

# ***AGRICULTURAL CENSUS 2000***

**PAKISTAN REPORT**



GOVERNMENT OF PAKISTAN  
STATISTICS DIVISION  
**AGRICULTURAL CENSUS ORGANIZATION**  
May, 2003

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## CENSUS 2000 AT A GLANCE

	Area in Acres
<b>Number of Farms</b>	6620100
<b>Number of Farms by Tenure</b>	
Owner	5134500
Owner-cum-tenant	559000
Tenant	926600
<b>Farm Area</b>	50425200
<b>Farm Area by Tenure</b>	
Owner	36969300
Owner-cum-tenant	7322700
Tenant	6133200
<b>Cultivated Area</b>	40715900
<b>Uncultivated Area</b>	9709300
<b>Average Farm Size</b>	7.6
<b>Number of Fragmented Farms</b>	2601600
<b>Average Number of Fragments per Farm</b>	3.9
<b>Cropped Area</b>	57875200
<b>Kharif Crops Area</b>	25665500
<b>Rabi Crops Area</b>	31271300
<b>Orchard Area</b>	938400
<b>Wheat Area</b>	23396900
<b>Rice Area</b>	7210600
<b>Cotton Area</b>	7910200
<b>Sugarcane Area</b>	2183200
<b>Maize Area</b>	2160100
<b>Fodder Area</b>	6130200
<b>Land Use Intensity (%)</b>	85
<b>Cropping Intensity (%)</b>	142
<b>Number of Family Workers</b>	16852100
Male	11604800
Female	5247300

## P R E F A C E

This report presents the results of Agricultural Census 2000. This census is fifth in succession and was conducted in conjunction with World Census of Agriculture Programme laid down by Food and Agriculture Organization of the United Nations.

The report, basically, comprised of two main sections. In the first section introductory details about the census have been elucidated. It provides information about the objectives and scope of census, its methodology, field operations, sampling plan & estimation procedure, processing of data and presentation of the information for convenience of the users. The second section contains 85 statistical tables based on the census data pertaining to number, area, tenure and fragmentation of farms, land utilization, irrigation, land use and cropping intensities, acreage of crops, use of manures, fertilizers and insecticides, family workers and hired labour, indebtedness, investment for agricultural purpose, use and ownership of agricultural machines and livestock. These tables are given at the country and provincial levels in this report while district level data are available in the Provincial Reports (Vol. II).

This report portrays structural changes in the Agriculture Sector since 1990 when the last census was undertaken in Pakistan. It is envisaged that the statistical information produced in this report will prove useful for administrators, researchers, students and experts responsible for policy formulation for development of agriculture in the country.

In the pursuit of this exercise, the hard work and dedication put in by the staff of Agricultural Census Organization, Data Processing Centre and Regional / Field Offices of Federal Bureau of Statistics and Provincial Revenue Departments are duly acknowledged.

**MUHAMMAD YOUNIS**  
Agricultural Census Commissioner

Lahore  
May, 2003

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# INTRODUCTION

Agriculture is the hub of economic activity in Pakistan. It lays down foundation for economic development and growth of the economy. It directly contributes 25 per cent to Gross Domestic Product (GDP) and provides employment to 44 per cent of the total labour force of the country. In the export earnings, direct as well as indirect share of agriculture is very high. Thus, it is prudent to call agriculture as the backbone of Pakistan's economy.

Major proportion of the population depends, wholly or partially, on the earnings from agriculture. Therefore, the development of agriculture is synonymous to the development of the country and availability of timely and realistic statistics is pre-condition for sound agricultural development planning.

In the pursuit of generating statistics on agriculture, the current exercise of conducting Agriculture Census was undertaken for fulfillment of under mentioned objectives.

## OBJECTIVES

1. To generate basic information on the structure of agriculture.
2. To develop detailed basic information about the agricultural resources, state of their utilization and to find out the degree of acceptability of modern farming practices among the farming community for the purpose of regional, provincial and national development, planning and research in the field of agriculture.
3. To fulfill data needs of the international agencies like FAO which require the country information for a world wide study of agricultural resources in order to formulate international policies in the matters relating to supply of food and raw materials on sustainable basis in the long run.

## LEGAL BASIS

The Agricultural Census Act, 1958 (Act No.XLI of 1958) provides the legal cover for the census operations. The Act makes it binding on

the Government for taking agricultural census and also on the respondents to cooperate with the census enumerators and to furnish information on or with respect to items specified in the said Act. At the same time it assures secrecy of the information supplied by the respondents.

## ADVISORY COMMITTEE

The census taking exercise was guided by an Advisory Committee. This committee comprised of about 50 official and non-official members drawn from the concerned Federal and Provincial Government Departments, Universities, Research Institutes and Agricultural Development Bank, while non-official members from the progressive farmers.

## TYPE & GEOGRAPHICAL COVERAGE

The Agricultural Census 2000 was sample based. The design however varied for different regions of the country in view of the ground realities.

This census covered whole of the country, i.e. NWFP (including Provincially and Federally Administered Tribal Areas / Agencies), Punjab (including Islamabad district), Sindh and Balochistan provinces. The geographic coverage was also extended to Northern Areas and Azad Jammu and Kashmir each as a separate entity.

