

# **farm and input prices: collection and compilation**

**statistics division**

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

M-75

ISBN 92-5-101007-2

The copyright in this book is vested in the Food and Agriculture Organization of the United Nations. The book may not be reproduced, in whole or in part, by any method or process, without written permission from the copyright holder. Applications for such permission, with a statement of the purpose and extent of the reproduction desired, should be addressed to the Director, Publications Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.

© FAO 1980

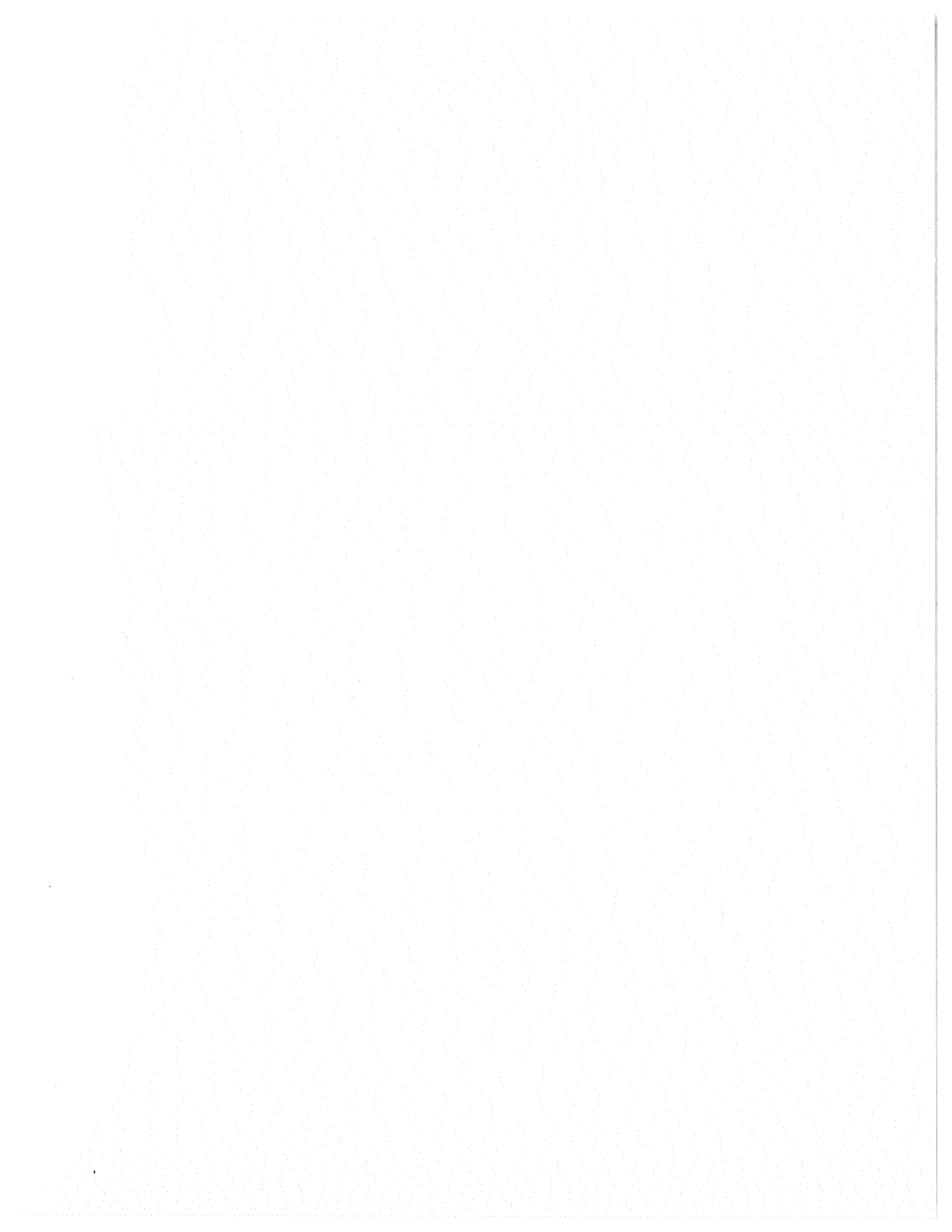
## FOREWORD

Action at the national and international levels was recommended at various FAO meetings and seminars for the improvement of national statistics on agricultural producer prices. The preparation by FAO of a manual on prices paid and prices received by farmers has been repeatedly recommended. This provisional manual has been prepared in response to these recommendations.

The main objective of the manual is to assist countries in the improvement of their price statistics including its use in the training of national staff in the collection and compilation of agricultural producer prices. It is hoped that this manual will contribute to promoting the compilation of data on agricultural producer prices and to the improvement of their quality. The details of the treatment given to the subject matter, and the descriptive style employed, have been deliberately chosen so as to make the manual of particular use to developing countries.

This manual is based on material prepared by Mr. S.C. Chaudhri, FAO Consultant, which was further reviewed and prepared for publication by Mr. E.L. Snowdon, FAO Consultant.

For the purpose of revising this manual and issuing it in final form, comments and suggestions by national and other statisticians engaged in the collection of agricultural producer prices will be greatly appreciated. These comments should be sent to the Director, Statistics Division, FAO, 00100 Rome, Italy.



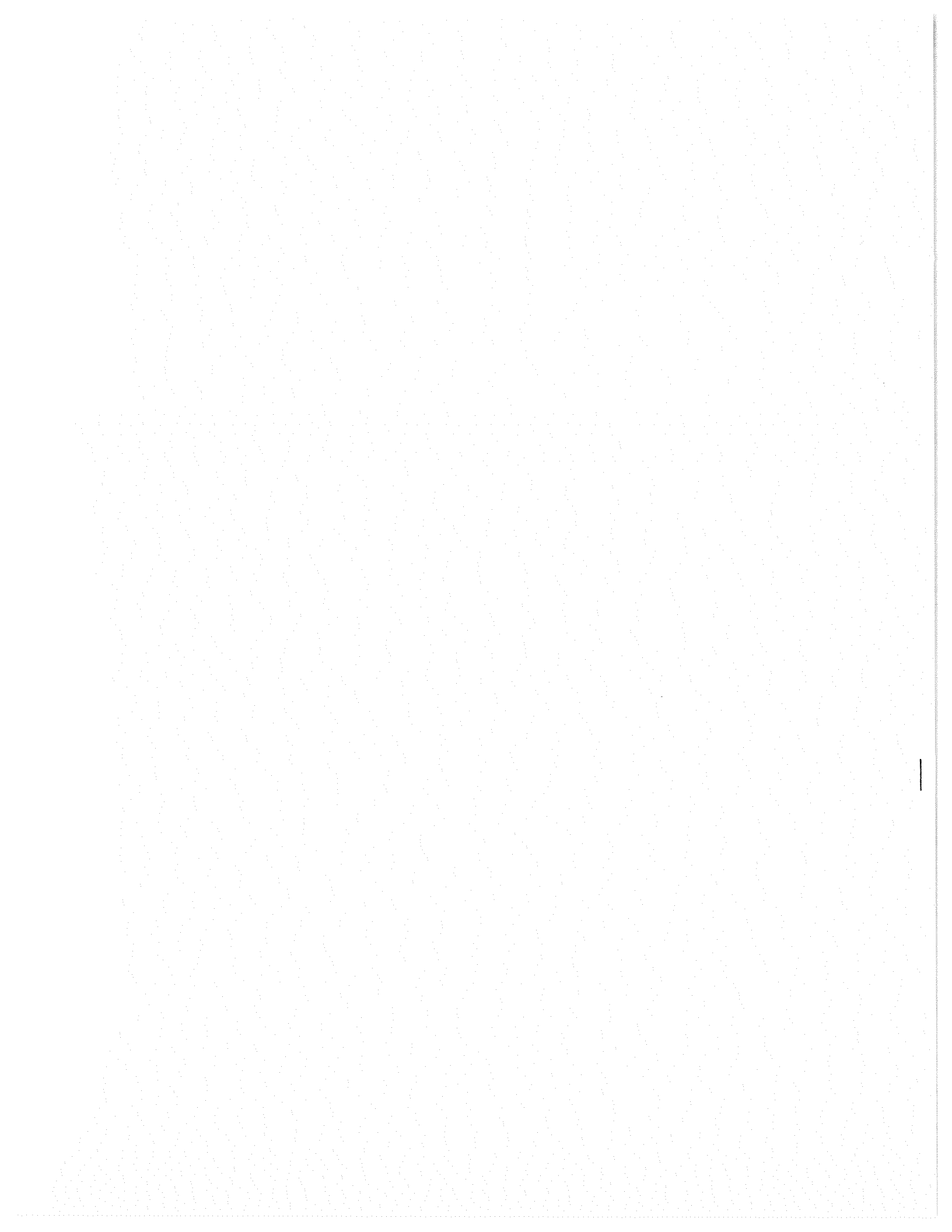
COLLECTION AND COMPILATION OF PRICES  
RECEIVED AND PRICES PAID BY FARMERS

	<u>Page</u>
I. INTRODUCTION	1
II. USES OF AGRICULTURAL PRICE DATA	2
Uses by individual farmers	2
Uses by private and cooperative business organizations	2
Uses by public agencies	2
Uses in agricultural sector accounts	3
Uses in agriculture's terms of trade	3
Other uses	3
Two broad groups of uses	3
Comparison	4
Valuation	4
Influence of final use on the price collection system	5
III. TYPES OF AGRICULTURAL PRICES	6
Distribution channels	6
Prices received by farmers (producer prices)	6
Wholesale prices	7
Retail prices	8
Export prices	8
Prices paid by farmers	9
Conceptual distinction between prices received and prices paid by farmers	9
Utilization of prices received and prices paid	9
IV. STANDARDIZATION OF THE PROGRAMME OF COLLECTION OF PRICES RECEIVED BY FARMERS	10
Market procedures survey	10
Technical considerations	11
Definition of prices received by farmers	11
Techniques of averaging prices	11
Selection of commodities	12
Specification of variety and quality	12
Time of price collection	13
Period of price collection	13
Frequency of price collection	14
Unit of quotation	15
Other technical aspects	15
Selection of markets	16
Descriptive market schedules	17
Price reporting form (prices received by farmers)	18
Instructions for field staff	18
Price spread	19
Sampling for price statistics	19
Survey of farmers for collecting prices received	20
Other sources of price statistics	21
Ancillary information	21

	<u>Page</u>
V. STANDARDIZATION OF THE PROGRAMME OF COLLECTION OF PRICES PAID BY FARMERS	22
Definition of prices paid by farmers	22
Requisites of agricultural production	22
Costs of production survey	23
Suggested list of production requisites	23
Commodity specifications	24
Locations for price reporting	24
Nature of price quotations	26
Time, period and frequency of price collection	26
Unit of quotation	26
Subsidies and taxes	27
Price reporting form (prices paid by farmers)	27
Instructions for field staff	28
Survey of farmers for collection of prices paid	28
Other sources of price statistics	29
VI. COMPILATION, STATISTICAL TREATMENT, DISSEMINATION AND ANALYSIS OF PRICES RECEIVED AND PRICES PAID BY FARMERS	30
The price reporting forms	30
Scrutiny of price reporting forms	30
Format for compilation	31
Averaging for comparison purposes	32
Averaging for valuation purposes	33
Index numbers	33
Index numbers of prices received by farmers	35
Index numbers of prices paid by farmers	35
Parity index numbers	36
Dissemination	36
Publication	37
Timeliness of publication	37
Analysis	38
VII. ORGANIZATIONAL STRUCTURE FOR PRICE COLLECTION	39
National price collection authority	39
Statisticians	39
Field workers or price reporters	39
Supervisors	40
Training	40
Compilers	41
Analyst and publishers	41
Other considerations	41

APPENDICES

	<u>Page</u>
I. List of meetings, seminars, etc., at which the preparation of a technical Manual on agricultural price statistics has been recommended	43
II. Suggested content of descriptive market schedules	44
III. Example to illustrate the calculation of farm-gate prices from wholesale market prices	46
IV. Agricultural price index number construction	48
V. Prices paid by farmers for household consumption goods	50
VI. References	52





## I. INTRODUCTION

The Food and Agriculture Organization of the United Nations, conscious of the basic importance of agricultural price statistics, has, over the years, been active in promoting meetings and seminars to discuss the utility of these statistics and to review the current status of price collection in member countries. A list of such meetings and seminars and a summary of the recommendations made at each is shown in Appendix I.

In pursuance of the suggestions made at these various meetings, the FAO agreed to work out international recommendations on agricultural price statistics and to produce a technical manual for the guidance of member countries. Such a document would describe the procedures necessary for setting up a price collecting system, including the essential preliminary surveys, the statistical treatment and analysis of the data collected, and the subsequent calculations of price index numbers. This present manual represents the results of the efforts so far made to achieve these objectives.

Since the agricultural producer is both a seller of his produce as well as a buyer of agricultural production requisites, agricultural prices cover not only the prices "received" by farmers ("output" prices) but also the prices "paid" by farmers ("input" prices). The present manual deals with the collection and compilation of both types.

The farmer is also, of course, a buyer of consumer goods for use in his own household. Prices for such purchases are not to be regarded as "agricultural prices", and are not, therefore, strictly within the coverage of this manual. Nevertheless, Appendix V deals with the suggested statistical treatment of such prices should the need for them arise.

## II. USES OF AGRICULTURAL PRICE DATA

Agricultural prices are important economic variables in a market economy. Price relationships have a significant influence on decisions relating to the type and volume of agricultural production activity. They provide a measure for reaching judgement on policy formulation and administrative and executive action. Being crucial for purposes of decision-making in the sphere of economic activities, price data acquire considerable importance. Their collection and compilation, therefore, deserve attention no less than that given to obtaining information on other socio-economic characteristics. The systems to be adopted in the compilation of price statistics must, therefore, be meaningfully determined in relation to their end uses.

### Uses by individual farmers

In the short run, an individual farmer needs output prices to determine the pace and volume of his sales so as to optimize the return from his farm production. In the long run, knowledge of price trends helps a farmer to formulate the investment plan on his farm and to take decisions on the structure and nature of his enterprises. An understanding of the normal differences in the prices of his products and production requisites during the year helps a farmer to react logically to the marketing situations in order to optimize the planning of the sale of his products and the purchase of his supplies. His production plans are governed by the price expectations of the various commodities he can produce, and these expectations are based on the trends both of output prices as well as the prices of the agricultural inputs that he has to buy.

### Uses by private and cooperative business organizations

Business organizations use price data in a number of ways, such as planning the character, location and size of their agricultural business enterprises; determining the time and place for purchasing agricultural production requisites; deciding on inventory expansion or contraction and hedging; selecting the markets and time of sale of their produce so as to reap the best advantage; and formulating credit policies. These organizations also use price data to decide on the nature and volume of storage accomodation needed for stocking goods and to determine the quantum of flow required from time to time to keep prices from fluctuating sharply.

### Uses by public agencies

Public agencies use price data in planning agricultural programmes and ensuring that the allocation of available resources to different uses is consistent with the price system. Profit expectations from alternative agricultural development plans depend on the structure and behaviour of both output and input prices. Both product substitution in domestic agriculture and planning of regional production programmes are facilitated by adequate price data. With their aid, public agencies can make necessary adjustments to agricultural programmes if faced with price distortions, and can modify input-output price relationships to ensure the success of those programmes.

Public agencies need price data more importantly for formulating agricultural price policies, such as direct control of prices or indirect influence upon prices (through measures like subsidies, indirect taxation, import/export duties) with a view to stabilizing prices or attaining the desirable goals of adequate production, supply and distribution. Decisions on policies and measures on market intervention, output price support, regulation of the supply and demand of individual commodities and control of prices of agricultural inputs also depend on price data.

