

CURRENT STATUS OF AGRICULTURAL STATISTICS AND TASKS AHEAD

A SYMPOSIUM on Current Status of Agricultural Statistics and Tasks Ahead was held on 31st December 1962 during the 16th Annual Conference of the Society. Shri P. C. Mathew¹ presided over the symposium. Extended summaries of remarks made by the speakers who participated in the symposium are given below against the topics on which they spoke, in view of the special importance of the subject at the present time.

SHRI M. V. DIVATIA²: *Statistical Requirements of Agricultural Planning.*

In India's Five-Year Plans for economic development, agricultural planning plays a most vital role. In each of the three Five-Year Plans, nearly 20% of the total investment has been allocated to agricultural development. In absolute terms investment in agriculture amounts to over Rs. 4,000 crores, out of an aggregate during the three plan periods of Rs. 20,500 crores. Income from agriculture proper, also accounts for nearly 40% of the national income, and despite the large growth over the last decade (1950-51 to 1960-61), in industrial sector, increase in agricultural income has been the main determinant of the overall growth of India's economy.* Because of this importance of agriculture in India's plans, statistical requirements for effective and efficient planning in this sector deserve special attention.

Objectives of Agricultural Planning.—In the Third Plan the ultimate objective of agricultural planning is to increase crop production by 30% by 1965-66, or at a cumulative annual rate of 5.4% that is, nearly twice the rate of growth realized during the Second Plan. Although certain economic and social objectives of the Plan as a whole must be achieved in the agricultural sector as well, the ultimate objective of agricultural planning is to be viewed in terms of a specific target of production for each crop separately. If these targets are to be realistic they should be aggregates of technically feasible and economically sound

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* A 42% increase in real national income during the decade 1951-61, was the result of 41% increase in agricultural output, 94% increase in industrial output and 56% increase in services sectors' output.

state targets, which in turn should be the aggregates of similar targets for districts or development blocks. No district or block targets could be realistic unless these are aggregates of scientifically formulated village targets. In the ultimate analysis, therefore, it is inevitable that if agricultural planning in India is to be placed on a proper footing, the national crop targets must be based on a proper assessment of technically feasible and economically viable growth potentiality in respect of each crop, and formulation of a crop pattern which would result in optimum utilization of land, water and human resources at the village level. The first attempt at target setting is to be made on the assumption that other essential inputs, such as improved seeds, fertilizers and requisite financial resources would be available in required quantities. The targets are then to be adjusted upwards or downwards, depending upon whether more or less of these inputs could be provided during the plan period, and the extent to which production could be stepped up by improvement in agricultural practices, organizational changes, etc.

Unfortunately, so far, plan targets in agriculture have not been determined on such basis. It is only now that the need for planning agricultural development from the village level upwards is likely to be seriously considered. The attempt made in this direction at the time of formulating the Second Plan was not scientific, as the basic idea was to give weight to the felt needs of the people at the district, taluka and village level, rather than to set production targets on the basis of feasible potentialities.

Once the crop targets based on economic feasibilities are determined realistically, several related objectives of agricultural plan become apparent. If the given crop pattern and crop targets are to be achieved, additional requirements for different types of improved seeds, fertilizers and manures, irrigation water, land reclamation, manpower, bullock power, credit can be determined. The extent of improvement necessary in cultural practices, etc., must also be carefully worked out at the village level and then aggregated for estimating requirements at the district or block, state and national levels. To the extent that these requirements cannot be met, the crop targets, have to be further adjusted. Provision of correct input at the right place and right time then gives rise to several related objectives of an agricultural plan. The decisions regarding individual crop targets, specially at the State and national level, also require scientific forecasts of future demand of various agricultural products by final users of these products, as also of export demand. In absence of such

knowledge lopsided development may take place and agricultural planning become inefficient and infructuous.

Among the economic objectives of agricultural planning, the two predominant objectives are:

- (a) to raise the *per capita* real income of the farmers; and
- (b) to increase land and human productivity to an optimal level.