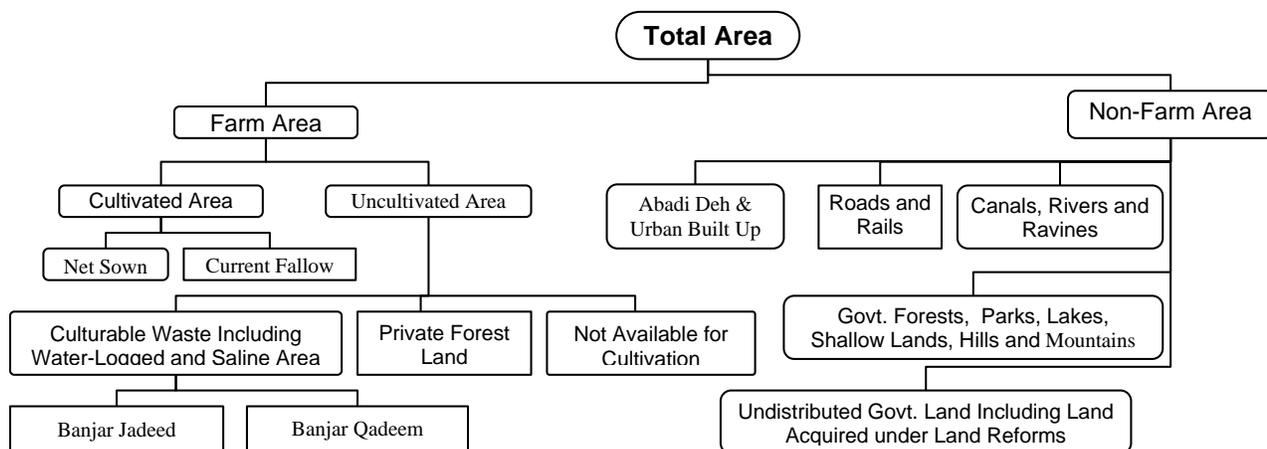
## SCOPE

The scope of the census with reference to farm area was restricted to the agricultural farms held and / or operated at the time of census taking by the Government or by private household(s), individually or collectively or under corporate arrangement. Consequently, the undistributed Government lands other than Government farms, undistributed portion of the lands resumed by the Government under land reforms; built up areas, land under roads, rails, ravines, rivers, canals, Government forests, parks, lakes, shallow lands, hills and mountains, etc. falling under the category of non-farm area

is outside the scope of the census. The chart given below illustrates the scope of the census in respect of area.

While scope of census in respect of subjects, as finally approved, included the collection of data on type, size, tenure and parcels of farms, land utilization, irrigation, area under crops and orchards, number of fruit and

non-fruit trees, use of manures, fertilizers and plant protection measures, use of agricultural machines, livestock population, extent of indebted-ness and investment made for different purposes, household members by sex and age groups, type of residential structures, economic activity and educational levels of household members and their main source of income.



**REFERENCE PERIOD**

The data on land and land utilization pertain to the agricultural year 1999 - 2000,

i.e. Kharif 1999 and Rabi 1999-2000. However, the data on number and size of farms, and other items refer to the below mentioned period of numeration if not otherwise indicated.

Area Covered	Enumeration Period
<p><b>Hot Area</b> Peshawar, Mardan, Kohat, Bannu and D.I.Khan Divisions; Agencies of Khyber, Mohmand and FRs of Peshawar, Kohat, Bannu, D.I. Khan and Tank in NWFP; whole of Punjab except Murree, Kotli Sattian and Kahuta Sub-divisions; whole of Sindh; Nasirabad and Makran Divisions and Districts of Chagai, Barkhan, Sibi, Kohlu, Musa Khel, Dera Bughti, Lasbella, Khuzdar, Awaron, and Kharan in Balochistan.</p>	<p>January-March, 2000</p>
<p><b>Cold Area</b> Hazara, Mansehra &amp; Malakand Divisions; Agencies of Malakand, Bajour, Kurrum, Orakzai, North Waziristan, South Waziristan and FRs of Mansehra, Kurrum (Sadda) in NWFP; and Districts of Quetta, Kila Abdullah, Ziarat, Pishin, Kalat, Zhob, Loralai, Kila Saifullah and Mastung in Balochistan; and Azad Jammu &amp; Kashmir.</p>	<p>April-June, 2000</p>
<p><b>Very Cold Area</b> Northern Areas</p>	<p>July-August, 2000</p>

## SAMPLING PLAN

It was considered necessary to adopt different sample designs for different parts of the country in view of the varied local conditions and availability of relevant information for selecting a sample. Therefore, the entire country was divided into three distinct parts for the purpose of sampling, detailed as below :-

- a) Rural settled areas of NWFP, Punjab and Sindh Provinces; where a three stage weighted and stratified sample was used.
- b) Rural settled areas of Balochistan and Azad Jammu & Kashmir; where a single stage weighted sample was used.
- c) Rest of the country, comprising entire urban areas and unsettled rural and tribal areas including Northern Areas; where a single stage systematic sample was used.

In rural settled areas, sample size was determined at sub-division level and in rural unsettled areas at the district / agency / FR levels. In urban areas, the sample size varied according to the size of populace in an urban unit. In the three stage sample, patwar circles in the first stage and mouzas in the second stage were selected with probability proportional to size, whereas households in the form of roughly equal clusters were selected at the third stage with equal probability.

This sampling plan called for preparation of elaborate frames involving great deal of effort and expense. The frames prepared were:-

- i) National Certainty Holdings (NCH) list; comprising of all government and private farms of 100 acres or more scattered all over the country.
- ii) Mouza list; containing only rural mouzas arranged by patwar circles and kanungo circles showing mouza wise total area, cultivated area and number of households. This list excluded purely forest mouzas and those urban mouzas which were declared urban or formed part of adjoining urban ward(s).

