. Many countries did not want to apply the automatic computer correction of data. Some planned to apply the following procedure: Errors detected in the first computer edit run were referred back to the questionnaires and corrections were made on special sheets or on the computer listing of error cards. All data were then passed back to the computer for second edit run and the whole process was to be repeated until computer detected no errors. This method resulted in a very long operation, particularly in countries in which experienced clerks which could correct errors without making new mistakes were not available.

The remedy to the situation described above was searched for by countries in different directions. One way was to separate by the computer "good" from "bad" records and to avoid in this way unnecessary handling by the computer of records already found to be "good". This approach resulted in an increase of data files to be handled.

Another remedy applied by many countries was automatic correction of data by the computer. Automatic correction was considered, however, to be a very risky and delicate operation and was therefore applied only in countries with a long experience in data processing and in some of those that received foreign assistance.

One of the principles in automatic editing which was applied by many countries was to accept automatic editing only for those groups of questionnaires for which the number of corrections made by the computer was small. If many errors were found, it was considered necessary to repeat punching and/or review the questionnaires.

As an illustration of such approach, a part of instructions for editing as proposed for the 1971 Census of Agriculture of Panama is reproduced below:

"The computer edits will yield the following products:

- (a) A revised and adjusted basic record for each farm.
- (b) The basic record for the farm will show which items have been changed in the edit process.
- (c) A summary report for each segment showing the number of farms and the number with revisions of each type. The content of this report is outlined in Section
- (d) A diary showing the identification number for each farm with any revision, and the data as reported and as revised.

The analysts will review the edit summary as produced by the computer. The results of the edit will be accepted when the number of revisions is small.

The diary of revisions will be reviewed when the number of revisions is not small. The diary will show the number and magnitude of changes for each farm. Some of these changes will result from an effort by the computer to correct punching errors.

In many cases, these computer changes will be acceptable. In other cases, it will be necessary to repunch all or some of the cards for the farm and reprocess the records for such farms."

#### Tabulation by small areas

In the 1970 World Census of Agriculture the need was generally recognized to provide statistical data by small administrative units. Of course, the meaning of the term "small" varied from one country to another. However, one might take it as a general rule that data of the most important censuses had to be tabulated, in addition to the country as a whole, by states, provinces, districts and even by smaller units.

The information on number and names of small areas for which census data were tabulated is shown for 37 countries in Table 12.6.

The appearance of the electronic computers has greatly facilitated the data tabulation. As a result, quite a lot of data have become available by small units. It did not mean, however, that there were no problems left. In fact, even if all the tables included in the tabulation programme were available for each small unit, it was not possible to publish everything. The publication of all the data available by all the small units would have resulted in such a large number of volumes that the cost of the whole work would probably have been prohibitive.

Many ways were suggested to overcome this problem. One of them would be to establish a minimum common tabulation programme for all the units. Larger units could also have several stages of the additional programmes based on sample tabulations. As to the small units they would also have the right to order their additional tables at their own cost. An arrangement of this type was not easy to implement as the demand for data on the part of small units always varied, and agreement as to the minimum common tabulation programme was difficult. On the other hand the paid tabulations are also not easy to organize. It would probably require a system of terminals so that data needed can be obtained without complications. In this case, however, the question arised of who was authorized to utilize the stored information and how to secure an efficient protection of the confidentiality of the statistical data?

There was an element that increases the complexity of the situation. This was the rapidly growing appetite in data on the part of small areas. In many countries more and more authority was being transferred to the low administrative units. As a result they were pressing for more data in order to be able to carry out correctly their duties. This is why some statistical offices found it impossible to keep pace with the increasing demand. Rather than expanding their tabulation programmes they spoke of the need to reduce drastically the volume of tabulation operations and putting thus on the small units the problem of how to solve their needs. As against this there is a need to recognize the fact that quite a lot of useful information remains unutilized in a system of tabulation which is guided by the principles of economy.

#### Difficulties with large computers in developing countries and use of "baby computers".

Already in early 1970 statistical offices in most of the developing countries had access to computers. It was expected that the computerization of data processing would result in faster and more accurate processing, but in many countries it turned out differently. Often, the larger and more capable is the computer used, the bigger are the problems met.



The difficulties encountered are due to many factors such as lack of qualified computer programmers, lack of experience, priorities given to other computer applications such as payroll, etc.

The main difficulties seem to be of organizational nature. On one hand, there are computer programmers with lack of experience in statistical data processing. On the other hand there are statisticians who do not know exactly how to present the data processing request. Between the two categories of technicians, it is often difficult to establish close collaboration particularly when they belong to two different organizational units.

Another problem often met was the estimation of resources required for computer processing of agricultural censuses. Unless a series of surveys was already processed by the same computer and thus the experience is gained, it is very difficult to estimate the amount of programming work and the number of computer hours required to complete the processing.

Still another problem was the fact that the statistician was not able to follow, step by step, data processing procedures. There were cases in which it was discovered that data collected were full of errors, only when the computer tabulations were delivered.

Some of the problems mentioned above were overcome in a number of countries by use of "baby computers". Although these "baby computers" cannot be compared in efficiency and possibilities they offer to users with the standard computers, they were successfully applied for processing of small surveys in a number of countries. In two countries they were used for processing of censuses of agriculture. In Haiti a WANG 2200 is being used for the entire census processing, while in Ivory Coast a Hewlett Packard Model 30 (with 6 K memory and card reader) is used as a complement to a large computer.

In the 1974 sample census of agriculture of Ivory Coast, a large computer (IBM 370/145) was used for processing of the main census questionnaire for the traditional sector, a number of other data processing operations were performed by "baby computers". The following is a description of the major applications of "baby computer":

1. Selection of sample villages. Given the list of villages (2 500 in the Northern part of the country) with the serial numbers and population estimates, a sample of 366 villages was selected with the probability proportionate to size of population.
2. Processing of a yield survey. The survey consisted of about 5 500 questionnaires each containing about 10 data. Processing consisted of manual keying in the data, checking the data by a computer programme, correction of wrong data, and tabulation. Tabulations included the average yield for seven most important crops, shown by administrative areas, by three categories called "state of soil" and three categories called "nature of soil". For each crop three yield estimates were required: (i) pure stand; (ii) mixed predominant; and (iii) mixed secondary. Also the frequencies of most important mixtures were calculated. Finally, the sampling error was calculated for all estimates.

Input data were keyed in manually from coding sheets at a speed of about 1 hour for 2 000 data (1 and 2 digits data). Total time required for input was about 30 man/hours. For each of the seven crops one tape cassette was used for data storage.

Editing by the "baby computer" consisted in checking whether individual data had permissible values and also some consistency checks between data were performed. Errors detected were reported by "baby computer" and corrections were keyed in manually.

It was reported that preparation of all computer programmes and their testing and correcting took about 9 hours. (To this time should be added the time spent for planning how to organize the programmes and the whole work, as well as the time for preparation of report, which would increase the time reported by several times).

3. Processing of the village questionnaires. This refers to processing of three questionnaires for 366 sampling villages. The three questionnaires contained 126 data. The processing which was organized in a similar way like the yield survey processing required the use of 6 tape cassettes. Altogether 36 tables were produced. About 3 weeks were needed to complete all the processing including the preparation of computer programmes.

4. Plans for processing of the census questionnaire for modern sector. This refers to processing of 500 questionnaires each containing about 150 data. It is expected that the time needed to input manually all data will be 3 to 5 weeks. The time needed for the organization of the work and preparation of all computer programmes will be 2 to 3 months.

5. Research and experimentation. A number of interesting studies were made by use of the random number generator available with Hewlett Packard Model 30. Studies consisted in comparison of efficiency of different sampling designs and were performed in the following way. A part of the data collected during the census were stored on tape cassettes. Random samples from the data were repeatedly drawn by use of different sampling designs (20 samples or more each). For each sampling design variance of obtained estimates was calculated and in this way efficiency of different designs was compared. This simulation technique permits the evaluation of efficiency of these designs which cannot be evaluated analytically.

6. Calculation of areas. All fields belonging to sample holdings were measured by use of compass and chain and their areas were calculated by the "baby computer".

APPENDIX 11.1 - 1969 CENSUS OF AGRICULTURE - YUGOSLAVIA

PRAVILNO POPUNJEN OBRAZAC PP-1/69.  
- primjer za vjošbu -

SOCIJALISTIČKA FEDERATIVNA REPUBLIKA JUGOSLAVIJA  
SAVEZNI ZAVOD ZA STATISTIKU

Obrazac PP - 1/69.

SR, SAP	SRBIJA
Općina	Batočina
Naselje	Lapovo
Ulica i kućni broj	Maršala Tita 103

ZAKON O POPISU POLJOPRIVREDNIH  
GOSPODARSTAVA u 1969. „SL. LIST SFR“ br. 13/69.

Šifra statističkog kruga	0 1 3 7 3 0
Redni broj popisnog kruga	1
Redni broj domaćinstva	3 5
	1

POPIS POLJOPRIVREDNIH GOSPODARSTAVA 1969.

LIST ZA DOMAĆINSTVO

PETROVIĆ JOVANA ILIJA

(Prezime, očevo ime i ime osobe na koju se vodi domaćinstvo)

1. Koliko ukupno članova živi u vašem domaćinstvu računajući i vas ..... 6<sup>13</sup>

2. Koliko je članova stalno zaposleno izvan domaćinstva odnosno gospodarstva ili su zanatlije ..... 1

3. Kolika je vaša i vaših članova ukupna vlastita obradiva i neobradiva površina zemljišta ..... ha ..... ari  
5 0 7

4. Kolika je površina zemljišta koje ste uzeli u zakup za novac, u arandu, u napolicu (napola), besplatno i slično ..... ha ..... ari  
5 0

5. Kolika je površina zemljišta koju ste dali u zakup za novac, u arandu, u napolicu (napola), besplatno i slično ..... ha ..... ari

6. Prema tome ukupna obradiva i neobradiva površina zemljišta koju sad koristite iznosi ..... ha ..... ari  
5 5 7 3  
(Kontrola: 3+4-5=6)

Od ukupne površine zemljišta koje sad koristite (red. br. 6), kolika je površina:

7. Oranica i vrtova ..... 3 8 0<sup>15</sup>

8. Voćnjaka ..... 3 5

9. Vinograda ..... 4 0

10. Livada ..... 4 5 5<sup>44</sup>

Obradiva površina (7+8+9+10). 4 5 5

11. Pašnjaka ..... ha ari  
2 2<sup>46</sup>

12. Trstika, bara i ribnjaka

13. Šuma ..... 7 0

14. Neplodnog zemljišta ..... 1 0<sup>58</sup>

(Kontrola: Zbroj red. br. od 7 do 14 treba da je jednak površini u red. br. 6).

15. Da li uzgajate radi prodaje: povrće; cvijeće; ljekovito, aromatično i začinsko bilje; duhan ili mak ..... Da ..... Ne ..... 2

Koliko imate:

16. Teladi do 3 meseca ..... 1<sup>64</sup>

17. Teladi i junadi od 3 meseca do 1 godine ..... 1

18. Junadi preko 1 godine

19. Krava i steonih junica ..... 2<sup>65</sup>

20. Od toga krava koje se koriste za rad

21. Bikova za priplod ..... 2

22. Volova ..... 4<sup>68</sup>

Goveda ukupno (16+17+18+19+21+22) 4

## CHAPTER XII

### QUALITY CHECKS

Quality checks represent a means of obtaining information about the quality of data collected in a survey. The results of quality checks are important to users as they provide information on the quality of the figures published and a basis to enable users to take correct decisions. For this reason a quality check has become an important component of important surveys. Quality checks are equally important to the statisticians themselves because the results provide information on the deficiencies in the methods of work and thus open up chances for improvement for future work.

The quality checks of data might be classified into two basic groups. The first group is composed of indirect checks. These checks cover the techniques which evaluate the final census results, such as aggregates of various characteristics in the census programme. These checks are carried out after the census is completed. Also, the results of such checks refer to the aggregate as a whole rather than to the individual units. As against this the direct checks represent an evaluation of data obtained for the individual units. Such checks are normally taken at the time of the collection of data in the main survey or immediately after. In the latter case they are known under the name of post-enumeration survey. They are therefore able not only to measure the magnitude of biases in the census aggregates but they also indicate the properties of the units which are associated with various types of errors. In this way, these checks offer a very useful basis for study of measures for the improvement of the methods of work.

Compared to earlier censuses, a good part of the countries which have taken the census of agriculture around 1970 did go into quality checking of some type. Many countries went into simple quality checks but some implemented elaborate quality checks which touched into many aspects of the problem of the accuracy of census data. It is difficult to say anything about the percentage of censuses in which no effort whatsoever was made to check the quality of data. The available census reports are very meagre on this matter.

One important development was that most of the countries that participated in the 1970 World Census of Agriculture were aware of the importance of the reliability of the census results. As was done in the previous censuses, many of the censuses around 1970 were checked by indirect methods. On such technique was the comparison of census totals with the information available about some characteristics from some other sources which were independent from the census itself. The other technique used was the use of subject matter specialists who were supposed to be able to indicate where census results deviated significantly from the generally acceptable expected results.

Some countries carried out quality checks as a separate part of the census as a whole through direct methods using sampling methods. Namely, a sample of units was selected and the accuracy of the information for these units as obtained in the census was checked by means of some more reliable techniques. The comparison of the two series of data thus obtained is a basis for the estimation of biases in the census results. The use of sampling methods in checking the quality of data usually covers three different fields of work. The first one is the check of accuracy of the census list of holdings. This is synonymous to the check for the completeness of enumeration or check of the coverage. The second is the check of the accuracy of the response and the third is the check of the processing errors. From the available sources it appears that more countries have carried out quality checks in their 1970 censuses of agriculture.

A systematic account of the work undertaken on quality checks in the 1970 censuses of agriculture is not possible as most national reports did not contain sufficient details of the quality checks carried out. There are only a few countries where such reports were issued. Some of these which contain sufficient details and might provide useful ideas of the methodology used or the results obtained are presented in the following sections.

Some Case Studies

1969 CENSUS OF AGRICULTURE IN ARGENTINA<sup>1/</sup>

The 1969 agricultural census conducted by the "Instituto Nacional de Estadística y Censos" (INDEC) was on a complete enumeration and in two phases: for the provinces north of Colorado River the reference date was 30 September 1969 and 31 March 1970 for those provinces south of this river. The information was collected through questionnaires given to the holders, who returned them filled out. A certificate of compliance with the census was provided upon return of the questionnaires, which could be required for a period of one year by banks, public institutions, etc.

Previous censuses of agriculture and livestock taken in the country showed varying amounts of incompleteness. Recognizing these imperfections, INDEC started the preparatory work for a post-enumeration survey (P.E.S.) nearly four months before the census taking. The work was planned with a view to consider also the possibility of utilizing this survey as a basis for further developments and improvements in the methodology of censuses. The knowledge gained on the uses of area sampling in the country pointed out that, despite the limitations of cartography, the method could be used for the P.E.S. as well as for future current agricultural sample surveys.

Since in an evaluation survey each of the items covered may require extensive questioning, the objectives had to be limited to topics that could be adequately covered. Moreover, as the information collected in the agricultural census was considered difficult to be verified and studied satisfactorily by a post-enumeration survey alone, this limited further the objectives of the P.E.S. Thus the survey estimates were limited to the number of holders who should have reported in the census and likewise the numbers who should have reported on various characteristics such as the planting of wheat, the keeping of different kinds of livestock, or the possession of different farm installations and agricultural machinery. An attempt was also made to measure the extent of error in reporting total area of holdings, with a breakdown of data according to land tenure.

The P.E.S. used a three-stage probability sample of small areas, segments, chosen within 115 first stage units (departamentos and partidos). Census subdivisions (fracciones) were selected at the second stage and segments were selected at the third stage. At the first stage the units were selected with varying probabilities, according to the relative importance of agricultural activities of the "departamentos" and "partidos" (minor administrative divisions of provinces). Thirteen "departamentos" were considered sufficient to be selected with certainty. At the second stage, three "fracciones" were generally chosen, but "departamentos" with only a very few "fracciones", some or all of "fracciones" were subdivided. Second-stage units were likewise selected with varying probabilities. At the third stage, two segments were in general chosen within each selected second-stage unit with equal probabilities. The segments generally contained parts of five to ten holdings although occasionally many more when the holdings were extremely small. The process of sampling and the assigning of probabilities was carried through in such a way that the product of the probabilities of units for three stages was equal to  $1/200$  for the provinces north of the Colorado River and  $1/100$  for the provinces south of this river.

All the holdings having part or all of their land located within the segments sampled were canvassed. As a result, the large holdings, since they cover more land, were more likely to be selected, which leads to a greater accuracy of the results. A basic objective of the P.E.S. was to compare, holding by holding, the information obtained in the survey with that obtained in the census. In cases where a difference was found, a second visit was made to correct or check the data. The requirements of scrutinizing each segment reduced the danger of omitting the small holdings.

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<sup>1/</sup>Based on the FAO Report "Encuesta de Evaluación del Censo Agropecuario" by Roe Goodman, Rome 1972.



A series of questions began with the identification of the holder in control of a parcel of land within a sample area, and then continued by seeking detailed information which would show whether this same person had been in control of the parcel at the census date or there were other persons in control of the land or part of it and, if so, the names of such persons. The same questions were repeated for any other parcels of land, wherever located, which were or had recently been under the control of the same person or legal entity and there were finally various questions to ascertain whether the holding had been engaged in production of certain crops, keeping specific kinds of livestock, or in possession of certain equipment, machinery or farm installations. Whenever a name was obtained of another person who might have been in control of any of the land at the census date, a questionnaire was also filled for such person.

The interviewing was carried out by competent field staff of the "Instituto Nacional de Tecnología Agropecuaria" (INTA) under a cooperative arrangement between INDEC and INTA. Most of the interviewing was carried out between June and October 1970 and a small part as late as mid-1971 or even later. No mention was made to respondents of the fact that P.E.S. results were to be compared against the census questionnaires. As a final question, however, the respondent was asked to give information from his census certificate, for subsequent location of the census questionnaire in the office.

Following the completion of field work in a given "departamento" the questionnaires were reviewed for consistency and completeness. In some cases the questionnaires were returned to the field for necessary corrections.

The fact that varying numbers and size of parcels located outside the segments were also to be included meant that the probabilities of selection of holdings varied considerably. This was solved by using an estimation procedure known as the weighted segment technique, in which all data are weighted individually by multiplication by a factor, prior to summation and expansion of results. This factor is the proportion of the total land of the holding which was reported to be located within the sample segment. On the whole the use of the varying probabilities was likely to produce a gain in the efficiency of the sampling.

The method of estimation used was largely ratio estimates in which the ratio of P.E.S. data to census data lead to estimated totals of what the census results would have been if the omissions measured by the P.E.S. had not occurred.

Before estimates of any type could be prepared, it was necessary to find out how successful the interviewers had been in reporting properly the amount of land located within segments, separately for each holding. For this purpose, measurements were made on the maps of the approximate number of hectares, segment by segment. These data were compared with the reported quantities of land of segment totals. The comparisons showed a marked upward bias in the reported quantities. Adjustments had to be made on the number of hectares within segments for individual holdings in order to eliminate the bias for the P.E.S. as a whole. The ideal way for such adjustments would have been to revisit each of the segments which were in doubt and to make the corrections based on observations in the field. However, due to lack of time and funds, an alternative way was used, which consisted in utilizing the sketches which had been prepared by the interviewers and to make corrections somewhat arbitrarily. Once the areas of land within segments had been corrected, estimates of cattle inventory numbers, numbers of holdings and areas in holdings were calculated utilizing the census matched holdings. These estimates at the level of the "departamento" were then compared with the known census totals.

FAO has received no further information on the results, however there are some qualitative results which would provide useful information such as the following:

- (i) There was a substantial number of cases in which the data entered on two census questionnaires (sometimes three or four) should have been combined and entered on one questionnaire since it related to a single agricultural enterprise only. In some of the cases the name of the holder was the same, while in others it was a brother or a sister.

- (ii) There were other cases in which two or more questionnaires were filled in the name of the same holder, although different agricultural enterprises were involved.
- (iii) There was a strong tendency to fill the census questionnaire in the name of the owner whereas he was not necessarily the operator of the holding.
- (iv) There were numerous cases of properties belonging to estates and it was often difficult to know the proper tenure and name of holder.
- (v) Many very small holdings were omitted. Since these holdings are quite numerous some consideration should be given to improve the situation. It may be desirable to establish a minimum value of sales of products as a part of the definition of holdings when the area is less than 5 hectares.
- (vi) There has been clear evidence from the P.E.S. as well as from the editing review of the census processing that certain questions were seriously incomplete due to defects of design of the questionnaire. Such defects could have been avoided if enough pretests had been carried out.

An analysis of the differences in reports of the same holders on successive occasions was made in the Province of Santa Fe, where a number of holders were selected from the 1969 census list for a current agricultural survey conducted about the same time that the P.E.S. was carried out in the same Province. Data on total land area and cattle inventory obtained in the three reports: agricultural census of September 1969, P.E.S. and current survey relating approximately to mid-1970 for the identical holders were compared. The consistency of reporting on the extremely large holdings was noteworthy. Most of the discrepancies were in the cases where two census questionnaires were found for the same holder. There were a few non-response cases in the current survey but this is a normal situation.

1971 CENSUS OF AGRICULTURE IN CANADA<sup>1/</sup>

The 1971 Post-Census of Agriculture Survey was carried out one month after the agricultural census with two objectives:

- (i) to obtain a measure of the completeness and accuracy of the census enumeration on a number of farms, area and use of farm land;
- (ii) to supplement the census with information on farm capital values, business expenditures and farm machinery and equipment.

Being a multi-purpose survey, the sample design that is efficient to estimate some items may be inefficient for others. In order to minimize both sampling and non-sampling errors, within the limitation of the financial resources, the most efficient sample design, methodology, field procedures and intensive training of enumerators have been used.

The master frame utilized for the sample selection was based on the information of the 1966 agricultural census, and is composed of the following frames: rural area, urban area, specified farm list and municipalities with no farms at the 1966 census. Newfoundland Island, Northwest Territories, the Yukon and all Indian reserves were excluded. The master frame consists of 70 strata: 44 in the rural area frame, 9 in the urban area, 9 in the specified farm list and 8 in municipalities with no farms at the 1966 census. In the rural area the primary sampling units are stratified by type of farming and province. The sampling procedure and the sampling rate varies from frame to frame, but the survey is basically a multi-stage sampling design with two independent replicated samples, selected with probability proportional to size of specific measure for each replicate without replacement. The largest sample was selected from the rural area frame with a 2% sampling fraction. The selection procedure, using as an example a mixed crop stratum in the rural frame, is the following: the primary sampling units (PSU) were selected with probability proportional to total cropland acreage. At the second stage, enumeration areas (EA) within the selected PSU were selected using the same procedure, and at the third stage, segments (with an expected 6 to 10 farms) were selected at random within the selected EA. A total of 16,000 farms were covered in this survey.

The questionnaire was pretested in the field a year before the survey was conducted. This made possible the necessary adjustments, including testing of the training methods and the nature of response to be expected. It also helped in the estimation of time and budget requirements.

The enumerators of this survey, 500 in total, were selected on the basis of their competence in completing their work during the agricultural census and received intensive training. A supervisor checked the work of four enumerators and each enumerator took care of approximately five segments.

In order to locate the boundaries of the sample areas attached to them, the enumerators made use of topographical maps and were also equipped with the latest available aerial photographs of the areas. After the completion of each questionnaire, the enumerator performed a check and the discrepancies were resolved at the time of interview. No questionnaires were completed for units not meeting the census-farm definition. Supervisors attended all immediate problems of enumeration and the checking of each completed questionnaire for errors and omissions.

A manual check and editing were carried out, especially to avoid duplication of specified farms. After this check, the questionnaires were harmonized and computer-edited.

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<sup>1/</sup>Based on the report "Data from the Post-Census Agriculture Sample Survey" published by Statistics(Canada), January 1973.

The technique used for estimation purposes is the one called "weighted segment", i.e. the data for each holding are weighted according to the proportion of land from that holding within the sample area. For this purpose, the aerial photograph was used to ensure an accurate estimate of the proportion of the farm within the sample area.

In a survey of this nature, non-sampling errors in collecting some items, especially expenditure data, can be substantial. In some instances, respondents were unable to give the expenditure for items separately, but could give the total expenditure for several items combined. It seems that detailed information for component items may be subject to bias, especially memory bias. In other instances, the definition of certain items may cause misunderstanding either by interviewers or respondents.