Public agencies must keep price behaviour under constant study with a view, for example, to diagnosing the factors leading or about to lead to inflationary or deflationary pressures in order to take timely remedial actions. Overall economic planning, of which agricultural development is a part, uses price data as a major determinant of the resources required to achieve the desired goals.

Public agencies need price data in working out and operating international trade agreements, customs unions and regional common markets.

Public agencies disseminate market intelligence and price outlook data for agricultural products and requisites to help farmers in taking decisions on their sale and purchase operations.

#### Uses in agricultural sector accounts

Price data are used in constructing economic accounts for agriculture within the general framework of national accounts. This involves the estimation of the value of agricultural output, expenditure on goods and services purchased by farmers and total agricultural income. The data so computed enable the trend in agricultural income and the share of agriculture in total national income to be properly studied.

#### Uses in agriculture's terms of trade (See also page 36)

Raw price data, when properly processed, can yield index numbers. Index numbers of prices received by farmers, studied over time, indicate the extent to which changes in the value of output or farm disposals are attributable to changes in prices. Similarly, index numbers of prices paid by farmers throw light on the contribution of prices to changes in the total expenses incurred by farmers. The ratio of the two indices gives agriculture's terms of trade with the rest of the economy, and can be useful in explaining the variations in farmers' prosperity from time to time.

#### Other uses

Price data are needed by economists, planners, administrators and others for a variety of uses. They can provide an explanation of the changes in the socio-economic pattern of society, the nature of demand for farm policy legislation, and the pressures for greater social justice. Commodity price data are used for generating price elasticities, so useful for making demand projections and for giving a forward view of possible emerging imbalances. Price data constitute the basis for various cost studies: cost of production, cost of marketing and distribution, cost of living. They can also be used for working out the return from investment; the cost of subsidising agricultural output and input commodities; and the cost of adjusting wages and allowances. To the extent that prices influence the shares of the participants in economic activity, price data provide the most significant economic indicator and are indispensable for a proper understanding of given economic phenomena. Price data enter all economic studies, whether it be the measurement of that part of the population living below the poverty line; the determination of increases in wages and allowances needed to offset the rise in the cost of living; the evaluation of changes in the purchasing power of money; the examination of variations in per capita incomes; or the assessment of the impact of a country's budget on its national economy.

#### Two broad groups of uses

From the foregoing it is obvious that the uses to which price data are put are many and varied. These uses, however, possess two broad characteristics: their use for purposes of comparison and their use for purposes of valuation.

### Comparison

The use of price data for comparison purposes takes several forms. Temporal comparison is effected by comparing the prices of a commodity in a market or a country over time, with a view to studying the order of change in the price position over the given period. Spatial comparison is made by comparing the prices of a commodity at a given point of time at different markets in the same country, or in different countries, to observe the relative levels of prices of the commodity. Comparison of prices of a commodity over the different marketing stages through which it passes throws light on the marketing margins. Inter-commodity comparisons of prices reveal the order of change or parity in the prices of a commodity in relation to others. Inter-sectoral comparisons of prices are often made - say, between agricultural prices and industrial prices - to gauge, inter alia, the terms of trade of one sector vis-à-vis the other.

Whatever form the comparison of price data takes, the data ought to satisfy the essential criterion of being "comparable". Comparability requires that price data should reflect the true state of supply and demand of the commodity undiluted by the impact of other operating factors. In a meaningful temporal comparison, this would be possible only if price attributes, other than the time of transaction, are kept constant. Thus, while the time factor changes, the quality specifications of the commodity, the concept of price, the unit of measurement, the market and other characteristics of transactions should not change. Otherwise, it would be difficult to isolate the effect of the solitary factor of temporal change on prices. Similarly, for valid spatial comparison, price attributes other than space should be kept constant. Appropriate considerations of comparability of price data need to be kept in view in other forms of comparison too.

For comparison purposes, the price data are maintained in the form of (i) absolute price quotations for different, but specified, grades of specified commodities, (ii) price relatives and (iii) price index numbers.

### Valuation

Valuation of agricultural output in a country is made when constructing the economic accounts for agriculture, and estimating the share of agriculture in the national product. For calculating index numbers of agricultural production or output, it is necessary to value quantities produced or marketed at constant prices, or to apply appropriate price index numbers to current priced value aggregates. For example, the FAO index numbers of production of individual countries in the new series (1969-71 = 100) are constructed using national average producer prices as weights, each price weight being the three-year (1969-71) weighted average price of individual commodities produced in these three years.

For valuation purposes, price data have to satisfy at least two major requirements. Firstly, the price should be of the nature of a unit value; that is, it should represent the average price per unit quantity. In the averaging process, prices of different grades of the concerned commodity would be weighted together, if data are available, by the proportion of quantities of the various grades produced or marketed. Secondly, information should be available on the components of price such as subsidies, indirect taxes, commissions and other charges included in the price. Such components are often difficult to identify, particularly if they are not directly associated with the price quoted in the market. For example, if a subsidy granted for the production of a commodity is linked with the area grown, it would not be identifiable as a part of the market price.

### Influence of final use on the price collection system

The choice of the system to be adopted in the collection and compilation of price data is influenced to a considerable extent by the type of use - comparison or valuation - to which the data are intended to be put. The price statistics should satisfy all the requirements needed for the purpose in view. Collection of market quotations of specified varieties is essential for temporal comparison; for valuation purposes, however, what is relevant is the unit value.

The nature of the use of price data should also determine the stage of marketing transaction to which the data should relate. Prices relating to the first stage in the marketing process (i.e. when the farmer parts with his produce) have no relevance for measuring the changes in the purchasing power of money, or for studying the changes in the cost of living. Likewise, prices relating to the last stage in the marketing process (i.e. when the ultimate consumer or exporter buys the commodity) are meaningless for evaluating farm incomes.

Generally, a public agency entrusted with the task of collecting and compiling agricultural output and input prices is required to maintain price data usable for all purposes, i.e. for both temporal and spatial comparisons, as well as for valuation. The agency has, therefore, to be very clear about the distinguishing features of the various types of agricultural prices.

### III. TYPES OF AGRICULTURAL PRICES

Conceptually, agricultural prices cover prices of agricultural products (output prices) and prices of requisites for agricultural production (input prices), at various stages of marketing.

#### Distribution channels

After an agricultural product leaves the farm gate it may pass through anyone of a number of different marketing and distribution channels before reaching the ultimate consumer. It may move directly to the consumer (if the producer himself sells at the farm-gate, at the roadside or in a local village market); it may be sold by the producer directly to a retailer, to an exporter, or to a manufacturer (particularly production under contract); or the producer may sell directly to a government controlled official marketing board which will pay fixed prices that may have been determined well in advance of harvesting, for example.

Alternatively, the producer may sell to a wholesaler who will then resell to any of the buyers mentioned above either directly or through other wholesalers or middlemen. All combinations are possible.

In the same way, a farmer buying the requisites of agricultural production may deal directly with retailers, wholesalers, manufacturers or importers.

Thus agricultural prices derive their meaning and significance from the stage of marketing to which they relate. They may, therefore, in accordance with the above, be prices received by farmers, wholesale prices, retail prices, or export prices (for produce sold); and import prices, wholesale prices, retail prices or prices actually paid by farmers (for the purchased means of production).

It is because of the wide range of marketing methods which may operate in individual countries, and the consequent wide variety of price quotations available, that it has been found most appropriate to use the principle of farm-gate prices (actual or national) for the purposes of agricultural price statistics. This principle is dealt with in detail in the remainder of this chapter. It should be borne in mind, however, that if, in any country, the vast majority of sales of agricultural commodities, or purchases of requisites of production, are made through one single marketing system, then it may be more expedient to record prices at that marketing point and not attempt to work back to notional farm-gate prices by making estimated deductions or additions in respect of transport, etc., costs.

Such a situation, however, is not likely to occur in many countries.

#### Prices received by farmers (producer prices)

In line with the Handbook of Economic Accounts for Agriculture (Provisional)\* and the deliberations at the regional seminars and conferences convened by the FAO at which the subject of agricultural producer prices has been discussed, prices received by farmers for their produce are, in principle, the prices realised by them for that produce at the farm-gate. Thus, the costs of transporting agricultural produce from the farm to the market or to the first point of sale off-farm, and of selling it there (whether

---

\* Issued by Food & Agriculture Organization of the United Nations, Rome, 1974, page 23, para. 56.

these activities are performed by the farmer himself or by specialised agents) are not, by definition, to be included in the farm-gate price. The cost of such activities, if included in the price realized at the market or the first point of sale must, therefore, be deducted from that price to arrive at the estimate of the farm-gate price.

It can be argued that activities such as transportation and sale of farm produce are an integral part of the agricultural production activity and that the price quoted at the first point of sale off-farm should, therefore, be taken as the price received by the farmer. Against this view, it should be noted that the first point of sale may even be the retail market, as often happens in the case of perishables, particularly where cold storage facilities are either inadequate or non-existent. Inaccuracies will result if, in evaluating the total agricultural output, a part of it is valued at the farm-gate price, a part at the wholesale market price, a part at the retail market price and a part even at the export price. To avoid this, a single, uniform concept of price received by farmer must be defined and adhered to. The concept normally used is that of the price actually or notionally received at the farm gate. For agricultural products for which actual farm-gate prices are not available, notional farm-gate prices must be estimated by deducting transportation charges, marketing expenses and taxes, etc., paid by the farmer per unit quantity from the appropriate wholesale or retail price (see page 11 and Appendix III).

#### Wholesale prices

After an agricultural product leaves the farm-gate, it may pass through one or even two wholesale markets, and a chain of other "middlemen" before reaching the retailer from whom the ultimate consumer buys it. Where two wholesale markets are involved, the first may be only an assembling market and may be called a primary wholesale market; and the second may be a distributing market, called a secondary market. Sometimes, one comes across a third category of wholesale market, viz., a terminal wholesale market, from where there is no further resale, as for example, a market from where the product is exported. It is not necessary that the functions of assembly, distribution and export should necessarily be performed by three separate wholesale markets; a single wholesale market may perform one, two or all three of these functions.

An assembling wholesale market, as its name implies, is one where, by and large, the producer-sellers or their agents assemble their products and offer them for sale in bulk or large quantities. The wholesalers buy in this primary wholesale market for further sale to local or nearby retailers, to exporters or to another set of wholesalers who would carry the products to other places or markets for resale to retailers there.

A secondary or distributing wholesale market is one where the products are brought for sale largely by the wholesalers from the assembling markets. Small quantities are brought by the producer-sellers too. The agencies buying from the secondary wholesale market are the retailers, and also the exporters or bulk consumers.

A wholesale market may thus be defined as a market situated somewhere between farm gate and retail market, usually handling a large quantity of sales for a further stage of distribution of the commodity. Wholesale price accordingly is the rate at which a relatively large transaction, generally for further sale, is effected. Depending upon the extent to which the transportation charges and other expenses incidental to marketing are borne by the sellers and buyers in the wholesale market, and remembering also that the wholesalers include their profit margin in their price quotations, a wholesale price may take any of the following forms:

- (a) In a primary wholesale market, the wholesale price of a product may refer to the price at which the wholesale buyer makes purchases from the producer-seller or his agents. This price would differ from the price the producer-seller gets,

depending upon whether the buyer or the seller bears the incidental charges; and if both bear them, then in what proportion.

- (b) In a primary wholesale market, the wholesale price of a product may also refer to the price at which the wholesaler offers it for sale to the retailers, etc. This price should exceed the price in (a) above by the wholesaler's margin of profit.
- (c) In a secondary wholesale market, the wholesale price of a product may refer to the price at which the wholesaler sells it to the retailers, etc. This price should exceed the price in (b) above by transportation charges, incidental expenses and margin of profit.

The effect of the above is that if the notional price received by the farmer for an agricultural product at the farm gate is to be derived from any of the above types of wholesale prices, it will be essential to make arrangements for determining the magnitude of deductions on account of transportation and marketing charges, etc. to be made from the wholesale price to estimate the price received by the farmer at the farm gate. This obviously calls for appropriate investigations, possibly through random sample surveys.

Wholesale prices of agricultural products are collected in most countries. This is so for three broad reasons. Firstly, the wholesale markets are usually well organized and consequently wholesale prices are easy to record. Secondly, wholesale prices are quoted throughout most of the year and can, therefore, be obtained with the needed frequency, whereas farm gate prices are obtainable only for that period after the harvesting of a crop over which the agricultural producer disposes of his surplus. Lastly, the dealers in a wholesale market are usually well informed of the supply and demand situation of the product, so that the wholesale prices tend to reflect the sensitivity of the market to forces of supply and demand; this essentially is the element of price statistics of greatest interest to most economists and administrators.

#### Retail prices

Retail prices are established in transactions in which quantities dealt with are relatively smaller than in wholesale transactions and in which the final consumers of the agricultural product participate as buyers.

Retail prices of agricultural commodities are collected in most countries. Unlike farm gate prices, they are available throughout the year. Retail prices are used in constructing consumer price indices, in undertaking studies into cost of living and levels of living, and in determining cost of living allowances for wage earners.

If an agricultural producer sells his product in the retail market directly to consumers, the notional farm-gate price received by the producer is estimated by deducting transportation and marketing charges from the retail price. If, however, the product is brought for sale from a wholesale market, then deductions from the retail price must be made for transportation and marketing charges, and for margins of profit, at both wholesale and retail stages, to arrive at the notional price received by the farmer at the farm gate.

#### Export prices

Export prices are determined in export markets for products intended for delivery outside the customs boundary of the country. Export markets are also described as terminal wholesale markets, where the valuation of the product is made as free-on-rail, or free-alongside-ship or free-on-board. If the producer-seller sells his product in



such markets, the notional farm gate price is worked backwards by deducting from the export price the transportation charges and all other incidental expenses incurred by him.

#### Prices paid by farmers

The concept of prices paid by a farmer is the counterpart of prices received by a farmer and covers all prices paid by him as he participates in the transaction of goods and services in his capacity as a buyer of the means of agricultural production.

Just as the price received by a farmer for his produce is the price realised by him for that produce at his farm-gate, so the price paid by a farmer for an agricultural production requisite is, in principle, the price paid by him for that item at his farm-gate or village site. If a requisite of agricultural production is bought off-farm, say, from a factory or a government store, the expenses incurred in transporting it to the farm must be added to arrive at the estimate of the price at the farm-gate. If, however, it is purchased from a local blacksmith or tradesman in the village, then the purchase price can be taken as the farm-gate price paid by the farmer.

#### Conceptual distinction between prices received and prices paid by farmers

Both prices received by farmers and prices paid by farmers have the same common locational reference, that is, the farm-gate, but there is an important distinction as to the stage of marketing to which the two sets of prices relate when first collected. In most instances, the farmer sells wholesale but buys retail. Therefore, farm-gate prices received by farmers are usually derived from the average WHOLESAL price at which they dispose of their produce; while farm-gate prices paid by farmers are, in general, calculated from the average RETAIL price at which they make purchases.

#### Utilisation of prices received and prices paid

As has already been indicated in Chapter II, prices received by farmers are used in preparing economic accounts for agriculture, and in the context of policies related to output price support, farm incomes, resource allocation to different commodities, etc. Prices paid by farmers for materials used in current agricultural production, for factor services and for investment goods are also needed for the agricultural accounts; in addition, they are used for constructing price deflator series to calculate value aggregates consistent with the national accounting framework. The two sets of prices are also converted into index numbers (see page 36) which can indicate the parity between prices received and prices paid by farmers and can act as warning signals to public agencies to consider either raising the output prices for agriculture or lowering the prices of agricultural inputs (or vice versa), in order to correct imbalances developing between the two. So important are parity index numbers to policy makers, particularly in countries where agriculture represents a significant proportion of the national economy, that the task of collection and compilation of agricultural prices is accorded high priority in national programmes for price statistics.