- iii) A complete list of urban blocks.
- iv) A list of households in selected mouzas showing total area rented-in and area owned constituting their farm holding was prepared from selected mouzas. With the help of this list, households farming 25 acres or more as area owned and / or area rented-in were segregated and treated as Mouza Certainty Holdings (MCH).
- v) A list of households with 25 or more cattle and / or buffaloes; 25 or more camels; 50 or more sheep and / or goats was prepared from the sampled mouzas. These livestock rearing households were also treated as Mouza Certainty Holdings (MCH).

The selection procedure adopted for various sampling stages is given below:-

### FIRST STAGE; Selection of Patwar Circles:

The number of patwar circles to be selected from each sub-division was determined keeping in view the number of enumerators which could be made available, effectively trained and properly supervised, besides inherent variance of the population in respect of the main items under study.

First of all each mouza was given a measure of size which is the geometric mean of its cultivated area as per 1996-97 revenue record and its number of households as per 1998 Population Census. This measure of size helped to arrive at the mouza probability of selection which was separately worked out and was proportional to its measure of size in the sub-division multiplied by the number of patwar circles to be selected from the same sub-division. Then, each patwar circle was assigned a probability by addition of the probability of selection of its mouzas. The patwar circles falling in various kanungo circles were arranged by their cultivated area within the respective kanungo circles. The patwar circles getting a probability more than 0.890 were selected with certainty and sifted out from the list. The patwar circles having probability less than 0.020 were merged with the immediately above non-certainty, non-merged patwar circles of the same kanungo circle

such that after merger the collective probability of merged patwar circles becomes greater than 0.019 and were retained in the list as a single unit with their collective probability.

The non-certainty patwar circles were re-assigned a probability by repeating the above mentioned process. A moving cumulative probability was worked out and shown against each patwar circle in a sub-division. For a sub-division to be sampled, a random number over zero and upto 0.999 was selected. The first patwar circle with cumulative probability equal to or greater than the random number was considered selected. Similarly, random number plus 1 (one) selected the second patwar circle, random number plus 2 (two) selected the third patwar circle and so on until the pre-determined number of patwar circles were selected from the sub-division.

### **SECOND STAGE; Selection of Mouzas:**

It was, a priori, decided to select two mouzas per selected patwar circle. The mouzas falling in certainty and selected patwar circles were arranged in serpentine fashion, i.e. within the odd numbered kanungos in descending order of cultivated area of the mouzas and within even numbered kanungos in ascending order of cultivated area of mouzas. The method employed at the first stage was repeated at patwar circle level for segregating the certainty mouzas and also for the selection of the non-certainty mouzas. Like the patwar circles with small probability of selection, the mouzas getting small probabilities were merged together by applying the principle mentioned in the first stage and treated as one mouza for sampling purposes.

One sub-stage at this level was introduced only for those selected mouzas which were having nine hundred or above households as per 1998 Population Census. Such mouzas were termed as big mouzas and were divided into convenient number of sectors, each having approximately 500-700 households. The number of households in a sector was treated as the measure of size to work out the probability of selection of a sector. One sector from each big mouza was selected with equal probability.

### **THIRD STAGE; Selection of Clusters of Households:**

A systematic selection of clusters of nearly 30 households each was made with equal probability from all the selected mouzas with the help of the list of households (Form-1). The number of clusters to be selected, with a minimum of two, was determined with regard to raising factor of the mouza and the pre-fixed overall raising factor at cluster level for a particular mouza. The limit of overall raising factor was fixed at 25 for all the rural settled areas. Ultimately the sample included:

- i) The households in the selected clusters.
- ii) The households located in the selected urban blocks.
- iii) The households located in the selected villages / basties / killies of unsettled areas.
- iv) The households located in the selected mouzas designated as Mouza Certainty Holdings.
- v) The households located any where in the country included in the list of National Certainty Holdings.

Total number of units and the units selected in the first, second and third stages are given in Appendix-I.

### **CENSUS QUESTIONNAIRE**

A comprehensive questionnaire was presented to the Advisory Committee for its consideration. The questionnaire, consequently, finalized on the basis of the recommendations of the Advisory Committee was used in the census.

The questionnaire used in the census had two versions. The main questionnaire (Form-2) was spread over 8 pages and was meant for households reporting owned and / or rented-in land. For landless households a short questionnaire (Form-3) was used which contained all the questions of Form-2 except those relating to land and crops. Specimen of

Form-2 is given in Appendix-II. The questionnaires were printed in Urdu, except for Sindh where the language used was Sindhi. The main questionnaire (Form-2) had fourteen parts.

There were 123 main items in the questionnaire with over six hundred sub-items concerning the main items.

To assist the enumerators a rather detailed instruction manual was provided. An extensive training made the enumerators fully conversant with the basic idea of every item included in the census questionnaire and equipped him to frame and re-frame suitable questions for eliciting the requisite information.

The format of the questionnaire was made to suit the data processing requirements. To further facilitate data processing the questionnaire was fully pre-coded. The type of forms used in the census are as under:-

- Form-1 To prepare the list of all the households located in the selected mouzas, villages and urban blocks.
- Form-2 Main census questionnaire (of eight pages) to be filled-in only for the selected households reporting owned and / or rented-in land.
- Form-3 Brief census questionnaire ( of two pages ) to be filled-in for the selected households not reporting any land.
- Form-4 Weekly progress report in the form of a pre-paid postage card to be filled-in and posted by each enumerator to the Census Organization Headquarter, Lahore every week throughout the census enumeration period.
- Form-6 National Certainty Holdings (NCH) form used for recording full address and other particulars of the NCH, in case the same could not be enumerated at his already noted address on any account.

Form-7 Identity Ticket to be filled-in by an enumerator for handing over to nomades to avoid re-enumeration.