The outright refusals were insignificant. About 6 percent of the non-responses were missing data or partially filled schedules.

For the number of farms, the survey gave a total of about 5 percent above the census count, however, this difference was not statistically significant at 5 percent probability level. The coefficient of variation of the survey estimate was 2.8 percent.

1974 AGRICULTURAL CENSUS IN ECUADOR <sup>1/</sup>

In 1974 the Government carried out the census of agriculture on the basis of complete enumeration. The reasons for this decision were: the Government's interest in tabulating data at "parroquial" level and for all crops, even though grown on small acreages. A more important technical reason was the non-availability of an efficient sampling frame for carrying out an agricultural census on a sampling basis and, moreover, the census figures were to be used as a basis to improve the efficiency of the future surveys for improvement of current agricultural statistics.

The first priority was given to the preparation of good maps and sectorization of each "parroquia". This sectorization served to form well defined areas of enumeration and was quite an expensive and arduous task.

The data were collected by interviewing the holder directly. The major part of the census questionnaire was precoded and special emphasis was placed on the enumeration of large holdings.

The practice of cultivating different crops simultaneously on the same piece of land made it difficult to ascertain the proportion of total area to be ascribed to each crop. The enumerators were required to take note of the gross area under the mixture and at the same time the name of each component crop. An investigation using a simple sampling design was used to ascertain the areas to be assigned to each component by collecting additional data on areas sown, quantities of seeds used or number of trees and the distance between rows and plants.

Sampling was also used for the evaluation of the census results. The main objectives of this evaluation were to measure the accuracy of the total number of holdings, total area of the holdings and total number of cattle. Transportation problems and cost considerations excluded the four oriental provinces and the new province of Galapagos from this evaluation. In the provinces of Cotopaxi, Tungurahua and Chimborazo, only important holdings were included due to the resistance offered by the indigenous people.

A list of holdings which had reported 200 hectares or more of total area was prepared. From this list, all holdings reporting 500 hectares or more have been taken for evaluation and only 50 percent from the remaining ones. For the evaluation of small and medium size holdings all the census sectors were grouped or sub-divided so as to form primary sampling units (PSU's) with about 80 households. These PSU's were ordered according to geographical location and type of agricultural activity as far as possible and a systematic sample of 20 PSU's was selected with a random start for each province. The second stage sampling units were holdings. In each selected PSU the holdings were stratified according to the following four strata and a sub-sample was taken for evaluation:

<u>Stratum No.</u>	<u>Total area of the holdings (ha.)</u>	<u>Fraction selected for evaluation</u>
1	Less than 0.1	Nil
2	From 0.1 to less than 10	1/3
3	From 10 to less than 50	1/3
4	From 50 to less than 200	All

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<sup>1/</sup> Based on the Report prepared by P. Sahota, FAO Agricultural Statistician, FAO, Rome, Italy

It is quite possible that the holders under-reported their land and cattle in the census due to fear of taxes. Also many varying units of area and weights constitute sources of error. The problem of different measures of area was solved by noting the replies in the units which the informants considered easiest for them to give the best possible information at the time of enumeration. At the same time, information was collected regarding equivalents of these measures in standard units.

1970/71 CENSUS OF AGRICULTURE IN GHANA<sup>1/</sup>

This census was conducted in two phases, the first in 1970 and the second the following year, both phases were carried out on a sampling basis. The design used was a two-stage stratified sample. The frame used was the list of enumeration areas prepared for the 1970 Population Census, which was stratified into agricultural districts in such a way that they could be aggregated to give regional totals. A systematic random sample of enumeration areas was selected from each stratum, the sampling fraction varying between 1/10 and 1/20. This procedure resulted in 702 sample enumeration areas for the first phase; 275 of these were used in the second phase.

In the first phase, every holder in the selected areas was interviewed making a total of 58,000 holders. A 10 percent sample of holders was selected at random for detailed enumeration conducted twice during the year. In the second phase, 20 holders were selected at random in each of the 275 enumeration areas used, which gave a sample of approximately the same size as the sub-sample in the first phase. In this phase, information was collected on crop yields, farm equipment, more details on agricultural employment and quarterly estimates for livestock and poultry.

Area measurements were used in the sub-sample of the first phase and in the whole sample of the second phase. Crop yields were estimated by locating at random plots within the fields and harvested by the enumerators. These data were supplemented by weighing the complete harvest from a few fields. For tree crops, a group of 8 to 16 trees were selected within the grove. Livestock and poultry were counted by the enumerator as far as possible.

Perhaps the major sources of error were due to the failure of the enumerator to enumerate the correct areas, inefficient coverage of the area and failure to obtain the correct information from the respondents. An attempt to reduce the effect of these errors and to estimate their size was made by conducting a post-enumeration survey (PES). The PES was carried out by the district supervisors, apart from their daily supervision of the enumerators, and was conducted after the first visit to the holders had been completed. For this survey a sub-sample of enumeration areas was chosen at random from each district, a total of 167 enumeration areas, out of the 702 enumeration areas included in the census.

For the PES, the district supervisor listed all holders and recorded the number of farms each holder was operating. Neither the supervisor nor the enumerator were aware of which areas had been selected for the PES. Only after all questionnaires had been received in the office, the Regional Officer informed the supervisor of the chosen area and instructed him to conduct the PES. Upon receipt of the PES forms, the number of holders and the number of farms operated by them were compared with the data collected by the enumerators.

In 98 of the 167 enumeration areas covered in the PES, the two estimates of number of holders, as enumerated in the census and in the PES, were within 10 percent of each other. In 29 areas, the difference was greater than 20 percent (in 8 cases the difference was over 50 percent). The differences were sometimes in one direction and sometimes in the other but, in general, the PES estimate of number of holders was higher. At the national level the PES showed an under-estimation of holders in the census of the order of 4 percent (7 enumeration areas in which the two estimates related to completely different areas have been removed from this analysis).

The comparison of the number of farms reported in the census as opposed to the number reported in the 160 remaining enumeration areas showed an under-estimation of 7 percent of the farms by the census at the national level.

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<sup>1/</sup>Based on the report published by the Division of Economics and Marketing, Ministry of Agriculture, Accra, Ghana.

In the Eastern Region, this under-estimation reached 22 percent whereas in the Northern and Upper Regions some over-estimation was observed. The crops affected are likely to be the cash tree crops, particularly cocoa. Area under cocoa reported in the Eastern Region may be seriously under-estimated. The lower number of farms in the Northern and Upper Regions was mainly due to the adverse climatic conditions that resulted in farmers failing to plant in farms that had been opened for planting at the time of the census taking; these farms were not reported in the PES.



1972 GENERAL CENSUS OF AGRICULTURE IN HUNGARY<sup>1/</sup>

The 1972 census of agriculture covered the large-scale state farms, the farms of cooperatives, enterprises and distributions, as well as the small-scale farms (household plots of members of agricultural producers' cooperatives, auxiliary and private farms). Its preparation started in 1969 and several pilot census surveys were conducted in different parts of the country so as to ensure clarity of definitions, questionnaires and instructions.

Larger agricultural units supplied most of the data in questionnaires used regularly for their reports during the year. As for data on small agricultural units, they were collected by a complete enumeration survey containing comparatively few questions on important data and through a coherent succession of sample surveys conducted at different times between April 1972 and May 1973. The sample frame used for this purpose was the enumeration districts defined on the basis of the livestock census taken in the Spring of 1971. The size of an enumeration district comprised 150-200 small farms in the case of heavily populated areas, while for outskirts of villages and scattered farms, one enumeration district consisted of about 80-100 farms. The areas of the different districts were easily described so that the identification of borders between districts could not cause any problem when taking samples.

Hungary provides an interesting example of exhaustive quality checks to assure the accuracy of census results though without conducting any post-enumeration surveys. In the course of the complete enumeration and the various sample surveys of small agricultural units, a supervisor controlled and checked the work of 3 to 4 enumerators on the spot, and the work of four supervisors was also controlled and checked by an officer-in-charge of the census in the country.

Besides supervision on the spot, it was also the duty of a supervisor to check whether the samples had been fully covered by the enumeration and to check the questionnaire numerically. To assure the completeness of the census, each supervisor was expected to make sure that:

- (i) the enumerators kept the checking list according to instructions;
- (ii) the enumerators went from house to house;
- (iii) the enumerators covered all the holdings of the district;
- (iv) the number of every house was indicated on the list;
- (v) the enumerators recorded the data on the spot and not later;
- (vi) the enumerators carried out the enumeration at those places where it was not feasible at the time of the first visit.

The supervisors were also to check on double coverage by comparing control lists with the description of the district. In the case of fruit-trees the enumeration was carried out mostly by independent enumerators and in some cases - i.e. large territories - by teams of 4 to 6 enumerators. A more frequent check was made with enumerators whose work was not considered satisfactory. Only enumerators having performed satisfactory work were paid.

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<sup>1/</sup> Based on the Report by the Central Statistical Office, Budapest.

1973 CENSUS OF AGRICULTURE IN INDONESIA <sup>1/</sup>

The 1973 census of agriculture, conducted during the months of August and September, was a two-stage stratified sample and covered all the provinces, except Irian Jaya. The "Ykabupatens" (regencies) in each province formed the strata, the enumeration blocks of the 1971 Population Census were the primary sampling units and the agricultural holdings the second stage unit. From each of the regencies a 5 percent systematic sample of blocks was selected and 50 percent of holdings in each selected block. The "kotamadyas" (Municipalities) were covered through a separate listing schedule on a single-stage sample with variable sampling fractions.

About two months after the completion of the census, the post enumeration survey (P.E.S) for quality check was carried out. In order to complete the work of evaluation two independent surveys were conducted. The data were collected through re-interview, using intensively trained enumerators and supervisors but without any physical measurements.

For the coverage check survey, a systematic sample of enumeration blocks was selected from each of the 15 provinces out of 25 provinces covered in the census. The sampling fraction in different provinces varied from 1 to 3 per thousand with an average of 1.5 for the 15 provinces. Data were received from 366 enumeration blocks of 399 samples, making a total of 25,000 holdings. The content check survey was carried out in a sub-sample of the enumeration blocks selected for the census of agriculture in the same 15 provinces in which the coverage check was independently conducted. The sampling fractions of enumeration blocks varied from 4 to 26 per 10,000 blocks over the different provinces. The number of blocks selected were 281 but only 267 were accomplished. In each of the blocks selected, a sample of holdings included in the census were re-interviewed. In both surveys, areas represented by municipalities were not represented.

The coverage check related to the holdings erroneously included and omitted from the census arising as a result of both listing and response errors. Among the items studied were number of holdings, total land and its dry and wet components under the holdings, and the combined estimate of coverage and response bias of three kinds of livestock: cows (ordinary), buffaloes and goats/sheep.

The content check aimed at investigating the combined effect of interviewer and respondent errors of land under the holdings (total land, wet land and dry land) as well as of the area under a few selected small holder plantation crops (clove, coconut, rubber and coffee) by one to one matching between census and P.E.S. data.

The results of the coverage check indicated for the different provinces as a whole that holdings were undercounted by about 13 percent and total land by 9 percent, of which, the dry land component contributed to 6 percent. The under-counting of holdings was higher for smaller holdings. Some of the errors were caused by the poor quality of the work of enumerators, probably one cause was due to the use of defective maps.

Collecting data from the appropriate respondents is important to ensure the quality of data obtained. An evaluation in the province of West Java showed that the information was obtained from the heads of households only in 74 percent of the holdings.

The combined effect of coverage and response bias on livestock show in most provinces large net under-counts for cows (ordinary) and buffaloes. As these estimates were accom-

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<sup>1/</sup> Based on the reports on "Coverage Check of the 1973 Census of Agriculture" and "Content Check of the 1973 Census of Agriculture" by Uttam Chand, published in April and June 1976, respectively, by the Central Statistics Bureau, Jakarta.

panied by large standard errors, only the net under-count for cows in East Java was statistically significant. Large enumeration of goats/sheep was observed in some of the provinces, but was also subject to large standard errors.

The results of the content check did not show any indication of deliberate under-reporting, however, 10 out of 15 provincial estimates showed a negative response bias which amounted to 441,000 hectares (about 4 percent of the estimate of total land) for land under the holdings for the whole domain of the 15 provinces. However, the estimates of response bias are subject to large standard errors so that the total response is not statistically significant. As a matter of fact, the negative response bias of dry land was larger than that of the total land area because of a small positive response bias in the reporting of wet land. But on account of the relatively large coverage bias (809,000 ha.) the sum of the coverage and response biases which are both negative is statistically significant.

The combined estimate of response bias for clove and coconut indicated under-reporting in the census, whereas rubber and coffee are over-reported. These results followed by their respective standard errors are given below in thousand hectares:

<u>Smallhold plantation crops</u>	<u>Under-reporting</u>
Clove	85.5 ± 56.4
Coconut	39.3 ± 44.5
<u>Smallhold plantation crops</u>	<u>Over-reporting</u>
Rubber	616.5 ± 456.6
Coffee	76.7 ± 52.8

The overall effect of classification error, as part of response error, in misclassifying holdings from one size class to another, has been investigated. Under the system adopted in the census procedures, the holdings were not stratified according to size classes before selection but the results are tabulated in sixteen size classes. For the study of classification errors on number of holdings, only four size classes were chosen: < 0.5 ha., 0.5 - 1 ha., 1 - 5 ha. and > 5 ha. In most of the provinces, census enumerators were able to classify the holdings in the same size class in more than 70 percent of the cases. The compensating characteristics of the two components of gross error of classification (over-classified + under-classified) have resulted in substantial reduction in the net error of classification for several provinces. For most provinces, however, the enumerators tended to return more of smaller sized holdings.

1971 CENSUS OF AGRICULTURE IN IRAQ<sup>1/</sup>

As in the previous censuses, the 1971 census of agriculture was also conducted on a complete enumeration basis and covered a total of 591,187 operational holdings in the whole country. The concepts and definitions were in line with the 1970 FAO Programme for the World Census of Agriculture with minor modifications to suit local conditions. The field work was carried out by about 11,000 enumerators and supervisors and the information collected through direct interview.

In order to test the accuracy of the data, the Central Statistical Office conducted a quality check survey, on a sampling basis, using objective methods. This survey was carried out by different enumerators at the same time as the census and covered 27,812 holdings, including households of agricultural workers on holdings but who are not holders themselves. For each selected holding the area under crops was measured and the number of trees and of livestock of different kinds were counted. The list of holdings was arranged by enumeration districts and about 5 percent of holdings were selected. A systematic sample with a random start was taken in each "nahia" (administrative unit).

The difference between the values of the characteristic under study as given by the quality check and the census was calculated for each holding in each "nahia". However, before matching the two sets of data they were both validated logically and the errors detected were corrected. For the calculation of the standard errors of estimates, the systematic samples were treated as simple random samples.

Lower and upper 95 percent confidence limits were calculated for the total of the different characteristics for each "muhafadha" (province) and for the whole country. If the census total for the "muhafadha" lies between these two limits, the census value is accepted. Otherwise, it is replaced by the quality check estimate, provided the standard error of the estimate does not exceed 5 percent of this estimate. In such cases, the census total is also accepted as the "muhafadha" total of the characteristic. The same criterion was applied for the country totals.

This was done for each of the 88 items included in the quality check. For the country as a whole, the census totals were replaced by quality check estimates for only nine items. For the remaining 79 items, the census totals as given in the results of the 1971 Census of Agriculture are accepted.

The results for the whole country for items for which the census totals were replaced by quality check estimates are given in the following table.

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<sup>1/</sup>Based on "Quality Check of 1971 Census of Agriculture" published by CSO, Iraq, February 1975

Quality Check Estimates

Item (Characteristic)	Census Total $\bar{T}$	Quality Estimate $\bar{T}$	Difference $\bar{T} - \bar{T}$	Difference expressed as percent of $\bar{T}$	Standard Error of Quality Estimate as percent of $\bar{T}$	Lower 96 percent confidence Limit of $\bar{T}$	Upper Confidence Limit of $\bar{T}$
Area owned from agrarian farm	3 586 277	3 372 588	-213 689	5.96	1.26	3 289 584	3 455 586
Area managed by farm other than ..... and agrarian farm	292 131	318 936	26 805	9.18	3.78	295 314	342 558
Number of olive trees	70 832	81 548	10 716	15.13	4.91	73 698	89 398
Number of date palm trees	19 043 247	19 955 294	912 047	4.79	2.01	19 167 710	20 742 878
Number of cattle	1 200 499	1 337 311	136 812	11.40	0.59	1 321 815	1 352 808
Number of buffaloes	111 964	123 131	11 167	9.97	2.77	116 440	129 822
Number of goats	1 521 661	1 793 387	271 726	17.86	1.36	1 745 589	1 841 185
Number of sheep	4 736 241	5 579 845	843 604	17.81	1.10	5 459 799	5 699 891
Number of horses	85 230	92 957	7 727	9.07	1.36	90 470	95 443

1970 AGRICULTURAL CENSUS IN KOREA<sup>1/</sup>

The 1970 census of agriculture was conducted on a complete enumeration basis, but a sample survey was used to collect data on certain items such as: quantity of fertilizers applied to rice and barley, production for some important crops and agricultural employment. The information on the various items was collected by interviewing each farm household and recording data in the questionnaire.

The survey was designed to obtain "gun" (country) estimates. In each "gun", one-fifth of the enumeration districts (EDs) (about 30) were selected with probability proportional to the number of holdings. Each enumerated district consists of 50 to 70 farm households and their boundaries do not cross provincial or township boundaries. The number of holdings selected in the ED's was determined on a sub-sampling rate basis and chosen systematically. The overall sampling fraction was 1/50.

Pilot census and pre-testing surveys preceded the main census.

A post-enumeration survey was also conducted in February 1971 on a sampling basis for checking the extent of coverage, i.e. the accuracy of the census list of holdings, as well as the accuracy of response. The design of the survey was one of self-weighted, stratified, three-stage random sampling. A total of approximately 10,000 agricultural holdings in 400 ED's in the country.

In each province of the country, strata of about 13,000 farm households were formed, making a total of 200 for the whole country. In forming the strata, degree of urbanization (as measured in terms of percentage of farm households to the total number of households) and the area of paddy cultivation were taken into consideration.

The "myeon" (township), the ED's and the farm households were selected with probability proportional to the number of farm households. Within each ED the farm households were selected in such a way that a uniform sampling fraction was obtained in each stratum. The overall sampling fraction was 1/260.

The interview method was used for data collection, with physical count for number of cattle and pigs and fruit trees.

The survey was related to the following items: areas under paddy, upland and permanent crops; farm population by: age, sex, occupation (only for over 14 year olds) for agriculture and non-agriculture activities; livestock and poultry; number of chickens, number of local cattle, number of pigs; fruits; area and number of trees under: apples, pears, grapes, peaches, persimmon, chestnuts, oranges, other fruits; list of holdings: in agreement, omitted and erroneously included.

For the purpose of enumeration, 200 regular statistical staff working in the various provinces were employed. All of them worked as supervisors in the agricultural census.

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<sup>1/</sup> Based on the report of Mr. M.P. Jha, Agricultural Statistician and the report of the Regional Statistician, Dr. H.K. Oh, on his visit to Korea 12 March - 21 May 1971.

1970 CENSUS OF AGRICULTURE IN LESOTHO<sup>1/</sup>

The 1970 agricultural census was the third in a series of decennial censuses carried out in Lesotho. Its planning started very early in 1967, as it was recognized that difficulties would be encountered in collecting agricultural statistics in the land tenure system of fragmented holdings and that farmers were unable to provide reliable information. Like the previous censuses, the 1970 census was conducted on a sample basis; the major deciding factor was the availability of resources.

The census covered the whole country, excluding non-agricultural settlements such as urban centres and extended over the entire crop year. The enumerators collected the information by interviewing the heads of households and direct measurements were taken of their fields. Wherever possible, a physical count of livestock present on the holding was taken.

The sample design used was a stratified multi-stage design. Administrative districts were considered as strata. Enumeration areas (EA) constituted the primary sampling units, households the second stage units and cropped fields the third stage units. The 1966 Population Census provided the frame for the first stage. The rural enumeration areas (EA) were in total 1954 of which 320 EA's were selected with probability proportional to the total population (1966), with replacement. Within each selected EA, eight households were selected without replacement, giving a total of 2,560 households. For the third stage units, two frames were constructed, one for each crop season. For the estimation of crop area, all fields of the selected households were measured, while crop-cutting plots for yield estimates were taken only on a sample of five fields for each crop from among the fields of selected holders.

A post enumeration survey (P.E.S.) was carried out to check the coverage and the accuracy of the census results. For this purpose, a systematic sample of 40 EA's with a random start, were selected among the 320 sample census EA's. Three households, out of the eight selected for the census, were selected in each of the 40 EA's making a sample size of 120 households. Within each EA one household was selected at random and the next two consecutive households on the list were taken to make the total of three.

The P.E.S. was conducted in November/December, whereas the census operations had been concluded in August. This is a rather long period considering that some of the responses had to be given from memory. Besides faulty memory, the other main sources of error were coverage at the listing stage and field measurements. Some of these figures did not close as expected. While census enumerators used chains to measure the dimensions of the fields, compasses, chains and planchettes were used for area calculation by enumerators in the P.E.S.

Another source of non-sampling error was in the processing stage. In spite of instructions given to coders before beginning the operation, a few coding errors were spotted at the punching stage and these were corrected. As the machine processing was done by a firm outside the country, this created a number of problems. When the tabulation eventually reached the office, a number of errors were spotted and corrected manually. In fact, a whole batch of them had to be redone manually and this proved to be very costly, both in time and money.

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<sup>1/</sup>Based on the Report of the Bureau of Statistics, Maseru, Kingdom of Lesotho, December, 1972.

1968/69 NATIONAL SAMPLE SURVEY OF AGRICULTURE IN MALAWI<sup>1/</sup>

The National Sample Survey of Agriculture (NSSA) was the first agricultural survey ever carried out on a national scale in the traditional rural areas of Malawi. Because of the substantial amount of preparatory work it was decided that a pilot survey be carried out in 1967/68, followed by the main survey in the 1968/69 crop season.

The pilot survey revealed a number of flaws in the sample design, the questionnaires and the lack of field and office procedures. The chief failure of this survey, perhaps, was the lack of systematic checks completed in writing by both the team leaders and the office supervisors. Every attempt was made to eliminate them from the NSSA.

The purpose of the NSSA was to obtain information on the acreage of land under main crops, number and kind of livestock, the yield per acre of maize and groundnuts and on household income and expenditure. This information was obtained in different phases of the survey. A small post enumeration survey (PES) constituted the third phase and was undertaken in order to ascertain the completeness and accuracy of the data collection in the first phase of farm operators, gardens, crop acreage and livestock. It was also used to collect additional information on the sex and age of livestock.

The NSSA was a multi-stage sample survey. The first stage was the selection of 410 enumeration areas (EAs) out of 4,059 EA's demarcated for the 1966 Population Census. The second stage was the selection of one village from each sampled EA. Then 10 or 15 households were selected from each sample village at the third stage. Selection of a sub-sample of households for yield studies of maize and groundnuts was the final stage.

The P.E.S. was a sub-sample of 40 enumeration areas systematically selected from the 410 EA's which constituted the main sample survey. All the selected households in the 40 EA's were re-interviewed with a P.E.S. questionnaire and had their gardens re-measured and their livestock counted by a team other than the one that conducted the NSSA. The results were checked in the office against the original reports and a third team went back to the EA's to reconcile the differences.

A summary of the results is given below:

- (i) The first phase estimate of 977,400 farm operators is less than the P.E.S. reconciled estimate by 5 percent. Some of this undercount can be explained by the appearance of new farm operators between the two surveys, however, 80 percent of the undercount is the result of enumerator and response error.
- (ii) The number of gardens found on the first phase is lower than that found on the P.E.S by 10.3 percent. This under-count is expected because farm operators were missed during the first phase but only 25 percent of this under-count can be explained by the under-enumeration of farm operators. The chief reason was the failure of the surveyors to persuade the farm operators to show them all their garden.
- (iii) Overall, the acreage under cultivation measured on the first phase is lower than the reconciled estimate by 4.6 percent, the main cause being the missed gardens. All the main crops had their acreage under-estimated.

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<sup>1/</sup>

Based on the NSSA Government Report.