The social objectives of agricultural planning are:

- (a) to reduce disparities in real incomes of farmers,
- (b) to reduce the extent of under-employment; and
- (c) to increase the extent, the level and standards of education and health among the farmers.

Statistical requirements of Agricultural Planning.—Statistical requirements of an agricultural plan embodying these objectives must necessarily be varied and complex. The basic requirement is that of reliable statistics of land utilization and of agricultural production, crop by crop, down to the village level.

Statistics of crop area and yield.—The work of building up reliable statistics of land utilization and area under individual crops, at the village level received great attention after the Second World War. A technical committee of Central and State representatives prepared a report on "Co-ordination of Agricultural Statistics" in 1949 which recommended various measures to improve agricultural statistics, *e.g.*, strengthening of the primary reporting agencies, rationalisation and extension of it to non-reporting areas, introduction of the standardized forms for land use statistics at village level, cadastral surveys of un-surveyed areas and a number of other measures. Steps were also taken to implement these recommendations and noticeable improvements in agricultural statistics also followed. I.C.A.R. under the leadership of Dr. Sukhatme, also launched upon large-scale crop cutting surveys with a view to obtaining objective yield data on a regional basis and building up statistics for preparing normal yield estimates right up to the district and even lower levels in due course. But the advent of the National Sample Survey in 1952, with its promise to provide quick and reliable estimates for area as well as yield statistics, for all crops, along with a host of other estimates, resulted in a serious set-back to improvements in basic agricultural statistics. The promise is not yet fulfilled and after 10 years of the working of the National Sample Survey, we are still having unsatisfactory or no estimates of

crop areas for nearly 180 million acres of land. Yield estimates are also far from satisfactory. We have no reliable estimates of either area or yield for all the minor cash crops. The coverage of crop cutting experiments for yield estimation varies from 17% for small millets to 20% for tobacco, 36% for other pulses to 99% for Bajra and Gram. Some 10% of production, even for an important crop like rice is still estimated by unscientific methods. Cotton which should have been fully covered by these experiments long ago is covered only to the extent of about 65%. This highly unsatisfactory state of area and yield estimates needs to be corrected quickly. Once the areas under crops are correctly reported all over India and objective yield estimates obtained in respect of entire area covered by all the important crops, the need for annual adjustments in the index of agricultural production will diminish and ultimately disappear, and the index will reflect the true progress in agricultural production.

Reliable crop forecasts are also important for planning, as they enable the planners to watch the progress of agricultural development at shorter intervals and take remedial measures if production of different crops, in different regions, is not keeping up to expectations. Good forecasts are also necessary for making reasonably acceptable, short term advance estimates of agricultural income. Difficulties of making such forecasts cannot be underrated. But they are not entirely insurmountable. If basic statistics of area under crops and yield per acre, rainfall and other conditions affecting the field are maintained with meticulous care at the village level, sampling methods can be devised to building up a body of data, which on analysis could give reasonably good crop forecasts.

Since assessment of production potentialities for different crops in different regions is a matter of vital importance to agricultural planning, the planners must also ensure that fairly accurate information on relevant items is maintained regularly at the village level. If the objective of agricultural planning is to have a good village plan for each of our 560,000 villages, and there seems to be no escape from it, it is necessary that the village records should give for each survey number or holding, data regarding soil type, extent to which it can be fully cultivated, nature and extent of irrigation facility currently available, type and amount of fertilizer and manure used, cultural practices currently followed, type of seeds used, alternative crops which can be grown with advantage, etc., besides the usual land-use data now being kept in reporting villages. In addition, village data regarding irrigation potential, additional irrigation facilities likely to become

available in the plan period, credit requirement for the farmers of each village, capacity of local co-operatives to provide increased credits, etc., will also be required. Outputs yardsticks for different inputs, used severally and jointly, e.g., irrigation, fertilizers, improved seeds, etc., in respect of different crops for the States and their main sub-regions, are far from realistic and need to be based upon scientific data from relating to field experiments. It is only on the basis of detailed information of this type that a proper assessment of production potential, not only at the village level, but also at the state and national level can be made.