## **FIELD ORGANIZATION AND TRAINING**

The Patwaris / Tapedars of the provincial revenue departments were designated as the census enumerators, while the Kanungos / Supervising Tapedars were engaged as their immediate supervisors. The Kanungos / Supervising Tapedars were also made responsible for the enumeration of National Certainty Holdings (NCH) located outside the sample mouzas of their respective jurisdictions. In big urban areas like Peshawar, Islamabad, Rawalpindi, Gujranwala, Sialkot, Lahore, Faisalabad, Jhang, Sargodha, Multan, Bahawalpur, Sukkur, Hyderabad and Karachi the field staff of the Federal Bureau of Statistics was employed for enumeration under their own supervisory staff designated for the purpose. In the unsettled areas, however, the revenue staff being very scanty was substantially supported by the Agricultural Field Assistants, Stock Assistants, School Teachers and Development Assistants for the field operation. The enumerators and supervisors were normally deputed to work within their respective jurisdictions, unless otherwise compelled by the local circumstances.

At tehsil and sub-division levels, concerned Tehsildars and Assistant Commissioners were designated as Tehsil Census Officers and Sub-Divisional Census Officers, respectively, and made responsible for the census operations to be carried out within their respective jurisdictions. The Deputy Commissioners were designated as District Census Officers and overall incharge of the census operations within their jurisdictions. Before the start of the census field operation, a meeting was arranged at every district headquarter to brief the above mentioned officers on the census methodology, schedule of work and to review the arrangements for launching the census field operation in the district.

One or more Census Master Trainers (CMTs) were placed at each district headquarter according to work load for the entire duration of

field operations to train the enumerators, supervise the enumeration work, select within mouza sample and to provide technical guidance to the enumerators as well as supervisors. The CMTs were also required to ensure completeness, quality and arrange the despatch of completed census documents to the census office.

The enumerators and their immediate supervisors were intensively trained in batches of approximately 30 each in census methodology, census forms and the concepts involved at their respective sub-divisional headquarter by Census Master Trainers (CMTs) specially trained and deputed for the purpose. The training sessions at district headquarters were inaugurated by the concerned Deputy Commissioners and at sub-divisions by the respective Assistant Commissioners. The four days training for enumerators and supervisors included first two days for classroom lectures ending in written test, third day in the field for practical work followed by revision, and finally review of the entire training on the fourth day. In addition to the theoretical and practical training, the enumerators were required to fill-in two census questionnaires independently during the listing operation (filling of Form-1) and show these to the CMT for checking. The enumerators were given the go ahead signal for enumeration by the CMT only after the latter was fully satisfied with formers' training.

To maintain reasonable quality in census results, a detailed supervisory programme was also planned to supervise the country-wide census operations to be completed within a short span of six to eight weeks. For the purpose, Mobile Teams of ACO officers remained in the field both during training and census enumeration periods. Each team was assigned a few contiguous districts for overall supervision. Special emphasis was given in the supervision programme for the districts where difficulties in the census operations were particularly anticipated for the timely and satisfactory completion. In big cities where field staff of the FBS was used for enumeration, the supervision was done by their incharge officers.

## **PUBLICITY**

A publicity campaign was launched on T.V, Radio and newspaper to project the importance of the census and its objectives. Similarly, handouts were issued to the newspapers at appropriate junctures during the census field operation.

Since the census was based on sample enumeration and the enumeration work was to confine to the selected mouzas / villages, a large number of members of the District and Tehsil Councils, Chairmen of Union Committees and Councilors of the selected villages were individually contacted and addressed on the issue.

## **ENUMERATION PROCEDURE**

Enumeration triggered off immediately after the training of enumerators. In settled areas of NWFP, the Punjab and Sindh, where three stage sample design was adopted, each enumerator on conclusion of the training proceeded to the assigned sampled mouza(s) and prepared a sketch map of the mouza showing location of houses and important landmarks. He then numbered the residential houses and recorded those alongwith names of head of the households in the listing sheet (Form-1). Area owned and area taken on rent / share cropping basis by households were also recorded. The numbers put on the houses were marked on the sketch map showing the location of each household with reference to important landmarks. After completing the households list (Form-1) for the mouza(s) assigned to him, the enumerator returned to the respective tehsil headquarter for getting the sample of households selected by the CMT. The CMT scrutinized the lists (Form-1), selected the sample and marked the selected households on the list (Form-1) giving them a separate serial number. The enumerator then returned to his assigned sampled mouza(s) and did the enumeration of the selected households.

In urban areas, unsettled NWFP and Balochistan, Northern Areas and AJ&K where a single stage sample design was adopted, listing (filling-in of Form-1) and enumeration work

(filling-in of Form-2 / Form-3) was done side-by-side, because all the households in selected villages / killies / blocks were to be enumerated.

The requisite information enlisted in the questionnaire for the purpose of census was collected through direct interview with head of selected household or in case of his absence with very close associate of the head of selected household.

During the course of listing and enumeration, each enumerator was required to fill-in and mail a pre-addressed weekly progress report card to the census headquarter stating the progress of work and problems, if any, faced by him. After completion of all the work in assigned mouza(s), the enumerator was required to put all the documents back in the census kit bag(s) and return the same to the CMT in the sub-division. The documents were then checked for completeness and despatched to the ACO headquarter by the CMT.

In the meanwhile the supervisors conducted the enumeration of National Certainty Holdings (NCHs) in the non-selected mouza(s) and also supervised the progress of work of enumerator(s) within their respective jurisdictions.

## PROCESSING AND TABULATION

The census data were processed on a main frame computer. The processing and tabulation was carried out through a number of steps devised in a logical scheme of work, viz- viz, document control, coding, manual editing, data entry and verification, computer editing, census tabulation and quality control.