- (iv) As for livestock, in the first phase the enumerators asked each head of household to give the number of livestock and poultry owned by the household. These numbers, however, were counted in the selected households of the P.E.S. The first phase estimates for cattle; goats and pigs showed an overcount of 0.4 percent, 7.2 percent and 35.4 percent respectively. The differences for cattle and goats are almost entirely due to respondent or enumerator error, but the overcount of pigs appears to be due to slaughterings and an outbreak of swine fever between the first phase and the P.E.S. However, the P.E.S. estimate for chickens was 45.1 percent higher than the first phase estimate. The P.E.S. count was at the peak period of the chicken population and only conducted before the annual outbreak of Newcastle disease in the later part of the dry season.

It should be said that no adjustments have been made in the published census figures as a result of the findings of the P.E.S.

Another quality check was the quality control of all questionnaires at each stage of their editing and coding. The method used was a continuous sampling, i.e. all questionnaires were inspected until five consecutive error-free questionnaires were found; a systematic sample of every 20th questionnaire was then taken and the selected questionnaires inspected and, as soon as an error was discovered, again 100 percent inspection was re-started and so on. The punch cards for all questionnaires underwent a 100 percent verification.

## 1970 CENSUS OF AGRICULTURE IN PAKISTAN<sup>1/</sup>

The 1970 Census of Agriculture was the second agricultural census in Pakistan. As in the 1960 Census, it was taken on a sample basis so designed as to make use of a limited number of enumerators who could be effectively trained and supervised. The experience of the first census of agriculture had indicated the need for intensive research on various aspects of census methodology and careful pretesting of census plans in order to ensure high quality of the results. Among objectives of the pretests were the recognition of various sources of non-sampling errors and to test methods to minimize them.

The sample for the first census was a simple random sample of "mouzas" (villages) which did not provide effective control of the non-sampling errors. As a result, the second census adopted a stratified multi-stage sampling design with first and second stage sampling units selected with probability proportional to size and the third stage units (households) with equal probability.

The pretests also indicated that the method of extraction from revenue records tends to over-estimate the number of holdings and under-estimate the average size of the holding, giving an incorrect size distribution of holdings. It was also learned that direct interviews with farmers in spite of inaccurate answers and deliberate biases were more realistic. Accordingly, the second census was based entirely on direct interviews.

Subject to financial and administrative limitations, all efforts were made to ensure high quality of census enumeration. The incidence of non-sampling errors can be identified only through an independent checking of the census work following immediately the census enumerations. The experience of the census pretests has shown that any post enumeration check survey would have to be limited to the items which could be physically verified without considerable investment of resources. On the other hand, the re-enumeration of holdings through different enumerators at different times often shows considerable differences in the responses, but there is no guarantee that one is better than the other. Therefore, the post enumeration survey carried out after the second census emphasized mainly the completeness of listing and enumeration of households which could be done in a completely objective manner.

For the purpose of the Post Enumeration Survey (P.E.S.) a sub-sample of 580 sample "mouzas" was selected in all the "tehsils"<sup>2/</sup> in which the census was conducted. Within each sub-sample "mouza" one sector of about 100 households was selected at random. The selected sectors were easily identified on the ground. The P.E.S. enumerators who had no access to the original census documents relisted all the households in the selected sector. Finally, a sub-sample of about 5 to 10 holdings was selected from the list of sample holdings enumerated in the census. The selected holders were interviewed and information was obtained on area owned and area operated by them.

The P.E.S. results were compared with the corresponding census data in a tally sheet and the results were expanded to the provincial level using appropriate raising factors equal to the inverse of the probabilities of selection.

The most important findings are summarized below:

- (i) The census estimates of the number of total households were subject to under-enumeration of 4.2 percent.
- (ii) The census had missed some households and enumerated others which actually did not exist. This was one misconception of the rural population that the household

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<sup>1/</sup>Based on the publication "Second Census of Agriculture in Pakistan" by the Regional Institute for Research and Training in Statistics for the Near East, by A. Sattar, February 1974.

<sup>2/</sup>Small administrative unit composed of many "mouzas" but smaller than district.

listing for the agricultural census might have something to do with the land reforms, under which the landless households and those with very little land would get ownership of the state lands. As a result, some single household families got themselves listed as multiple households. This over-enumeration amounted to 2.5 percent and thus, on the whole, there was a net under-enumeration of 1.7 percent of households.

- (iii) In the case of agricultural households alone, there was under-enumeration of 1.3 percent. Against this there was over-enumeration which almost completely off-set the under-enumeration and the net impact on the number of agricultural holdings in the country as a whole was nil.

A quality check was also made through the scrutiny of the preliminary tabulations from the computer, for which the staff had been specially trained to check for internal inconsistencies and errors and to make comparisons with check totals and control figures already available from different sources.

1969 CENSUS OF AGRICULTURE IN THE U.S.A.<sup>1/</sup>

The 1969 Census of Agriculture differed in a number of ways from the previous census of agriculture. The major changes was the introduction of a mail-out/mail-back method of data collection. Through this procedure, farmers were requested to fill out and mail back their report forms, and the enumerators then only had to follow-up on the forms that were not returned by mail. In the new method, the Bureau of the Census constructed a mailing list of potential farm operations derived from records of the 1964 census, the Internal Revenue Service, Social Security Administration and Agricultural Stabilization and Conservation Service.

The standard questionnaire was sent to all farms with an expected value of sales of \$2,500 or more and a simplified form was sent to a 50 percent sample of the smaller farms. Most of the questions asked in the 1964 census were repeated in 1969, however, new items were included in the standard form and some questions used in 1964 were omitted; in particular those for which adequate data were already available from other sources.

The major advantages of the new system were that the cost of data collection and processing was substantially reduced and once the mailing list was constructed, the possibility of up-dating it periodically was available.

A coverage check or evaluation has been conducted for each census of agriculture since 1945. As for the past censuses, the basic procedure of the coverage check for the 1969 census was the same but for each census the techniques have been more refined and the sample design improved. However, since the 1969 census was the first one enumerated by mail, some objectives were changed and others added.<sup>2/</sup>

As stated in the report, the objectives for the 1969 Census of Agriculture Coverage Check were as follows:

1. To measure the completeness of the census farm count, including the completeness of the census processing procedure in identifying farms on the list.
2. To provide estimates of the completeness of the data for selected items, indicating the characteristics of farms not included in the census.
3. To evaluate the accuracy of the reporting acres of land in farms by operators included in the census.
4. To evaluate the quality of the various administrative lists used to construct the census mail list and to provide information for improving coverage in future censuses. Special emphasis was placed upon evaluation of the contribution of the different list sources to the number of farms counted in the census, evaluation of the accuracy of the size indicators in these sources, and measurement of the duplication between sources.

The basic procedures for the coverage checks have been:

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<sup>1/</sup>Based on the Report of the 1969 Census of Agriculture, Volume V - Special Reports, Part 14, published by the Bureau of the Census, Washington, June 1974.

<sup>2/</sup>A more detailed report on the coverage is given in Part 16 of the above Volume V. However, it is not available in the FAO files. The Statistics Division has requested a copy of this report and when it is received the present paper will be reviewed to include the additional information.

- (i) Selection of an area probability segment sample and canvass for all farms associated with each segment to establish a measurement base or standard;
- (ii) A match of all farms in the base sample to the census reports and lists to establish the relationship of the base to census;
- (iii) Follow-up to check and clarify differences and to establish "true" values;
- (iv) Processing, tabulation, analysis and publication of results.

The measurement base for the 1969 coverage check was the area sample of farms from the June 1969 Enumerative Survey conducted by the Statistical Reporting Service (S.R.S.) of the U.S. Department of Agriculture. This survey is a single stage, stratified, general purpose sample of the 48 conterminous States. The stratification is geographical, based on the intensity of agricultural operations, and the sample consists of about 17,000 area segments with approximately 23,000 resident farm operators. The sample used in the coverage check, however, did not include the entire samples of the S.R.S. June survey, but the major part was the sample of the 23,000 farm operators for whom whole-farm data comparable to census data were available. In addition, a sub-sample of 30,000 non-farm persons living inside the segment was used to provide a supplemental estimate of census overcount.

Besides other advantages, the June survey provided the agricultural census with a valuable source for the evaluation which was not possible in previous censuses. However, due to the limited availability of the data obtained in that survey, it was possible to evaluate only the number of farms and land on farms. Moreover, the difference between the reporting dates of the census and the S.R.S. caused some conceptual problems when ownership changes occurred during the census year.

The coverage check provided estimates of the number of farms and acreage included in the census, over-counted in the census and missed in the census. These estimates were based on resident farm and on-farm places falling in the June survey re-classified on the basis of the census farm definition.

The coverage indicated that the census included 85.0 percent of all farms in the conterminous United States. For the whole country, 17.6 percent of the farms were missed and 2.6 percent over-counted, thus making a net miss rate of 15.0 percent. However, as in the other censuses, the net missed farm rate was considerably greater for small farms than for large farms, respectively 31.6 percent and 3.3 percent. Whereas the completeness of the 1969 census for large farms (those with a total value of products sold of \$2,500 or more) was of the same magnitude as that for the 1964 and 1959 censuses, for small farms it was somewhat less: only 68.4 percent of the small farms were included in the 1969 census compared with 81 percent in 1964 and 86 percent in 1959.

For the country as a whole, the coverage check estimates showed that 76 percent of the total missed farms were not located on the mailing list and 24 percent were on the mailing list but misclassified in processing.

According to the 1969 Census of Agriculture, 37 percent of the total 2,730,250 farms enumerated were farms with a value of products sold of less than \$2,500. These small farms had only about 2 percent of the total value of products sold for all census farms and as the majority of the missed farms were small farms (78 percent), the census coverage of farm production measured in terms of value of products sold was considerably greater than the 85 percent farm count coverage.

The standard error for the coverage check estimates was expected to be between 1 and 2 per cent at the national level and from 2 to 6 per cent at the census division level. Possible sources of non-sampling errors mentioned were errors in coverage check matching and processing procedures, response error in coverage reports, and possible bias in the measurement base.

The coverage check sample was also used to provide early warning of problems so that action could be taken before they became substantial. In addition, the coverage check sample was used when early review of reports indicated a possibility of under-reporting of soybeans and hay in the agricultural census. In order to provide an estimate of the magnitude of the under-reporting a subsample of coverage check farms was taken.

Data reported by the respondents of the 1969 census were reviewed in various stages. In each stage of review, adjustments were made in order to improve the quality of the published statistics.

For the purpose of this study, the returned questionnaires and records for a sample of counties were reviewed. This evaluation programme is called the Processing Master Sample. For this Master Sample, 10 counties were selected for the evaluation based on the 1964 census data ranking all counties by specific agricultural characteristics. Each county selected was among the 10 top counties in at least one of these characteristics and among the 100 ranking counties for the greatest number of additional agricultural characteristics. The counties were purposively selected and as such, neither national nor regional estimates will be made reflecting the quality of census processing.

Corrections of census figures whenever errors are discovered goes on continuously, without any time limit. The Bureau of the Census maintains one set of bound volumes in which corrections are entered as they are found throughout the years.

1969 CENSUS OF AGRICULTURE IN YUGOSLAVIA<sup>1/</sup>

The 1969 Census of Agriculture in Yugoslavia consisted of a complete enumeration of cooperative and other holdings of the Socialist sector, and a sample census of individual holdings. The sample of individual holdings was conducted in two phases. The enumeration districts (ED's) constituted the primary sampling units (PSU) and the sample consisted of 8,000 ED's out of a total of 45,000 ED's. In the first phase all households in the sampled ED were enumerated, using a short questionnaire which included information on household population, land use and livestock. The scope of the first phase was also to list all agricultural holdings in the selected ED.

In the second phase, a sub-sample of about 8 agricultural holdings was enumerated in all 8,000 selected ED's. The questionnaire used for this purpose was much longer and included data on area, production and sales of individual crops, use of agricultural machinery and implements.

Quality checks were performed for both phases. For the first phase, i.e. the larger sample and shorter questionnaire, the quality check was made on a sub-sample of 399 ED's with 33,071 individual agricultural holdings, i.e. 5.1 % of the holdings enumerated in the first phase. The quality check for the second phase (smaller sample and longer questionnaire) was on a sub-sample of 353 ED's in which 2,815 individual agricultural holdings were included in the check survey, i.e., 4.4% of the holdings enumerated in the second phase.

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<sup>1/</sup> Based on the summary translation from Serbo-Croatian prepared by Mr. P. Petricević, FAO Agricultural Statistician.

ANNEX I.

SAMPLING PLAN USED FOR THE 1972 AGRICULTURAL CENSUS IN CAMEROON <sup>1/</sup>

The sampling plan used for the agricultural census is a classical one with two stages of selection.

The primary sampling units are population groups with name which can vary (villages, districts, etc.).

Secondary sampling units are agricultural holdings located in these primary sampling units.

1. Sampling of Primary Units

1.1 Construction of the sampling frame

The sampling frame for primary sampling units (PSU) consists of the list of villages along with the indication of the population of each village as available from the last population census. This list was compiled by senior agricultural extension workers and verified at the level of departments and agricultural sectors. The scope of the verification was to: eliminate double counting; find omissions; and establish the conformity between the official list of villages for each department and the one communicated by the agricultural services.

The most frequent errors detected refer to certain groups of dwellings which were sometimes considered as villages and sometimes as hamlets attached to other villages.

Population figures associated to each village on the list were provided by local authorities on the basis of the administrative censuses. The reference period varies from one department to another. Nevertheless, these figures provide a good measure of the respective importance of villages.

The principal built-up (urban centres) area in Cameroon, namely, Douala, Yaoundé, Mbalmayo, Ebolowa, Faroua and Ngaoundéré, were excluded from the census.

1.2 Stratification

In order to obtain a more representative sample of agricultural holdings and to improve the quality of census results, the country was stratified by taking into account the division into departments and the existence, within the departments, of relatively homogeneous zones with respect to crop patterns.

In some departments a separate stratum which included population centers with more than 5,000 inhabitants was formed. These centers showed a clearly urban character (particularly those with densely populated districts).

1.3 Distribution of the sample between strata

The total number of PSUs included in the sample is 1,381.

The PSUs were allocated to the different provinces in such a way as to take into account the size of the population. Consequently the ratio (population)/(number of sample

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<sup>1/</sup> Working document used for UNDP/Special Fund Project RAF/71/186 in Cameroon.



villages) is not strictly uniform for all provinces. It has been reduced in the less populated provinces in order to obtain the number of PSUs which would ensure a sufficiently representative sample on the province level:

Province	Total population	Number of sample villages	Ratio
			$\frac{\text{Population}}{\text{Number of sample villages}}$
01 - North	1 408 785	373	3 777
02 - East	270 009	124	2 177
03 - Center-South	941 324	245	3 842
04 - Coast	364 280	123	2 962
05 - West	788 236	210	3 754
06 - North-west	752 676	192	3 920
07 - South-west	453 451	114	3 978
Country	4 978 761	1 381	3 605

Allocation of PSUs to departments and strata within provinces was made proportionately to the size of population, with exception made in urban strata in which the ratio population/number of PSUs was much larger. This was justified by the fact that in these strata the part of population engaged in agriculture was smaller.

#### 1.4 Sampling of Primary Units

A sample of PSUs was drawn independently in each stratum with probability proportionate to the size of population. In practice the sample was drawn in the following way:

- the villages in each stratum were ordered in the way in which the lists were submitted by the authorities who compiled them. Re-ordering of lists, for example according to size of population, was not done since it would have involved considerable manual work, while it was not sure it would contribute to greater precision.
- Cumulative total of population figures was calculated throughout the list from the beginning to the end. The final cumulative total corresponded to total population  $P$  of the stratum.
- If  $m$  denotes the number of villages to be selected from the stratum, the ratio  $L = \frac{P}{m}$  is calculated and a random number, say  $x_1$ , is selected between 1 and  $L$
- the arithmetic series is developed:  

$$x_1, x_2 = x_1 + L, x_3 = x_1 + 2L, \dots, x_m = x_1 + (m-1)L$$
- each number of this series designates one unit selected in the sample by comparison with the cumulative population totals.

This way of drawing a sample is therefore selection with unequal probabilities. The probability that a unit having population  $P_I$  is selected equals  $\frac{P_I}{L} = \frac{m P_I}{P}$ .

## 2. Sampling of Secondary Units

After the PSUs are selected the first operation to be performed by the census enumerators consists of making a systematic inventory of all houses in the selected villages and to make a complete list of households which practice agriculture, i.e. the list of agricultural holdings.

The lists of agricultural holdings established for each sample village is used as basis for selection of secondary sampling units.

In each sample village secondary sampling units are selected with equal probabilities without replacement. In each village five agricultural holdings are selected and census questionnaires are completed. If a village has less than five agricultural holdings, all holdings from this village are enumerated.

## 3. Calculation of Sampling Error

In view to simplifying the notation the formulas for sampling estimates and for the variance will be given for one stratum only. The formulas are additive for a group of strata.

### 3.1 Notation

	<u>POPULATION</u>	<u>SAMPLE</u>
Number of villages (PSU)	M	m
Village subscript	I = 1, M	i = 1, m
Number of holdings in a village	$N_I$	$N_i$
Number of sample holdings in a village	$n_I$	$n_i$
Subscript relating to a holding within a village	J = 1, $N_I$	j = 1, $n_i$
Value of a variable under study for one holding in a village	$Z_{I,J}$	$z_{ij}$
Sum of the variable for a village	$Z_I = \sum_{J=1}^{N_I} Z_{IJ}$	$z_i = \sum_{j=1}^{n_i} z_{ij}$
Total value of the variable	$Z = \sum_{I=1}^M Z_I$	
Average value for a village	$\bar{Z}_I = \frac{Z_I}{N_I}$	$\bar{z}_i = \frac{z_i}{n_i}$
Dispersion between secondary units of a village	$S_{2I}^2 = \frac{1}{N_I - 1} \sum_{J=1}^{N_I} (Z_{IJ} - \bar{Z}_I)^2$	$s_{2i}^2 = \frac{1}{n_i - 1} \sum_{j=1}^{n_i} (z_{ij} - \bar{z}_i)^2$
Probability of selecting village I in one trial	$A_I = \frac{P_I}{P}$	$A_i = \frac{P_i}{P}$
Probability of selecting village I in m trials	$mA_I$	$mA_i$

	<u>POPULATION</u>	<u>SAMPLE</u>
Extrapolation factor for a sample village		$T_i = \frac{1}{mA_i} = \frac{P}{mP_i}$
Extrapolation factor for holdings within a sample village		$E_i = \frac{N_i}{n_i}$
General extrapolation factor for holdings		$G_i = T_i \times E_i$
Sum of squares of the variable for a village		$q_i = \sum_{j=1}^{n_i} z_{ij}^2$
Extrapolation of the variable for a village		$a_i = T_i \times \frac{N_i}{n_i} \times z_i$

### 3.2 Estimates

Value to be estimated is the total sum Z. An unbiased estimate of Z is

$$z' = \frac{1}{m} \sum_{i=1}^m \frac{N_i}{A_i n_i} \sum_{j=1}^{n_i} z_{ij}$$

which can also be written as

$$z' = \sum_{i=1}^m a_i$$

or

$$z' = \sum_{i=1}^m \sum_{j=1}^{n_i} G_i z_{ij}$$

Thus if the elementary data measured on the holding level are multiplied each time by the general extrapolation factor the sampling estimate can be obtained by simple summation.

### 3.3 Variance

#### 3.3.1 Sample variance

BETWEEN VILLAGE	$\frac{1}{m} \sum_{I=1}^M A_I \left( \frac{Z_I}{A_I} - Z \right)^2$
BETWEEN HOLDINGS WITHIN VILLAGES	$\frac{1}{m} \sum_{I=1}^M \frac{1}{A_I} \frac{N_I^2}{n_I} \frac{N_I - n_I}{N_I} S_{2I}^2$
TOTAL	$\frac{1}{m} \sum_{I=1}^M A_I \left( \frac{Z_I}{A_I} - Z \right)^2 + \frac{1}{m} \sum_{I=1}^M \frac{1}{A_I} \frac{N_I^2}{m_I} \frac{N_I - n_I}{N_I} S_{2I}^2$

### 3.3.2 Estimation of sample variance

The unbiased estimates of variances shown above are given in the table below:

BETWEEN VILLAGES	$\frac{1}{m} \left( s^2 - \frac{1}{m} \sum_{i=1}^m \frac{1}{A_i^2} \frac{N_i^2}{n_i} \frac{N_i - n_i}{N_i} s_{2i}^2 \right)$
BETWEEN HOLDINGS WITHIN VILLAGES	$\frac{1}{m^2} \sum_{i=1}^m \frac{1}{A_i^2} \frac{N_i^2}{n_i} \frac{N_i - n_i}{N_i} s_{2i}^2$
TOTAL	$\frac{s^2}{m}$

where:  $s^2 = \frac{1}{m-1} \sum_{i=1}^m \left( \frac{z'_i}{A_i} - z' \right)^2$  and  $z'_i = \frac{N_i}{n_i} z_i$

### 3.3.3 Calculation of the estimate of variance

We shall rewrite the formulas given above in a way which will permit the calculations by use of data directly accessible from data records.

- variance between holdings within a village. This variance can be expressed as:

$$V_2 = \sum_{i=1}^m T_i^2 \frac{N_i^2}{n_i} \frac{N_i - n_i}{N_i} \left( \frac{q_i}{n_i - 1} - \frac{z_i^2}{n_i(n_i - 1)} \right) = \sum_{i=1}^m b_i$$

- total variance. This can be expressed as:

$$V = \frac{m}{m-1} \sum_{i=1}^m a_i^2 - \frac{z'^2}{m-1}$$

- variance between villages. Estimate of this variance is obtained as difference

$$V_1 = V - V_2$$

### 3.3.4 Case when calculation is not possible

The formulas given above cannot be evaluated if

$$n_i = 1 \quad \text{or if} \quad m = 1$$

In practice the case  $n_i = 1$  does not appear. On the contrary, the case  $m = 1$  is very frequent. To avoid this difficulty one can proceed as follows:

- The quantities  $z'$ ,  $mV$  and  $mV_2$  are cumulated gradually for all strata. It can be assumed that ratios  $\frac{mV}{z'^2}$  and  $\frac{mV_2}{mV}$  do not change much from one stratum to another.

At the end of each stratum the following values are calculated

$$s = \frac{\sum mV}{(\sum z')^2} \quad \text{and} \quad r = \frac{\sum mV_2}{\sum mV}$$

In case of a stratum where  $m = 1$  the variance and its components are then calculated as follows:

$$V = sz'^2, \quad V_2 = rV, \quad V_1 = V - V_2$$

### 3.3.5 Estimation of the number of agricultural holdings

The estimation of the number of holdings can be considered as a special case of the formulas given above where variable  $z_{ij}$  systematically takes the value 1. It can be seen that in this case the variance due to the second stage of sampling is zero.

In the same way, the estimate of the total number of sub-groups of holdings with a particular characteristic (for example holdings producing cocoa) can equally be treated as a special case of the above formulas, considering that  $z_{ij}$  takes the value 1 if the holdings belong to the sub-group and the value 0 if otherwise.

ANNEX II

SAMPLING FRAME  
FOR THE 1971 CENSUS OF AGRICULTURE IN LIBERIA 1/

1. Introduction:

In 1968 the Government of Liberia decided to participate in 1970 World Census of Agriculture. It was the first agricultural census in the country and, consequently, there was very little previous information which could be used in planning the census.

From the very beginning it was clear that a complete enumeration of all agricultural holdings would be impossible because of the high cost and scarcity of prospective enumerators.

It was therefore decided to carry out the census on a sample basis. After some preliminary decisions were made concerning the type of sample, definition of primary units, secondary units etc., the problem of the frame for sampling had to be solved.

In this paper we shall briefly describe the administrative division of the country, available previous information and materials and the sample design. In more detail we shall discuss the problems encountered in the preparation of the frame.

2. Administrative Division of the Country:

Major administrative divisions in Liberia are 9 counties. In terms of population (1962 Population Census, P.C.) they range between 30 and 200 thousand. The area varies between 1,200 and 7,500 sq. miles. Besides the 9 counties there are also 5 territories, in administrative hierarchy ranging somewhat below the county, but for all practical purposes they are regarded as to be at the same level. The population of the territories varies from 9,500 to 38,000 and the area from 400 to 1,700 sq. miles.

The capital of Liberia, Monrovia, with the suburbs, forms the Commonwealth District of Monrovia. This area was excluded from the census of agriculture.

Counties and territories were treated as domains of study, i.e. separate estimates were produced for each area and results will be published for each of them separately.