#### IV. STANDARDIZATION OF THE PROGRAMME OF COLLECTION OF PRICES RECEIVED BY FARMERS

##### Market procedures survey

Before drawing up any programme of price collection suited to a particular country, it is necessary first to collect information on the procedures adopted therein for the marketing of different agricultural commodities. From the farm, one commodity may go directly to the exporter, another directly to the processor or miller, a third directly to the retail market and a fourth may pass through several stages of marketing before reaching the ultimate consumer. If prices for these commodities are not available at the farm-gate, they will have to be collected at the first point of sale which will vary for each of the four commodities. A commodity may also pass through other channels; e.g. an itinerant merchant may collect the produce of small farmers for sale in a nearby market; a commission agent may locate appropriate buyers; processors (flour millers, rice millers, cotton ginners, tobacco curers) may process the commodity and sell it in processed form; a cooperative marketing society may undertake to sell the produce of its members; and transporters, shippers, forwarding agents and warehousemen may also play a part. All these and related aspects will have a bearing on the organization of a system of price collection, definitions of the prices and instructions to the price reporters. Hence the need for a study - however broad - of the marketing procedures followed for each commodity. Information on the seasonality of marketing and of prices, and on government taxation, subsidy and price regulation will also be useful when formulating the price collection programme. While the items on which information may be collected will depend on the requirements of those drawing up the programme, the following deserve consideration:

- (1) Names of agricultural commodities and major varieties grown in the country; regions of concentration of production for each commodity.
- (2) Harvesting period for each commodity.
- (3) Marketing procedures adopted; different stages of marketing; channels through which a commodity passes before reaching the final consumer.
- (4) Which commodities mainly enter domestic consumption and which are grown mainly for export.
- (5) Location of markets with an indication of their size (annual turnover may be a suitable indicator).
- (6) Seasonal variations in quantities sold and in prices.
- (7) Major agencies engaged in sale or purchase operations.
- (8) Processing facilities and their location.
- (9) Storage accommodation and its location.
- (10) Government taxation and subsidy policies.
- (11) Government price regulation measures.

Information on marketing procedures can be obtained through properly designed surveys or from agencies and individuals who are either in the business of sale and purchase of agricultural commodities or are otherwise knowledgeable. The information

once collected would need to be checked periodically and brought up-to-date, since significant changes could necessitate revisions to the price collection programme.

### Technical considerations

In standardizing the programme of collection of prices received by farmers, several technical aspects connected with price reporting require to be considered with a view to ensuring that the data are collected at a reasonable cost, on a uniform basis, with adequate accuracy, and are suitable for the purpose for which they are obtained. These aspects pertain to the framing of standard definitions of product, variety and quality; time, period and frequency of price collection; unit of quotation; selection of markets, etc.

### Definition of prices received by farmers

The price received by a farmer for an agricultural commodity produced by him has been defined as the average (notional or actual) price measured at his farm-gate at which he disposes of the commodity. Where sales do not take place at the farm-gate, the notional price must be estimated by subtracting from the wholesale or retail price, as the case may be, those costs included in that price such as the transportation expenses, marketing charges and taxes, etc., paid by the farmer for activities which take place after the product has left the farm-gate. For ascertaining the magnitude of these deductions, it will be necessary to undertake appropriate surveys or other investigations ( see page 17 and Appendix II para. 7).

### Techniques of averaging prices (see also page 32)

The price should be an average price. Different lots of a commodity may not all be marketed at a uniform, identical, price. Even if they belong to the same variety, the prices may differ according to difference in moisture content, refraction, admixture, etc. The price of a commodity can thus vary within a range every day. But, for purposes of comparison of prices over two or more points of time, it is more convenient and meaningful if, for each point of time, a single quotation, instead of a range, is available. The single quotation should neither be the minimum price nor the maximum price quoted on the reporting day in as much as these two extremes will not be representative. For the same reason, it should neither be the opening nor the closing quotation of the day. It should be an average of the day's quotations, a measure of the day's central tendency.

What kind of average should it be? If it is to be an "arithmetic average" or "median", the price for each transaction during the day will have to be recorded. If it is to be the "weighted mean", data will be needed additionally on the quantities transacted at each price. This is a laborious task and while there is no objection to using such averages, the time and energy spent on the operation would hardly be commensurate with the advantage to be gained. The purpose would be served equally well by taking the modal price, i.e. the price at which the majority of the day's transactions take place. Oral enquiry about such price - the most commonly quoted price - on the reporting day should be enough to reveal it. (It should be emphasized that we are here speaking of prices actually agreed for transactions, not prices asked for, or offered, in advance of the transactions being completed). The modal price gives the overall sense of the market and may be established at the wholesale or retail level, or for farm-gate prices.

Subject to one important condition, modal prices are satisfactory for valuation purposes too, although for an accurate valuation it is necessary to have data on quantities and prices involved in each transaction, or for a representative sample of such transactions. The condition is that not only should the modal price be the price at

which the major number of the day's transactions take place, but it should also be the price at which the major part of the total quantity marketed is transacted. For instance, if 10 quotations at the same price for lots of 1 ton each were accompanied on the same day by 2 lots of 10 tons each at a very different price, the modal price (i.e. the former) would not be sufficiently accurate for valuation purposes and would be misleading as a price average.

### Selection of commodities

In formulating a programme for the collection of prices, it is necessary to make a selection of the commodities for which data are to be obtained. In market economies, practically all agricultural commodities find their way to the market. Accordingly, in a comprehensive programme of price collection, all agricultural commodities offered for sale should be covered. But if their number is very large, then a selection must be made depending upon the uses for which the data are needed and the resources available for their collection; the remaining commodities can be included later when necessary or feasible. As first priority, those commodities for which estimates of production are available should be included since this enables an accurate evaluation to be made.

### Specification of variety and quality

When reference is made to the price of an agricultural commodity there is generally an implicit assumption that the commodity is homogeneous, i.e. that each unit thereof is a perfect substitute for any other unit. In practice, this assumption is rarely correct. Not all wheats, for example, are the same wheat. Wheat has several botanical varieties: Triticum durum, Triticum vulgare, Triticum turgidum, Triticum dicoccum, and Triticum compactum. Of these varieties, the first two are widely grown. Each variety is subdivided into a few colour groups. Durum has two colour groups: amber and red; vulgare has three: white, amber and red. The kernel structure of the grain varies from soft to semi-hard and hard. Durum wheat is also known as macaroni wheat: it has a high gluten content and is much used in making semolina and vermicelli. For these characteristics, it fetches a premium over other varieties. Vulgare is also called common wheat and is generally used by the milling industry for manufacture of flour. The same is true of many other agricultural products.

For each variety of a commodity, there may be several qualities. Wheat, for example, may be designated by different grades, depending on the percentages it contains of foreign matter (like dust, chaff, straw); edible foodgrains other than wheat; wheat of other varieties mixed with the main variety; or damaged, immature, shrivelled, and weevilled grains. Uniformity of size, shape and colour and the moisture content are other factors taken into account in determining the grade.

A commodity may thus consist of several varieties and for each variety there may be several grades. Prices of the commodity will therefore vary with the difference in botanical and commercial characteristics. Some varieties and qualities will command a high premium while others will sell at a discount.

What varieties and qualities then should be specified? A comprehensive programme for collection of prices may provide for collection of price statistics of most varieties and qualities of an agricultural commodity. In this case, a spectrum would result throwing light on inter-varietal and inter-quality differences in prices of the same commodity. Prices of those varieties and qualities most needed can then be selected, while the full range of price data along with quantities of each variety and quality marketed would be available for valuation purposes. Such a comprehensive programme is possible only if the volume of work involved is manageable with the available resources.

The volume of work can be reduced if the varieties and qualities of a particular commodity can be standardized into a few. Where, however, the varieties and qualities are numerous and standardization is difficult to achieve, it should be remembered that the mass of information which results is often confusing to the user apart from being expensive to collect.

There is, however, a solution. Just as the price to be collected can be the modal price, so the selected representative variety and quality may also be modal; that is, the modal price could refer to the most commonly traded variety and quality. Clearly, care must be taken, before deciding on this course of action, that limiting the price reporting to the modal variety only does not exclude some important other varieties.

The criterion for selecting the modal variety in each market should be whether it is the most commonly traded among the different varieties, and whether it is transacted continuously over the larger part of the marketing year, if not over the entire year. If the specified modal variety ceases to be transacted during the marketing year, another frequently traded variety, as close as possible to the variety originally chosen, may be substituted provided that the circumstances are fully noted since this will be of importance when constructing price indices. If such substitution has to take place, it would help the splicing of prices if quotations for the two varieties - the initial and the substitute - are collected for a few reporting days when both varieties are being traded.

After specifying the modal and substitute varieties for each market, the next step would be to prescribe the modal quality or grade composition.

If quality standards are in force for a commodity, the most commonly traded quality may be chosen; otherwise, the choice may fall on what is generally called the fair average quality. In the latter case, the grade specifications will be determined on the basis of trade descriptions and must be defined unambiguously.

Situations may arise where, simultaneously with the newly harvested produce, the remainder of the old harvest is still on sale and the two are sold at different prices. In such situations, prices for the new harvest should be reported from the date when it is reasonably certain that disposals from the new harvest will be fairly continuous. Prices for produce from the old harvest should, however, continue to be recorded as long as the quantities traded remain significant.

#### Time of price collection

If it is intended to collect data on prices and quantities involved in each transaction on the reporting day, obviously the price reporter will have to be at work the entire day unless there are some institutional arrangements (like a market committee or an association of market men) to do the job. If the prices to be calculated for the various agricultural products are the modal prices, the price reporter need not be in the market the whole day. It would be sufficient if he visits it during the peak marketing period of the day, that is, when the bulk of the transactions usually take place. The peak period will not necessarily be the same hour of the day in all markets and throughout the marketing season or the year. Accordingly, the programme for price collection should provide for determining the peak marketing period of each market over different months of the marketing year.

#### Period of price collection

Unlike most industrial products, agricultural products are characterized by seasonality. In general, the marketing year for an agricultural crop may be defined as starting with its harvesting and continuing until the next harvest. (There are, of course,

exceptions to this, e.g. where a crop is grown under contract and sold even before harvesting). Whether or not the agricultural producer spreads his sales over the twelve months of the marketing year after the harvest depends on the volume of output, the perishability of the crop and on the storage facilities, owned or hired, available to him. If the storage facility is inadequate or non-existent; or if the roads are fair-weather roads and not all-weather roads; or if, as the marketing year advances, snowfall or rains might interrupt the transportation or damage the commodity in transit; or if the cash needs of the producer are very pressing immediately after the harvest - in all such cases, the producer will have little option but to dispose of his produce within a short period after the beginning of the marketing year. Again, even if none of these disabilities exist, the crop may be too small to permit sales to be spread over the full year. The period of collection of farm-gate prices will therefore coincide with the period of marketing, which may stretch over a full year in some instances, but not in others. The programme for collection of prices received by the farmer should, therefore, lay down appropriate guidelines for determining, in respect of each location and each commodity, the period over which the prices should be reported.

This problem will not generally arise in the case of wholesale and retail markets. They run on a regular basis, making continuous reporting of prices possible.

#### Frequency of price collection

How often should prices be collected: daily, weekly, fortnightly or monthly? The answer depends on the uses to which the prices are to be put. Anyone interested in the buying and selling of a commodity, and thereby earning a profit, requires daily prices of that commodity. A state or public agency wishing to disseminate market prices for the guidance of producer-sellers through the press, price bulletins, radio or television also needs daily quotations. For administering a policy of direct market intervention, the State, with the help of daily prices, would be enabled to decide where to buy in order to support prices and where to sell in a bid to counter excessive price rises.

The above are special cases which call for collection of daily prices. For other uses, such as for studying price trends, making comparisons, or watching price movements as an indication of the inter-action of the forces of supply and demand, daily prices are unnecessary. A fortnight or a month, on the other hand, is a rather long period, particularly where wide variations in prices are known to occur. A week is probably the most suitable period, and instructions for price reporting might, therefore, provide for collection of prices on a specified day of every week.

Which particular day in the week should be declared as the price reporting day? Ordinarily, any day of the week would be as good as any other day excluding, of course, the day (or days) on which the market is closed. If the market opens for only one day in each week, as is not uncommon for primary wholesale markets in several countries, there is no choice except to report on the weekly market day. If the market opens more often than one day per week, the reporting day should be chosen so that the weekly postal holiday does not intervene to cause additional delays in the transmission of prices to the headquarters of the organization where such communications from various reporting markets are received for compilation, study and dissemination.

The day prescribed must be adhered to so that prices are reported on the same day every week. Sometimes, instead of specifying a day of the week, dates in a month are prescribed, such as the 7th, 14th, 21st and 28th of each month.

### Unit of quotation

In determining the unit of quotation, three points require investigation. The first concerns the unit of weight. In a country where standardized weights and measures are in use, there should be no problem and prices may be reported per standard unit of weight applicable to the commodity, such as, per metric ton, per quintal or per kilogramme. Where, however, weights have not yet been standardized and a wide variety of local weights are in use, differing from region to region within the country, the price reporter should be provided with a table of coefficients with which to convert the prices collected in local units into standard units before reporting the latter to the headquarters. It would be the duty of the supervisor, during his inspection tours, to provide the necessary guidance to the price reporter and to verify the accuracy of the conversions.

The second requirement is to define the form of the commodity to which the unit of weight should refer. For example, in the case of wheat, should it relate to the net weight of the grain, or be inclusive of the weight of the bag, sack, or basket in which it may be brought for sale? Decisions on this point will have to be taken in advance so that they can be applied uniformly to the commodities concerned in all reporting markets in order to permit valid comparisons of prices. Prices should, however, normally refer to the unit net weight of the commodity, the weight of the container in which it is brought for sale being excluded. If there is any insurmountable difficulty in doing this, and the prices for a commodity are, for example, quoted including the container in some markets and without it in others, the facts should be specified by the reporter when reporting the prices to enable the user to make appropriate adjustments and to exercise caution when comparing such quotations.

In this context, it should also be noted that farmers generally sell their produce in the form in which it is harvested. A grower of paddy would normally sell unhusked paddy rather than cleaned or milled rice (also called dehusked paddy). A cotton producer normally sells raw cotton as harvested, that is cotton from which cotton seed has not been separated. These situations are applicable to farm-gate prices or prices in primary wholesale markets. In secondary wholesale markets and retail markets, however, the form of the product will most probably have undergone a change due to processing. There, milled rice or cotton lint (also known as ginned cotton) would be sold. The form of the commodity to which the prices refer should, therefore, be unambiguously defined and kept in view when comparing farm-gate prices with wholesale or retail prices, or when estimating farm-gate prices from wholesale or retail prices.

The third requirement is how to express the price. Prices should be quoted in terms of so many units of a country's currency per unit of standard weight, and not in terms of so much weight per unit of currency. If international comparisons of prices are desired, up-to-date information on exchange rates to convert national currency into currencies of other countries will be needed.

### Other technical aspects

A few other technical problems touching on price collection must be considered. Firstly, what price should be reported if no transaction takes place on a particular reporting day. This may happen in either of two ways: either the market may be closed because of a holiday or strike, or the market may be open but there may be no transaction because of, say, the non-arrival or non-availability of the commodity, or buyers may have decided for some reason not to bid on that day. While these situations call for local solutions, a general rule is that, in the former case quotations for the previous day should be repeated, while in the latter case notional prices should be estimated. A notional price is a "probable" price and may be estimated by adjusting the previous day's price for the specified variety and quality in line with the changes

observed in prices of other varieties in the same market, or price changes of the specified variety in neighbouring markets. The principle underlying the reporting of the previous day's or notional prices is to achieve continuity and comparability of quotations even when no transactions have actually taken place in the selected variety and quality in the selected market. Such situations fortunately tend to be the exception rather than the rule. Nevertheless, it must be emphasized that unless the price reporter is very experienced, his notional estimates may be inaccurate, particularly in the case of commodities where the price-quantity relationship is sensitive. The fact that estimates have been made must, therefore, always be reported.