## ESTIMATION OF CENSUS RESULTS

As the census was based on sample enumeration, the sample observations were to be raised to the population level. Therefore, the raising factors determined at various sampling stages, representing the inverse of the probability of selection of the respective household, were fed to the computer alongwith the other data. In case of a joint holding, 1/2, 1/3, 1/4 of the holding (or as the case might be)

was considered enumerated when one of the two, one of the three or one of the four partners of a holding, respectively, was enumerated.

The terminology used in the estimation of aggregates along-with the mathematical formulae for developing census estimates is given below:

### a) Terminology

For convenience, the standard notations have been adopted such as small letters used for sample observations, capital letters for population values and capped capital letters for estimates of population values.

$Y_{hijkl}$  is the observation from the  $l^{\text{th}}$  sample household

of the  $k^{\text{th}}$  Cluster  
of the  $j^{\text{th}}$  Mouza  
of the  $i^{\text{th}}$  Patwar Circle  
of the  $h^{\text{th}}$  Stratum

and  $x_{hijk}$  is the number of elementary units in the  $k^{\text{th}}$  cluster having such attributes.

With the number of :-

Total households in the  $k^{\text{th}}$  cluster,  
 $l = 1$  to  $N_k$

National Certainty House-holds in the  $k^{\text{th}}$  cluster,  
 $l' = 1$  to  $N'_k$

Mouza Certainty House-holds in the  $k^{\text{th}}$  cluster,  
 $l'' = 1$  to  $N''_k$

Non-Certainty Households in the  $k^{\text{th}}$  cluster,  
 $l''' = 1$  to  $(N_k - N'_k - N''_k)$

Total Clusters in the  $j^{\text{th}}$  mouza,  
 $k = 1$  to  $Q_j$

Sample Clusters in the  $j^{\text{th}}$  mouza,  
 $k = 1$  to  $q_j$

Total Mouzas in the  $i^{\text{th}}$  patwar circle,  
 $j = 1$  to  $R_i$

Sample Mouzas in the  $i^{\text{th}}$  patwar circle,  
 $j = 1$  to  $r_i$

Total Patwar Circles in the  $h^{\text{th}}$   
stratum,  $i = 1$  to  $S_h$

Sample Patwar Circles in the  $h^{\text{th}}$   
stratum,  $i = 1$  to  $s_h$

Total Strata in a sub-division,  
 $h = 1$  to  $L$

Total Strata in a sub-division  
comprising non-certainty Patwar Circles,  
 $h' = 1$  to  $L'$

Total Strata in a sub-division  
comprising certainty Patwar Circles,  
 $h'' = 1$  to  $(L - L')$

For example:  $Y_{h''ijkl''}$  represents the  $l''^{\text{th}}$   
non-certainty household of the

$k^{\text{th}}$  cluster of the

$j^{\text{th}}$  mouza of the

$i^{\text{th}}$  Patwar circle of the

$h''^{\text{th}}$  stratum comprising one  
certainty patwar circle.

## b) Probabilities of Selection

$P_{hijkl''}$  = Overall probability of  
selection of the  $l''^{\text{th}}$   
household from  $k^{\text{th}}$  cluster  
of  $j^{\text{th}}$  mouza of  $i^{\text{th}}$  patwar  
circle of  $h^{\text{th}}$  stratum.

For non-certainty holdings,  
 $P_{hijkl''} = P_{hijk}$

For mouza certainty holdings,  
 $P_{hijkl''} = P_{hij}$

For national certainty holdings,  
 $P_{hijkl''} = 1$

By each stage of sample selection,  
probabilities are :-

1)  ${}_h P_i$  = probability of selection  
of the  $i^{\text{th}}$  patwar circle

2)  ${}_{hi} P_j$  = probability of selection  
of the  $j^{\text{th}}$  mouza

3)  ${}_{hij} P_k$  = probability of selection  
of the  $k^{\text{th}}$  cluster

Cumulative overall probabilities of  
selection of each stage of selection are:-

$$\begin{aligned} 1) \quad P_{hi} &= {}_h P_i \\ 2) \quad P_{hij} &= {}_h P_i \times {}_{hi} P_j \\ 3) \quad P_{hijk} &= {}_h P_i \times {}_{hi} P_j \\ &\quad \times {}_{hij} P_k \end{aligned}$$

## c) Census Estimates

Step1: Estimate for total of all non-  
certainty observations for the  $k^{\text{th}}$   
cluster

$$\hat{Y}'''_{hijk} = \frac{(N_k - N'_k - N''_k)}{l''} \sum y_{hijkl''}$$

Step2: Estimate for the  $j^{\text{th}}$  mouza for  
non-NCH

$$\hat{Y}_{hij} = \frac{\sum q_j \hat{Y}'''_{hijk}}{k \cdot {}_{hij} P_k} + \frac{\sum Q_j N''_k}{k \cdot l''} \sum y_{hijkl''}$$

Step3: Estimate for the  $i^{\text{th}}$  patwar circle for  
non-NCH

$$\hat{Y}_{hi} = \frac{\sum r_i \hat{Y}_{hij}}{j \cdot {}_{hi} P_j}$$

Step4: Estimate for the h<sup>th</sup> stratum for non-NCH

$$\hat{Y}_h = \sum_i \frac{s_h \hat{Y}_{hi}}{P_i}$$

Step5: Estimate for the sub-division for all holdings

$$\hat{Y} = \sum_h \hat{Y}_h + \sum_h \sum_i \sum_j \sum_k \sum_l \frac{S_h R_i Q_j N'_k}{P_{hijkl}} y_{hijkl}$$