The boundaries of the counties and territories follow, in some cases, natural features (rivers, mountain ranges etc.) but in other cases they are defined as arbitrary lines. For example, the description would read something like: "From

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1/

Working document prepared by M. Stefinovich, FAO Agricultural Statistician, 1974.

point A the boundary follows the straight line which joins point B with the coordinates of x degrees N, and y degrees W." Although it is relatively easy to draw such a line on a map, it is virtually impossible to identify such a boundary on the ground.

Lowest administrative units are clans. During the census there were about 500 clans in the country. Clan boundaries are not officially described, but can be identified with the help of local chiefs. Usually the clan boundaries follow natural features, such as rivers, water streams, valleys, ridges and sometimes roads.

Villages, usually called towns, irrespective of their size, do not have a clear boundary. Only larger urban agglomerations, the townships, have identifiable boundaries. The towns vary in size from one hut to 1,000 or more structures.

### 3. Population Census 1962

The possible use of information obtained from the Population Census was thoroughly discussed.

Theoretically it would have been possible to use the census enumeration areas as primary sampling units. In practice this turned out to be impossible, because the lists of EA's were not more available, which is understandable since 8 years have already elapsed from the time when the census had taken place.

The only information which was available and useful in designing the sample was the census publication, with break-down by counties. Unfortunately, the results were not published by clans, which would have been more useful.

### 4. Maps and Related Materials:

At the time of preparations for the census of agriculture, the Cartographic Division of the Ministry of Lands and Mines was compiling the so-called contour maps, based on aerial photographs. The contour maps, at that time, were not checked on the ground and topographic features (rivers, towns etc.) appeared without names. We tried, however, on basis of one segment, which was already checked and on which topographic details were entered, to test its usefulness in the field work. As it turned out, the segment contained some errors that we, from the head office, were able to correct only with difficulties. Since the enumerators, who we intended to employ,

would have at most some grades of high school education, and therefore would not be able to master the map reading and even less map corrections, we had to abandon the idea of using those maps.

Another possibility was the use of the photographs themselves. This idea was immediately discarded, because reading the stereo photographs in the infra-red technique, requires specially trained personnel. We were also told, that a skilled photo reader could not positively identify towns of less than 10 structures, and in some areas more than 25% of the towns fell into this group.

As the third possibility, the use of the EA's sketches was examined. Tests have shown, that the average enumerator could be trained to read such simple sketches. The only problem was that we were not sure how accurate the sketches were and whether many changes occurred since the census. The sketches were, in fact, segments from an old administrative map 1:250,000. For the PC 1962 the enumerators were given each a segment showing their respective areas of assignment, and the boundaries of the EA were drawn. During the census, names of localities that had been enumerated, were entered on the sketch. After the census, the number of inhabitants for each clan was entered onto the map, and this map was also used for the agricultural census.

#### 5. Tax Lists:

The so-called hut tax is collected by town chiefs. We have examined the possibility of using these lists for the construction of a frame. Field checks let appear that there was no uniform treatment of towns: in some cases two towns would pay the taxes to one of the chiefs, in some cases people of a "half-town" (sort of a hamlet) would pay taxes to their own chief. The spelling of the names presented another difficulty in identifying the town. Therefore it was decided not to use these lists as the census for the frame.

#### 6. Sample Design:

From the beginning it was clear that a clustering of the sampling units would be necessary, in order to facilitate the supervision and decrease travel time and expenses of the enumerators.

The clans would be satisfactory primary units if only the estimates on the country level were needed. As it was mentioned



before, the decision was made to treat counties and territories as domains of study, i.e. to produce separate estimate for each of them. Some of the smaller counties and almost all territories have a very small number of clans. To get a reasonable number of primary units in the sample, 20 for example, in some cases it would have been necessary to take all clans into the sample.

Finally it was decided to use towns as primary sampling units, and subsample agricultural holders in sample towns.

In large sized counties overall sampling fraction of  $1/48$  was set as a guideline, in medium sized counties  $1/24$  and in small counties and territories  $1/12$ . Towns with 250 and more structures formed a separate stratum.

All towns had to be grouped into seven strata, according to the number of huts (structures), and the primary and the secondary sampling fraction had to be determined in such a way, that the overall sampling is obtained. For example, in large counties with the sampling fraction of  $1/48$ , the towns in the first stratum (1-7 huts) were selected with  $1/48$  and all holders in the sample towns were selected. In the second stratum (8-15 huts) the towns were selected the fraction of  $1/24$ , and the holders in the sample towns were selected with the fraction of  $1/2$ , and so forth. Towns with 150-250 structures were selected either with certainty ( $1/1$ ) or with  $1/2$ , depending on their number in the stratum. Too many of such large sample towns would considerably increase the time for listing of households in them.

Large agricultural holding were defined as holdings having 100 and more acres under rubber or those having 15 acres or more of any single crop except rubber. These holdings were put into the eight stratum, with certainty.

#### 7. Construction of the Frame:

The only way to get a list of villages (towns) was to canvass the whole country, clan by clan.

Several decisions had to be made, in order to make this phase of the census as reliable as possible and, at the same time, as cheap as possible.

It goes without saying, that this phase offered the opportunity of collecting some additional information on towns and their inhabitants, which information could have been used for further stratification. The main obstacle to this was the fact that even with all kind of recommendation letters, the enumerator had

difficulties in introducing himself to the local chiefs. It was easier with the clan chiefs, who usually had a literate clerk, but it was quite difficult with the town chiefs who were mostly illiterate and did not have a clerk. Besides, after spending quite a time in the county headquarters introducing himself to the county superintendent and getting a letter of recommendation for the clan chiefs, the enumerator had to repeat the same step in the clan headquarters.

Therefore it was decided to consider a clan as the unit of canvassing. A questionnaire was prepared, containing the name of the clan and the names of neighbouring clans, some general information on the crops grown in the area and the crop calendar. The most important part of the questionnaire was the list of towns.

From the population census EA sketches, names of towns were copied and the enumerator had to check with the clan chief, clan elders and other persons, the name of each town and its location relative to the neighbouring towns. Newly founded towns had to be entered with the remark "new", abandoned towns with the remarks "abandoned" and, if possible the time and reason for abandonment. In case the PC list contained the name of a town unknown to the clan officials, the enumerator had to try to locate this town on basis of his sketch, when canvassing the corresponding area, and to record the proper name, if the town really existed. Another list which had to be prepared during the canvassing, was the list of large farms. The enumerator had to collect from the clan officials names of such large holders, and to check their location during the canvassing.

To avoid the lengthy introductions to the town chiefs, the enumerators were instructed, when passing a town, only to count the number of structures, without contacting the chief if not necessary. Later it was found that this instruction was helpful in cases, which were rather frequent, when there were only old people and children in the town, the rest of the inhabitants working on their fields.

In that way a rough measure of size was obtained for each locality.

Changes in names or in spelling, new towns and any other important facts (new roads etc.) had to be entered on the sketch.

In carrying out this phase of the census many problems were encountered. Some of them were identified as such and solved, but many went undetected until it was too late to remedy the

situation.

Although, because of lack of funds, no systematic quality check of this phase was carried out, spot-checks performed by field inspectors and head-office staff have detected some errors, and measures were taken to correct them immediately.

Comparing the revised lists of towns with the PC lists, it was noticed that in some areas the number of towns marked as "not found" or "abandoned" was much higher than in other neighbouring areas. In such cases it was suspected that the enumerator was negligent, and the field supervisor had to return to this area and check the list town by town.

In some cases the difference between the number of huts as recorded on the PC list and the number reported by the enumerator was too big. Usually the number reported by the enumerator was smaller, sometimes only 10 or 20% of the PC number.

One of the reasons was the different definition of the town. During the PC some towns were enumerated together with their half-towns were taken separately, or vice versa. Another reason was the negligence of the enumerator.

Some cases were detected, where the enumerator entered on the list two towns with similar spelling, interchanging their number of huts.

In many cases it was not clear what was the origin of the discrepancy and we had to take the supervisor's report as correct, although it might have been him who brought the wrong information.

It was also found that changing names of a town is by no means a rare case, especially when the town is very small.

In other cases there was a considerable growth of towns, due mainly to the construction of new roads. Such a growth sometimes led the enumerators to think that they were in the wrong area.

Since there was no systematic check of the quality of canvassing it is impossible to state to what extent each type of error occurred.

In the large holding's listing, the most frequent error was an overstatement of acreage. For example, the holder having only 50 acres of rubber would report having 100 acres. In many cases a cross-check was possible, because the enumerators were required to record also the number of rubber trees, whenever available.

The treatment of large farms deserves more explanation. Besides the list prepared during the canvassing, two other lists were obtained independently. One was the list of the Liberian Rubber Growers Association. It turned out that the list was only partially complete. It contained namely only those rubber growers who were actually paying the memberships fees. These growers were, as further check showed also those who exploited their plantations. Others did not have an interest to be active members of the Association.

The other list was obtained from the Ministry of Industry and Commerce, containing those holders who were registered as commercial farmers. Neither this list was complete.

Both lists were compared with the master list obtained in canvassing phase, duplicates were removed and omissions from the canvassing list were added.

Many of the holders falling in the category of large farms reside in Monrovia, which was excluded from the sample. Special care had to be taken to include plantations of these holders in the large farms list. Almost without exception the necessary information, i.e. the name and address of the holder were obtained from managers, caretakers or other persons living on the holding. In very few cases this information had to be obtained from neighbouring holders.

As it was already mentioned, there was a tendency of over-reporting the acreage of large farms. This, however was not so important, since the main purpose was to include all very large farms. If some smaller farm was erroneously included, it was left on the list.

After the sample towns were selected and holders listed in them, the large farms, if they happened to be in those towns, were excluded from the sample list.

#### 8. The Quality of the Frame:

In the sample towns all huts were numbered with a serial number and all households listed. The list included some screening questions, i.e. whether any member of the household runs a farm on his own, or whether he has 10 heads of cattle or other livestock. On basis of the answers the field supervisor decided who was to be considered as a holder. The number of persons living in the household was also recorded.

From this list the final sample was selected in a systematic way.

9. The Quality of the Frame:

As it was mentioned before, no proper check of the quality of canvassing and listing was carried out. However, during the field trips, we were able to detect at least the types of errors, even if it was not always possible to correct them.

Omissions of towns during the canvassing certainly did occur, and in some cases the list was corrected. But we do not know, and even a thorough quality check would have not revealed all the omission of small towns consisting of 1-7 huts. If the number of such towns were small, one would not have to worry too much, but in one county more than 25% of towns were in this category. Such towns are difficult to locate. As we already said, they can hardly be seen on the aerial photographs. I was told of one case where a town of 22 huts could not be seen on the photograph.

Small towns are extremely volatile. They are here today, but after some time the inhabitants might move elsewhere. Such cases were observed rather frequently.

For future censuses it should be possible to use the enumeration areas which were used in the 1974 Population Census. But the accuracy of the boundaries of these areas has to be checked yet.

The population census has just be completed and the mapping material has to be sorted before it will be possible to examine its usefulness for future censuses.

Towns as primary areas, in Liberian conditions, are certainly not suitable units. They were used in the census of agriculture because at that time we had no better choice.

Better results could have been achieved with more field staff. Actually, the canvassing was carried out by about 70 field supervisors each accompanied by a locally hired guide, and it took 5 months to complete the work. Expensive as it was, this exercise did not yield the desired quality of work.

During the second stage listing many other problems were encountered, which very likely resulted in a selection bias.

The first type of errors was that the enumerator listed the wrong town. As far as we could check it, it occurred for different reasons. In some cases the name of the sample town on our list was either written completely wrong or misspelled. Although the enumerators were instructed to consult their supervisor in case of doubt, they mostly listed another town with a

similar name and a similar number of huts. Considering the scattering of towns, the supervisors could not always be at hand to help the enumerator, and in some cases they neglected their duty, or, sometimes they accepted the wrong town in good faith that it was the right one.

We were able to detect only those cases where the spelling was entirely different or the number of huts was different, from the one we had on the canvassing list, by a factor of 2 or three. But if the town was small, e.g. if it had on the canvassing list 3 huts, and the enumerator listed 6 huts, it was quite possible that, in the meantime, 3 new huts had been erected.

Another typical problem was the numbering of the huts. Although all precautions were taken to write the number on the hut in a visible place and in such a way that it could not be easily erased, in some cases we could not find any number on some huts. Partly this was due to the omission of the enumerator, but in some cases we suspected that the owner of the house erased the number. In such cases it was not always clear whether it was an omission or not, because the owner changed or he changed his name, and therefore could not be identified on the list.

In very many cases, when the enumerator came back to the town for enumeration, he found in the hut, properly listed and numbered on the list, a person with a quite different name. Mostly this was due to the fact that people easily change their names, or use several names at the same time, but in some cases they would give a false name on purpose.

If the enumerator was skilled enough he would enlist the help of the town chief or some other person in town, but the town chiefs were not always excessively helpful. We do not think that this type of interchanging holders introduced any serious bias, but it certainly did cause a great confusion.

During the enumeration some enumerators reported that the selected holder actually did not have any cultivated land or livestock, although he reported during the listing of having it. In order to preserve the prescribed selection probability, such cases were left in the sample and actually treated as non-responses.

How many holders denied during the listing having a field or livestock, we do not know. In the cases where we had carried out a check, we could not get a straight answer. The head of the household would say one thing, his neighbour another and the town chief would usually answer that he did not know about any farm. This was obviously the result of mistrust on the part of the population, partly due to the insufficient publicity prior to the census.

ANNEX III

SAMPLING PROCEDURES USED IN THE SECOND CENSUS OF AGRICULTURE IN PAKISTAN 1/

III. General Description of Sample Design

The sample design of the Second Census of Agriculture of Pakistan is a combination of various sampling techniques. It can be described as a stratified systematic multi-frame multistage sample with first and second stage sampling units selected with probability proportional to size and the last stage (3rd stage) sampling units selected with equal probability. The general outline of the sample design is given below:

Outline of the Sampling Plan for  
the Second Census of Agriculture

<u>Population</u>	<u>Basis of Sampling</u>
Provinces 4	Administrative Units for which estimates required
Districts 50	
Sub-Divisions 152	
Step I: Patwar Circles in NWFP, Punjab and Sind 7904	Selected as many patwar circles as the number of enumerators that could be trained, selecting patwar circles with probability proportionate to the sum of the square roots of the products of cultivated acres and number of households for mouzas in the patwar circles.
Patwar Circles in Baluchistan	Taken all.
Step II: Average Five Mouzas per patwar circle Total mouzas 39,195	Two sample mouzas per patwar circle with probability proportionate to the square root of the product of cultivated acres and number of households in each mouza.
Step III: Households within sample mouzas	Selected at least two clusters of 30 H.H. each per mouza or minimum four clusters per patwar circle: the number of sample clusters fixed keeping in view total number of households and the resultant overall raising factor.

The measure of size assigned to various mouzas was the geometric mean of number of households in the mouza according to 1961 Population Census and the cultivated area during the year 1969/70. Mouzas were arranged patwar circle-wise and the measure of size of any patwar circle was the sum total of the measures of size of the mouzas constituting that patwar circle. In each sub-division, patwar circles were arranged

1/ Taken from Volume IV - Methodological Report, Part 4. Agricultural Census Organization, Ministry of Food and Agriculture, Government of Pakistan, October 1972.

generally in geographical order within each kanungo circle. Mouzas within sample patwar circles were, however, arranged in descending order of the measure of size and were selected systematically at the second stage of sampling. Within the sample mouzas the listed households were selected in clusters not exceeding thirty households each. Large holdings throughout the country were taken with certainty and medium large holdings (not already included in N.C.H.) were also taken on 100 percent basis within the sample mouzas and were called as Mouza Certainty Holdings.

#### IV. Sampling Frames

##### A. National Certainty List

A list of large holdings and Government farms was prepared through the Revenue Department in advance of the Census and was termed as N.C.H. list. All large holdings and Government farms included in this list were enumerated on 100 percent basis. The N.C.H. falling in sample mouzas were enumerated by the enumerators concerned with respective mouzas while those falling in non-sample mouzas were enumerated by the supervising staff.

##### B. Mouza List

A list of mouzas for each province prepared for the 1960 Census of Agriculture was up-dated in 1964/65. These lists were compared with the mouza list maintained in the Bureau of Statistics, West Pakistan, lists published by the Director Land Records and the reports of the 1961 Population Census. The discrepancies were removed by reference to revenue records at Tehsil headquarters. Finally the mouzas were arranged patwar circle-wise within kanungo circles and the lists were prepared tehsil-wise containing the following information:

- (i) Name of the mouza.
- (ii) Had Bast Number.
- (iii) Total Area.
- (iv) Cultivated Area for the year 1969/70.
- (v) Number of households according to 1961 Population Census.
- (vi) Whether the mouza is rural or urban.

The verified and up-dated lists were used as a frame for the selection of patwar circles and mouzas within the sample patwar circles. A specimen page of the mouza list is given in Appendix A. In unsettled areas of Baluchistan Province and Malakand Division of NWFP a complete list of killis/abadis was prepared since there is no concept of mouza as applicable in the settled areas. The sample in these areas was essentially a single stage sample of killis/abadis selected directly from the list for each sub-division.

##### C. Within-Mouza Frame

All the households in the sample mouzas were numbered and listed before census enumeration. In exceptionally large mouzas, listing of households was done only in sectors selected randomly. This list of households prepared in Form I served as the frame for the selection of households within mouzas. Households were treated as elementary units and clusters of contiguous households as sampling units. At the time of listing of households the total area owned by each household and the area taken from other owners for agricultural purposes was ascertained and recorded. Households having 50 or more heads of cattle, buffaloes or sheep/goats were also identified. On the basis of this information and by reference to the list of National Certainty Holdings the households were categorized as follows:

- |            |   |
|------------|---|
| Category 1 | National Certainty Holdings.  |
| Category 2 | Mouza Certainty Holdings comprising households having 50 or more acres of land owned or operated or 50 or more heads of livestock excluding any such household included in N.C.H. |
| Category 3 | All other households.   |



V. Sample Allocation

The allocation of work at different stages of the sample has been done not in accordance with the traditional optimum allocation formula but by taking account of the over-riding consideration of controlling non-sampling errors. Each sub-division was considered as the domain of study and a sample of patwar circles was selected from within each sub-division. The number of patwar circles to be selected from each sub-division was determined keeping in view the relative agricultural importance attached to various sub-divisions and the number of enumerators that could be reasonably trained. Patwar circles were selected in pairs within strata to facilitate the calculation of variances. As a rule, two mouzas were selected from each sample patwar circle. The allocation of sample patwar circles and the number of sample mouzas in each sub-division is give in Statement I.

Statement I. First and Second Stage Sampling Units and Size of Sample in Different Sub-Divisions

Sl. No.	Sub-Division	Total PCs	Sample PCs	Total Mouzas	Sample Mouzas
1	2	3	4	5	6
<u>N.W.F.P.</u>					
1.	Peshawar	89	26	271	47
2.	Charsada	67	24	205	51
3.	Nowshera	51	24	164	47
4.	Abbottabad	74	24	370	54
5.	Haripur	74	26	371	59
6.	Mansehra	75	26	351	58
7.	Betgram	19	15	60	29
8.	Mardan	57	26	169	52
9.	Swabi	69	25	158	37
10.	Kohat	43	26	174	60
11.	Hangu	21	14	51	23
12.	Kark	24	14	73	27
13.	Bannu	49	26	236	47
14.	Lakki Marwat	58	25	152	47
15.	D.I. Khan	55	25	296	47
16.	Kulachi	35	16	88	29
17.	Tank	30	15	86	27
Total:		890	377	3 275	752
<u>PUNJAB</u>					
1.	Attock*	85	26	295	55
2.	Talagang	49	14	102	31
3.	Pindigheb	61	14	156	29
4.	Rawalpindi	113	20	592	63
5.	Kahuta	43	14	289	36
6.	Murree	23	13	103	26
7.	Gujar Khan	74	14	384	33

\* including Tehsils Attock and Fateh Jang.

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Statement I. First and Second Stage Sampling Units and  
Size of Sample in Different Sub-Divisions (cont'd)

Sl. No.	Sub-Division	Total PCs	Sample PCs	Total Mouzas	Sample Mouzas
1	2	3	4	5	6
<u>PUNJAB</u> (cont'd)					
8.	Jhelum	80	14	461	38
9.	Pind Dadan Khan	66	14	232	36
10.	Chakwal	81	26	262	51
11.	Gujrat	88	26	547	57
12.	Kharian	70	26	544	60
13.	Phalia	103	26	441	58
14.	Mianwali	92	25	187	35
15.	Isa Khel	39	14	66	21
16.	Bhakkar	126	34	477	73
17.	Sargodha	58	26	297	53
18.	Shah Pur	73	24	265	56
19.	Bhalwal	76	26	285	51
20.	Khushab	106	29	320	62
21.	Jhang	119	28	447	60
22.	Shorkot	82	26	248	49
23.	Chiniot	90	28	360	64
24.	Lyallpur	56	30	268	61
25.	Toba Tek Singh	111	28	539	61
26.	Samundri	65	28	309	57
27.	Jaranwala	56	28	265	56
28.	Sialkot	86	26	627	61
29.	Narowal	100	28	601	62
30.	Shakargarh	113	28	746	64
31.	Daska	81	26	370	56
32.	Pasrur	83	26	623	57
33.	Lahore	87	30	369	65
34.	Kasur	72	28	320	64
35.	Chunian	68	29	333	65
36.	Gujranwala	133	28	573	65
37.	Wazirabad	60	14	262	31
38.	Hafizabad	89	28	422	61
39.	Sheikhupura	80	26	291	48
40.	Nankana Sahib	66	14	347	35
41.	Ferozewala	99	28	459	62
42.	Sahiwal	126	28	530	58
43.	Pak Pattan	142	28	694	65
44.	Okara	75	26	383	56
45.	Depal Pur	103	28	549	64

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Statement I. First and Second Stage Sampling Units and  
Size of Sample in Different Sub-Divisions (cont'd)

Sl. No.	Sub-Division	Total PCs	Sample PCs	Total Mouzas	Sample Mouzas
1	2	3	4	5	6
<u>PUNJAB</u> (cont'd)					
46.	Multan	100	27	334	58
47.	Khanewal	80	26	396	59
48.	Lodhran	95	28	436	55
49.	Shujabad	75	26	181	52
50.	Mailsi	62	26	309	56
51.	Kabir Wala	85	26	281	47
52.	Vehari	84	28	349	59
53.	Muzaffargarh	115	28	423	66
54.	Leiah	113	30	701	60
55.	Kot Adu	70	28	155	52
56.	Ali Pur	90	27	336	52
57.	D.G. Khan	95	28	265	54
58.	Jam Pur	51	14	180	28
59.	Rajan Pur	64	14	234	26
60.	Taunsa	45	14	195	33
61.	Bahawalpur	78	26	286	55
62.	Ahmad Pur East	47	14	187	28
63.	Hasil Pur	47	14	223	28
64.	Rahimyar Khan	65	28	322	62
65.	Liaqat Pur	37	14	245	31
66.	Sadiqabad	61	28	320	60
67.	Khanpur	47	24	261	51
68.	Bahawalnagar	45	24	244	52
69.	Chishtian	49	14	220	28
70.	Minchinabad	48	14	272	33
71.	Fort Abbas	36	14	163	28
72.	Haroonabad**	40	14	187	28
Total:		5 572	1 696	24 945	3 612

\*\* including Tehsils Haroonabad and Faqirwali.

SIND

1.	Hyderabad	13	13	84	26
2.	Badin	56	26	313	52
3.	Hala	39	14	210	32
4.	Tando Mohd Khan	62	28	321	58
5.	Thatta	31	14	255	34
6.	Shah Bunder	50	26	414	64
7.	Sanghar	57	27	192	55
8.	Shahdadpur	70	28	224	56

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Statement I. First and Second Stage Sampling Units and  
Size of Sample in Different Sub-Divisions (cont'd)

Sl. No.	Sub-Division	Total PCs	Sample PCs	Total Mouzas	Sample Mouzas
1	2	3	4	5	6
<u>SIND</u> (cont'd)					
9.	Dadu	110	30	308	62
10.	Sehwan	47	14	168	30
11.	Nara Valley	71	28	228	56
12.	Mirpurkhas	68	28	376	59
13.	Desert Mithi	45	26	166	51
14.	Khairpur	45	14	172	29
15.	Mir Wah	51	24	224	48
16.	Nawabshah	42	14	158	29
17.	Moro	69	26	173	52
18.	Naushero Feroze	72	26	186	52
19.	Sukkur	31	14	218	34
20.	Mirpur Mathelo	39	14	189	29
21.	Ghotki	33	14	187	34
22.	Shikarpur	48	14	195	30
23.	Larkana	46	24	186	50
24.	Kambar	33	14	134	31
25.	Shahdad Kot	30	14	147	28
26.	Jacobabad	28	14	118	29
27.	Kandh Kot	70	29	246	59
28.	Karachi	9	9	91	18
Total:		1 365	566	5 910	1 187

BALUCHISTAN (Settled area of Quetta Division only)

1.	Quetta	9		57	17
2.	Pishin	19		415	46
3.	Chaman	5		79	20
4.	Sibi	29		394	91
5.	Mari Bugti	34		429	58
6.	Loralai	24		384	64
7.	Duki Sinjawi	10		148	27
8.	Chagai	6		93	23
9.	Upper Zhob (Hindhugh)	10		158	28
10.	Lower Zhob (Fortsandeman)	7		157	18
Total:		153		2 314	392

## VI. Sample Selection Procedures

### A. Selection from National Certainty List

From the National Certainty List, all holdings in the enumerated sub-divisions were selected for enumeration. Those located in sample mouzas were enumerated by Patwaris concerned who acted as the Census enumerators. In non-sample mouzas, National Certainty holdings were enumerated by specially trained senior Revenue Department officers who also acted as Census supervisors.