Another problem relates to what prices to report when a public authority imposes a statutory control over market prices and yet the market transacts at different prices. This, again, is a matter calling for local solution. Whether the dual price system is legally permitted, i.e. where statutorily controlled prices apply only to certain transactions while others are left open to free market forces, or whether sales at higher than the statutorily controlled prices are not legally recognized even though they do take place, the price reporter either has to exercise his judgement as to which of the two groups of transactions represents the larger bulk and report those prices, or he must compute the weighted average of the two prices using the quantities transacted as weights. An alternative would be to quote both the statutorily controlled prices and the open (or black, or grey) market prices giving also the best estimate of the relative proportion of transactions at the two prices.

A question may arise as to whether the price reporter should obtain price quotations always from the same set of dealers, selected in advance. This arrangement is acceptable as a minimum arrangement where the price reporters are not very experienced, but the aim should be to train reporters to assess the overall sense of the market by contacting a wide variety of dealers in the reporting market, supplementing this oral enquiry with personal observation of at least some transactions during the peak marketing hour of the reporting day.

A problem sometimes occurs in distinguishing a wholesale transaction from a retail transaction. Should a limit on the quantity handled in a transaction be prescribed, so that all sales above that quantity may be regarded as wholesale and those below as retail? This would be incorrect. No hard and fast rules regarding minimum quantities can be prescribed in as much as the minima will vary from commodity to commodity and from market to market. On the other hand, dealers in the markets generally understand what a wholesale transaction is, so that market conventions will be a better guide in this matter than any written rule.

#### Selection of markets

In selecting markets for regular price reporting, the most important consideration is whether the national price collection authority is responsible for collecting only prices received by farmers, or prices at all stages of marketing. If the latter is the case (which is the most likely) the list of markets selected should include farm-gate locations, primary, secondary and terminal wholesale markets and retail outlets. If, however, the authority is charged with collecting farm-gate prices only, the selected list can be confined to farm-gate locations. But if in a country, or for some commodities in a country, the majority of transactions are not made at the farm-gate, it will be necessary to select markets where the producer-sellers generally dispose of their produce.

Markets should be selected on the criterion of their being representative. A market, regardless of the volume of transactions it handles, can be considered as representative if it is sensitive to changes in supply and demand conditions; i.e., if it reacts or responds quickly to changes in prices in other markets with which it has trade links.



In selecting the reporting markets from such representative markets, preference should be given to those which operate throughout the year so that continuous price data would be available and, in the interests of staff economies, to those from which quotations for more than one commodity can be reported.

The choice of the number of markets will depend on how extensive are the needs for price data. If it is intended to evaluate agricultural production by districts or by smaller regions within a country, or if the inter-regional variations in prices within a country are known to be large, the number of markets to be selected for reporting price data needs to be much greater than if it is intended merely to observe overall price trends. Likewise, the implementation of price support measures, for example, would call for a much larger spread of markets than that needed for constructing price indices.

As a general rule, the number of reporting markets should be such as to ensure that the calculated national, regional and sub-regional average prices for a given commodity are sufficiently accurate for the objectives in view. At the sub-regional level, the concerned authority may require information on prices in respect of a few important markets, located within its administrative jurisdiction for, say, an appraisal of the economic situation or an estimation of the value of agricultural output in the sub-region. The total number of markets for all sub-regions within a region may turn out to be too large for the purposes of the regional authority who may therefore, for its own uses, select a manageable number of markets from the sub-regional lists. Likewise, the national price collection authority may find the total number of markets in all regional lists too unwieldy for its purposes and may therefore select from the regional lists only the more sensitive and important markets. Thus, the sub-regional lists will include the regional lists, and the regional lists will include the national list of markets.

In conclusion, while the number of markets should be selected in the light of technical considerations such as those mentioned above, a limiting factor is the availability of trained reporting staff and/or resources for appointing new staff. It should be the aim, however, to strengthen the reporting staff gradually over the years until all the selected markets are covered.

#### Descriptive market schedules

For every market selected for price reporting, a schedule should be drawn up to show certain important details. (A suggested schedule is given at Appendix II). Firstly, the schedule should give the market's identification - where is it located; in what direction and at what distance from a well-known place; and by what route is it reached? Is it situated on a river bank, or near a lake, or in hilly terrain, or in a desert area or a plains region? Is it approachable by rail, by road, or by boat? Secondly, what are the means of communication; i.e. are postal, telegraph and telephone facilities available in the market, so that the price reporter knows in advance the fastest means to adopt in case of need?

For each market should be indicated details of the individual commodities traded and their varieties and qualities for which price data are to be collected. The nature of the market should also be stated, i.e. whether the market is a farm-gate location, a primary, secondary or terminal wholesale market, or a retail market. If this function varies with commodities, it should be stated separately in respect of each. A detailed inventory of market practices should also be included (see Appendix II, para. 7).

Lastly the price reporter should be informed through the schedule about any institutions, such as a market committee or a chamber of commerce, and any individuals who are well conversant with the market, the system of sale adopted in it, the marketing

practices and charges, etc., to whom the reporter may turn for clarification or closer understanding.

It should be emphasized that all the information about markets will have to be kept up-to-date and the schedules revised periodically since they will be in constant use not only by the price reporters but also in headquarters.

Price reporting form (prices received by farmers)

The descriptive schedules will provide essential information for the completion of the standard form which all price reporters will be required to transmit to their headquarters. Such a form should include the following details:

Price reporting form for prices received by farmers

Name of market:

Sub-region (county or district):

Region (province):

Prices as on (date):

Time of visit to market:

Commodity	Modal Variety & Quality or Standard Specification (specify)	Standard unit of weight (specify)	Prices per standard unit of weight	Nature of price (i.e. farm-gate, primary, wholesale, retail, etc.) (specify)
1	2	3	4	5

Date of Despatch:

Signature of price reporter:

From the prices for a particular modal variety and quality recorded in column 4, the farm-gate modal price will be calculated at headquarters (see page 32) unless the price reporter is sufficiently experienced to determine the modal price himself.

Instructions for field staff

In addition to the descriptive market schedules appropriate to his place of work and a set of price reporting forms, each price reporter should also be provided with a set of instructions drawn up for his guidance. The instructions should, inter alia, cover the following:

1. Definition of the term "price received by farmers" (i.e. the farm-gate price).
2. How this price will be estimated by headquarters staff depending on whether the market is a primary/secondary wholesale market or retail market.
3. Commodities, varieties, qualities for which price statistics are to be collected.
4. Price reporting days.
5. Peak marketing hour when prices are to be collected.
6. Need for the price reporter to obtain prices by actually visiting the market and observing a few major transactions, besides making oral enquiries.
7. Unit of quotation; table of conversion coefficients.
8. What to do if the selected variety goes off the market; or if both old and new crop products are being sold simultaneously; or if the price of a commodity is statutorily controlled; or if the market is closed on the reporting day.
9. An explanation of the columns of the price reporting form.
10. Addresses to which the price reporting form should be despatched after it has been completed.
11. Instructions for collecting ancillary information (see page 21).
12. Instructions for updating the descriptive market schedules.

In the instructions to the price reporters, it should be emphasized that the completed schedule should be despatched on the reporting day itself so that it reaches the headquarters price collection authority with the least delay. Sometimes the requirements of the headquarters authority are so urgent that the price data may have to be telegraphed, telexed or telephoned. This is particularly the case when these data are to be broadcast to farmers over radio or television to enable them to take informed marketing decisions.

#### Price spread

The descriptive schedules for each selected market will enable the headquarters staff to ascertain the merchandising charges, handling and transport charges, wholesaler's margin, etc., for each commodity which must be deducted from the wholesale market price of that commodity in order to arrive at the price received by the farmer at the farm-gate. These deductions will be extended if the price received by the farmer at the farm-gate is to be worked backwards from the retail market price. The example in Appendix III illustrates the process of estimation of farm-gate price from the secondary wholesale market price.

#### Sampling for price statistics

In the market approach, it is envisaged that markets would be selected on the basis of sensitivity and representativity, and that the price reporter would provide quotations on the basis of oral enquiry in the selected market supplemented by physical observation of a few major transactions on the reporting day. In this context, it is worth considering whether, to achieve greater objectivity in price collection, resort should not be had to sampling techniques.

Probability sampling methods have been used extensively in the estimation of area and yield of crops, but such methods have been so little used in the collection of price statistics that it is difficult to prescribe a standard methodology of general applicability in this field. Even in statistically developed countries where sampling techniques are used for the collection of agricultural prices, it is admitted that there are many practical and theoretical difficulties to be overcome. For example, it is not easy to define the sampling unit and the problem of constructing a comprehensive and up-to-date sampling frame is a difficult one. A market transaction where a price is quoted is a complex event with many dimensions; a price quotation is an attribute of a transaction, but it is hardly practical to use a transaction as a sampling unit in a single or non-stratified sampling design. Transactions take place over time and throughout the length and breadth of a country, but they cannot be listed in advance. Naturally, therefore, recourse has to be had to area sampling procedures if it is desired to use sampling for collection of price statistics; and preferably, this should involve at least a two-stage, or better, a multi-stage, stratified random sampling design. Farmers, farm-gate locations, wholesalers, wholesale markets, retailers, and retail markets, stratified according to some suitable criterion such as administrative or other locational characteristic, or volume of transactions, or type of commodities marketed, or magnitude of price variations, could serve as the first stage sampling units. In each stratum, transactions over time and by commodities could be the subsequent stages of sampling. The sample may be a fixed one (which is generally suitable for temporal comparisons) or a changing one with a fixed sub-sample (which may be suitable for both comparison and valuation purposes). As experience accumulates, further improvements may be effected in the sampling design. It is, however, evident that owing to the skewness of the distribution of sampling units in respect of various attributes, refinements will have to aim at ensuring adequate stratification so that each stratum is as homogenous as possible.

The difficulties of designing an efficient sample for the collection of price statistics calls into question the reliability of data collected through this approach. It is a moot point whether the hoped-for gain in objectivity of data is really commensurate with the time and energy expended in evolving a suitable sampling technique. Furthermore, in countries where fast computing facilities are inadequate, the entire exercise of calculating average prices from data collected by sampling may prove to be so time consuming that the results, when available, are out of date, and hence of no use for quick decision making. These factors go to explain why sampling is not yet the general routine for regular price data collection.

#### Survey of farmers for collecting prices received

So far, the discussion has presumed that prices data would be collected through inquiries conducted by price reporters in the selected markets. It may, however, be equally satisfactory to make inquiries from the farmers themselves about the prices which they have received instead of (or, perhaps in addition to) collecting prices in the market. Under such a procedure, a sample of farmers would report either directly (if they are literate and willing) or through price-interviewers, the prices which they have received for selected commodities, varieties and qualities. The sampling procedure to be adopted would need to be such as would yield a sufficiently representative and numerous sample of farmers to ensure reliable averages.

Considering, however, the difficulties involved in resorting to this procedure (e.g. the costs of travelling if interviewers are employed) it is probable that the survey approach alone will not be very satisfactory. If, on the other hand, this method is used as a supplement to the market approach, it could serve as a useful check on the farm-gate prices estimated from wholesale or retail market prices. Where a survey of farmers has to be made as the sole method of collecting prices received by farmers, the desirability of a gradual shift to the market approach (as the marketing

system improves in the country) should always be kept in view, since the market approach is able to give more representative data.

#### Other sources of price statistics

Apart from the collecting and disseminating of price statistics by the public authority, in most countries newspapers, commercial journals, and agricultural and trade organizations also publish market reports and/or price data. At first sight, such data would appear to be useful, for example, as a corroborative check on the price statistics flowing from the market reports in the national price collection system. But great caution needs to be exercised in using such data. For one thing, bias cannot be ruled out altogether; for another, definitions of the term "price" and other concepts used in the collection of these data may differ widely over time, space, commodities, varieties and grades, thus preventing their comparison with the price statistics gathered by the national price collection authority.

#### Ancillary information

Price data in themselves do not throw sufficient light on the process of price formation from day to day. Prices in a free market economy are determined by the forces of supply and demand. Supply is determined by the quantity offered for sale, that is the closing stock of the previous day plus the fresh arrivals of the day. Demand is represented by the offtake from the market, i.e. the quantities sold for local resale and for shipment to other places. Thus additional information on supply quantities goes a long way to providing an insight into the price formation process - why prices are rising if they are rising, why falling if they are falling.

A comprehensive programme for the collection of price data should therefore aim also at collecting the quantities of each variety transacted at a quoted price. These details would be invaluable in using price data for valuation purposes and for assisting administrators in the formulation and implementation of price support and price stabilization policies.

Visits by price reporters to selected markets can also be used for collecting market intelligence: why the price quoted is high or low; is crop production likely to be higher or lower than last year; is any demand-pull factor operating; is any dislocation in transport likely to occur; is any cornering of the commodity by a producer or trader likely; is the magnitude of marketing charges likely to undergo a change; is the quantity unloaded on the market so large as to lead to storage bottlenecks, etc.? Equally important would be information on market sentiment or future outlook: is the market going to be bullish or bearish in the coming few days and, if so, why?

Only the most experienced of price reporters could, however, be expected to operate in this way and only then with the help of well-worded questionnaires. For the majority of reporters, unfortunately, the work will be beyond their capabilities.

## V. STANDARDIZATION OF THE PROGRAMME OF COLLECTION OF PRICES PAID BY FARMERS

The opening remarks to Chapter IV concerning the technical requirements for the proper collection of prices received by farmers apply with equal force to prices paid. The need for standard definitions of product, variety and quality; time, period and frequency of collection; unit of quotation; selection of price reporting locations, etc., cannot be emphasized too strongly.

### Definition of prices paid by farmers

The price paid by a farmer for a requisite of agricultural production may be defined as the price (notional or actual) measured at his farm gate or in his village which he pays for the requisite. Where purchases do not take place at the farm gate or in the local village, the notional price must be estimated by adding to the price actually paid the additional transportation expenses, marketing charges and taxes, etc., incurred by the farmer in bringing the requisite to the farm-gate. For ascertaining the magnitude of these additions it will be necessary to undertake appropriate investigations or surveys.

### Requisites of agricultural production

Before planning to collect prices paid by farmers for requisites of agricultural production, it is necessary to list the various items involved. These will depend, naturally, on the socio-economic situation, the state of agriculture and the farming practices obtaining in the country concerned. The input items used in a developed agriculture may be quite different to those employed in traditional farming; the items important for farming in a low-lying region may differ markedly from those used in a hilly region.

A comprehensive list of agricultural requisites should include all the materials and services required to carry out agricultural activities; from a theoretical point of view, they may be grouped as under:

- (i) Materials used in current agricultural production: e.g. seeds, fertilizers, pesticides, insecticides, fuel, electricity, fodder.
- (ii) Factor services: these include such items as wages for farm labour; farm rentals; interest on capital; rates, insurance, taxes.
- (iii) Investment goods: these include equipment, machinery, vehicles, etc., which are generally not fully consumed during any one accounting year; and construction and fencing materials used for the creation of fixed assets on the farm.

The above general classification is the one normally used in the compilation of economic accounts for agriculture and for the construction of index numbers of prices of agricultural production requisites. In practice, however, the list of items used in any particular country must be established by appropriate enquiries such as a costs of production survey which would be designed to furnish information, inter alia, on all but the least important requisites of agricultural production actually in use. The survey may have to be repeated when the package of requisites changes significantly.

### Costs of production survey

A random sample survey of farmers in representative areas of a country to obtain data on their costs of production would be the surest means of establishing the list of production requisites in use. No important requisite should be omitted. Properly designed, the survey could also yield information on specifications of the requisites, the locations at which price data in respect of them may be obtained and their relative value weights in the over-all basket of production costs. These weights would be used in constructing index numbers of prices paid by farmers for production requisites.