It can be seen that the last estimate could also be calculated directly by :-

$$\hat{Y} = \sum_h \left[ \sum_i \sum_j \sum_k \frac{S_h R_i Q_j (N_k - N'_k - N''_k)}{P_{hijk}} y_{hijkl} \right]$$

$$+ \sum_k \frac{Q_j N''_k}{P_{hijk}} y_{hijkl} + \sum_i \sum_j \sum_k \sum_l \frac{S_h R_i Q_j N'_k}{P_{hijkl}} y_{hijkl}$$

The estimate of the number of primary units reporting a certain characteristic ( $\hat{X}_w$ ) will be obtained by the following formula:-

$$\hat{X} = \sum_h \left[ \sum_i \sum_j \sum_k \frac{S_h R_i Q_j (N_k - N'_k - N''_k)}{P_{hijk}} \right]$$

$$+ \sum_k \frac{Q_j N''_k}{P_{hijk}} + \sum_i \sum_j \sum_k \frac{S_h R_i Q_j N'_k}{P_{hijk}}$$

This formula simply involves raising each observation by its combined raising factor, and summing up throughout the sub-division. The ratios such as Average Farm Size can then be obtained by the following:-

$$\frac{\hat{Y}}{\hat{X}}$$

## PUBLICATION OF CENSUS DATA

The census data as mentioned above have been tabulated at district, division, province and national levels. The tabulations thus prepared are published in the following reports :-

**Vol.1: Pakistan Report** contains tabulations at country and province levels in acres/hectares for the local as well as foreign users.

**Vol.2: Provincial Reports** consist of four parts, i.e. one for each province. Each contains tabulations at province, division and district levels in acres for the local users.

**Vol.3: Special Reports** consist of two reports, i.e. one each for Northern Areas and Azad Jammu & Kashmir. Each contains tabulations at the district and overall levels in acres for the local users.

## QUALITY OF CENSUS DATA

In spite of the best efforts to ensure quality the likelihood of some margin of sampling and non-sampling errors is always possible. Therefore, the important consideration was to control the extent of sampling and non-sampling errors. In addition the quality of the census data was adjudged on the criterion of (1) internal consistencies and (2) comparison with other corresponding series.

### (1) Sampling Error

To estimate sampling error the relative variance and then the co-efficient of variation have been worked out for a number of important items and given in Appendix-III. The formula used for estimating relative variance and the co-efficient of variation at sub-division, district, province and country levels is described in the succeeding paragraphs.

At the sub-division level, R.V. was estimated simply by first raising the sample observations of each patwar circle to stratum level using the overall raising factor for each holding but excluding all National Certainty

Holdings (NCHs), and then summing up to obtain an estimate for each half stratum as under :-

$$Y_{h'1} = \sum_j \left[ \sum_k \sum_{l''} \frac{r_1 q_j (N_k - N'_k - N''_k) y_{h'1jkl''}}{P_{h'1jk}} + \sum_k \sum_{l''} \frac{Q_j N''_k y_{h'1jkl''}}{P_{h'1j}} \right]$$

$$Y_{h'2} = \sum_j \left[ \sum_k \sum_{l''} \frac{r_2 q_j (N_k - N'_k - N''_k) y_{h'2jkl''}}{P_{h'2jk}} + \sum_k \sum_{l''} \frac{Q_j N''_k y_{h'2jkl''}}{P_{h'2j}} \right]$$

then, R.V. for the sub-division estimate of aggregates of the attribute is obtained by taking square of differences between estimates for successive pairs of half strata divided by the sub-division estimates as follows :-

$$\text{Var.}(Y) = [\text{C.V.}(Y)]^2 = \sum_{h'} \left[ \frac{\hat{Y}_{h'1} - \hat{Y}_{h'2}}{\hat{Y}} \right]^2$$

Similarly, R.V. for the sub-division estimate of units having the attribute is :-

$$\text{Var.}(X) = [\text{C.V.}(X)]^2 = \sum_{h'} \left[ \frac{\hat{X}_{h'1} - \hat{X}_{h'2}}{\hat{X}} \right]^2$$

Per cent Sampling Error, i.e.

$$(\text{C.V.}) = \frac{\sqrt{\text{R.V.}}}{\text{R.V.}} \times 100$$

If the R.V. for the aggregate of characteristic (W) for sub-division (g) is denoted by  $RVYW_g$  and  $Y_{wg}$  is the estimate for the aggregate (Y) of characteristic (W) for sub-division (g), then the R.V. for the district with  $g = 1$  to  $u$  sub-divisions in the district is

$$RVYW = \frac{\sum_g^u (RVYW_g) \hat{Y}_{wg}^2}{\left( \sum_g^u \hat{Y}_{wg} \right)^2}$$

and

$$RVXW = \frac{\sum_g^u (RVXW_g) \hat{X}_{wg}^2}{\left( \sum_g^u \hat{X}_{wg} \right)^2}$$

R.V. estimates for provinces and country levels have also been worked out on the same pattern as at the district level.

## (2) Non-Sampling Error

In Agricultural Census 2000 the non-sampling errors were minimized through careful planning, elaborate training and intensive supervision. Comprehensive editing of census data was another measure adopted to reduce such errors.

## (3) Consistency of Data

Consistency and reasonableness of data was adjudged through a number of interrelationships between various census items. The users of census data would certainly find the required fineness in the quality of census estimates reflecting a reasonable degree of consistency.

## (4) Comparison with Corresponding Series

The census estimates were also checked / compared with the corresponding series as far as possible at the district, division, province and country levels. The discrepancies identified were sorted out diligently by digging in the source documents, raising factors, computational process, etc. and corrected after careful considerations.