### B. First Stage of Selection - Patwar Circles

The lists of patwar circles were first arranged geographically within Kanungo Circles for each Tehsil or Taluka. Where more than one Tehsil or Taluka constituted a sub-division, these too were in geographical order. In effect, this served to stratify the list geographically, since selection was to be done systematically.

A further refinement, used to control selection of urban patwar circles, was the device of placing all such circles at the head of the list in each sub-division. By the method of selection used as described below, this maintained a representable proportion of this type of patwar circles, which tend to have different agricultural as well as household characteristics than rural patwar circles.

Samples selected with probability proportional to size are nearly always more efficient than equal probability samples provided there is a positive relationship between the measure of size and the items being observed. For the Census of Agriculture, two components constituted the measure of size: acres of cultivated land and number of households.

Since the Agricultural Census relates primarily to land operations, cultivated acreage was considered an important criterion in measuring the importance of a mouza or patwar circle. Cultivated area of each mouza for the year 1969/70 was obtained directly from each Patwari.

In as much as the size of holdings is a joint function of the number of acres and number of households and the Agricultural Census consists of interviews of individual households, the number of households became the other measure of size for each mouza and patwar circle. The household count was obtained from the 1961 Population Census reports. While the information was ten year old, comparisons during pre-test inquiries revealed that these were well correlated with numbers of households to be found now.

Both measures of size were considered of about equal importance, so it was decided to use the geometric mean of the two, i.e. the square root of their product. This has the desirable attribute of reducing the effect of extreme values. Since, by definition, each unit in probability sampling must have a known probability other than zero, no values of zero were permitted to remain. In the case of households, a value of five was allocated to any mouza reported unoccupied during the 1961 Census. Where cultivated area data were not available, these were imputed based using the average relationship of number of households to cultivated area in the respective sub-divisions. In no case was a patwar circle given less than one-hundredth of the total measure of size of the sub-division. Otherwise, it would have a small probability of selection and, if selected, the raising factor would be so large that any abnormal observation would be greatly magnified, thus increasing sampling error.

Where a single patwar circle had a measure equal to or more than 90 percent of the sampling interval (total sub-division measure of size divided by the number of patwar circles to be selected) it was considered a certainty patwar circle and was excluded from the sub-division before calculating the final measures of size and the probabilities of selection. The number of non-certain patwar circles to be chosen was always an even number so that they could be chosen in pairs within strata for ease in variance calculations.

The measure of size of a patwar circle was the sum of the measures for all mouzas within the patwar circle. One can recognize that this does not ordinarily constitute the geometric mean of the patwar circle's cultivated area and number of households. However, in practice, the difference is very small and it becomes convenient for the sum of mouza probabilities within a patwar circle to be equal to the patwar circle's probability.

Once the cumulative measure of size was calculated for all the non-certain patwar circles, this was divided by the number of non-certain sample patwar circles allocated to the sub-division to find the sampling interval. The measure of size of each mouza was then divided by this interval to obtain a "probability of selection". By rounding adjustments, these were made to add up exactly to the number of non-certain patwar circles allocated. A pair of patwar circles was now to be selected from successive imaginary strata comprising consecutive patwar circles adding up to a probability of 2 000.

For the first sub-division to be sampled, a random number over zero and up to and including one was selected. The first patwar circle with cumulative probability equal to or greater than the random number was thus selected. Similarly, random number plus 1 000 selected the second patwar circle, random number plus 2 000 selected the third and so on until the allocated number of patwar circles was selected and at the same time the cumulative probability was exhausted. For example if the random number chosen was 0.235, the first patwar circle, whose cumulative probability equalled or exceeded 0.235 was selected. Similarly the first patwar circle whose cumulative probability equalled or exceeded 1.235 was the second patwar circle chose, and so forth. Thus a systematic selection was effected, assuring a relatively even geographical spread over the sub-division. The first and second selection patwar circles constituted the first stratum and the third and fourth selected patwar circles were considered the second stratum, and so forth, each certainty patwar circle constituting its own separate stratum. A page from the computer record of selection of patwar circles is reproduced below as an illustration of the process.

To maintain the control of selection of non-certain urban patwar circles, the mantissa of the cumulative probability of all such circles of the first sub-division was subtracted from the first random number, ignoring the integers, to determine the random number for the next sub-division. For example, if the random number was 0.235 and the cumulative probability of non-certainty urban patwar circles in that sub-division was 0.044 then the random start for the next sub-division would be 0.191. Had the cumulative probability been 0.496, then the next random start would be 0.739. The effect of this is to lower the random start number for the next sub-division if an urban patwar circle was not selected and increase the random number if it had been selected. Thus, over an entire province, the proportion of non-certain urban patwar circles will be close to their proportionate share of the total measure of size for the Province.

ILLUSTRATION OF SAMPLING PROCEDURES

STAGE I - SELECTION OF PATWAR CIRCLES

SUB-DIVISION CODE 215

(RANDOM START FOR THIS SUB-DIVISION IS 299 )

Kanungo Code	Patwar Code	Mouza Code	Culti-vated Area	Measure of Size	Probab-ility	Cumulative Probab-ility	House-holds	Raising Factor	Remarks
02	03	04	1814	986.055	.151		536	3.311	
02	03	02	1983	791.598	.121		316	4.132	
02	03	05	1574	713.023	.109		323	4.587	
02	03	01	1487	662.318	.101		295	4.950	
02	03	03	1433	579.070	.089		234	5.618	
PATWAR TOTAL			8291	3732.064	.571	10.867	1704		SELECTED
02	13	03	1790	711.737	.109		283	4.587	
02	13	05	2022	614.910	.094		187	5.319	
02	13	04	1740	611.637	.094		215	5.319	
02	13	06	1590	584.679	.089		215	5.618	
02	13	02	1590	575.083	.088		208	5.682	
02	13	01	1006	495.443	.076		244	6.579	
PATWAR TOTAL			9738	3593.489	.550	11.417	1352		SELECTED
02	12	03	1797	718.150	.110		287		
02	12	01	1486	647.342	.099		282		
02	12	04	1597	633.125	.097		251		
02	12	02	1206	520.913	.080		225		
02	12	06	1043	510.637	.078		250		
02	12	05	1137	446.066	.068		175		
PATWAR TOTAL			8266	3476.233	.532	11.949	1470		
02	02	02	1514	808.732	.124		432	4.032	
02	02	01	1650	702.389	.108		299	4.630	
02	02	04	1340	577.633	.088		249	5.682	
02	02	05	1037	514.232	.079		255	6.329	
02	02	03	845	359.562	.055		153	9.091	
02	02	06	506	198.666	.030		78	16.667	
PATWAR TOTAL			6892	3161.214	.484	12.433	1466		SELECTED

C. Second Stage of Selection - Mouzas

Once a patwar circle was selected the mouzas for that circle were listed in descending order of the measure of size. Probabilities were then re-calculated so that the sum of probabilities for all mouzas in the sample circle would be equal to two. The combined raising factor, from mouza to patwar circle - to half stratum, was also calculated. A mouza whose raising factor exceeded 24 in the Punjab, or 18 elsewhere, was merged with another mouza of same patwar circle so that the combined raising factor for the merger did not exceed the limits. In a few cases, even three or four mouzas had to be combined. The merging operation was also part of a computer programme. The step is illustrated in a copy of the computer record sheet reproduced below:

ILLUSTRATION OF SAMPLING PROCEDURES

SELECTION OF MOUZAS WITHIN SAMPLE PATWAR CIRCLES - MERGING STEP

SUB-DIVISION CODE 215

Kanungo Code	Patwar Code	Mouza Code	Culti- vated Area	Measure of Size	Probab- ility	House- holds	Raising Factor	Remarks
03	09	02	820	349.543	.054	149	9.259	
PATWAR TOTAL			9850	4081.586	.626	1699		
03	10	05	1944	754.713	.116	293	4.310	
03	10	06	1346	493.585	.076	181	6.589	
03	10	02	786	308.000	.047	121	10.638	
03	10	03	518	234.325	.036	106	13.889	
03	10	04	606	210.328	.032	73	15.625X	
03	10	01	373	94.615	.014	24	35.714X	
03	10	00	979	304.943	.046	97	10.870	MERGED 01 04
PATWAR TOTAL			5571	2095.566	.321	798		
03	11	01	8341	1994.657	.305	477	1.639	
03	11	02	1568	628.598	.096	252	5.208	
PATWAR TOTAL			9909	2623.255	.401	729		
03	12	02	2099	944.497	.145	425	3.448	
03	12	06	1261	601.587	.092	287	5.435	
03	12	01	1350	494.318	.076	181	6.579	
03	12	03	1021	480.360	.074	226	6.757	
03	12	05	1132	420.229	.064	156	7.813	
03	12	04	1002	377.206	.058	142	8.621	
PATWAR TOTAL			7865	3318.197	.509	1417		
03	16	04	2636	934.086	.143	331	3.497	
03	16	01	1253	489.207	.075	191	6.667	
03	16	05	1017	400.857	.061	158	8.197	
03	16	02	975	388.748	.060	155	8.333	
03	16	03	453	200.791	.031	89	16.129	
PATWAR TOTAL			6334	2413.689	.370	924		

After mergers, those mouzas or merged mouzas whose measure of size comprised half or more of the measure of size of the patwar circle, were considered certainty selections and assigned a probability of one. The remaining mouzas were assigned probabilities totalling to one. In this way, a mouza could only be selected once.

A random number over zero upto and including one was selected for each patwar circle and a systematic sample of two mouzas obtained from each sample patwar circle. In this way, a Patwari was more likely to avoid having to enumerate two large mouzas or two small mouzas. The fresh random start for each patwar circle was necessary due to the arraying of mouzas in each circle. Otherwise a very small random number would assure that the largest mouza in each patwar circle would be selected. It may be seen that when there were only one or two mouzas in a patwar circle they were selected with certainty and selection at this stage was involved only when there were three or more mouzas (after mergers) in a patwar circle.

The selection process was performed by a computer programme and a sheet from the computer record is reproduced below as an illustration:



ILLUSTRATION OF SAMPLING PROCEDURES

STAGE II - SELECTION OF MOUZAS WITHIN SAMPLE PATWAR CIRCLES

SUB-DIVISION CODE 201

Kanungo Code	Patwar Code	Mouza Code	Cultivated Area	Measure of Size	Probability within Tehsil	Probability within Patwar	Cumulative probability	Number of Households	Raising Factor	Remarks
RANDOM NUMBER FOR THIS PATWAR CIRCLE IS 710 FROM ROW 1 COLUMN 18										
05	09	01	3245	869.531	.164	.659	.659	233	3.035	
05	09	05	1665	535.145	.101	.404	1.063	172	4.950	SELECTED
05	09	02	1203	435.975	.082	.329	1.392	158	6.079	
05	09	04	1104	368.500	.070	.278	1.670	123	7.194	
05	09	03	791	278.421	.053	.210	1.880	98	19.524	SELECTED
05	09	06	748	159.474	.030	.120	2.000	34	16.667	
PATWAR TOTAL			8756	2647.046	.500	2.000		818		
RANDOM NUMBER FOR THIS PATWAR CIRCLE IS .654 FROM ROW 1 COLUMN 19										
05	11	02	4572	1544.857	.292	1.000	1.000	522	2.353	SELECTED
05	11	01	1835	702.577	.133	1.000	2.000	269	2.353	SELECTED
PATWAR TOTAL			6407	2247.434	.425	2.000		791		
RANDOM NUMBER FOR THIS PATWAR CIRCLE IS .499 FROM ROW 1 COLUMN 20										
05	15	02	2907	885.940	.167	1.000	1.000	270	3.322	SELECTED
05	15	05	912	254.464	.048	.434	1.434	71	7.655	
05	15	03	438	189.515	.036	.238	1.672	82	13.959	SELECTED
05	15	04	461	140.794	.027	.177	1.849	43	18.770	
05	15	01	381	120.325	.023	.151	2.000	38	22.002	
PATWAR TOTAL			5099	1591.038	.301	2.000		504		
RANDOM NUMBER FOR THIS PATWAR CIRCLE IS .012 FROM ROW 1 COLUMN 21										
05	19	05	1960	735.500	.139	1.000	1.000	276	5.208	SELECTED
05	19	03	485	139.284	.026			40	19.231X	
05	19	02	399	95.797	.018			23	27.778X	
05	19	01	107	27.368	.005			7	108.000X	
05	19	04	71	18.841	.004			5	125.000X	
05	19	00	470	114.638	.022	.672	1.672	28	7.750	SELECTED
05	19	00	592	166.652	.031	.328	2.000	47	15.879	MERGED 04 02
PATWAR TOTAL			3022	1016.790	.192	2.000		351		MERGED 01 03

X Mouzas merged with others and not to be considered separately for selection.

D. Sub-sectoring of Large Mouzas

In mouzas having a large expected number of households (generally 700 or more), an extra selection stage was introduced by dividing them into sub-sectors and choosing from sub-sectors for listing of households and sub-selection.

Sub-sectoring is necessary and in fact desirable for large mouzas in which the time required for complete listing of households may wipe out all or most of the time available for census operations, thus jeopardizing the enumeration in patwar circles concerned. Usually, such large mouzas had been selected with very high probability and the introduction of this additional sampling stage did not push the resultant raising factor beyond limit. On the other hand a better quality of house numbering and listing could be ensured when listing operations were restricted to a reasonably small portion of the mouza. Sub-sectoring of large mouzas was, therefore, adopted as the standard technique to even out the work load of the Patwaris as census enumerators.

Several months before the census was scheduled to begin, tehsil offices were requested to detail the concerned Patwaris of the large mouzas to prepare detailed mouza maps showing landmarks and identifiable boundaries within the mouza, and estimating the number of households in each sub-sector. The maps were checked for completeness and unsuitable maps were returned to tehsil headquarters for correction. Sub-selection was performed at the Census Headquarters on a specially designed form, by trained statistical staff. Each sub-sector was assigned weight proportional to the estimated number of households in each sub-sector, and then one or two sub-sectors were selected randomly with probability proportional to this size. The selected sector or sectors were clearly marked and delineated on the mouza map. The Patwari, at census time, was assigned only the selected sub-sector for listing of households.

In forming sub-sectors within a mouza, a common practice was to combine blocks in different parts of the mouza, so that the combined number of households in each sub-sector was large enough to give it at least the minimum weight required to keep the raising factor within limits. For instance, if a mouza was divided into six unequal sectors with relative weight units varying from 1 to 3 per sector and totalling 10, then the smallest of these sub-sectors would have a one-tenth probability of selection which would be acceptable if the original probability of selection of the mouza was no less than  $\frac{1}{2.4}$  in the Punjab or  $\frac{1}{1.8}$  elsewhere. But if the original probability was lower than that, the sub-sectors had to be further combined to increase the lowest probability of selection of any sub-sector to the adequate level. This procedure tended to lower the sampling variance for this stage and gave some basis for estimating the between sub-sector component.

The sampling fraction used at the additional stage of selection of sub-sectors was recorded on Form 9-P for inclusion in the overall raising factor for those mouzas.

#### E. Third Stage of Selection - Households within Mouzas

Analysis of pre-test results had shown how substantial a reduction in sampling variance would be achieved if large holdings of land and livestock were included with certainty at the sample mouza level.

At the time of listing each household in the sample mouza, the Patwari recorded the number of acres owned by the household and area of land taken from others for agricultural purposes on Form I. If either of these items equalled or exceeded fifty acres, and the household was not already designated a National Certainty Holding (NCH), it was classified as a Mouza Certainty Holding (MCH) and was selected with certainty. For a few mouzas in barani areas, in which an excessive number of holdings of fifty acres or above were encountered, this limit was raised to avoid having an excessive proportion of mouza certainty holdings. Besides, the enumerators ascertained and recorded the households with 50 or more heads of livestock, and such households were also designated as Mouza Certainly Holdings.

The extent to which a sample of clusters of households is less efficient than a systematic sample of the same number of households, was brought out by pre-test analyses. The results also illustrated that sampling variance increased as the size of cluster increased. But from a stand-point of controlling non-sampling errors, it was argued that

the cluster approach might be superior as it would facilitate the identification and enumeration of sample households and supervision of field operations. The cluster approach also afforded better chance of catching houses or households omitted during listing.

In analyzing pre-test results, actual within-mouza relative variances were computed for area operated and number of livestock held for clusters of maximum size of 10, 20, 30 and 50 households. Average for West Pakistan test areas were:

Maximum Number of Households per Cluster	Relative Variances			
	Excluding MCHs		Including MCHs	
	Area operated	Livestock held	Area operated	Livestock held
10	2.79	1.76	9.22	4.56
20	3.66	2.31	10.53	5.02
30	4.40	2.62	11.82	6.73
50	5.13	3.09	13.03	6.91

The advantage of taking large holdings with certainty (MCHs) is immediately apparent. A sample of clusters of 30 households excluding MCHs shows less than half the net-variance of a sample of clusters of size ten without MCHs being removed. While the smallest size cluster (10 H.H.) yields the lowest net-variance, a cluster of that size would take away the advantages of controlling non-sampling errors through fewer cluster locations. A cluster of size thirty was considered to be the best balance.

No sub-sampling was to be done if the number of households did not exceed 75 in one mouza or 180 in both sample mouzas of the patwar circle. In such cases, all households within the mouza or mouzas were enumerated.

A minimum sampling rate for the third stage of selection was imposed so that a household was not to represent any more than 24 in the population in the Punjab and 18 elsewhere.

In the list of sample mouzas (Form 6), the Census Training Assistants, who were to do sub-sampling in the field, were given guidance in determining cluster requirements by information provided in columns 7 through 10. Four clusters per patwar circle and two clusters per mouza was considered as the minimum desirable work load for an enumerator but the number of clusters suggested to be taken in any mouza was based on the overall raising factor of the mouza, the limit fixed for no sub-sampling and the expected number of households. This number of clusters suggested was listed as "C" under column (7) and the maximum number of households for which this number would remain valid was shown as "MAX 1" in column (8). In the next column (9), the next higher number of clusters was shown as "C+1" with its limit of households, "MAX 2" shown in column (10). A page from Form 6 is reproduced below as an illustration.

If the listed number of households exceeded "MAX 2", the CTA was to project linearly by adding the difference of "MAX 2" and "MAX 1" to "MAX 2" to obtain "MAX 3", for which C+2 number of clusters would be required, and so on. As a rule, no more than eight clusters were to be selected in a patwar circle but exceptions were made when a mouza selected with a relatively low probability was found to be much larger than the expected number of households and consequently more than eight clusters were required to be taken to keep the overall raising factor within limits. In such cases an additional enumerator was provided in the patwar circle to cope with the extraordinary volume of work.

ILLUSTRATION OF SAMPLING PROCEDURES

METHOD OF DETERMINING WITHIN-MOUZA SAMPLING FRACTIONS

FORM No. 6

LIST OF SELECTED MOUZAS: PUNJAB

TEHSIL: SHUJABAD

CODE: 248

Patwar Circle	H.SL	Name of Mouza	H.B. No.	H.H.	R.F.	C	MAX 1	C + 1	MAX 2
1	2	3	4	5	6	7	8	9	10
MOTHA	39	MOTHA	61	458	2.481	5	1440	6	1740
KANUN	40	KANUN	68	413	2.012	2	690	3	1050
	41	BASTI LONG	66	312	2.012	2	690	3	1050
KHAN BELA	42	KHAN BELA	42	580	2.268	2	630	3	930
	43	BET MUGHAL	40	240	2.268	2	630	3	930
SHEHNI	44	SHEHNI	43	534	2.849	5	1230	6	1470
LANGAR	45	DARAB PUR	46	902	1.366	2	1050	3	1560
	46	LANGAR	47	145	1.366MI				
	47	DAULAT PUR	45	19	1.366MI	2	1050	3	1560
SHUJAT PUR	48	SHUJAT PUR	49	803	1.848	5	1920	6	2280
KANUNGO CIRCLE:		ABADI JALAL PUR PIR							
KARAM ALI WALA	49	KARAM ALI WALA	94	249	2.714	2	510	3	780
	50	HOOT WALA	93	366	1.930	2	720	3	1110
BOHAR	51	BOHAR	77	140	4.753	2	300	3	450
	52	BAMB	95	229	3.661	2	390	3	570

A systematic cluster selection was considered desirable since this, in effect, "spreads" out the sample over the mouza, thus increasing representativeness, and thus lowering the sampling variability between clusters. It prevents the occurrence, as could happen in simple random selection, of having three adjacent clusters chosen, which in reality would be one cluster of size ninety.

The accomplishment of the systematic selection, however, posed a problem. Unless the designated number of clusters was a simple fraction of the total clusters in the mouza, the number of clusters actually selected would vary according to the random number chosen, although each cluster would still have an equal chance of selection. To avoid this, one could change the cluster size to make total clusters and even multiple of the number required but this would then be undesirable from sampling point of view.

The solution found was to retain the cluster size as a maximum of 30 and to arrange a number of acceptable systematic patterns for a given number of total clusters in such a way that each cluster had equal chance of selection. A Form Number 7 was developed as an aid for quick selection of clusters by selecting one systematic pattern randomly. For this purpose, a random number between one and the total number of clusters was chosen to determine the pattern selected under the appropriate column showing the required number of clusters. A page from Form 7 is reproduced below as an illustration.