The required information may already be available from other surveys or studies such as reasonably up-to-date farm management studies or a sample of farm accounts. If such studies have not recently been conducted in the country and if it is not immediately possible to organize a costs of production survey, then recourse must be had initially to the best possible information from knowledgeable persons until a survey can be carried out later.

It is important that the requisites of agricultural production whose prices are collected at any time are fully representative of the actual conditions under which production activities are then being carried out. For, as agriculture in a country develops, more modern inputs replace the old ones and these changes must be reflected as quickly as possible in the list of agricultural production requisites for which prices paid by farmers are collected. Again, as the package of inputs changes, so does the structure of farm costs, and the consequent changes in the relative importance of various items of production requisites should be incorporated as soon as convenient in the weightings used in the construction of index numbers of prices paid by farmers for agricultural production requisites. Costs of production or related surveys would therefore need to be repeated as soon as sustained changes in farming practices are seen to have occurred.

The design of costs of production surveys will need to take account of the socio-economic conditions under which agriculture is carried on in a particular country. Ideally, it should be a stratified multi-stage random sample survey with farm holdings as the ultimate unit of sampling. The holdings selected should represent small, medium and large holdings, as well as traditional and modern holdings in proper proportions. The aim should be to establish the cost structures, covering both operational and fixed costs. The method of obtaining the required information from the farmers operating the selected holdings may either be from an examination of their day-to-day accounts of expenditure, or by mailed questionnaires to be completed by the selected farmers, or from answers to oral questions put by trained interviewers. As each item of cost is listed during the course of the survey, and information is recorded on the quantity used and price paid, other particulars which will be useful in organizing the collection of data on prices paid by farmers should also be noted. These would include specifications of the requisites; whether they are imported or produced in the country; the expenses incurred in transporting them to the farm gate or village site; whether the prices are government controlled; the time of the year when the items are generally bought; etc.

### Suggested list of production requisites

In the initial stages of organizing the collection of data on prices paid by farmers for requisites of agricultural production, it may not be feasible to cover the full range of items constituting operational costs and fixed costs. Apart from the difficulties of organization, there are a host of technical problems which need to be resolved carefully before attempting to construct a comprehensive index of farm production costs. Fixed costs, such as farm rents, depreciation on building and machinery, interest on borrowed capital, management expenses and taxes, although

relatively much less variable than operational costs, are much more difficult to measure statistically. Attention should therefore be paid first to the more important and more variable items of operational costs for which it should be relatively easier to obtain the prices data.

In the light of the foregoing, the following list of requisites of agricultural production, which will probably account for 80 percent or more of total costs, is suggested for initiating the work on collection of prices paid by farmers:

1. Seeds and seedlings of agricultural products.
2. Feedingstuffs of all types of livestock.
3. Manures and fertilizers: nitrogenous, phosphatic, compound, others.
4. Protective farm chemicals: insecticides, pesticides, others.
5. Machinery and implements: ploughs, harrows, drills, mowers, harvesters, tractors, axes, spades, pails, others.
6. Irrigation rates.
7. Electricity, light and fuel.
8. Other materials used in current production: gasoline, oil, bags, rope, twine, others.
9. Services: hired human labour (wage rates), contract services, artisans, others.
10. Credit: interest on borrowed capital.
11. Farm rentals.

#### Commodity specifications

Most, if not all, of the production requisites for which prices paid by farmers are to be collected may consist of several varieties, and for each variety there may be several grades. This may be true particularly of seeds and seedlings, feedingstuffs for animals and fertilizers and chemicals. What varieties and qualities should be specified for these commodities? The costs of production survey should reveal the precise specifications of the various commodities bought by farmers, so that, if the number of these specifications is not too great, prices may be collected for each of them. If, however, their number is too large, then the modal - or most commonly used - specifications may be selected. In drawing up the programme for price collection, therefore, the commodity specifications - modal, or otherwise - should be indicated for each location at which price quotations will be obtained; and it should be stipulated that prices should be reported only for those specifications in order to ensure comparability over time.

If it is not possible to carry out a costs of production survey and the list of production requisites has to be prepared in the light of information obtained from knowledgeable persons, then an attempt should be made to obtain modal specifications either from those persons, or from enquiries as to the varieties and qualities most commonly traded in the retail market locations selected for price reporting.

#### Locations for price reporting

A costs of production survey or discussions with knowledgeable persons should reveal the locations at which data on prices paid by farmers may be obtained. In some countries, some requisites of agricultural production, such as seeds and fertilizers, are provided to farmers at fixed prices by government, public or cooperative agencies, or manufacturer's agents. Gasoline and kerosene are also sometimes supplied at fixed prices. In such cases, the prices paid by farmers may be obtained from the supplying agencies. Similarly, information on farm rentals, wage rates of hired human labour, interest charges on borrowed capital, and costs of irrigation, electricity, etc., may also be obtained from the responsible agencies. (In any case, no recourse to retail markets per se will be needed in these cases as there is no question of market quotations for these items).



For those production requisites for which price quotations will have to be obtained from the retail market, the alternatives available are: (i) to obtain modal prices, for modal specifications, from the retail markets where farmers generally make purchases; (ii) to obtain price quotations for prescribed specifications from selected shops in the rural areas where farmers generally purchase their supplies; (iii) to obtain from a selected sample of farmers the prices which they have actually paid; (iv) to utilize appropriate prices which may be collected by other government agencies; or (v) to take price quotations from newspaper reports.

In the light of the foregoing, the following list of price reporting locations for requisites of agricultural production is suggested:

1. Government departments or public agencies supplying inputs such as seeds, fertilizers, machinery, irrigation, electricity, gasoline, to farmers at fixed prices.
2. Government agencies collecting farm rents or taxes from farmers, or fixing wages of hired labour.
3. Marketing unions or producers' cooperatives providing inputs to farmers at fixed prices.
4. Retail trading stores run by manufacturers or producers of some input items.
5. Export companies who make available to farmers certain special inputs for the production under contract of commodities for export.
6. Local tradesmen, blacksmiths and mobile shops in rural areas.
7. Retail shops in rural areas or adjacent urban areas where farmers generally obtain their supplies; if their number is large, some representative selection may be made.
8. Banks or credit supplying agencies (for interest on borrowed capital).

Not all the above-reporting locations will need to be used. For each requisite, the choice of location will be decided in advance in the light of the prevailing practices.

The choice of the number of reporting locations from which price data should be obtained for each requisite will depend, firstly, on how extensive are the requirements for prices paid by farmers in different districts or regions of a country. Secondly, if the inter-regional variations in prices (including wage rates, interest charges, electricity costs, etc.) are known to be large, then the number of locations to be selected for price reporting will need to be much greater than if the country's economy is a homogeneous one. In principle, the number of price reporting locations should be determined so that the prices (including rates, etc.) collected will yield a sufficiently accurate average of national prices for that requisite. A limiting factor, of course, will be the availability of trained reporting staff and resources.

In deciding on the number of price reporting locations, however, the requirements of data at the regional (provincial) and sub-regional (district or county) levels within a country must also be kept in view. In dealing with this aspect, the same general considerations which apply to the selection of markets for the collection of agricultural commodity prices should be followed also for input prices (see page 17).

The standard programme for the collection of prices paid by farmers should provide for a periodical review of the list of reporting locations so that the list can be updated frequently to take account of changes in input supply patterns and in the types of production requisites being purchased.

### Nature of price quotations

For the production requisites that farmers have to buy, the prices required, in principle, are those at which the requisites reach the farm-gate. In other words, if prices collected are retail prices relating to the last stage in the marketing process, it will be necessary to know whether they relate to delivery of the requisite at the point of sale, or to delivery at the farm-gate or village site. In the former case, the cost of transporting the requisite to the farm-gate or village site must be established and added to the retail price.

It may happen in a country that while the State statutorily fixes prices of some commodities, say, fertilizers or insecticides, the market may still indulge in transactions at different prices. The question of which prices should be reported in such cases, is a matter that should be resolved along the lines indicated on page 16 for output prices.

### Time, period and frequency of price collection

Retail prices can be collected from the market or other price reporting locations at any time of the day although, if for any requisites there is a peak marketing time, the quotations should be ascertained then.

Retail markets are normally run on a regular basis throughout the year. Retail prices for production requisites are therefore mostly obtainable continuously. In the case of requisites which have a marked seasonal use, such as seeds and seedlings, it is enough to collect prices a little before the sowing season rather than throughout the year.

How often should the prices be collected? This depends on the use to which the data are to be put. A State or public agency wishing to disseminate the prices of production requisites for the guidance of agricultural producers through the press, price bulletins, radio or television will need the quotations at least weekly. For the purposes of constructing index numbers of prices paid by farmers, however, average monthly quotations are normally required and these can be calculated from data collected weekly or monthly as appropriate.

### Unit of quotation

The prices should be quoted per standard unit of weight, volume, length, etc. If, however, units have not been standardized in a country and a variety of local units is in use, the price reporter should be provided with a table of conversion coefficients with which to convert prices quoted in local units into standard units before reporting them.

The form of the commodity to which the unit of weight should refer, should, in principle, be the weight net of bags, containers, etc., but this may have to be determined by the practices observed in the retail market. In many countries seeds, fertilizers, animal feedingstuffs, etc., are sold in packed form, that is in bag or container. The net weight may be marked on the container, but if not, and the prices have, as a result, to be reported per unit of gross weight (i.e. inclusive of the weight of the container), this fact must be clearly indicated when the prices are reported.

### Subsidies and taxes

In the case of some important requisites of agricultural production, subsidies, credit at concessional rates of interest, and other types of promotional grants are often made available to farmers to induce or enable them to buy the requisites in adequate quantities. Since this assistance takes various forms, the manner of treating it in the collection of prices paid by farmers requires careful understanding. If the subsidy or other assistance is given in such a way that the actual price paid by farmers is reduced by the amount of the subsidy, the resulting reduced price should be reported as the price paid by farmers. On the other hand, if the subsidy or other assistance is given to farmers as an acreage or production grant and is not directly associated with the production requisite being purchased, then, the full price paid for the requisite should be reported. Again, if the subsidy is given to the manufacturers or importers of a requisite, the price actually paid by farmers for that requisite should be reported since the manufacturer or importer should be passing the subsidy to the farmer in the form of reduced prices.

If farmers are allowed discount for prompt payment or for bulk purchases, or are charged interest for late payment of bills in connection with their purchases of production requisites, average rates must be assessed and the appropriate adjustments made to the prices at which the transactions are made.

In several countries, taxes are imposed on some articles which farmers buy for carrying on their productive activities. Where the tax is added to the price, the tax-inclusive price is the price to be reported.

If requisites of agricultural production are supplied to farmers free of charge, no imputation of price need be made and a zero price should be reported.

### Price reporting form (prices paid by farmers)

A standard price reporting form for completion by all price reporters and subsequent transmission to their headquarters should be prepared. The example given below may be considered as a specimen.

#### Price reporting form for prices paid by farmers

Name of reporting location:  
 Sub-region (county or district):  
 Region (province):  
 Prices as on (date):

Commodity	Specification (Modal or standard) (specify)	Standard Unit (specify)	Prices per standard unit	Nature of price (i.e. farm-gate, retail market or shop, public agency, cooperative, etc.)(specify)
1	2	3	4	5
I Requisites of agricultural production (See page 23)				

Date of despatch:

Signature of reporter:

Against "name of reporting location" will be inserted either the name of the public, cooperative or trade agency from which prices or rates have been obtained followed by the name of the place where it is situated; or the name of the village, town, etc., where the market, shop, tradesman, etc., is located and from where prices are collected. In column (2), special care must be taken when reporting on factor services. For example, interest rates vary with the period of the loan, so that the period should be specified; and wage rates should be quoted as either for skilled labour or for unskilled labour. For investment goods, machinery can be specified in terms of make and horse power, and so on.

Instead of the price reporter obtaining information on, say, government supply prices or rates applicable to electricity, water and interest from the respective public agencies, the agencies themselves may be requested to supply regular information to the headquarters of the price collection authority.

#### Instructions for field staff

To accompany the price reporting forms, a set of instructions should be drawn up for the guidance of field staff, or price reporters. The instructions should, inter alia, cover the following:

1. Definition of the term "prices paid by farmers", (i.e. the farm-gate price).
2. The locations or sources from which data on Government supply prices and rates, etc., may be obtained if these data are not furnished by the concerned agencies direct to the headquarters of the price collection authority.
3. Commodities, varieties, qualities for which prices paid are to be collected.
4. Price reporting day or days of each month.
5. Need for the price reporter to obtain prices by actually visiting the market and observing a few transactions, besides making oral enquiries.
6. Unit of quotation; table of conversion coefficients.
7. What to do if the price of a commodity is statutorily controlled.
8. An explanation of the columns of the price reporting form.
9. Addresses to which the price reporting form should be despatched after it has been completed.

In the instructions to the price reporters, it should be emphasized that the completed form should be despatched on the reporting day itself so that it reaches the headquarters price collection authority with the least delay. Sometimes the requirements of the headquarters authority are so urgent that the price data may have to be telegraphed, telexed or telephoned. This is particularly the case when these data are to be broadcast to farmers over radio or television to enable them to take informed purchasing decisions.

#### Survey of farmers for collection of prices paid

So far, the discussion has presumed that price data would be collected through inquiries conducted by price reporters in the selected reporting locations. Under certain conditions, however, it may, as with output prices (see page 20) be equally satisfactory to make inquiries from the farmers themselves about the prices which they have paid. Under such a procedure, a sample of farmers would report either directly (if they are literate and willing) or through price-interviewers, the prices which they have paid for the different varieties and qualities of the production requisites purchased by them. The sampling procedure to be adopted would be such as would provide a sufficiently

representative and numerous sample of farmers to ensure reliable averages. This procedure can also be used as a supplement to the reporting location approach, in which case it would serve as a useful check on the farm-gate prices estimated from retail market prices.

Other sources of price statistics

See the paragraph on this subject at page 21.

## VI. COMPILATION, STATISTICAL TREATMENT, DISSEMINATION AND ANALYSIS OF PRICES RECEIVED AND PRICES PAID BY FARMERS

In organizing the compilation, etc., of price data at headquarters, several aspects require consideration. These include the scrutiny and editing of the forms flowing from the price reporters, the format for compilation, methods of averaging, construction of index numbers, and dissemination and publication of the results. If the price data do not represent farm gate prices, then the available information on price spreads must be used to estimate farm-gate prices. Ancillary data, if they are collected, should also be processed. Above all it is important to ensure timeliness of dissemination and publication.

### The price reporting forms

The forms containing prices and other separate ancillary information will flow to the national price collection authority (or the regional price collection authorities under it) from the price reporters at regular daily, weekly or monthly intervals as prescribed. The price data arriving will be as indicated on pages 18 and 27 while quantity data (if available) will be as described on page 21.

Besides the above, the following categories of data may also be available from institutional, private or cooperative agencies, or may be culled from market reports and commercial journals and newspapers:

- (i) Prices of agricultural commodities and production requisites, together with information on the relating definitions of price, variety and stage of distribution;
- (ii) Quantities sold, with information on variety and stage of distribution;
- (iii) Ancillary data, such as those on market arrivals and stocks.

### Scrutiny of price reporting forms

Before undertaking compilation of data received by the national price collection authority (or regional authorities), the forms must be scrutinized and edited. For this purpose, procedures and instructions for scrutiny have to be prescribed for the guidance of scrutineers. Improbable, absurd and inconsistent data reported ought to cause doubt as should sudden steep rises or falls in comparison with the recent past. In these cases checks should be made against any explanatory remarks made by the price reporter on the price reporting form or against any available independent evidence. If the scrutineer is still not satisfied with the correctness of the information, he should contact the price reporter to seek necessary clarification marking the data as "under verification" until a reply is received. Experience in handling the schedules will, however, overcome many difficulties which arise initially.