## DEFINITIONS AND EXPLANATIONS

1. **Census** means the Census of Agriculture.
2. **Census Year** begins from 1st July, 1999 and ends on 30th June, 2000. In terms of Agricultural Year it begins from mid March, 1999 and ends on mid March, 2000 and covers the crops of kharif 1999 and rabi 1999-2000.
3. **Census Day** refers to the day of enumeration of a household.
4. **Mouza / Deh** is a demarcated territorial unit for which separate revenue record including a cadastral map is maintained.
5. **Village / Basti / Killi** means a chunk of houses known by a certain name. There may be one or more villages / basties / killies in a mouza.
6. **Sample Mouza / Deh / Village/ Killi** is a unit selected by means of certain sampling method for census enumeration. In settled areas, mouza / deh has been used as a sampling unit while in unsettled areas village / basti / killi and in urban areas block has been taken as the sampling unit.
7. **House** means any structure in use for human habitation.
8. **Household** means a person or a group of persons living together and eating from the same kitchen whether or not related to each other. Hospitals, hostels, jails and hotels are not considered as household.
9. **All Households** include Farm Households and Non-Farm Households.
  - a) **Farm Households** include households operating any farm area irrespective of its ownership and whether operating individually or jointly with other households. Farm household may or may not have any livestock.
  - b) **Non-Farm Households** include households not operating any farm area. Households owning land but not operating any land area are also included in this category.
10. **Livestock Holder** is a household having at least one head of cattle and / or buffalo, 5 sheep and / or goats but not operating any farm area.
11. **Agricultural Households** include Farm Households and / or Livestock Holders.
12. **Non - Agricultural Households** include households which do not fall in the categories of Farm Households and / or Livestock Holders.
13. **Farm** is the aggregate area of land operated by member(s) of one household alone or with the assistance of member(s) of other household(s) without regard to location, size or title and normally used for crop production. Farms wholly uncultivated during the census year are also included in this category.
14. **Individual Farm** means a farm operated by one or more persons of the same household.
15. **Joint Farm** means a farm jointly operated by persons belonging to two or more different households.

16. **Land Tenure** is concerned with the rights / arrangements under which the land is operated.
- a) **Owner Farm:** A farm of which entire land is owned by the operator.
  - b) **Tenant Farm:** A farm of which entire land is taken from other household(s) against a fixed rent in cash / kind or a share in the produce.
  - c) **Owner-Cum-Tenant Farm:** A farm of which a part of the area is owned by the operator household and the remaining taken from other household(s) against rent or share of the produce.

17. **Area Owned** includes the total area owned by all members of a household irrespective of its location. It also includes the area held in owner like possession; such as land temporarily allotted, the mortgaged land under possession, government land taken on lease, etc.

18. **Area Self-Operated** includes whole or only that part of area owned which is under the day-to-day operational control of a household on the census day.

19. **Area Share Cropped** means the rented-in area for which a pre-decided share of the produce is paid by the tenant to the owner of the area.

20. **Area Taken on Lease / Rent** means the rented-in area for which a pre-decided fixed rent in cash or kind is paid by the tenant to the owner of the area.

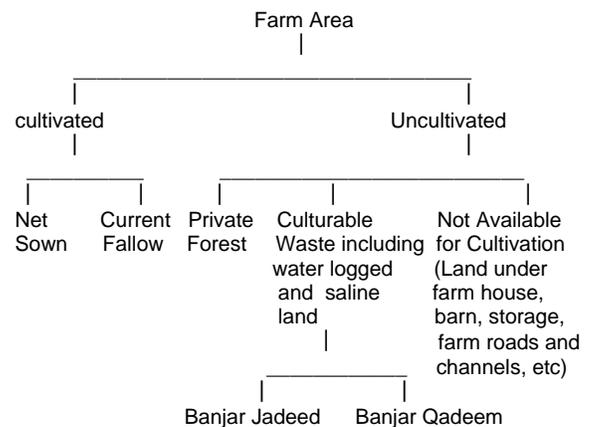
21. **Other Area** includes area operated by a household, other than the area owned,

without paying any rent in the usual form, e.g. kaccha area along the river side, etc.

22. **Total Farm Area** includes total culturable and un-culturable area of a farm but it does not include area outside the farm such as area under government forests, roads, railways, schools, playgrounds, canals, rivers, abadi deh, urban built-up area, undistributed government land, etc.

23. **Fragment / Parcel** refers to any piece of land of a farm entirely surrounded by land of other farm(s) and / or by land and / or water not forming part of any farm. One farm may have one or more fragments / parcels in it.

24. **Land Utilization** means classification of the farm area in accordance with its use as under:-



25. **Cultivated Area** is that farm area which was sown at least once during the census year, i.e. 1999-2000 or a year before. It is the sum of area Net Sown and Current Fallow.

26. **Net Sown Area** means the cultivated farm area which was actually cropped during the census year regardless of becoming 'kharaba' (crop failure) and / or the number of crops raised, and also includes area under orchards.