SYSTEMATIC CLUSTER SELECTION TABLES

FORM No. 7

Page 1

Holdings in Mouza	Total Clusters in Mouza	Random Numbers	Systematic Sample Grouping When Selecting				
			Two	Three	Four	Five	Six
76-90	3	1	1 2	-	-	-	-
		2	1 3	-	-	-	-
		3	2 3	-	-	-	-
91-120	4	1	1 3	1 2 3	-	-	-
		2	1 3	1 2 4	-	-	-
		3	2 4	1 3 4	-	-	-
		4	2 4	2 3 4	-	-	-
121-150	5	1	1 3	1 2 4	1 2 3 4	-	-
		2	1 4	1 3 4	1 2 3 5	-	-
		3	2 4	1 3 5	1 2 4 5	-	-
		4	2 5	2 3 5	1 3 4 5	-	-
		5	3 5	2 4 5	2 3 4 5	-	-
151-180	6	1	1 4	1 3 5	1 2 4 5	1 2 3 4 5	-
		2	1 4	1 3 5	1 2 4 5	1 2 3 4 6	-
		3	2 5	1 3 5	1 3 4 6	1 2 3 5 6	-
		4	2 5	2 4 6	1 3 4 6	1 2 4 5 6	-
		5	3 6	2 4 6	2 3 5 6	1 3 4 5 6	-
		6	3 6	2 4 6	2 3 5 6	2 3 4 5 6	-
181-210	7	1	1 4	1 3 5	1 2 4 6	1 2 3 5 6	1 2 3 4 5 6
		2	1 5	1 3 6	1 3 4 6	1 2 4 5 6	1 2 3 4 5 7
		3	2 5	1 4 6	1 3 5 6	1 2 4 5 7	1 2 3 4 6 7
		4	2 6	2 4 6	1 3 5 7	1 3 4 5 7	1 2 3 5 6 7
		5	3 6	2 4 7	2 3 5 7	1 3 4 6 7	1 2 4 5 6 7
		6	3 7	2 5 7	2 4 5 7	2 3 4 6 7	1 3 4 5 6 7
		7	4 7	3 5 7	2 4 6 7	2 3 5 6 7	2 3 4 5 6 7
211-240	8	1	1 5	1 3 6	1 3 5 7	1 2 4 5 7	1 2 3 5 6 7
		2	1 5	1 4 6	1 3 5 7	1 2 4 6 7	1 2 3 5 6 7
		3	2 6	1 4 7	1 3 5 7	1 3 4 6 7	1 2 4 5 6 8
		4	2 6	2 4 7	1 3 5 7	1 3 4 6 8	1 2 4 5 6 8
		5	3 7	2 5 7	2 4 6 8	1 3 5 6 8	1 3 4 5 7 8
		6	3 7	2 5 8	2 4 6 8	2 3 5 6 8	1 3 4 5 7 8
		7	4 8	3 5 8	2 4 6 8	2 3 5 7 8	2 3 4 6 7 8
		8	4 8	3 6 8	2 4 6 8	2 4 5 7 8	2 3 4 6 7 8
241-270	9	1	1 5	1 4 7	1 3 5 7	1 2 4 6 8	1 2 4 5 7 8
		2	1 6	1 4 7	1 3 5 8	1 3 4 6 8	1 2 4 5 7 8
		3	2 6	1 4 7	1 3 6 8	1 3 5 6 8	1 2 4 5 7 8
		4	2 7	2 5 8	1 4 6 8	1 3 5 7 8	1 3 4 6 7 9
		5	3 7	2 5 8	2 4 6 8	1 3 5 7 9	1 3 4 6 7 9
		6	3 8	2 5 8	2 4 6 9	2 3 5 7 9	1 3 4 6 7 9
		7	4 8	3 6 9	2 4 7 9	2 4 5 7 9	2 3 5 6 8 9
		8	4 9	3 6 9	2 5 7 9	2 4 6 7 9	2 3 5 6 8 9
		9	5 9	3 6 9	3 5 7 9	2 4 6 8 9	2 3 5 6 8 9

To determine the total number of clusters in a mouza, the number of households in the mouza was divided by thirty and if there was any remainder the quotient was rounded up to the next higher digit. The minimum number of households in each cluster was determined by dividing the total number of households by the total number of clusters. Any remaining households were allocated one each to the clusters in serial order. For example with 153 households, this would be  $\frac{153}{30} = 5 \frac{3}{30} = 6$  clusters. Then  $153 \div 6 = 25 \frac{3}{6}$ . The first three clusters would contain 26 households each and the last three 25 each. In practice the field staff did not have to make these calculations as the total clusters in mouzas with different numbers of households were indicated in Form 7 while Form 8 was designed to show the inclusive household serial numbers for each cluster in a mouza of given size

One refinement introduced to allay fears and suspicions was to specify that all households in a house would either be selected or not selected. Otherwise, persons would fail to understand why one household in a house would be omitted while another was included. To accomplish the objective of designating houses to be excluded and included, a simple rule was established: all households in the same house in which the first designated household in a cluster was located, were to be included in the cluster; and if the house containing the last designated household of a selected cluster included any non-selected households, then all households in that structure were to be omitted. Form 9-C was designed to assist in and record the step by step process of selection of clusters and determination of the households to be enumerated as part of selected clusters.

It may be mentioned here that the cluster formation was done without regard to the N C H and M C H but it was pre-determined that any N C H or M C H included in a sample cluster would not constitute a part of the cluster. After formation of the clusters, the N C H, M C H and households designated as part of sample clusters were given a running serial number called Serial Number of Selected Households in the Listing Sheet (Form 1) which was returned to the enumerators with instructions to go to the selected households and enumerate them.

#### F. Post-Selection Modifications

Some changes in frames are commonly encountered after selections are made, which must be accommodated. In this case, despite the extensive checking of lists, there were instances of mouzas belonging to patwar circles other than ones in which they were drawn. In such cases, the mouzas were assigned to the concerned Patwaris for enumeration, but for sampling purposes they were treated as belonging to the respective sample patwar circles in which they had their probabilities of selection. If some National Certainty Holdings (NCH) and Mouza Certainty Holdings (MCH) were found to be smaller than the minimum size fixed for them, they were still treated as certainty holdings and their category was not changed. Similarly, if a holding at the time of listing did not qualify as Mouza Certainty Holding it remained in category 3 even when its size at the time of actual enumeration was found to be larger than the minimum necessary to qualify it as MCH. In other words the categorization of the holdings at the time of their selection was retained intact.

More complicated was the situation of two selected mouzas found to be physically unseparable from two non-selected mouzas on account of common abadi-deh. Since there was no practical way of separating the mouzas, the whole area comprising four mouzas was treated as a unit and it was considered that it could have been selected if either of the other two mouzas had been chosen. Therefore, the commingled group was given the combined probability of selection of the four mouzas and the next stage of selection could, therefore, be at a smaller rate while still keeping the overall raising factor within permissible limits.

Several instances were encountered in which prior to actual listing the Patwaris grossly over-estimated the number of households in some mouzas, evidently to assure that sub-selection would take place resulting in reduced amount of work. Later on, when listing took place in the selected sub-sectors, there were so few actual households that the required number of clusters were sometimes not available, and worse yet, the probabilities of selection based on the estimated number of households would bear little resemblance to those that should have occurred. This would not introduce any bias, but would increase the sampling variance. To prevent this, a rule was established that whenever the number of households listed in a selected sub-sector was less than 60 percent of the number estimated by the Patwari (upon which the sub-sector's selection was based) the sub-sector selection was voided and new information was obtained which usually led to complete listing in the mouza or a fresh sub-sample of sectors from an up-dated and improved sketch map.

It was discovered that some mouzas comprised two distinct areas, a rural portion and an urban area. Naturally, the rural area is of more importance for an agricultural census than the urban portion, so it was decided to stratify such mouzas and to use a higher sampling rate in the rural part than in the urban part - the two sub-selections being accomplished independently. This usually allowed the rural area listing and enumeration to proceed first leaving the less important and more tedious urban portion to follow. Enumeration forms belonging to the two portions were separately identified and the proper raising factors used as applicable.

In listing houses serially, there is always a danger of overlooking some house. To cope with such a possibility, the enumerators were instructed to use the "half-open interval" survey procedures. Any time an unnumbered structure was encountered within the sequence of a cluster, all households contained in it were included in the sample. To cover structures at starting end of the cluster, the enumerator was told to locate the highest structure number of the next previous cluster, and, if he encountered any unnumbered structure on the way, all households therein would be enumerated. On the other side of the cluster, however, no such inclusion would be made. In that way, the households of a missed structure would be uniquely associated with only one cluster, and would have the same probability of selection.

A slightly different problem occurred when structures were found in an isolated portion of a mouza, usually after the selection process. If they could not be associated with any cluster, they were listed at the end of list of households and taken as mouza certainty holdings with probability of selection the same as MCH holdings.

Joint holdings, more than one household sharing in one holding, posed a different problem. Since the probability of selection of such a holding was the sum of the probabilities of the selection of the involved households, the raising factor of such a holding had to be adjusted. This was done by multiplying the raising factor by the number of households of the joint holding selected in the sample, and dividing by the total number of households involved. This applied only to those parts of the census questionnaire which pertained the joint holding and its operation. Characteristics of each household, however, were raised by the inverse of the probability of its selection.

There were some cases, specially of urban and semi-urban mouzas, which had been purposely given relatively low probability of selection by arbitrarily reducing their number of households and thereby their measure of size. Subsequently at the time of household listing the number of households in these units were found to be much larger than expected with the result that the workload limit of 8 clusters per patwar circle had to be thrown away and additional enumerators had to be provided to enumerate the number of clusters necessary for keeping the raising factor within limits.

ANNEX IV

USE OF SAMPLING METHODS IN THE CENSUSES OF AGRICULTURE IN LATIN AMERICA<sup>1/</sup>

Introduction

Many countries are now using sampling methods in the undertaking of their recent censuses of agriculture. The increase in the number of countries in the world which have taken the census of agriculture is due exclusively to the use of sampling methods. This is perhaps the result of the continued and intensified efforts of FAO in promoting and in providing assistance in the use of sampling methods in the previous censuses of agriculture. The Programme for the 1960 World Census of Agriculture gives more emphasis on the uses of sampling methods and on the purposes for which sampling can be used. This new emphasis in the Programme was followed by a programme of promotion of the uses of sampling methods through training centres, seminars and through the experts made available to the countries by the international and bilateral technical assistance projects. This promotional programme had a considerable impact on the subsequent development and improvement of census methodology. The 1970 Programme for the World Census of Agriculture has elaborated in a more specific way the advantages of sampling methods and the areas of their uses. This contributed to the development of a flexible census methodology which has made possible census taking in countries where it would not have been possible otherwise. In addition, the use of sampling methods made possible better preparation of censuses on the basis of pre-testing and the achievement of more accurate results on the basis of quality checks and the experimentation related to choice of working methods.

A review was made in early 1969 of countries in Latin America regarding the preparation and progress of the censuses of agriculture within the framework of the 1970 Programme. The result of the review indicated that out of 19 countries planning to take and/or are in the process of undertaking the census of agriculture, 16 reported the use of sampling methods in any form. The names of the countries in Latin America and the uses of sampling methods in the census of agriculture are shown in the following table.

Use of sampling in agricultural census by FAO Member Countries

Countries	As a substitute for complete enumeration	Pilot census	Broadening the scope of the census	Broadening the scope of tabulation of the programme	Advance estimates of census results	Checking the quality of the field work	Checking the quality of the processing
Argentina	-	x	-	-	x	x	x
Bolivia	-	x	-	-	-	-	-
Brazil	x <sup>2/</sup>	x	x	x	x	-	-
Colombia	-	x	x	-	x	x	-
Costa Rica	-	-	x	x	x	x	x
Dominican Republic	-	-	-	-	-	x	x
El Salvador	-	-	-	-	x	x	-
Guyana	-	x	-	-	-	-	-
Honduras	x	-	x	-	x	x	x
Mexico	x	-	x	-	x	x	-
Panama	-	-	x	-	x	x	x
Paraguay	-	x	-	-	-	x	-
Puerto Rico	-	-	-	-	-	x	x
Trinidad and Tobago	x	-	x	-	-	-	-
Venezuela	-	-	x	-	x	x	x
Virgin Islands (U.S.A.)	-	-	-	-	-	x	x

<sup>1/</sup> FAO : Paper presented at the XII Session of COINS, Lima, Peru, 11-18 November 1975.

<sup>2/</sup> Only for holdings under 10 ha.



The Programme for the 1980 World Census of Agriculture has also underlined the importance of utilizing sampling methods in carrying out the census of agriculture. For this reason the basic uses of sampling methods in connection with the census of agriculture are briefly described in a separate chapter called "Guidelines for the taking of a Census of Agriculture" of the 1980 Programme. These range from the taking of the whole census on a sampling basis instead of complete enumeration to the application of these methods at various stages of a complete enumeration census.

In general the countries using sampling methods in their censuses of agriculture are the countries where the conditions for statistical work are very difficult. In most cases the farm operators in these countries are not able to co-operate with census enumerators because they were not aware of the standard units of area, weight, length, etc. and could not express themselves in a way that would be meaningful to the enumerators. In addition to this, there are other difficulties like transport, recruitment of sufficient number of qualified enumerators, etc. The limited resources available in these countries in terms of money and trained personnel are the main reason for using sampling methods in their census of agriculture.

Even if these countries can afford or have to undertake the census of agriculture on a complete enumeration basis for compliance with a legal obligation or for providing information at the level of the smallest administrative division and for minor crops or for establishing an inventory for agriculture for future use, it will be still necessary to use sampling methods for other purposes for a better control of the operations of the census of agriculture. Such operations as pre-testing of questionnaires, checking the quality of data, determining the extent of incompleteness of census count, have necessarily to be undertaken on the basis of probability sample. Also where computer facilities are not readily available tables needed urgently by the Government could be processed on the basis of a sample of the data. Because of the inability of the farmers to provide data needed it was necessary to introduce the use of objective techniques. As this involves equipment and necessitates transport, there was no alternative to a reduction of the size of a large-scale census operation by using sampling methods.

Control of errors due to faulty response can be better organized in a sample census. As a matter of fact, control of non-sampling errors including that of non-response is only possible using sampling methods. Thus even though a census may have been planned on the basis of a complete count, sampling methods shall have to be used for controlling the census operations and of the errors of the data under collection and processing. In order to carry out these tasks efficiently there is need of highly qualified persons for designing the sampling plans and its implementation. It will be necessary to give adequate training to persons responsible for supervising the various operations in the use of sampling methods. Often it is necessary to find a solution in a situation where the proposed sampling plan could not be undertaken as such, but resulted in significant deviations from the original plan. The situation may be one where the resulting executed sampling plan becomes one which ceased to have a probability basis. This particularly happens when units other than selected sampling units are canvassed by mistake or if some of the originally selected units do not respond. Thus the use of sampling methods in some form is necessary for successfully completing the work of an agricultural census.

#### Choice of sampling designs

The sample design has to be one which is optimum for the study of multiple characters and multiple census operations. An optimum design perhaps does not exist unless one puts certain restrictions on the overall requirements of accuracy. But a reasonably good design will depend upon the resources available, especially funds and trained personnel, the desired accuracy of estimates of principal characters, taking into account the seriousness of the various problems indicated in the introduction. It is also necessary that the sample design is simple enough to operate in the field with the help of the available personnel. One experience indicates that it is difficult to make adjustments for significant deviations from the sample design specially if this happens to occur in case the sample design is not simple. Also the size of the sample has to be fixed at an adequate level but capable of

being executed within the time limit prescribed for the particular census operation. It is also necessary to estimate the cost of executing the various individual sample designs for various census operations beginning with the one for testing the incompleteness of the frame and ending with that for processing the data. The total cost and requirements of personnel and other facilities required for their operation should be clearly indicated and a definite approval of the Government obtained for incurring this expenditure. In case funds and other resources required are much beyond the capacity of the country, the sampling designs have to be adjusted within the resources available, indicating to the authorities the type of results expected to be achieved by the change in the design.

There is no doubt as to the desirability of encouraging the use of sampling methods in censuses of agriculture. However, such should not result in a tremendous reduction in the volume of information which is usually achieved through complete enumeration operations and that the sampling design does not complicate the field operation so much so that nothing much is gained over the usual total interview approach. In spite of the use of sampling, censuses of agriculture should still provide for the basic structural information on the agricultural activities of any country. Traditionally, censuses of agriculture have been the principal sources of information not usually expected to be covered in a general crop and livestock survey. This should still be the primary aim of censuses of agriculture. Hence, the sampling design should be so structured as to retain such primary aim of censuses of agriculture.

The choice of the method to be used for the delineation or formation of strata for sampling purposes is now-a-days becoming more of a question of availability of facilities for computation rather than that of the availability of data. The accessibility of electronic computer has encouraged the use of more elaborate methods of delineating strata. For purposes of agricultural censuses two types of stratification schemes using two or more variables are commonly encountered in the field. One type is a scheme of a series of stratification using different variables at every stage of the stratification process. The second is a single stratification scheme based on the combination of two or more variables involving the rotations of the correlation matrices of these variables. The sampling design contemplated for the next census of agriculture in Uruguay is of this type. Results of a case study of this scheme using two departments, San José and Tacuarembó in Uruguay, showed that stratification based on the combination of two variables seems to be satisfactory for the purpose of an agricultural census, specially so if one of the variables used is a measure of intensity of cultivation and the other of extensiveness of cultivation.

In the choice of the sample design the nature and extent of experience already available in the country has to be taken into account. Much simpler designs have to be recommended for countries which have practically no experience in conducting sample surveys on a scientific basis.

#### Some uses of Sampling Methods in a few Latin American Countries

In designing their sample censuses the countries' aim is to reduce the burden imposed by various difficulties. Reduction of the size of the operation is obtained by using relatively small samples. However, with small samples one cannot hope to provide satisfactory data for a demand which is continuously increasing in standards. Obviously a further progress in census taking would need to go into a rationalized increase of the size of the sample by considering not only the efficiency of the design but also the resources, personnel, etc.

One popular application of sampling methods is the preparation of advance estimates. Advance estimates may be prepared in the case of both the sample censuses and the complete enumeration censuses. In sample censuses a sub-sample is selected from the main sample and the corresponding data are tabulated. One reason for the use of sampling methods for the preparation of advance estimates even in the case of sample censuses is probably due to tabulation difficulties caused by lack of adequate equipment or qualified staff. The 1974 census of agriculture in Honduras was carried out by complete enumeration, but

provisional results were obtained through a sample of the cards. With the purpose of obtaining advance results of the census of agriculture, in Panama, a sample was taken consisting of about 23 percent of the enumerated holdings. The sample included 1/5 of small holdings systematically selected from each province, and all large holdings. The large holdings gave a very high contribution with respect to the other holdings regarding total area of holding, total area sown for rice, total area sown for maize, area sown for sugarcane, number of coffee trees, number of cattle, number of pigs and number of poultry. Mexico did not utilize sampling methods to obtain advance census results although all the work for sampling had been carried out up to the stage of the physical separation of the sampled questionnaires. Because of the change in a number of census personnel and some other administrative reasons, it was decided to process the complete census data. Later, sampling was carried out as an experiment to obtain advance estimates of census results and thus gain experience for the 1980 Census of Agriculture.

Another application of sampling methods is the use of auxiliary sample census. According to this technique the population of agricultural holdings is divided up into at least two parts. One part containing the large holdings is enumerated completely as more detailed information is needed on holdings which contribute the major part of census totals. The other parts consisting of small holdings is sampled to receive data on these groups which normally contain a large number of small holdings. This technique is used because it reduces the size of the main census operations to the large holdings while less attention is paid to small holdings. Small holdings generally have a low income and are often very active in fields other than agriculture. It is therefore considered that not much is lost in terms of information about agriculture if only a sample of these holdings is undertaken for study. The census of agriculture of Trinidad and Tobago consisted of two main phases: a) complete enumeration of holdings of ten acres and over, listed from the land register; b) enumeration of a sample of holdings not included in the first phase. This consisted mainly of holdings under ten acres, and also included holdings of ten or more acres omitted in the first phase. Holdings under one acre were only included if one-eighth of an acre was cultivated. Thus holdings under one acre which were purely residential or for business were excluded. In addition, persons who had no land holding were enumerated as holders if they kept one or more heads of livestock or twelve or more heads of poultry of two weeks old and over. The sample was collected in the following way: a sample of 50 percent of the enumeration districts was taken and all the holdings of less than ten acres were enumerated by means of a simple questionnaire. Then, to one in every three holdings, a more detailed questionnaire was applied. The enumeration districts were selected with probability proportional to the expected number of holdings. This technique was also applied in the Mexican census of agriculture. For example, the agricultural holding in the private sector was stratified into three strata. All holdings having area more than 50 hectares belonged to stratum A; all holdings having area between 5 and 50 hectares belonged to stratum B; and all holdings with area less than 5 hectares belonged to stratum C. It was decided to take a complete enumeration of stratum A, ten percent and one percent of stratum B and stratum C respectively.

Another use of sampling methods was the systematic quality checking of data collected in the census of agriculture. One reason for using sampling methods was the desire to get quantitative estimates of the quality. Another reason was that sample checks of individual units show the sources of errors. Sample checks of the quality of census data indicate not only the deficiencies in the methods of work but also indicate the direction where the improvements are needed. In the census of agriculture of Honduras the verification of the punched cards was undertaken on the basis of a ten percent sample of all the cards. The evaluation of the 1974 census of agriculture in Ecuador was undertaken on a sampling basis. The principal objectives of this evaluation are to measure the precision of a) total number of holdings, b) total area of holdings and c) total number of cattle. Because of communication problems and cost considerations, the four oriental provinces and the new province of Galapagos were excluded from this evaluation. The rest of the provinces were grouped into eleven domains of study. In one domain the indigenous people offered a lot of resistance to the census activities during the enumeration period. Therefore only important holdings were considered in this domain. For the other domains two sampling

designs were used: list sampling for important holdings and two-stage stratified cluster sampling for small and medium size holdings. For every domain a list of holdings was prepared which had reported 200 hectares or more of total area. From this list all holdings reporting 500 hectares or more were taken for evaluation and only 50 percent of the remaining ones. For the evaluation of small and medium size holdings all the census sectors were grouped so as to form primary sampling units (PSU) each containing around 80 households. These PSUs were ordered according to geographical location and type of agricultural activity as far as possible. Then from each domain a systematic sample of 20 PSUs was selected with random start. The second stage sampling units are holdings. The evaluators were instructed to stratify the holdings in each PSU into four strata and a sub-sample was taken for evaluation. Problems were encountered and it is quite possible that the data reported does not correspond to reality. The holders are afraid of taxes or that the government may take away their lands or cattle. As already mentioned there was some resistance in the central provinces to census activities during the enumeration period. Also many varying units of measurement of area and weights were encountered. Sufficient publicity was made before and during the period of enumeration using all media of communication to gain the confidence of the people. In spite of this the fears of the population were not entirely removed. The problem of the central provinces was solved to some extent by using the services of sociologists. In some cases where the indigenous population were reluctant to disclose individual information only one questionnaire was used for the whole community. The problem of different measures of area, etc. was solved by noting the replies in the units which the informants considered easiest for them to give at the time of enumeration. At the same time information was collected regarding equivalents of these measures in standard terms.

The use of sampling methods enabled the utilization of broader census programmes either by collecting some data from a sample of holdings or by splitting up the programme and collecting data on the various parts at different times during or after the census enumeration. Sampling also introduced the innovation that data on different characteristics can be collected by different methods and even at different convenient times. For example, in some countries area data are obtained by measurement at one time, yield data are obtained through crop-cutting at another time, and other data at some particularly suitable time. Investigation about mixed and associated crops was investigated using sampling methods in the complete enumeration census of agriculture in Ecuador. The practice of cultivating different crops simultaneously on the same piece of land is quite common in this country, and it becomes quite difficult to ascertain the proportion of the total area to be ascribed to each component crop. In the census returns the enumerators were required to note the gross area under the mixture and at the same time to note the name of each component crop. The same method was to be used whether the crops were mixed or associated. The investigation by sampling regarding mixed and associated crops was carried out by the supervisors during the period of census enumeration. The objective of the investigation was to determine the coefficients for ascertaining the areas to be ascribed to each component of the mixture or association. At the same time it would also oblige the supervisor to visit the work of each enumerator and thus ensure better supervision. A very simple sampling design was used for this purpose. Each supervisor was required to select a sample of holders at the rate of one in 25 systematically with a random start in each of the areas of enumeration under his charge, from amongst the completed census questionnaires and data collected on areas sown, quantities of seeds used or number of trees (compact plantations only) and the distance between rows and plants.

There has been a tendency towards linking census of agriculture and current statistics and other related statistics. The results of the census of agriculture are used as a basis for developing or improving current statistics or designing a specialized sample survey. This tendency is a result of a recent rapid increasing demand for data. For example, the census of agriculture of Honduras was designed in such a way that it was possible to derive from it efficient sampling designs. The census of agriculture was utilized for the forecast of coffee harvest, the evaluation of damages caused by the hurricane Fifi, and it is now being utilized for the forecast of harvest of basic grains and for the survey on livestock taxes.

### Suggestions for the Future

The successful realization of a census of agriculture using sampling methods can be achieved if the necessary prerequisites are present. The agricultural statistics set-up of the country should be large enough and flexible to cope with the requirement of a census of agriculture and other future related surveys. The selection of suitable enumerators and supervisors and their training should be satisfactorily solved by the agency responsible for executing the census of agriculture. There should be adequately trained personnel and equipment for processing data to avoid serious delays in the publication of the census results. Timely action on behalf of the census authorities would aid in avoiding problems of census taking. Emphasis should be given to the preparation of mapping material as it would help in the formation of well defined enumeration areas which are so essential for avoiding omissions and duplications. For subsequent sample censuses or surveys it would provide good sampling frames.

While planning sample censuses or other sampling investigations two aspects must be given due attention. Firstly, there should be adequate time for their preparation and execution. The administrative agency should avoid the unfortunate attitude that sample censuses or surveys could be planned in a very short period of time. An efficient sampling investigation is a result of a comparative study of a number of alternative designs where many factors may be varied, such as the number of stages of selection, the size of units in the different stages, methods of selection, etc. Studies may also help to find out what items are liable to errors and what precautions may be taken to eliminate or reduce them. All this type of study needs time, data and field testing, therefore to get the fullest advantage from the application of sampling methods preparations should be started as early as possible.