Instructions for scrutiny should also be laid down for any ancillary data (particularly on quantities) arriving from the price reporters.

In scrutinizing the schedules received from agencies other than price reporters, or in culling data from commercial journals, great care must be exercised to make sure that the concept of price used, stage of marketing, variety, etc., agree with those used by the price reporters of the national authority. To the extent that they do not, instructions will have to be laid down on how to make them comparable, or else to recognize the limitations.

If prices and other data are to be tabulated with the help of tabulating machines, instructions for coding, punching and verification of data will also be necessary as part of a detailed mechanical tabulation programme.

### Format for compilation

The uses to which the data are intended to be put should be the prime factor in deciding the format for their compilation. Broadly, the main uses are temporal and spatial comparisons; the evaluation of the worth of agricultural products and the cost of production requisites; and the construction of price index numbers. These requirements will be more easily achieved if, when devising a format appropriate for comparison of data, items between which comparison is to be made are placed as close to each other as possible. At the same time, the format or the register in which the data are recorded should not be too unwieldy. The rows are generally devoted to names of reporting locations and columns to reporting days, so that each cell contains the price, or quantity of sales, for a reporting day in a particular market.

Price comparison has several variants: e.g. temporal, spatial, inter-varietal, and between different marketing stages. To facilitate temporal comparisons, the rows and columns of the tabulation sheet should be so arranged that for the modal or selected variety it is possible to compare at a glance the current farm-gate prices with those on a particular day in the past or on the corresponding day in the previous year or years. If prices collected and transmitted by reporters are not "farm-gate", these will have to be estimated using all the information available on price spreads, margins, etc., before entry in the compilation sheet or register.

The tabulation format described above will also hold good for spatial comparison of farm-gate prices received or paid by farmers. For making inter-varietal comparisons, the format will additionally have to provide for the recording of farm-gate prices of separate varieties or commodity specifications. For inter-marketing stage comparisons, the tabulation format should provide for as many rows as there are marketing stages for the given commodity or production requisite; the column entries against each row will then give the relevant price quotations at the different stages.

Symbols may be used in the tables to denote whether a quotation is under verification, or is a nominal quotation, or relates to a day other than the reporting day, or is for an alternative variety, or is for the new crop, or represents a statutorily controlled price, or is a price other than the modal price, etc. Explanations of the symbols should be given in footnotes to the table.

For valuation purposes the unit value of each commodity is required. Accordingly, the compilation format should provide for the recording of the quantities of transactions of each variety as well as the corresponding prices. At the end of the table, there should be provision for the computation of the average price per unit quantity of the given commodity over a given period of time, the procedure for which will be considered later when dealing with averaging for valuation purposes (see page 33). The unit value for a commodity at the farm-gate is easy to obtain if all transactions take place there. If not, the quantities transacted at the different points of sale and the corresponding estimated farm-gate prices must be used.

Formats should also be drawn up for the recording of other ancillary data and information obtained on marketing procedures (see page 10); market practices (see Appendix II); price spreads (see Appendix III); and from costs of production surveys (see page 23) and family expenditure surveys (see Appendix V). These should be maintained in a form that will permit the entry of up-dated information.

The formats should be prepared by regions within each country. Within each region, markets may be arranged in geographical or alphabetical order under each district (or county, or sub-region).

Similar procedures will be followed if the data are to be compiled at the headquarters of the regional price collection authorities. It must be decided between the national and

regional authorities whether the former will compile all the data or operate on only a selected sample thereof, or whether the latter will supply the former with regional averages, etc.

Special analyses such as those needed for economic analysis of prices data, will, of course, call for special formats.

If price statistics are obtained from agencies other than the price reporters of the national price collection authority or from market reports, commercial journals, newspapers, etc., and it is intended to compare the two sets of prices, both sets of quotations should be entered in similar formats for ease of comparison. If the prices reported by the price reporters are modal prices while those obtained from other sources are not, this fact should be clearly brought out in footnotes as it will limit comparability.

Care should be taken in all compilations to ensure that no mistakes are committed in copying the data from the schedules received from the price reporters, or in preparing special compilations. Adequate checking should be carried out.

#### Averaging for comparison purposes

The formats considered so far have presumed that the prices and other data would be recorded in terms of absolute values adjusted to farm-gate level. Such compilations are in the nature of time series and are useful where absolute prices or quantities at a few reporting locations are to be studied or compared. But, if the number of reporting locations is large, it will not be easy to discern the overall price position in a region or country from prices derived from individual locations unless some measure of central tendency of these prices is calculated. The simple arithmetic mean would serve the purpose, but there is no objection to the computation of the median or mode. The median, which does away with the extreme values at either end of the series, is often preferred; but the mode, which gives the most common price for all the reporting markets, is no less representative. Whatever averaging method is selected, the compilation format should provide for recording the results - perhaps in a separate register. These averages may be computed for a group of reporting locations located in geographical proximity, or for a state or region, or for the country as a whole, to provide an easy basis for time comparisons. The prices to be averaged would all conform to the concept of farm-gate prices and be for the selected (modal) variety.

An unweighted average gives equal weight to all the quotations from which it is calculated. It may not, however, always be right to give equal weight to all quotations even if they relate to a common price definition, commodity specification and marketing stage. For, if the quantities appropriate to each quotation vary widely, an unweighted average may not give the true picture. In such situations, a weighted average farm-gate price, using quantities as weights, would be a more satisfactory measure of central tendency. This implies that in the compilation format, space will need to be provided against each reporting location for entering (i) the modal price for the modal variety; (ii) the quantity of the modal variety traded (or an appropriate weighting coefficient); and (iii) the product of price and quantity. There must also be provision for the summation of (ii) and (iii) and for the recording of the calculated weighted average farm-gate price. The weighted average farm-gate prices of a specified agricultural commodity or production requisite derived from all the reporting locations of a region or country at different points in time would be comparable with each other. If, however, data on quantities of modal varieties sold or purchased (or reliable weighting coefficients) are not available, weighted averages cannot be calculated.

If it is found difficult to collect data on quantities of modal varieties traded every day or week or month (depending on the frequency of reporting), a given set of weights deduced from the quantities of modal variety traded during a selected base period may be used. The weights so calculated should reflect the seasonality in the marketing



of the agricultural commodity or production requisite and may not, therefore, be constant for all weeks or months of a year. They would, however, be constant for the same week or month of each year until replaced by an updated set of weights based on a new base year.

The simple and weighted averaging considered so far has related to only one variety - the modal variety at each reporting location. But if an average is needed for all varieties, the question of appropriate weights becomes a little more complicated. In order that the price averages may be comparable in this case, the weighting pattern, once established, should be held constant until replaced by updated weights. As in the construction of base weighted index numbers, the weights should be constructed from the quantities of the different varieties sold or purchased during a selected time base period (preferably a three-year period to correct for abnormal conditions in any one year).

#### Averaging for valuation purposes

The averages considered so far, though useful for comparison purposes over time or space, may not be suitable for evaluation purposes. In all valuation problems, what is required is an average price for a commodity which when multiplied by the total quantity of that commodity, sold or purchased, gives its total value. The collection of price quotations and the method of price averaging used should be such as will give an unbiased average price, that is an average whose expected value is equal to the total value divided by the corresponding total quantity. Further, the estimate should, as far as possible, possess a minimum variance. These requirements can be met by the use of probability sampling procedures, employing an appropriate sampling design. This task, however, is by no means easy and it is sometimes doubtful whether the resources expended on the conduct of the required sample surveys are really commensurate with the gain in the precision of the average prices so estimated. Resort is therefore most often had to purposive selection of markets. In such a procedure, the more sensitive markets should be selected; these markets will generally be the larger markets measured by size of annual turnover, but some of the smaller markets may also be chosen.

In computing the average price per unit of a commodity over a given period of time, the quantities sold in the selected markets will provide the weights. The resulting weighted average price is the unit value by which the total sales of the concerned agricultural commodity (or the total purchases of a production requisite) may be multiplied in order to obtain its total value (or cost).

In some countries the only information available on quantities sold or purchased may be a weekly total of all varieties, even though prices may be available for each variety or for a specific or modal variety. In such cases, of course, all that can be done is to use the available data in the most efficient manner possible. If it is not possible to collect quantity data at all, one is left with unweighted price averages which may be biased and not sufficiently accurate for evaluation purposes. The price collection programme should therefore aim at collecting quantities by varieties as well as prices, even though such quantity data may be confined to only a small sample of markets. If it is found difficult to collect quantity data on a regular basis from even this small number of markets, then the alternative of obtaining them through a properly designed sample survey should be explored because the need for reliable weights for evaluation purposes is highly important.

#### Index numbers (See also Appendix IV)

The prices of a commodity over two points of time can be compared in absolute terms or in relative terms. The absolute change is expressed in the units in which the price is reported. Relative change is a pure number; it gives a better idea of the order of change. For example, if the price of a commodity in a given market or reporting location changes between two points of time from 40 units of currency per ton to 44 units, the absolute

change is 4 units of currency per ton while the relative change is 10 per cent; over the same period and for the same commodity if the price change in another market or location is from 50 to 55 units of the same currency per ton, the absolute change is 5 units of currency per ton which is higher than that in the first example, but the relative change is the same, viz., 10 per cent. It will therefore make for readily understandable comparison of a commodity's prices in individual markets or locations over a period of time if they are converted into price relatives with some past time period as the comparison base. Similarly, averages of prices of a commodity for all the reporting locations over time may be converted into price relatives for purposes of comparison.

As a further step, if prices are to be compared for a set of commodities taken together and, particularly if the quotations for them do not refer to the same unit of weight, the individual price relatives for the commodities in the set may be averaged. The resulting averages are called index numbers. The index number for the current date compared with the base period average (which would be equated to 100) would then provide a measure of the relative change in prices of all the commodities collectively.

The commodities included in the index number would not all be of equal importance. In most countries, for example, rice or wheat may have greater importance (as measured by value or volume of production, marketings or consumption) than, say, groundnut, or tobacco. Accordingly, when constructing the index number, the price relative for each commodity must be weighted in terms of its relative importance compared to other commodities in the selected group. If weights are ignored, the simple index would be an inappropriately weighted index.

Several formulae for constructing weighted index numbers are available the most common being Laspeyre's formula in which the weights used are base-period weights; Paasche's formula which uses current-period weights and Fisher's ideal index which is a geometric mean of these two.

Generally, Laspeyre's formula is used because of its relative simplicity which depends on the fact that, once calculated, the weights remain constant throughout the life of the index whereas with the Paasche formula weights, and hence the whole series, need to be continually revised (and this can only be done if data for constructing new weights for the current period become available relatively quickly). On the other hand, as the base period of the Laspeyre formula becomes out of date, the efficiency of that index declines steadily necessitating fairly frequent up-dating of the base period weighting pattern - with a consequent loss of comparability over a long time span.

The Fisher ideal index is an attempt to combine the more efficient features of the Laspeyre and Paasche formulae, but this index, too, suffers from the disadvantages of the Paasche in requiring readily available fresh weights for the current period and continual reworking of the whole series.

Whichever formula is used, weights for index numbers of prices received by farmers are usually based on relative values of production or marketings of different commodities in a "normal" year in the recent past; while for index numbers of prices paid, weights are based on relative costs of production requisites purchased or used.

A "normal" year is one whose prices are more or less stable, not being affected by boom, or depression, or catastrophes like wars, floods, famines. When the weight base year (using the Laspeyre formula) becomes distant from the current period, it must be revised to a more current normal year. The weight base year and the comparison base year (used for the calculation of the price relatives) may be the same, or different provided they are not too remote from each other. To take care of the vicissitudes of nature, the base year may be an average of three or five years.

If the price collection authority is charged with the responsibility of constructing index numbers of wholesale or retail prices, as well as those of farm-gate prices received or paid by farmers, the selection of markets and reporting locations, commodities and varieties, and the concept of price will have to be carefully considered at the time of formulating the programme of data collection. Special attention will have to be given to the varying patterns of production and consumption observed in the different regions when calculating the weights. The wholesale or retail prices received from the price reporters and the derived farm-gate prices may then be utilized for the construction of the index numbers. These index numbers may be computed for each region of a country and for the country as a whole. The national index may be constructed either directly from price data from a selection of representative markets or locations, or from the regional indices.

#### Index numbers of prices received by farmers

Index numbers of prices received by farmers are of crucial importance in many studies concerning the agricultural sector of a national economy. Firstly, they may be used in the context of economic accounts for agriculture. (These accounts read with similar accounts for other sectors of the economy provide a quantitative estimate of the contribution of agriculture to a country's national product.) Secondly, price index numbers, or the prices data on which they are based, are useful in the construction of index numbers of the agricultural production of a country. The FAO index numbers of production of individual countries in the new series (with the average of the three years 1969-71 as base) are weighted with national average producer prices, each price-weight being the three-year average price calculated using quantities of commodities produced in each of these three years as weights. Thirdly, index numbers of prices received by farmers are indicators of the overall trends over time in producer prices in a country, and of the relative movement of agricultural prices between two or more countries over a common period of time.

In constructing index numbers of prices received by farmers, prices of all the important agricultural commodities produced in a country need to be used. In terms of value of production, the commodities included should represent at least 80 per cent of the total value. The prices of these commodities should be farm-gate prices, or prices at the first points of sale converted into farm-gate prices. Monthly average prices, or prices collected once in a month, would serve the purpose. Weights may be assigned to the price relatives of the selected commodities on the basis of proportionate average values of the marketings of each commodity during the weight base period. If, however, data on marketed quantities are difficult to collect, values of production, or marketable surpluses may be used instead.

#### Index numbers of prices paid by farmers

The articles which farmers buy fall under two principal heads: those needed for his production activity and those needed for his domestic consumption. (The latter are dealt with separately in Appendix V.)

Depending upon the requirements and availability of data, the index of prices paid by farmers for requisites of agricultural production can be arrived at by combining price indices of (i) materials used in current agricultural production, (ii) factor services and (iii) investment goods, each weighted by the proportions that expenditure under each of these heads bears to the total expenditure on requisites of agricultural production. (Data from the production costs surveys or valuations of the costs of inputs in the economic accounts for agriculture will be needed for this.) Alternatively, the overall index can be calculated directly from the prices of individual requisites of agricultural production.

The list of commodities to be included in the above index numbers must be determined in advance using the costs of production surveys and should cover at least 80 per cent of the total costs of production requisites.

The comparison base and weight base periods for the indices (i), (ii) and (iii) above should be the same (or as close to each other as possible) in order to facilitate comparison and the combining of the separate indices. The universal criterion of "normality" should determine the choice and length of the base period. Prices should be monthly averages calculated from average weekly or less frequently collected data and should be weighted together by the pattern of weights derived from the production costs survey.

The chain base method, or splicing, may be resorted to if it is intended to provide for the deletion of commodities that go out of use or production and their replacement by new ones. An alternative is to revise the base period and weights when needed, and to link the new series with the old to get a long-time series.

### Parity index numbers

An important objective of collection of prices received and paid by farmers is to study them together with a view to getting an idea of the direction and degree of movement of the two sets of prices. Knowledge of the relative movements from, say, crop season to crop season, or year to year, is of help to policy-makers and administrators in formulating, modifying and executing price policies, including taxation and subsidization measures, affecting agriculture or the farmer. If the farmer has the assurance that the prices of his products will keep pace with the prices he has to pay for his purchases, he will feel less inhibited in adopting new farming techniques for augmenting agricultural production. Such assurances would extend social and economic justice to farmers and help develop agriculture.

The study of the parity between prices received and prices paid by farmers can be made using index numbers of the two sets of prices. Thus,

$$\text{Parity index} = \frac{\text{Index of prices received by farmers}}{\text{Index of prices paid by farmers}}$$

The parity index can be calculated on a monthly basis or for an agricultural year (or crop year) as a whole. Given the index of prices paid by farmers it will be possible to estimate the level of output prices that would yield the same figure for the index of prices received by farmers, and conversely.