27. **Current Fallow** means that cultivated farm area which was not cropped during the census year for the purpose of regaining fertility and / or any other specific objective but was cropped during the preceding year.
28. **Culturable Waste** is that uncultivated farm area which is otherwise fit for cultivation but was not cropped during the census year or in the year before due to presence of any of the constraints like non-availability of water, water logging, salinity, unleveling, manpower and / or funds shortage, etc.
29. **Area Not Available for Cultivation** is that uncultivated area of the farm which is under farm house, barn, storage, farm roads and channels, etc. and therefore not available for cultivation.
30. **Forest Area** is that uncultivated farm area which is under forest. It does not include area under government forests.
31. **Total Culturable Area** includes cultivated area and culturable waste.
32. **Irrigated Area** includes the cultivated area actually irrigated at least once during the census year by artificial means.
33. **Perennial Canal Irrigated Area** means the area irrigated by canal flowing round the year.
34. **Non-Perennial Canal Irrigated Area** means the area irrigated by canal flowing seasonally, i.e. for a few months in a year.
35. **Un-irrigated Area** includes the cultivated area not artificially irrigated. It depends for cultivation solely on rain fall (barani or rainfed) or river floods and seepage water (sailaba), etc.
36. **Total Cropped Area** means the aggregate area of crops raised at a farm during the census year including the area under orchards / gardens.
37. **Crop Area Irrigated** means area of a crop actually irrigated at least once by artificial mean(s). It also includes one or more irrigations given as part of land preparation before sowing of the crop.
38. **Crop Area Covered With Plant Protection Measures** means the area of a crop on which plant protection material was applied / sprayed irrespective of the number of applications / sprays made. It does not include aerial spray and seed treatment.
39. **Area Fertilized** means the area of a crop treated with chemical fertilizer(s), before and / or after sowing, irrespective of the number of times it was fertilized.
40. **Crop Seasons** are :-  
a) Kharif, and ;  
b) Rabi
- a) **Kharif** crops are sown in summer and harvested in late summer or early winter. The important Kharif crops are cotton, rice, sugarcane, maize, jowar and bajra.
- b) **Rabi** crops are sown in winter and harvested in late winter or during early summer. The important Rabi crops are wheat, gram, barley, rapeseed and mustard.
41. **Orchard Area** is the farm area compactly planted with fruit trees. The important fruit trees are mango, citrus, guava, date,

grape, apple, pear, plum, apricot and peach.

42. **Intensity of Land Use** represents the cultivated area measured in terms of total culturable area multiplied by 100, i.e.

$$\text{Intensity of Land use} = \frac{\text{Cultivated Area} \times 100}{\text{Total Culturable Area}}$$

It indicates the extent to which the culturable land was used for cultivation of crops.

43. **Intensity Of Cropping** represents the total cropped area in terms of total cultivated area multiplied by 100, i.e.

$$\text{Intensity of Cropping} = \frac{\text{Total Cropped Area} \times 100}{\text{Total Cultivated Area}}$$

It indicates the extent to which the cultivated area was used for intensive cropping.

44. **Pulses Area** includes the area under gram, rabi pulses as well as kharif pulses.

45. **Fodder Area** includes the area under rabi fodders as well as kharif fodders.

46. **Vegetable Area** includes the area under sugarbeet, potato, tomato, onion, chilli, melon, other rabi vegetables and other kharif vegetables.

47. **Mixed Cropping:** The following procedure was adopted for recording area reported under mixed crops :-

- a) **Crops Grown in Orchard:**  
If the orchard consisted of trees not of bearing age, the entire area of the

crop grown in the orchard was reported. If the orchard consisted of trees of bearing age, only half of the area of the crop grown in the orchard was taken. The area under orchard was included as such in either case.

- b) **Crops Grown Together:** If the two crops grown together were harvested at the same time, one half of the area in the crops grown together was reported for each of the crops. If the two crops grown together were harvested at different times, the entire area of the crops grown together was reported for each of the crops.

48. **Economic Activity:** The data on the type of economic activity is based on the concept of "usual" activity using 12 months period as the reference period in contrast to labour force concept of "current" activity in which a short time reference of one week or less is generally used.

49. **Economically Active Persons** are those persons of either sex of 10 years or above in age who, during the reference period, participated in the production of economic goods or services.

50. **Agricultural Work** includes farm work or planning thereof. It includes work on the farm, e.g. ploughing, planting, hoeing, weeding, application of fertilizer(s) and plant protection material(s), harvesting, winnowing, feeding and caring of the livestock, supervision of agricultural workers, hauling farm produce to market and any other work related to the operation of the farm.

51. **Non-Agricultural Work** refers to the work other than agricultural work, which may

relate to trade, cottage industry, occupation of village functionaries, service with government or other agencies and non-agricultural labour, etc.

52. **Family Agricultural Workers** include household members of 10 years and above who do any kind of agricultural work on their holding. Family workers have been classified into persons doing agricultural work on permanent basis or part time basis.

a) **Permanent Family Workers** Include members of the household who only do agricultural work of the holding. They also include senior household members who may not be doing any physical work at the holding but carry out and / or participate in the planning and operation of farm.

b) **Household Members Doing Part Time Work** include members of the household who in addition to the agricultural work of the holding also do some other work such as service, business, etc.

53. **Economically Inactive Persons** are those persons of the household who do not perform any work for profit or family gain in cash or in kind. Housewives and other members of the household who are mainly engaged in household duties in their own home, students attending any regular educational institution and other persons not economically active are generally included in this category.

54. **Permanent Hired Labour** means persons who work on the farm on whole time basis and are employed for longer periods. They get wages in cash and / or kind on a fixed period basis, i.e. monthly, quarterly, yearly, etc.

55. **Casual Labour** means the labour employed occasionally on daily wage basis for a specific agricultural work.

56. **Cattle** is the collective name given to bovine animals.

57. **Work Animals** include bullocks, male buffaloes and camels.

58. **Household Under Debt** include households reported under any type of debt at the time of census enumeration.

59. **Owned House** means a household's residential place with ownership or equivalent rights.

60. **Complete Pakka House** means a residential place, walls of which are made up of baked bricks / stones / concrete bonded with mud or cement.

61. **Complete Kacha House** means a residential place, walls of which are made up of mud or unbaked bricks bonded with mud.

62. **Partially Kacha / Pakka House** means a residential place having both Kacha and Pakka walls.