Sometimes it happens that all along funds are not available for taking a complete enumeration census and unexpectedly funds are available to finance a sample census. In such cases decisions are taken hurriedly to conduct a sample census on the plea that some data, although far from being fully satisfactory, are better than none at all. The fact is that the collection of agricultural statistics should form an integral part of the development plans of any country and funds should be allocated for this purpose in the same way as for any other development plans so that the necessary preparations for undertaking the census or surveys are made well in time. Secondly, sample censuses should be planned according to the more or less certainty of the availability of funds. It is no use starting a well designed sampling investigation and then leave it unfinished or modify when the work is half done for the reason that no funds are available. Collection of reliable and timely statistics using sampling methods costs time and money, and the administrative agency should be prepared to meet these prerequisites. In designing their sample censuses the countries should go into the solutions of reducing the burden imposed by various difficulties already indicated in this paper.

ANNEX V

**PROBLEMS IN ESTIMATION OF CROP AREAS  
AND CROP YIELDS**

*D.J. Casley* — United Kingdom

**INTRODUCTION**

The various methods that have been used for estimating crop areas, and the problems associated with each, have been discussed in many papers and survey reports. Such methods range from mailed questionnaires addressed to farmers, through the detailed measurement of individual plots by means of surveying techniques, and include indirect methods, such as extrapolation from seeding rates and the quantities of seed distributed. A good description of many of these methods is given by Hunt (1969). The standard methods of estimating crop yields are even better known, with a particularly voluminous literature on the various types of crop-cutting procedures. A manual on this topic was prepared by FAO as long ago as 1954 (Panse, 1954).

This paper is not concerned with a comparison and discussion of the various techniques and the errors associated with each, nor with a description of the cost issues associated with this method or that. Rather, the applicability of, what may be termed, the classical survey methodology is examined in the context of agricultural practices that are common in many tropical and sub-tropical countries, and the validity of many of the published crop area and yield figures is questioned. An alternative approach is suggested that does raise, however, certain fundamental issues regarding the conduct of surveys that are designed for the collection of holding and crop statistics.

**THE 'CLASSICAL' APPROACH TO CROP AREA AND YIELD  
ESTIMATION**

Whatever the differences in the methodology used, the design of most crop area and yield surveys that involve contact with the holder and the holding assumes, explicitly or implicitly, that the needed data can be collected within a short period of time reference to a point during the current agricultural season. In some cases the survey is timed to coincide

with the harvest period, so that the data on the area and yields of the crops can be collected simultaneously. In others, the survey is timed for a period when all the crops have been planted and none has been harvested. The phase of the survey during which the data on crop areas are collected is also used to select the plots to be included for the purpose of yield estimation, this second phase following at a time that is coincident with the harvest. Even if the data are to be obtained by interview, the interview is usually timed to follow after, what is assumed to be, the harvesting period.

The possibility of a second or minor crop season is sometimes recognised and the survey may be repeated in order to estimate the areas and yields relating to this second season. In many cases, however, the second crop season is ignored<sup>1)</sup>.

If an interview is the sole source of the data, it may very well be possible to conduct the enumeration within a short period of time, such as one or two weeks. Moreover, the questions on crop areas put to the respondent, hopefully at least, can refer to the total area cultivated during the entire reference period. Such a technique is, indeed, the one used in some developed countries, where farming is settled and the farmers are literate and numerate concerning their agricultural operations.

If, however, as is the case in most developing countries, the respondents are unable to give reasonably accurate responses to questions concerning the areas and yields of their crops, some level of measurement by the enumerator is usually introduced. Even if the techniques used are simple, the time taken to visit the various plots of the holding and to carry out the measurement of the plots, inevitably produces a very much slower rate of enumeration than that achieved in an interview survey. The inevitable consequence is that the time taken to complete the survey for a given number of respondents and a given force of enumerators is greatly increased. This clearly raises serious complications for the classical concept of conducting the enumeration when all the crops are in the ground. As the time taken for the survey increases, the probability grows that either part of the enumeration will be conducted before all the crops are planted or part of the enumeration will be conducted after partial or complete harvesting. Or both. When this happens it is likely that the crop areas will be underestimated and that the crop yield estimation procedure may not reflect either the late planted or early harvested portion of the crop.

A further problem exists in the very countries that face particular difficulty because of the need for objective measurement of areas and yields; namely the complication of the data collection procedure caused by the common existence of mixed and associated crops.

The method of recording the area and yield under mixed or associated

<sup>1)</sup> In Ghana, for example, it was not until 1970 that the official crop area estimates reflected the area grown during the second season in the latter part of the calendar year. There are many cases in which the minor season crop areas and yields are still not included in official estimates.

crops varies considerably from one country to another, and from one survey to another. In many cases, the enumerator is instructed to estimate the 'pure crop equivalent area' for each constituent crop in a mixture. Sometimes the constraint is imposed that the sum of the pure crop equivalent areas should equal the total area of the plot, sometimes not. In other instances, only the so-called 'major' crop is recorded. In still others, all the constituent crops are listed and varying methods of handling the resulting data are adopted at the data processing stage. The 'classical' approach, outlined above, for the estimation of crop areas and yields implies that a crop will be recorded according to its state at the time of enumeration, which will probably be late in the cropping season. It is assumed, therefore, that the crop mixture is constant throughout the growing periods of the crops concerned. This assumption may not be well-founded.

The 'classical' approach to the estimation of crop areas and yields is well demonstrated in the literature relating to the World Census of Agriculture Program. Consider, for example, the Program for the 1970 World Census of Agriculture (FAO, 1965). In discussing the advantages of sample censuses it is stated that sampling allows for the introduction of "objective methods of enumeration, such as measuring areas, weighing of crops from small plots, etc.". The Program goes on to say that "the use of these methods may be particularly important for developing countries". However, when dealing with the time reference for the census, the Program warns "the duration of the enumeration should be rather short and, if possible, should not extend one month...". Still dealing with the question of the reference period, the Program states that in "countries where there is more than one crop season during the year, information on total area of holding, areas under different forms of tenure, and areas classified according to utilisation should relate to a specific date in the major crop season".

Panse (1966) when writing on the problems of census taking in developing countries recognised that the time reference may pose a problem even for the size of the agricultural holding, since it may change during the year. Nevertheless, he recommends that the census should "be taken soon after the major harvesting operations of the agricultural year are over...", although, in another context, he notes that crop areas may best be obtained by visiting the farmer, not at the end of the crop year, but on two or more occasions when the seasonal crops are standing in the fields.

Reference has been made to the writings on the Census of Agriculture in order to illustrate the point that the concept of collecting data on crop areas and yields by means of a survey that relates to a specific reference period, to be completed within a short time period, is one that is regarded as fundamental by most survey statisticians. Even when the problems presented by the particular conditions existing in many developing countries are explicitly recognised, and the consequent need to adapt the concepts are, at least, partly understood, there is still a reluctance to



make a radical departure from those concepts that have become hallowed with time. Well may we say with Hunt (1969) that "much more discussion is needed about the agricultural statistics which would be effectively serviceable in developing countries. Practice in temperate countries is still all too often taken as the pattern".

#### EXAMPLES OF CROPPING PERIODS AND CULTIVATION PRACTICES IN DEVELOPING COUNTRIES

In many tropical and sub-tropical countries, particularly in Africa, the rainfall distribution is such as to allow planting of crops to be phased over a considerable period of the year. Records of planting and harvesting dates<sup>2)</sup> show that in many countries of early planted crops may be well advanced before late planting has taken place. This problem, it should be emphasised, is distinct from the existence of two cropping seasons. Indeed, in some countries planting is phased over a considerable period of time in the 'main' or first crop season which is followed by a 'short' season in which planting is more likely to be completed within a limited period of time. It is the spacing out of the planting in the main season that causes the 'overlap' between planting and harvesting. In Mauritius potatoes are planted from March to September with the harvesting commencing in May and continuing until December. In Iran the respective planting and harvesting periods for potatoes are reported to be May to December and September to April. The same overlap is commonly seen with crops such as beans, and also with a cereal such as maize as, for example, in Burma.

For more detailed examples of the spacing of planting of crops it is instructive to look at the situation in relatively small countries. Uganda, in Eastern Africa, is approximately 91,000 square miles in size, yet exhibits a wide range of climatic conditions in various parts of the country. In the areas bordering Lake Victoria, and in much of Western, Northern and Eastern Uganda, the annual rainfall is between 50 and 80 inches, well distributed throughout the year. In some places the mean monthly rainfall exceeds 2 inches in every month of the year; in others the mean is below 2 inches only in January. It was found that in one district of Uganda (Ministry..., 1964-67) millet was planted from January until the end of May. Harvesting of the millet commenced in April and continued until October. In another district, groundnuts were planted from March until May and again from August until October. Harvesting commenced in July and continued until September, starting up again, after a pause, in November. Even on individual holdings it was noted that a period between the completion of planting and the commencement of harvesting did not

<sup>2)</sup> Information obtained from returns by countries of completed FAO Questionnaire for the Production Yearbook for the years 1973 and 1974.

exist. Furthermore, such a period, where it did exist, was not the same for all crops. The position was complicated further by crops such as beans and sweet potatoes which were found to be planted throughout the year.

In Ghana, on the Western Coast of Africa similar examples are common. Data collected in a survey conducted in 1972, as yet unpublished, show that the planting and harvesting dates frequently overlap.

In the Fiji Islands, the island of Viti Levu although only 100 miles long contains two distinct climates. On the Western side the rainfall exhibits marked modality, but on the Eastern Coast, and in the interior rainfall may be well distributed throughout the year. Here again planting of certain root crops was observed as being spread over a time period so long that there was an overlap between planting and harvesting (Casley, 1968).

The spacing of the planting of cereals over weeks or months and the planting of root crops throughout the year is connected, also, with the type of holdings found in many countries. Often, the holding is not a fixed sized parcel of land but may be fragmented or even, in a sense, transitory, resulting from the practice of shifting cultivation. Even when the small peasant holder has a permanent holding, the clearing of land for planting in each year may be a slow and gradual process due to the holder's total dependence on his own labour, with the assistance of only simple tools. In such conditions, the holder may open up a plot of land and plant a crop; he may then gradually extend the size of the plot or open up another plot, planting a crop in each piece as soon as it is ready. If the climate is suitable, he may aim to maintain a certain minimum area under a staple root crop and so will plant the crop in a new plot in step with the harvesting for consumption of the crop from his existing plot. Such practices, linked with the existence of small subsistence holders, are not exceptional but, rather, usual in many developing countries. In Ghana 54.7 percent of the holdings were less than 1.6 hectares in size, and a similar picture is seen from the census data of many countries (Economic..., 1972). The typical farmer in these countries is a small, predominantly subsistence farmer whose agricultural practices are usually not formalised in any way.

To complicate the matter further, the common practice of mixed cropping<sup>3)</sup> is affected by the spacing of the planting of various crops over a period of time. The plots containing a mixture of crops may undergo various changes during the year. A plot may first be planted with a single crop; later a second and a third may be interplanted with the first; next, the first crop is harvested; following this, the second crop is harvested gradually for home consumption, whereas the third crop remains in the ground. The original plot, having started as a pure plot and having once contained

<sup>3)</sup> In Ghana 84 percent of the area under seasonal crops contained a mixture of crops and in Uganda the figure was 48 percent. In Botswana nearly 90 percent of the area under millet and more than two-thirds of the area under sorghum contained other crops in addition to the millet or sorghum.

three crops, now gradually changes from a single plot containing the second and third crops to two plots one of which is increasing in size and contains the third crop in pure stand and the second, which is diminishing in size, contains a mixture of the second and third crops. It can be seen from this hypothetical, but not untypical example, that a single plot may be described as containing various combinations of crops, depending on the timing of the enumeration.

The picture that may face the agricultural statistician as he plans a holding survey in many developing countries can be summarised as follows.

Most of the holders are unable to provide any reasonably accurate answers to questions regarding their holdings. Objective estimation is, therefore, necessary, but this means that, with the enumerator manpower available, the survey will need to be spaced out over a considerable period if a reasonable size of sample is to be covered. The holding may consist of several parcels, often cultivated according to the practice of shifting cultivation, and may vary in size from one part of the year to another. The planting of the crops will be spaced out in such a way that there is no one period when all the crops are in the ground. The constituent crops in any one plot may change several times during the year.

It is suggested that in these circumstances, or in circumstances approximating to these, the concept of conducting the estimation of area and yields within a very limited period of time and relating to a fixed time reference is inappropriate. If adopted, such a methodology is likely to give areas of holdings, areas of crops and crop yields that are seriously biased. The areas are likely to be underestimated. The yields, if collected according to the constituent crops of the plot, will not necessarily reflect the true yield of the crop when grown in the state recorded for the yield of the crop at the time of harvest may reflect, in fact, the yield of the crop when grown in a different mixture that may have prevailed until shortly before the survey.

In the remainder of this paper a method is proposed for producing, in the circumstance described above, unbiased estimates of the areas under crops grown in various conditions. Finally, the implications of adopting this method on the general system for collecting agricultural statistics is considered, specifically the problems associated with collecting the yields of the crops from, at least, a subsample of the plots measured during the collection of the area data.

**A METHOD FOR THE ESTIMATION OF HOLDING SIZE AND ANNUAL CROP AREAS<sup>1)</sup>**

It is desired to estimate the area  $A$  for a crop  $c$  on a holding  $k$  where  $A = \sum_{p=1}^N a_p$ ,  $a_p =$  the area of the  $p^{\text{th}}$  plot on the holding containing crop  $c$ , and  $N =$  the total number of plots containing crop  $c$  during the period for which the estimates are required.

The entire area  $a_p$  may not, however, have been planted at the same time. Therefore, let  $a_{pi}$  = the area of the portion of plot  $p$  which is planted with crop  $c$  at time  $i$ ,  $i = 1, \dots, M_p$ . Then

$$A = \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi}$$

If the holding is enumerated at a random point in time during the period of the survey, the probability that crop  $c$  is in the ground in the portion of plot  $p$  that has an area  $a_{pi}$  is given by

$$P\{a_{pi} | c\} = \frac{t_{pi}}{T}$$

where  $T =$  the period for which the estimates are required - normally one year and  $t_{pi} =$  the period of time within the total period that crop  $c$  remained in the ground in the portion of plot  $p$  that has an area of  $a_{pi}$ .

The expected value of the area enumerated under crop  $c$  on holding  $k$  is given by

$$E(a') = \frac{1}{T} \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} t_{pi} \tag{1}$$

The area actually measured ( $\hat{a}$ ) will be an unbiased estimate of  $a'$  if the enumeration of the holding is carried out at a random point in time during the reference period (and is not determined, for example, by consideration of likely dates for planting or harvesting) and if the methods used to measure the areas of plots are not themselves biased.

The weighted mean time period that crop  $c$  spends in the ground in the  $p$  plots of holding  $h$  may be defined as

$$\bar{T} = \frac{\sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} t_{pi}}{\sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi}}$$

<sup>1)</sup> The method was used by the present author and J. Jansomius when working in Uganda. Some of the area estimates in the "Report on Uganda Census of Agriculture" were obtained by this means.

Then, if  $\hat{a}$  is an unbiased estimate of  $a'$ .

$$E(\hat{a}) = \frac{\bar{t}}{T} \cdot \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi}$$

i.e. 
$$E(\hat{a}) \cdot \frac{T}{\bar{t}} = A \tag{2}$$

It may be that whatever period is chosen for the enumeration some plots may have been planted before the survey commences and some plots may be unharvested at the conclusion of the enumeration. In such circumstances

$$E(\hat{a}) = \frac{1}{T} \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} r_{pi}$$

where  $r_{pi}$  = the period of time that crop  $c$  remained in the ground during the survey period in the portion of plot  $p$  that has an area of  $a_{pi}$ .

The area it is required to estimate is now defined as

$$A = \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} \cdot \frac{r_{pi}}{t_{pi}}$$

If  $\tau$  is also defined as

$$\tau = \frac{\sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} r_{pi}}{\sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} \cdot \frac{r_{pi}}{t_{pi}}}$$

then equation (2) remains true.

It may be reasonable to assume that the time that crop  $c$  spends in the ground is uncorrelated with the area of the portion of the plot in which it is planted. The period of time that the crop spends in the ground may be correlated with the time of planting, and possibly with the location of the plot but there may be no reason to suppose that  $a_{pi}$  is correlated with these variables.

Granted this assumption that  $t_{pi}$  is independent of  $a_{pi}$ , equation (1) can be written as follows:

$$E(\hat{a}) = \frac{1}{T} \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} \cdot \frac{1}{\sum_{p=1}^N M_p} \sum_{p=1}^N \sum_{i=1}^{M_p} t_{pi} = \frac{\bar{t}}{T} \cdot A$$

where  $\bar{t}$  = the unweighted mean time that crop  $c$  spends in the ground in the  $p$  plots of holding  $k$ .

It is possible that the respondents' memory regarding the dates of planting and harvesting of certain crops is reliable enough to enable the time period between planting and harvesting of the crops to be obtained by interviewing the holder. This may not, however, be universally true and, in any case, for many purposes a separate computation of the area  $A$  for every individual holding might be considered an excessively lengthy procedure that is not essential. What is needed may be merely an estimate of the total area under crop  $c$  during the period for which estimates are required for all holdings in a stratum or zone.

Let  $h$  = total number of holdings included in the survey in a particular stratum. It is required to estimate the area  $G_A$

where 
$$G_A = \sum_{k=1}^h A_k \quad k = 1, \dots, h$$

It has been shown that an unbiased estimate of  $A_k$  is given by  $\hat{a}_k \cdot \frac{T}{\bar{t}}$ . It follows that

$$E \sum_{k=1}^h \hat{a}_k = \sum_{k=1}^h A_k \cdot \frac{\bar{t}_k}{T} \quad (3)$$

if the time reference period,  $T$ , remains constant for all holdings in the stratum.

If  $\bar{s}$  is defined as the weighted mean period that crop  $c$  spends in ground in all holdings:

i.e. 
$$\bar{s} = \frac{\sum_{k=1}^h A_k \bar{t}_k}{\sum_{k=1}^h A_k}$$

Then by substitution in (3)

$$E \sum_{k=1}^h \hat{a}_k = \frac{\bar{s}}{T} \sum_{k=1}^h A_k$$

giving the result that

$$E \sum_{k=1}^h \hat{a}_k \frac{T}{\bar{s}} = G_A$$

It has been shown above that if the time that crop  $c$  spends in the ground is not correlated with the area of the plot in which it is planted the weighted mean  $\bar{t}_k$  may be replaced by the unweighted mean  $\bar{t}_k$ . A similar argument can be used to show that if  $\bar{t}_k$  is independent of  $A_k$ , then

$$E \sum_{k=1}^h \tilde{a}_k \cdot \frac{T}{\bar{s}} = G_A$$

where  $\bar{s}$  is the unweighted mean time that crop  $c$  spends in the ground in all plots on all  $h$  holdings.

In this latter case there may be grounds for supposing that the necessary assumption will not hold true. It is possible, for example, that on a holding with a large area under crop  $c$  the time between planting and harvesting may be less than on a holding with a small area under crop  $c$ , due to the more efficient methods of cultivation used by holders with large holdings compared to the methods used by holders with small holdings. It might be true, also, that holdings with large areas under crop  $c$  are likely to be found in localities in which the climatic and soil conditions are particularly favourable to the early maturity of the crop. However, provided that the stratum or zone is reasonably homogeneous with regard to such factors, and taking into account the small scale of the cultivation on all but a minor percentage of the holdings in many developing countries, the use of the unweighted mean  $\bar{s}$  may be regarded as reasonable for practical purposes. If it be thought necessary to use the weighted mean, it will be necessary to record the relevant period for each holding included in the survey — or at least for a sample of the holdings sufficient to enable a reasonable estimate of a  $\bar{s}$  to be calculated.

In addition to the total area under crop  $c$ , it may be desired to make separate estimates of the part of the area grown in pure stand and the part of the area grown mixed with other crops. If the crop remains pure, or mixed with the same crop, throughout the period during which it is in the ground, it is only necessary to regard this constituent part of the total area as the statistic to be estimated and the method described above will be applicable. A complication arises if the constituent crops of the plot change during the period when the crop for which the estimate is required is in the plot. In such cases the method proposed will give an estimate of the area in each classification, which is proportional to the relative time periods that the crop spent in each classification. This would appear to be an improvement over an estimate that allocates the complete area to one or other of the classifications according to that existing at the time of the enumeration.

To take account of the possible classifications of crop  $c$  in plot  $p$  on holding  $k$  a new definition is introduced i.e.  $t_{pi}(j)$  being the period of time that crop  $c$  remains in the ground in the area  $a_{pi}$  during which time the classification of the constituent crops is  $j$ . It is assumed that the classifications used are mutually exclusive. It is desired to estimate

$$a_j = \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} \cdot \frac{t_{pi}(j)}{t_{pi}}$$

If the holding is enumerated at a random point in time the probability that crop  $c$  was in the area  $a_{pi}$  and that the existing classification of the constituent crops of the area was  $j$  is given by:

$$P\{a_{pi}|c,j\} = \frac{t_{pi}(j)}{t_{pi}} \cdot \frac{t_{pi}}{T}$$

Therefore, the expected value of the area under crop  $c$  in classification  $j$  is given by:

$$E(\hat{a}_j) = \frac{1}{T} \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} t_{pi}(j)$$

which can be written as

$$E(\hat{a}_j) = \frac{\bar{t}_j}{T} \sum_{p=1}^N \sum_{i=1}^{M_p} a_{pi} \frac{t_{pi}(j)}{t_{pi}}$$

giving the result that

$$E(\hat{a}_j) \cdot \frac{T}{\bar{t}_j} = a_j$$

where  $\bar{t}_j$  is the weighted mean period of time that crop  $c$  spends in the ground in the  $p$  plots in classification  $j$ .

The use in this case of the unweighted mean in place of  $\bar{t}_j$  involves the assumption that  $t_{pi}(j)$  is independent of  $t_{pi}$ . Even if  $t_{pi}(j)$  is correlated with  $t_{pi}$  the assumption of independence may not introduce a serious bias and the use of the simple mean ( $\bar{t}$  as defined earlier) may facilitate the estimation, for it then becomes unnecessary to know the time period that any portion of the plot spends in various classifications of constituent crops.

It has been assumed that the area to be estimated was that of a particular crop. The same method can, of course, be used for estimating the area of a holding, which itself is subject to change during a single season in countries where the land tenure system is of a traditional, tribal nature.

## IMPLICATIONS FOR DATA COLLECTION SYSTEM

The method proposed provides an unbiased estimate of the areas required in the conditions where other methods may result in biased estimates, but it involves a major change in the survey methodology from that usually adopted. Instead of the survey being carried out during a short time period before the crop harvest, it is necessary to phase the enumeration throughout the entire season or year. Moreover, the timing of the visit to any one particular holding should be randomised. This latter requirement is difficult to satisfy for it would entail the enumerator following a random route within each enumeration area with consequent major effects on the cost of the survey. However, the randomisation of visits to each small cluster of holdings within the enumeration area may be possible and this should be adequate for practical purposes.

A serious disadvantage of the method proposed is that details of particular holdings will only be available for a sub-sample that may be kept under surveillance for other purposes (see below). For the main sample the visits to any particular holding may be at a time when not all the plots for that year have been opened up by the holder. This means that census tabulations showing certain statistics classified by size of holding cannot be produced. It is recognised, however, that attempts to conduct censuses that do enable such tabulations to be produced are proving beyond the means of many countries and might mean very little if produced. It is often these countries that face the methodological problems described earlier in the most serious form and, therefore, are most in need of a new approach.



Conducting the enumeration over a lengthy period of time in order to use the method proposed, besides providing unbiased estimates of areas, overcomes the difficulty mentioned earlier of enumerating a numerically sufficient sample of holdings within a short period of time. If a method of obtaining an objective measurement of the areas is necessary the number of holdings that can be enumerated by one man in a traditional length census or survey is small. Therefore, a very large enumerator force is required. This may present great problems from several points of view, especially the recruitment of men of a satisfactory standard, the provision of adequate training for such a large force and the organisation of an adequate system of supervision. If, on the other hand, the enumeration can be, indeed should be, phased over the entire season or year, then a relatively small, well-trained body of enumerators becomes a practical possibility. The smaller enumerator force may indeed be a permanent survey team, thus avoiding the disadvantage of employing short-term enumerators with no security of employment who either may be of indifferent quality or, if of good quality, may resign during the survey if the opportunity of more permanent employment offers itself.

The phasing of the enumeration of areas over a complete year, the work being carried out by a permanent survey force of enumerators, also enables much better data to be collected on such items as labour utilisation, inputs in the form of fertilisers, insecticides etc., and crop yields. In particular the crop yield estimation can be based on sample of plots selected during the area estimation so as to reflect all conditions and classifications of plots.