### Dissemination

To maximize his income, a farmer naturally wishes to choose the optimum time and place for the sales of his agricultural commodities or his purchases of production requisites. He can be greatly assisted in this task if the price collection authorities, regional as well as national, arrange to convey to the farming community the prices for various agricultural commodities and production requisites available at different locations at given moments of time. The speed with which this information can be conveyed to the farmer is of the essence.

Accordingly, arrangements will need to be made to ensure that a particular day's market quotations for agricultural commodities reach farmers during the same day, or at least by that evening; (retail prices for production requisites, being more stable, need not be disseminated with quite the same urgency). Thus, market prices should be conveyed by the price reporters to the appropriate regional or national authority over the telephone, or by telex, soon after the peak marketing hour of the day. The authority

will assemble the quotations in respect of the markets in its area into a standard statement and pass it on for broadcast over the local radio or television. The time for the broadcast would be fixed and announced in advance. The broadcast may be done everyday, or every alternate day, or even weekly depending upon the marketing system of the region. Where telephone or telex facilities are not adequate, the market reporters may use the telegraph or postal services (in which case it may not be possible to broadcast the day's prices until the next day). If broadcasting facilities are not available, price bulletins may be printed and despatched to farmers or agencies connected with them. Use may also be made of the daily newspapers and weekly journals to give publicity to prices.

### Publication

Prices and other ancillary data need to be published to enable their wider use and to provide a permanent historical record. Since the only information available is that which has been collected, the national price collection authority must consider carefully the scope and content of the data to be published when first formulating the programme for data collection. If the need for any additional data arises later, the authority will have to revise and adjust the data collection programme accordingly.

The publication would be brought out at regular intervals depending on the frequency at which data are reported by the price reporters. A weekly bulletin might give data for each day of the week to which it relates together with comparable data for earlier periods. Likewise, a fortnightly or a monthly bulletin might give weekly data for the fortnight or month which it covers, and some past data for ready comparison. An annual publication consolidating the information for the different weeks, fortnights or months of the year, as convenient, together with corresponding data for selected past periods, would be useful as a reference work.

Suitable formats for the periodical and annual publications will need to be devised. The first issue of the periodical at the beginning of each year and every annual publication might, for example, describe the manner in which the data have been collected. This could cover the definition of price, the procedure or instructions for price collection, the commodity specifications, the nature of the different markets and locations (farm-gate, wholesale, retail, etc.) and any qualifications affecting the use of the data for comparison or valuation purposes (which can be given in footnotes to the relevant tables). These would indicate whether a particular quotation relates to a concept different from the standard concept; or to a variety different from the standard variety; or to a different date; or is a nominal quotation; or is a state intervention or controlled price; or includes the cost of sack or bag; or includes certain subsidies or taxes which other quotations do not; or relates to a system of payment different from that applicable to other quotations, e.g. discounts for prompt payment; and so on. This will help to avoid wrong inferences.

Besides the data on absolute prices, the annual publication might give the regional and national price averages, price relatives and index numbers. It might also include ancillary data such as market arrivals, sales, shipments, etc. Information on marketing procedures, market practices, market margins, costs of production, etc., may also be suitably consolidated in the annual volume. The inclusion of charts and diagrams to enable visual study of price trends is desirable, particularly in annual publications.

### Timeliness of publication

The publication of data is often delayed due partly to a lack of urgency in the finalization of the manuscripts, and partly to difficulties in printing. Consequently, there is sometimes a long time lag between the date on which the publication is brought out and the date to which the data inside it relate. But timeliness, which is essential in collecting and compiling data, is no less important in publishing them. If the release of data by the national price collection authority is delayed, there is a danger of unofficial and possibly misleading data appearing earlier.

## Analysis

Analysis of price data implies studying the behaviour of current prices in the context of the past in order to attempt to understand the future. The methodology varies from simple arithmetical comparisons to more complicated mathematical techniques depending upon the object of the analysis. Figures do speak, and it is the purpose of analysis to assess what they say; but the differing motivations of analysts may make the same figures tell different stories. Partly for this reason (i.e. that the analysis undertaken by one agency may be doubted or challenged by another), and partly for the reason that properly to understand current price behaviour often necessitates the study of certain other related data (such as those on stocks, production, flow of supplies, imports and exports of the concerned commodity), national price collection authorities generally publish price data without analysing them. It is the policy making agencies who, taking these data and using them in conjunction with other related data, draw their own conclusions about the current price situation and the factors behind it. This knowledge is then used for decision-making of various kinds. It is important to remember that current price levels may have been influenced by related policy decisions taken in the past, and will show how far those decisions have succeeded in achieving the desired price levels.

However, if the price collection authority is called upon to undertake the analysis of price data, the scope of such analysis and the methodology to be followed for the purpose in view will require to be decided. There is no problem if current prices (or index numbers based on them) are to be compared with previous prices. Such comparisons will generally be made in percentage terms. Certain analyses may, however, require the use of special techniques. A time series has several components: secular trend, seasonal variations, cyclical movement, and irregular fluctuations. In a given time series, some or all of these components may be present. Separation of the different components of a time series will depend on whether it is desired to study a particular component or to study the series after eliminating the effect of a particular component. For such analysis, special techniques involving the fitting of mathematical curves are used.

The analysis of past and current prices can also provide some indication of the future outlook. But the movement of a price in the immediate future depends not merely on the extension of a curve of past prices, but also on all other factors bearing on the expectations of supply and demand of the commodity and its substitutes. Outlook studies have assumed considerable importance in the context of planned economic development in many countries, but these studies need analytical expertise and experience in handling sensitive data. Agricultural prices are known to be affected by seasonality. From a study of past data it may look relatively easy to predict the time when prices are most likely to display a seasonal fall or peak, but the analyst has to take into account whether any action by the state to avert the seasonal fall, or to influence its magnitude in the coming year, is planned. Again, weather conditions can significantly affect the size of a crop, and the size in turn affects the prices. A knowledge of such inter-relationships is helpful in outlook studies but that alone is not enough. For example, the suspension of exports and the arranging for adequate and timely imports of a commodity in a year of adverse weather conditions would change the price outlook. Lastly, when commodity prices rise they do not all do so simultaneously; some commodities lead the rise while others lag behind. Thus, when prices of the leader commodities display a tendency to rise, an upward swing in the prices of the laggards and the likely time lag in it can often be predicted unless certain counteracting forces are known to be at work.

Lastly, the analysis of price data may reveal certain defects or deficiencies in the data themselves. Steps should then be taken to rectify them and to improve the quality and content of the data.

## VII. ORGANIZATIONAL STRUCTURE FOR PRICE COLLECTION

Although the organizational structure for the collection of prices in a country will normally result automatically from its socio-economic set up, some general guidelines deserve to be kept in view. The organization, headed by what may be called the national price collection authority, will, in general, comprise three sets of officials: statisticians, fieldworkers or price reporters, and supervisors.

### National price collection authority

This authority at the apex of a unitary or federal country, would be charged with the overall responsibility for organizing, directing and guiding the collection of all price statistics on a uniform standard basis throughout the country. Depending on the size of the country, it may have under it regional authorities too, but they would be responsible only for local control and execution of work, the guidelines for which will be set by the national authority.

### Statisticians

Under the general direction of the national price collection authority, the statisticians would design the entire plan of work; determine the concepts and definitions to be used; select the markets and price reporting locations, and the commodities and their specifications; devise the price reporting format; lay down instructions for the price reporters and train them; ensure proper supervision and execution of field work; organize compilation, analysis and dissemination of data; and keep the plan of work under constant review.

In a large country with a federal structure, some sharing of these responsibilities by the federal authority with the state or regional authorities may be necessary, but care will have to be taken to see that the basic essentials, such as concepts, definitions and commodity specifications, are uniform over the whole country to ensure comparability of price data between all markets and reporting locations. The statisticians would also be responsible for specifying the information needed on marketing practices and price spreads as well as defining the scope of the ancillary data that may be required to be collected. They should also design the costs of production and farm family budget surveys.

### Field workers or price reporters

The second set of officials would comprise the field workers or price reporters responsible for the actual price reporting from the selected markets and locations, and for obtaining up-dated information on marketing practices, etc. Their number would depend upon the volume of work - i.e. the number of markets and reporting locations, the number of commodities and the frequency of price reporting. Their pay scales may vary with the size of the market in which they operate or its turnover (which is an indication of the volume and often, but not necessarily always, the complexity of their work). Depending again on the volume of their work, and the structure of the country's administration, they may either be appointed as full-time staff of the national price collection authority itself or borrowed on a full-time or part-time basis, as necessary, from other departments of the federal or state government. In the latter case, preference may be given to staff employed in departments engaged on economic and statistical surveys or agricultural marketing, or those well acquainted with market operations. It will be an advantage if the price reporter is stationed at one of the markets or locations from which he is to report price data since he will then be in day-to-day contact with marketing practices and prices. High education in the case of field workers is not so important as the intelligence to understand and appreciate the significance of the definitions used in data collection and the procedures laid down. Where necessary,

even private agencies may be utilized for price reporting, care being taken to see that they follow the concepts and definitions adopted by the state agencies to ensure comparability of data.

In auction markets which are well organized, complete day-to-day records of each successful auction bid, specifying the quantity of the transaction and its price, are maintained for each commodity by the market committee or the marketing institution that conducts the auctions. The price reporters should use these records whenever possible.

### Supervisors

The third set of officials would be the supervisors of price reporters. Depending on the means of transport and communications, one supervisor can inspect the work of several market reporters every month. It will mean some saving in travel cost if he is located in the vicinity of the markets allotted to him for supervision. The supervisor would satisfy himself that the price reporter is adopting the prescribed concepts and definitions and is observing the standard procedures in collecting the required data. He should correct genuine mistakes committed by the price reporter and provide him with the needed guidance and clarifications on the spot. The underlying objective of supervision is to ensure that the data are being collected by all price reporters on uniform and prescribed lines so that they are reliable and comparable. The point cannot be over-emphasized that when regular supervision is provided for it creates in the price reporter the proper psychological frame of mind to do honest and accurate reporting. It is therefore essential that adequate arrangements are made for effective supervision of data collection work in all markets and price reporting locations.

The supervisors may also be required to furnish to the national price collection authority market intelligence reports based on their tours, e.g., are there any impediments in the way of a regular flow of supplies; what are the prospects for the new crops; are there any new technical developments in production requisites; will prices in the near future tend to rise or to fall, and why? They may also make suggestions to the national authority, in respect of individual markets or groups of markets, for improving the efficiency of marketing, raising the farmers' share of the market price, removing the disabilities under which he sells in the market, or ending possible malpractices which reduce his realizations, and so on.

### Training

The training of supervisors and price reporters should have an important place in the organizational structure for price collection. Before the price reporters are put on actual price reporting work and the supervisors are deployed on supervision duties, they should be given an intensive theoretical and practical training in the procedures of data collection including a full explanation of the concepts and definitions to be used. The schedules for data reporting and the relevant instructions should also be fully explained to them. They should be given practical demonstrations in actual data collection and selected locations, and later, they should be asked to carry out data reporting under close supervision. It is only after they have satisfactorily gone through this training that they should be posted to their places of duty. This initial training should be followed at intervals by refresher courses, so that reporters and supervisors do not get stale and to acquaint them with any new procedures. Even if elaborate instructions on revised procedures or modified concepts are issued to the price reporters and supervisors from time to time, it may happen in some cases that they are not properly understood. Refresher courses would be a great help in such cases.

In the initial stages, it may be difficult to find sufficient suitable training instructors. As work proceeds, however, the more experienced supervisors can be used for giving training to reporters either in regional groups or centrally as convenient.



### Compilers

The organizational structure should also provide for equipment and staff for the compilation of data. With electric or electronic data processing machines, the compilation will be faster and more accurate than if done manually. These machines may also prove useful for further analysis of data. But where the workload is small, or data processing machines are not readily available, compilation will be performed manually. The number of staff and kind of skills they should possess will depend on the nature and volume of the compilation work and on whether it is to be done manually or mechanically.

### Analysts and publishers

Where the analysis and publication of price and other related data is the responsibility of the national price collection authority, its organizational structure should provide for the necessary staff of requisite skill. Dissemination of data to farmers through various media also calls for expert staff to prepare scripts readily intelligible to them.

### Other considerations

In some countries the activities of agricultural produce markets are regulated by cooperative or state agencies. These agencies may, inter alia, decide the mode of marketing, conduct the auctions and standardize the various marketing charges to be paid. The object of such regulation is to protect the farmer against the marketing malpractices and arbitrary deductions to which he may be subjected by middle-men and others, and to help him secure a satisfactory price. These and other methods of improving the system of marketing deserve attention in the interest of the farming community as a whole. Accordingly, where considered necessary, the organizational structure may also provide for a unit to undertake studies on improving marketing efficiency.

It may happen that in a country a number of different authorities operate in the same set of markets or locations, collecting prices, often through different agencies and using different concepts, though for the same set of agricultural commodities or production requisites. Such duplication of effort should, as far as possible, be avoided. All authorities requiring price data should use the services of the national price collection authority which should attempt to cater for all requirements of agricultural price statistics. That would be a most effective way of ensuring coordination and conceptual clarity.

It is not impossible (though rather unlikely) that the price collection procedures and organizational arrangements relating to agricultural prices could be coordinated with price reporting programmes for non-agricultural commodities. Although the methods of collection and compilation of price statistics will obviously differ according to the types of prices, commodities, marketing practices, etc., there may be a sufficiently close inter-relationship to warrant careful consideration of the possibilities for integrating the different arrangements for price collection.

A further area where coordination may be possible is in the collection of agricultural price data directly from farmers. Reference has been made on pages 20 and 28 to the necessity, under certain conditions, for obtaining data on prices received and prices paid directly from a sample of farmers; further enquiries of farmers to establish costs of production, lists of production requisites and expenditure on household consumption goods are also dealt with on pages 23-24 and at Appendix V. Consideration should obviously be given to the possibilities of combining these enquiries bearing in mind, of course, the need for (i) adequate representativity of the sample to ensure the reliability of the various results it would be designed to give; (ii) regular and frequent reporting on prices received and paid; but (iii) less frequent data collection on the other aspects.

In conclusion, it must be emphasized that the standards and methods to be employed in the collection of prices received and paid by farmers must be compatible with the existing national economic and social conditions. The standards and methods chosen and the nature and volume of work involved will finally determine the organizational structure of the price collection machinery. Where price stabilization or other marketing schemes operate for certain commodities (e.g. those involving fixed domestic and/or guaranteed export prices), or where farmers generally sell their produce to, or buy their production requisites from, agricultural cooperatives, shipping associations or government or commodity corporations, an elaborate field organization comprising price reporters and supervisors would not be needed since much of the required data on prices can be obtained by the national authority directly from the concerned institutions. The organizational structure already described is designed to cover situations in which farmers operate through markets where prices are settled, by and large, by free forces of supply and demand. Even here, the shape and size of the price collecting organization may differ according to the stage of development of marketing reached. If marketing is relatively underdeveloped so that there are hardly any markets from where price reporters can obtain the required information, and farmers are either unwilling or not literate enough to reply to mailed questionnaires, price reporters will have no option but to interview farmers to record the prices which they have received and paid.

The methods and pattern of organization for the collection of price statistics may vary between countries, or between groups of commodities in the same country, but the underlying objective in all situations must be to obtain, as accurately as possible, the prices received or paid by farmers.

APPENDIX I

List of meetings, seminars, etc. at which the preparation of a technical  
Manual on agricultural price statistics has been recommended

1. Statistics Advisory Committee - 1965, Rome, Italy  
"The Committee recommended that a manual should be prepared to assist countries in the development of consistent data on prices paid and received by farmers."
2. African Commission on Agricultural Statistics - Regional Seminar on Agricultural  
Producer Price Statistics - Ghana, December 1965  
"The Seminar suggested that a Manual for sampling procedures for the purpose of collection, processing and publication of price statistics is needed and they requested that the FAO consider the possibility of preparing such a Manual for use in the countries of the African Region."
3. Fourth Session of the Sub-Committee on Agricultural Statistics to the Committee  
on Improvement of National Statistics - Washington, June 1968.  
"The Sub-Committee noted with satisfaction that FAO planned to prepare a manual on agricultural price statistics and related index numbers dealing with technical aspects of concepts and methods as well as with practical arrangements for the establishment and operation of agricultural price reporting programmes. The Sub-Committee recommended that adequate priority be given to the preparation of this manual."
4. Group of Experts on Agricultural Producer Price Statistics and Related Index Numbers -  
Geneva, January 1969.  
"The Group welcomed FAO's plans to prepare a manual relating to agricultural price statistics. This manual should provide the basic definitions and methods relevant to all stages of the work involved in the compilation of price statistics."
5. Statistics Advisory Committee - 1969, Rome, Italy  
"The Committee recommended the preparation of a Manual on Concepts, Definitions and Methodology in the field of agricultural price statistics."
6. Joint Session Near East Commission on Agricultural Statistics and Near East  
Commission on Agricultural Planning - Cairo, May 1970.  
"FAO should give a high priority to the preparation of a manual on the subject of index numbers to assist and guide member countries in the compilation of their agricultural indices of prices."
7. Seminar on Statistics of Agricultural Producer Prices in Asia and Far East, New Delhi,  
September 1972.  
"The Seminar welcomes the proposal of FAO to prepare a technical manual on agricultural price statistics and recommended that its publication should be expedited."
8. Statistics Advisory Committee - 1975, Rome, Italy  
"Urged that a manual on agricultural producer prices should be brought out and without further delay for the benefit of the developing countries."
9. Meeting of Asia and Far East Commission, Manila, March 1976  
"The Commission recommended that immediate steps should be taken to prepare a technical manual on agricultural producer prices."

## APPENDIX II

Suggested Content of Descriptive Market Schedules

1. Name of market
2. Identification of market
  - (i) location - sub-district, district, province, etc.
  - (ii) situation
  - (iii) best approach route
  - (iv) means of transportation - rail, road, river, etc.
  - (v) communication facilities - postal, telegraphic, telephone
3. Nature of market
  - (i) farm-gate
  - (ii) primary wholesale market
  - (iii) secondary wholesale market
  - (iv) terminal wholesale market
  - (v) retail market.

(If the nature of market varies with commodities, then give information by commodities)
4. Hinterland of market, if it is not a farm-gate location
  - (i) names of farming areas from which bulk of products come to this market for sale
  - (ii) radius within which hinterland lies.
5. Commodities traded and turnover
  - (i) names of commodities offered for sale
  - (ii) varieties/qualities traded
  - (iii) modal variety/quality
  - (iv) sold in raw or processed form, e.g. paddy unhusked or husked; cotton raw or ginned; groundnut with shell or without shell; maize cobs or separated grains; lentils whole or split?
  - (v) if sold in processed form, conversion co-efficients between raw and processed forms
  - (vi) sold net or with container (e.g. in sack, or basket)?
  - (vii) approximate quantities of each commodity traded monthly, quarterly, or annually.
6. Harvesting and marketing seasons
  - (i) harvesting months for each commodity
  - (ii) months over which each commodity is normally offered for sale in this market.

## 7. Market practices

- (i) day(s) of week, when closed
- (ii) hours of business; peak hour
- (iii) are weights, measures and unit of currency used local or standardized?
- (iv) if local, conversion factors to arrive at standardized units
- (v) is the price settled between seller and buyer directly or through intermediaries, e.g., commission agent, broker?
- (vi) if through the intermediaries, who pays for their services - the seller, the buyer, or both? (Amounts or percentages should be quoted.)
- (vii) how is price settled - tender system, open auction, private treaty, any other method?
- (viii) are any deductions made from the agreed price if, while weighing or taking delivery, the buyer finds the produce to be inferior to the sample for which the price was agreed? If yes, amounts or percentages deducted
- (ix) does the farmer/seller bear any other expenses, such as fees for entry to the market, local taxes, market charges, contribution to charity or festival celebrations, charges for cleaning, weighing, handling, transport, storage or processing? If yes, amounts or percentages
- (x) if a commodity is not sold net, but in container such as bag, sack or basket, does the farmer/seller bear the expenses for the container or does he charge the buyer? In either case, what is its value or percentage?

## 8. Names and addresses of market committees, chambers of commerce etc. or knowledgeable individuals from whom ancillary information can be obtained.

APPENDIX III

Example to illustrate the calculation of farm-gate prices from wholesale market prices

	<u>Percentage of secondary wholesale market price</u>	<u>Unit Price</u>
I. Secondary wholesale market price		100
<u>Less</u>		
(i) Cost of bag and stitching charges paid at primary wholesale market	2.50	
(ii) Transport to railway station at primary wholesale market	1.00	
(iii) Weighing and trading charges	0.75	
(iv) Railway freight from primary to secondary wholesale market	3.50	
(v) Unloading charges	0.75	
(vi) Transport from railway station to secondary wholesale market	1.00	
(vii) Other incidental expenses	3.00	
(viii) Secondary wholesaler's margin of profit	2.50	
<u>Total:</u>	<u>15.00</u>	15
II. Secondary wholesaler's purchase price at primary wholesale market		85
<u>Less</u>		
(i) Market charges payable to municipality or market committee or owner for use of premises	0.50	
(ii) Commission agent's fee	1.25	
(iii) Handling and weighing charges	0.50	
(iv) Charity or festival contribution	0.25	
(v) Other incidental expenses	1.00	
(vi) Primary wholesaler's margin of profit	1.50	
<u>Total:</u>	<u>5.00</u>	<u>5</u>

	<u>Percentage of secondary wholesale market price</u>	<u>Unit Price</u>
III. Price received by farmer-seller in primary wholesale market		80
<u>Less</u>		
(i) Transport from farm to primary wholesale market	1.00	
(ii) Market entry fee	0.75	
(iii) Other incidental expenses	1.25	
<u>Total :</u>	<u>3.00</u>	<u>3</u>
IV. Price received by farmer at farm-gate		77

Note: In the above illustration, the assumption is that the commodity retains the same form - raw or processed - and the same quality specifications throughout the different stages of marketing.

APPENDIX IVAgricultural Price Index Number ConstructionGeneral

The items to be included in the index should cover at least 80 per cent of the aggregate value of the sale of all agricultural commodities (or the purchase of all production requisites). Price relatives of individual commodities (calculated with reference to base period prices) must be weighted by value weights calculated over the base period; alternatively, prices of the selected commodities in the current and base periods may be weighted by the appropriate base period quantities of the commodity sold (or purchased).

Price indices in agriculture are normally constructed using average monthly prices and corresponding monthly weights.

Formulae

If a weighted arithmetic average is used with price relatives weighted by base year values then, using Laspeyre's formula

$$\text{Index} = \frac{\sum (\text{Por} \cdot \text{Qor} \cdot \frac{\text{Ptr}}{\text{Por}})}{\sum (\text{Por} \cdot \text{Qor})} \cdot 100$$

where

Ptr = Price per unit of commodity 'r' in year 't',

Por = Price per unit of commodity 'r' in base period,

Qor = Quantity of commodity 'r' sold (or purchased) in base period,

$\Sigma$  = Summation over all commodities,

Alternatively, using absolute prices and base year quantities as weights, the above is equal to

$$\frac{\sum (\text{Qor} \cdot \text{Ptr})}{\sum (\text{Qor} \cdot \text{Por})} \cdot 100$$

If the geometric mean is used, then, using the same notation:

$$\text{Index} = \left[ \text{Antilog} \frac{\sum (\text{Por} \cdot \text{Qor} \cdot \log \frac{\text{Ptr}}{\text{Por}})}{\sum (\text{Por} \cdot \text{Qor})} \right] \cdot 100$$

(Note the use of value rather than quantity weights).

The formulae quoted above are expressed in the familiar notation of the Laspeyre formula where the quantity or value weights using the subscript 'o' refer to an earlier, or base, period of time. If weights for a current period of time are used, then the subscript 'o' in the quantity or value weights is replaced by subscript '1' to give the Paasche formula.

In both types of index, the weighting period, selected on the basis of 'normality' (see page 34) is usually, but not always, taken also as the comparison period (i.e. the period against which prices in year 't' are compared), and as the time reference period (i.e. the period for which the calculated index is equated to 100).



### Arithmetic and Geometric Means

In theory, certain advantages are claimed for the geometric mean. Firstly, it gives equal importance to equal ratios of change. For instance, when a geometric mean of relatives is taken the effect of doubling one is perfectly counter-balanced by the halving of another; this is not so with the arithmetic average. Secondly, the geometric mean is less affected by extreme values than the arithmetic mean and this reduces the influence of sudden violent movements in prices.

Thirdly, the geometric mean makes possible the easy replacement of commodities which have ceased to be available or representative by those which have taken their place. Lastly, an index number calculated by using the geometric mean is reversible, that is a change of base year can be made without affecting the proportionate changes in the overall index. In other words, the geometric mean is efficient when judged by the time reversal test as applied to index numbers.

For all these reasons, the geometric mean is theoretically likely to give a better indication of true changes in prices than the arithmetic mean or medium. In practice, however, the arithmetic mean tends to be used where absolute prices and quantity weights are readily available and the geometric mean where price relatives and values are more easily obtained. But, it must not be overlooked that the computation of the geometric mean is somewhat tedious in that it involves taking logarithms of price relatives and anti-logarithms of their averages. In contrast, the computing of the arithmetic average is rather more straightforward.

APPENDIX VPrices Paid by Farmers for Household Consumption GoodsGeneral

Apart from expenditure on requisites of agricultural production, the farmer is also a buyer of household consumption goods. If data are required on prices paid for these, they may be obtained either from farm family living surveys, or from selected price reporting locations.

Farm family living surveys

Family living surveys, also called family budget surveys, are conducted in many countries generally with a view to preparing consumer price index numbers or cost of living index numbers. These surveys yield the list of household consumption goods, their specifications and relative weights. Since these surveys are location specific and also income-group specific, however, great caution must be exercised in using their results for locations and income-groups other than those to which they directly relate. Results of these surveys in respect of urban areas or industrial areas would, for example, be ill-suited for measuring the trends in consumer prices paid in rural areas or by farmers. If, therefore, family living surveys covering farm families have not already been conducted, fresh ones will need to be organized if the price data are considered essential.

Standard techniques are now available for conducting family living surveys, and these can be adapted to suit the purposes of a family living survey covering farmer households in a region or a country. The design and selection of the sample could be identical to that used for the costs of production surveys (see page 23) and the required information could be obtained from the selected farmers either by mailed questionnaires or from answers to oral questions put by trained interviewers. To eliminate the seasonal element, the sample of farm families may either be visited repeatedly over a complete cycle of seasons or visits may be spread over the seasons in a randomized manner.

Care will have to be taken from the very beginning to distinguish whether a particular commodity is an agricultural production requisite or a household consumer good. Where a commodity falls into both categories, the proportion of it going to each will have to be determined in order that, while the commodity appears in both, its relative weight in each of the two index numbers is properly reflected. For example, a vehicle or animal-driven carriage may be used for transporting a requisite of agricultural production from the place of its purchase to the farm, and for the private travelling of a farmer and his family; fuel, light or electricity may be used in common on the farm as well as in the household. How to divide the use of these items between production requisites and consumption goods must be decided in advance.

Suggested list of household consumer goods

In family budget surveys, consumer goods are generally classified into five groups as follows:

## I. Food, beverages, tobacco and intoxicants

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| 1. Cereals and related products    | 8. Fruits and related products      |
| 2. Lentils and other pulses        | 9. Sugar and related products       |
| 3. Oil-seeds, oils and fats        | 10. Tobacco and related products    |
| 4. Meat, fish and eggs             | 11. Alcoholic beverages             |
| 5. Milk and related products       | 12. Non-alcoholic beverages         |
| 6. Condiments and spices           | 13. Prepared meals and refreshments |
| 7. Vegetables and related products | 14. Others.                         |

## II. Fuel and light

- |                              |  |
|------------------------------|--|
| 1. Cooking gas               | 4. Kerosene and other oil for heating and lighting |
| 2. Soft coke, coal, firewood | 5. Others.   |
| 3. Electricity               |  |

## III. Housing, household requisites and services

- |                                  |   |
|----------------------------------|---|
| 1. House rent and water charges  | 4. Household appliances, utensils, etc. |
| 2. House repairs and maintenance | 5. Household services                   |
| 3. Furniture and furnishings     | 6. Others.                              |

## IV. Clothing, bedding, headwear and footwear

- |                          |             |
|--------------------------|-------------|
| 1. Clothing: ready made  | 4. Bedding  |
| 2. Material for clothing | 5. Footwear |
| 3. Headwear              | 6. Others.  |

## V. Miscellaneous

- |                                    |                     |
|------------------------------------|---------------------|
| 1. Medical care                    | 7. Personal effects |
| 2. Personal care, toiletries, etc. | 8. Taxes            |
| 3. Education and reading           | 9. Interest         |
| 4. Recreation and amusement        | 10. Legal charges   |
| 5. Transport and communication     | 11. Others          |
| 6. Subscriptions and charity       |                     |

List of price reporting for household consumer goods

Where it is not practicable to carry out regular family living surveys for the collection of price and quantity data on household consumption goods, it will be necessary, after having established the list of consumer goods, their varieties, specifications and quantities which are purchased by farm households, to create a price reporting system similar to that for agricultural production requisites. The following reporting locations are suggested:

1. Retail shops in rural areas or adjacent urban areas where farmers generally obtain their consumer goods; if their number is large, some representative selection may be made.
2. Public, cooperative or other semi-public agencies supplying, for example, fuel electricity, water, books, stationery, transport, communication services, etc.
3. Government agencies levying taxes, or charging educational fees.
4. Housing boards or agencies with information on house rentals.
5. Banks or credit supplying agencies (for rate of interest on borrowed capital).

For each commodity, the choice of location for obtaining the required information should be decided in advance in the light of the prevailing conditions and practices.

APPENDIX VIReferencesI. General

- a) For a concise summary of the concepts underlying the collection and use of agricultural price statistics, attention is drawn to "Statistics of Agricultural Prices - basic concepts and characteristics in relation to use" by S.H.Khamis (FAO Monthly Bulletin of Agricultural Economics and Statistics - Vol. 14, No. 1, January 1965).
- b) Two United Nations publications of general interest are:
  - i) "Guidelines on principles of a system of price and quantity statistics" (Statistical papers, Series M, No. 59 - United Nations, New York, 1977)
  - ii) "A system of quantity and price statistics" (ST/ESA/STAT.73/Rev.1 - United Nations, 1976).

II. Index Number Theory

For a more detailed treatment of this subject than is given in Appendix IV of this manual see:

- a) "Traditional Price Index Numbers - conceptual problems in relation to uses" by S. H. Khamis (FAO Monthly Bulletin of Agricultural Economics and Statistics, Vol. 17, No. 12, December 1968)
- b) "Index Numbers in Theory and Practice" by R. G. D. Allen (Macmillans, London, 1975).

III. Standard Classification

To determine what constitutes an agricultural product or an agricultural production requisite, attention is drawn to:

- a) "International Standard Classification of All Goods and Services" (E/CN.3/493 - United Nations, New York, 1976)
- b) "International Standard Industrial Classification of All Economic Activities" (Statistical papers, Series M, No. 4, Rev. 2 - United Nations, New York, 1968).