If the planting of certain crops occurs over a major portion of the season, it follows that the harvesting may be similarly spaced out. This is especially true of crops such as cassava and potatoes that may be harvested gradually as domestic consumption demands. In such cases the records of crop yields may have to be maintained over a period of time, and it will be necessary to allocate a part of the field force full-time to the surveillance of the holdings that contain plots selected for the yield estimation sample. Only in this way will a full history of the plot be obtained, including the changes in its constituent crops, the inputs the plot receives, as well as the yields obtained of the crop or crops for which such data are required.

The surveillance of the sub-sample of holdings may have even wider use in forming part of the early warning and food information system that the country may require. The maintenance of records as a sample of plots will clearly be of value in making an early forecast of the likely production of certain crops.

The method proposed fits very well into an integrated system for the collection of agricultural statistics by a permanent survey force. Such a system is essential for the more rapid development of an accurate agricultural data reporting system. Many countries have made little progress with their data collection systems based on decennial censuses with no permanent enumerator force to provide adequate data between the censuses.

ANNEX VI

SOME METHODS FOR CALCULATION OF AREAS OF POLYGONS SUITABLE FOR POCKET  
AND DESK PROGRAMMABLE CALCULATORS <sup>1/</sup>

Introduction

This article deals with the well-known traditional method of measurement of areas in agricultural statistics, which consists of identifying the boundaries of a field to be measured by use of sight poles and taking compass bearings and measuring the length of each side of a so obtained polygon. The traditional procedure of evaluating the area of a field on the basis of measurements consisted in plotting the field in the office by use of a planchette or a ruler and a protractor and then measuring the area of the sketch by use of a planimetre or grid paper.

This traditional procedure of evaluating the area can successfully be replaced by use of the programmable pocket or desk calculators which appeared on the market in the early 1970ties. The Statistics Division of FAO has developed several methods of calculating areas which are suitable for programmable calculators. These methods were first implemented in the 1974 Census of Agriculture in Ivory Coast.

These procedures are presented and evaluated in the latter part of this article.

The advantages of calculators over the traditional method of calculation of areas are multifold. They consist not only in simplicity of use and speed (it takes about 1 to 4 minutes to calculate the area of a field depending on the number of sides) but also in the fact that possible errors in the classical method, such as errors in plotting the sketch, errors in measuring the area from the sketch and, in particular, errors in applying the scale factor, are eliminated. Use of the calculators also permits the application of methods of distributing the closure error to all vertices, which is superior to the hand method of handling the closure error. Perhaps the most important advantage of the calculator is the possibility to use it directly in the field when measurements are made, as the closure error can be evaluated directly on the spot and in case of too large an error the measurements can be repeated.

Calculation of the area of a polygon

Let a polygon with  $n$  sides be defined by

$$a_i, \alpha_i \quad i = 1, 2, \dots, n$$

where  $a_i$  is the length of the side  $i$  and  $\alpha_i$  is the angle this side forms with North measured in clockwise direction.

Denote with  $\vec{a}_i$  the vector which represents the side  $i$  in a two dimensional space XOY in which Y-axis coincides with the North.

The horizontal and vertical projections of the vector  $\vec{a}_i$  (see Figure 1) are respectively:

$$a_i \sin \alpha_i$$

$$a_i \cos \alpha_i$$

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<sup>1/</sup> Prepared by P.I. Petricevic, Statistician, Statistics Division, FAO.

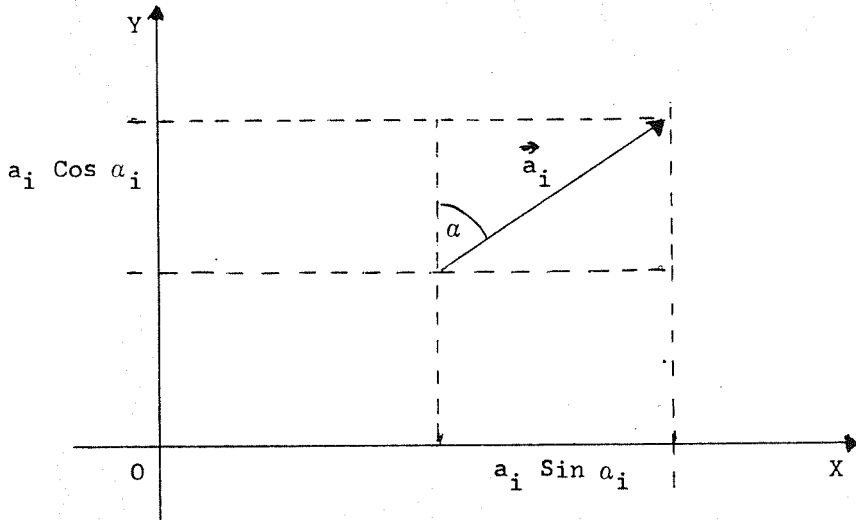


Figure 1

Define vectors

$$\vec{R}_i = \sum_{j=1}^i a_j \quad i = 1, 2, \dots, n \quad (1)$$

Their horizontal and vertical projections will be respectively:

$$X_i = \sum_{j=1}^i a_j \sin a_j \quad (2)$$

$$Y_i = \sum_{j=1}^i a_j \cos a_j \quad (3)$$

If the polygon is closed, then

$$\vec{R}_n = 0$$

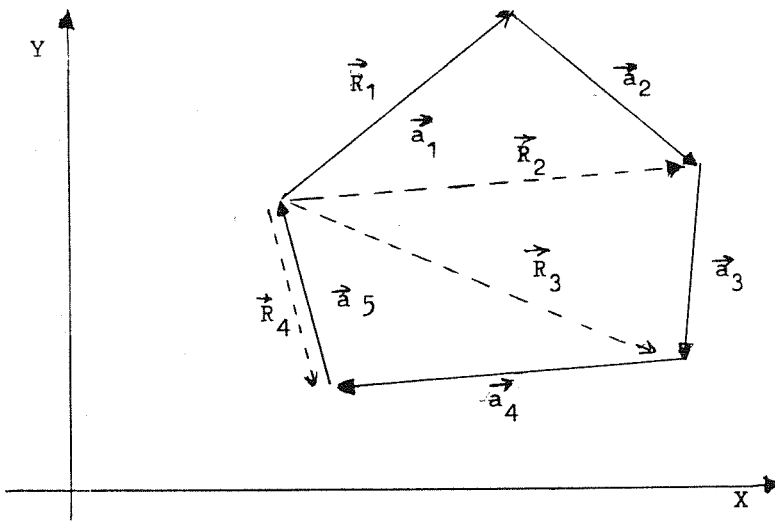


Figure 2

The area of a triangle formed by two vectors which start from the same point can be calculated as a function of their horizontal and vertical projections.

Thus the area of the triangle between vectors  $\vec{R}_1$  and  $\vec{R}_2$  (see Figure 2) is given by:

$$A_1 = \frac{1}{2} (X_2 Y_1 - X_1 Y_2)$$

It should be noted that this area will have a positive value if the vector  $\vec{R}_1$  precedes the vector  $\vec{R}_2$  (looking clockwise), otherwise it will be negative.

The area of the whole polygon calculated as a sum of areas of triangles, each formed by the two consecutive vectors  $\vec{R}_i$ , will be:

$$A = \frac{1}{2} \sum_{i=1}^{n-2} (X_{i+1} Y_i - X_i Y_{i+1}) \quad (4)$$

where  $X_i$  and  $Y_i$  are given by (2) and (3).

#### Closure error and corrected area of a polygon

In practice the polygon defined by the data which are collected in the field will never close. In this case

$$\vec{R}_n \neq 0.$$

The length of the vector  $\vec{R}_n$

$$R_n = \sqrt{X_n^2 + Y_n^2}$$

can be used as a measure of error. The normal practice is, however, to express the closure error as percent of the perimeter of the polygon:

$$C = \frac{R_n}{\sum_{i=1}^n a} \times 100$$

If the closure error is below a certain value, say 2%, the error may be considered as acceptable. The polygon can be closed in different ways and the area of a so closed polygon calculated. Let us consider different methods of closing the polygon.

#### A. Closure by connecting the last but one point with the starting point

This is the simplest method of closing the polygon (see Figure 3) in which the measurements taken for the last side of the polygon are not taken into account for the calculation of area. The formula to be applied in this case is given in (4). It should be noted that, if this method is applied, the measurements for the last side still have to be taken in order to permit the evaluation of the closure error.

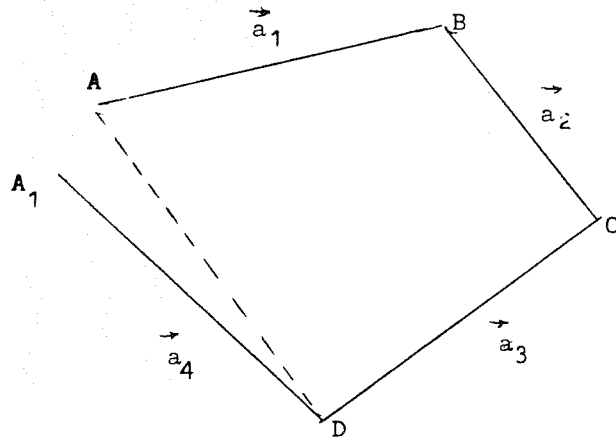


Figure 3

B. Closure from the mid-point

The method will be illustrated by use of Figure 4.

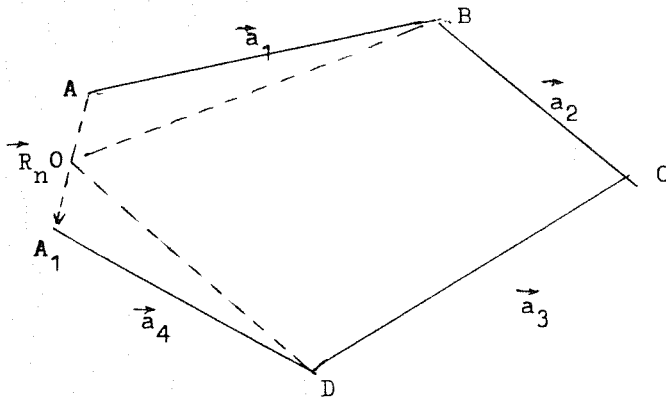


Figure 4

The closed polygon OBCDO is obtained by connecting the mid-point O between end points A and A<sub>1</sub> with the ends of the first and the last side of the open polygon, that is with points B and D.

Define new vectors  $\vec{R}'_i$ :

$$\vec{R}'_i = \vec{R}_i - \frac{1}{2} \vec{R}_n \quad i = 1, 2, \dots, n-1$$

with projections

$$X'_i = X_i - \frac{1}{2} X_n \quad (5)$$

$$Y'_i = Y_i - \frac{1}{2} Y_n \quad (6)$$

Then the area of the closed polygon will be

$$A = \frac{1}{2} \sum_{i=1}^{n-2} (X'_{i+1} Y'_i - X'_i Y'_{i+1})$$

or after substituting  $X'_i$  and  $Y'_i$  from (5) and (6)

$$A = \frac{1}{2} \sum_{i=1}^{n-2} (X_{i+1} Y_i - X_i Y_{i+1}) + \frac{Y_n}{4} (X_1 - X_{n-1}) - \frac{X_n}{4} (Y_1 - Y_{n-1}) \quad (7)$$

where  $X_i$  and  $Y_i$  are defined by (2) and (3).

C. Closure by shifting all vertices on equal basis

This method is illustrated by Figure 5, which shows an open polygon  $ABCD$ . Straight lines parallel to the  $AA_1$  are drawn through each of the vertices. The vertices are shifted along these lines so that the first one is shifted by

$\frac{1}{n} \overline{AA_1}$ , second by  $\frac{2}{n} \overline{AA_1}$ , and so on.

$$\overline{B^1B} = \frac{1}{4} \overline{AA_1}$$

$$\overline{C^1C} = \frac{2}{4} \overline{AA_1}$$

$$\overline{D^1D} = \frac{3}{4} \overline{AA_1}$$

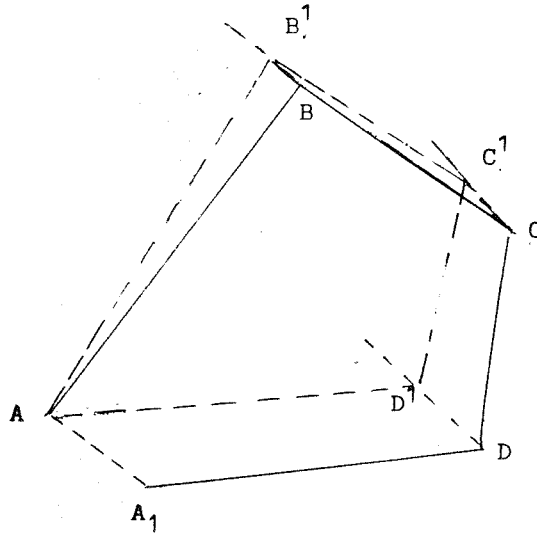


Figure 5

In this way a closed polygon  $AB^1C^1D^1A$  is obtained.

New vectors  $\vec{R}_i$  are defined by:

$$\vec{R}_i = \vec{R}_i - \frac{i}{n} \vec{R}_n \quad i = 1, 2, \dots, n-1$$

with projections

$$X'_i = X_i - \frac{i}{n} X_n \quad (8)$$

$$Y'_i = Y_i - \frac{i}{n} Y_n \quad (9)$$

The area of the closed polygon will be:

$$A' = \frac{1}{2} \sum_{i=1}^{n-2} (X'_{i+1} Y'_i - X'_i Y'_{i+1})$$

or after substituting (8) and (9), and reordering and simplifying the expression obtained:

$$A' = \frac{1}{2} \sum_{i=1}^{n-2} (X_{i+1} Y_i - X_i Y_{i+1}) - Y_n \left( \frac{X_{n-1}}{2} - \frac{\sum_{i=1}^{n-1} X_i}{n} \right) + X_n \left( \frac{Y_{n-1}}{2} - \frac{\sum_{i=1}^{n-1} Y_i}{n} \right) \quad (10)$$

where  $X_i$  and  $Y_i$  are defined by (2) and (3).

Formula (10) can be further reorganized to take a form more suitable for computer programming:

$$A' = \frac{1}{2} \sum_{i=1}^n (Y_i \Delta X_i - X_i \Delta Y_i) + \frac{Y_n}{n} \sum_{i=1}^n X_i - \frac{X_n}{n} \sum_{i=1}^n Y_i \quad (11)$$

where

$$\Delta X_i = a_i \sin \alpha_i$$

$$\Delta Y_i = a_i \cos \alpha_i$$

and

$$X_i = \sum_{j=1}^i \Delta X_j$$

$$Y_i = \sum_{j=1}^i \Delta Y_j$$

#### D. Closure by shifting all vertices on proportionate basis

This procedure is similar to the preceding one. While in the preceding procedure the closure error was equally distributed to all vertices, it is now distributed proportionately to the length of sides.

The new vector  $\vec{R}_i$  is defined by:

$$\vec{R}_i = \vec{R}_i - \frac{\sum_{j=1}^i a_j}{\sum_{j=1}^n a_j} \vec{R}_n$$

with projections

$$X'_i = X_i - \frac{\sum_{j=1}^i a_j}{n} X_n \quad (12)$$

$$Y'_i = Y_i - \frac{\sum_{j=1}^i a_j}{n} Y_n \quad (13)$$

The corrected area can be calculated by substituting the values calculated from (12) and (13) into (4). In this case a simple general formula cannot be obtained.

Comparison of methods

The four methods of dealing with the closure error have different characteristics from the computational point of view. It should be noted that in the case of the first three methods (A. Closure by connecting the last but one point with the starting point; B. Closure from the mid-point; and C. Closure by shifting all vertices on equal basis) there is no need to keep in the memory all input data till the end of calculation. In these three methods each pair of input data can be elaborated when they are entered, and required sums can be aggregated. As soon as the last pair of data is entered, corrected area and closure error can be evaluated. In the case of the fourth method (D. Closure by shifting all vertices on proportionate basis) it is necessary to keep in the memory all input data for one polygon till the end of calculation. This means that the first three methods can be programmed even for small programmable calculators as they do not require more than 8 registers for storage of data and intermediate results, irrespective of the number of sides of the polygon. The fourth method required two registers for each vertex and several more for intermediate results.

It can be shown that each of the four methods gives an unbiased estimate of the true area, provided, of course, that there is no bias in the measurements.

There are two important questions which cannot be answered analytically:

1. Given the closure error, what will be the expected error in area estimates?
2. Is there any significant difference in precision of area estimates as obtained by different methods of dealing with the closure error?

In an attempt to shed some light on the above questions a simulation model was applied. For this purpose a "typical polygon" with seven sides which closed "perfectly" was chosen. The compass bearings and the length of sides of the polygon are given below:

Side	Angle (degrees)	Length (metres)
AB	22.62	130
BC	102.68	205
CD	180	110
DE	225	35.3555
EF	306.87	50
FG	253.74	125
GA	315	91.924

Area = 3.33 ha. Closure error = 0.0002 percent.



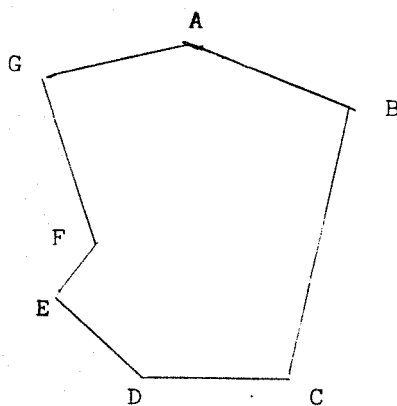


Figure 6

In the above data random errors were introduced. Four different types of errors were considered independently. Two types of errors were introduced in the length of sides, one independent of the length of sides and another proportionate to the length of sides. Two types of errors were also introduced in angles, one independent of the length of side and another inversely proportionate to the length of side - the last type of error occurs if the sight poles indicating end points of the side are not perfectly parallel.

Random errors were drawn from the normal distribution with zero mean. For each side and each angle a new random error was drawn. The standard deviations of the errors of different types were given the values which resulted in an average closure error of 1 percent. With these assumptions 1 000 simulations were made for each of the four types of errors, and each time the four different area estimates were calculated. The results are summarized in the table below:

Percentage standard errors of different area estimates corresponding to the expected closure error of 1 percent

Kind of random error		Percentage standard error of area estimate			
		Method A	Method B	Method C	Method D
Error in length of sides	S.D. constant	3.1	3.2	2.3	2.4
	S.D. proportionate to the length of side	3.3	2.9	2.4	2.3
Error in angles	S.D. constant	2.3	2.2	1.1	1.1
	S.D. inversely proportionate to the length of side	2.0	2.0	0.7	0.6

From the above table only indicative conclusions can be made, not only because the number of simulations was not large enough, but also because a similar exercise with a different polygon would produce different results.

Nevertheless, the following remarks are possible. Method A produces similar results as Method B and also Method C is similar to Method D. Methods C and D give much better estimates of area than methods A and B, particularly if the measurement errors occur in angles rather than in lengths. In this case application of superior methods reduces the error to half or less.

In other words, one can recommend the use of calculators which permit the application of Method C. Calculators with larger memory which can be programmed for Method D do not seem to be worth the cost for this application. For simpler programmable calculators which cannot deal with Method C, Method A is good enough.

Experience with pocket programmable calculators

The programme for calculation of areas by use of Method C was written for the following pocket calculators:

Hewlett Packard	- HP-67
	HP-65
	HP-55
	HP-25
	HP-25C
Texas Instruments	- SR-52
	SR-56
Casio	- fx-201P

Individual programmes can be obtained on request from Statistics Division, FAO, Rome. The programme for HP-25 (which can be used also for HP-25C) is appended to this article.

All programmable calculators with trigonometric functions and having at least 8 registers and 100 programming steps, can be used for calculation of areas. Some calculators need even less steps (HP-25 only 49 steps) depending on the efficiency of the programming language.

Of the calculators tested, the more suitable for calculation of areas, particularly for field application, are those which have programmes stored on magnetic cards. These are HP-67, HP-65 and SR-52. Almost equally suitable is HP-25C since in this calculator the programme once keyed in remains in the memory even after the calculator is switched off.

The other calculators, i.e. HP-55, HP-25, SR-56 and fx-201P, require that the programme be keyed in manually each time the calculator is switched on. This operation takes less than 5 minutes, but requires better knowledge of the calculator than in the case of those with programming cards. Still, these calculators can be recommended for office use.

PROGRAMME FOR THE POCKET CALCULATOR HP-25

Area of a polygon

This programme calculates the area of polygon of n sides, defined by:

$$\alpha_j, a_j \quad j = 1, 2, \dots, n$$

where  $\alpha_j$  is the angle (in degrees) the side j forms with North measured in clockwise direction, and  $a_j$  is the length of this side.

$$\text{Let} \quad \Delta X_j = a_j \sin \alpha_j$$

$$\Delta Y_j = a_j \cos \alpha_j,$$

$$\text{and let} \quad X_i = \sum_{j=1}^i \Delta X_j$$

$$Y_i = \sum_{j=1}^i \Delta Y_j$$

The area of the polygon (A), and the closure error (distance between the starting and ending point) expressed as percent of the perimeter (C), will respectively be:

$$A = \frac{1}{2} \sum_{i=1}^n (Y_i \Delta X_i - X_i \Delta Y_i) + \frac{Y_n}{n} \sum_{i=1}^n X_i - \frac{X_n}{n} \sum_{i=1}^n Y_i$$

$$C = 100 \times \frac{\sqrt{X_n^2 + Y_n^2}}{\sum_{i=1}^n a_i}$$

The area calculated represents the area of a closed polygon obtained by shifting the vertices of the given polygon along the lines parallel to the line passing through the starting and ending point. The vertex i is shifted by the i/n fraction of the distance between starting and ending point.

Programm

Display		Key entry
Line	Code	
00	////////////////////	
01	14 34	f STK
02	14 33	f REG
03	24 03	RCL 3
04	74	R/S
05	23 51 00	ST + 0
06	14 09	f → R
07	25	Σ +
08	22	R ↓
09	21	x ↔ y
10	22	R ↓
11	14 73	f LASTx
12	24 04	RCL 4
13	23 51 02	STO + 2
14	61	X
15	21	x ↔ y
16	24 07	RCL 7
17	23 51 01	STO + 1
18	61	X
19	41	-
20	41	-
21	13 03	GTO 03
22	34	CLx
23	02	2
24	71	÷

Display		Key entry
Line	Code	
25	14 21	f $\bar{x}$
26	24 02	RCL 2
27	61	X
28	24 04	RCL 4
29	24 03	RCL 3
30	71	÷
31	24 01	RCL 1
32	61	X
33	41	-
34	51	+
35	01	1
36	00	0
37	00	0
38	00	0
39	00	0
40	71	÷
41	74	R/S
42	24 04	RCL 4
43	24 07	RCL 7
44	15 09	g → P
45	24 00	RCL 0
46	71	÷
47	33	EEEX
48	02	2
49	61	X

Registers	
R <sub>0</sub>	Σ a <sub>i</sub>
R <sub>1</sub>	Σ X <sub>i</sub>
R <sub>2</sub>	Σ Y <sub>i</sub>
R <sub>3</sub>	n
R <sub>4</sub>	Y <sub>i</sub>
R <sub>5</sub>	USED
R <sub>6</sub>	USED
R <sub>7</sub>	X <sub>i</sub>

**REMARK:** This programme is made to calculate area in hectares for input in metres. Should different units be used, the conversion factor 10 000 given in lines 35-39 should be changed:

Input	Output	Conversion factor
Metres	Sq.metres	1.000
Feet	Acres	43 560
Feet	Sq.feet	1.000

Example:

j (side)	$\alpha_j$ (angle : degrees)	$a_j$ (length : metres)
1	15	430
2	64	360
3	168	420
4	253	540

A = 17.16 ha.      C = 0.42%

Instructions

Step	Instruction	Input	Keys	Output
1	Enter programme		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
2	Initialize		GTO   0   0   R/S	0.00
3	Perform 3 for  j = 1, 2, ..., n	$\alpha_j$  $a_j$	<input type="text"/> ↑ <input type="text"/> <input type="text"/> <input type="text"/> R/S <input type="text"/> <input type="text"/> <input type="text"/>	j
4	Calculate area		GTO   2   2   R/S	A
5	Calculate closure error		R/S <input type="text"/> <input type="text"/> <input type="text"/>	C
6	For a new case go to 2		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	