Statistics of demand.—For optimal planning in agriculture, it is necessary to plan commodity production to meet specific demands. It is, therefore, essential that reliable estimates of demand for different agricultural commodities, by agriculture itself, for consumption by the people and the livestock, for use in industry as raw materials, for stocks with households and industry, and for exports, should be made for each plan period, preferably year by year, and state by state. With known industrial targets, it is a relatively simple matter to estimate industrial demand for agricultural raw materials on the basis of appropriate technical coefficients. But the problems of making good estimates of future demand for human consumption, livestock consumption, and stocks, are many. In the attempts made so far in India, projections of foodgrains requirements for human consumption are based upon cross-section data, on consumer expenditure provided by the N.S.S. in their reports. The main limitation of this approach is that N.S.S. data give money value of expenditure on foodgrains, and not quantities consumed. The expenditure and income elasticities calculated from these data, rest on the assumption that changes in consumption levels and patterns, as households pass from one income (expenditure) group to the next higher group, take place without any time lag, at all levels of incomes. Requirements of agricultural sector for seeds, wastage stocks, etc., are estimated only at a macro-level, and cattle-feed requirements are at best intelligent guesses. Likewise export requirements for agricultural commodities are not based upon detailed scientific studies, and even industrial requirements are not derived from a careful input-output analysis. Perhaps the best organized attempt so far made in making long-term projections of supply and demand in respect of important agricultural commodities is embodied in the publication of the National Council of Applied Economic Research entitled **Long-term Projections of Demand for and Supply of Selected Agricultural Commodities, (1960-61 to 1975-*

76) issued in April, 1962. These projections are based upon available data and are subject to a number of assumptions. Moreover, projections once made must be revised periodically in the light of availability of new and better data and changing economic, agricultural and administrative conditions. Demand projections for agricultural commodities need not be done for each village or district. But State projections are necessary. It is in these directions that further improvements are possible and necessary. Estimates of long-term export demand for agricultural commodities, based upon detailed surveys and studies, are also essential for proper planning in agricultural field. A better idea of seed requirements and stocks with farmers, wholesalers and retailers, which set an upper limit to agricultural targets would also materially add to the value of demand projections for the plan periods.

Statistics of agricultural income and productivity.—Statistics required for estimating income from agriculture are, commodity production, ex-farm prices, value of seed requirements for different crops, feed requirements for farm cattle, wastage, and depreciation on farm implements. If these data are available, agricultural income can be estimated as value added to the value of seeds by deducting from the gross ex-farm value of production, the value of all other items mentioned above. The value added, expressed in terms of commodity prices of a base year, gives an estimate of real agricultural income. To obtain the *per capita* income, current agricultural population and its projection are also required. The current estimates are usually derived from the population census and projections are made by assuming the national population growth rate for a recent year, for the agricultural population as well. The main purpose of these estimates is to determine the level of *per capita* income in agriculture at the beginning of the Plan, to ensure a plan which would raise it to a given level, and to test periodically, whether the plan objective is being fulfilled.

Reliable land productivity data, even at the village level could be built upon a continuing basis only through the extension of crop-cutting experiments to all crops, all over the country. For assessing the human productivity in agriculture, periodic estimates of working form engaged in cultivation are necessary. The general practice is to project the census figures of agricultural working force on the basis of growth rate for the total population. This is not a satisfactory procedure. In fact as economic development goes ahead, agricultural workers shift to industrial and other non-agricultural vocations. It is, therefore,

necessary to make periodic estimates of working force in agriculture, perhaps by using a suitable sampling procedure.

For obtaining reliable information about prices and various types of farm costs indicated above, a great deal of concerted effort is called for. The cost studies undertaken by various institutions under the farm management research supported by the Research Programme Committee have not yielded the desired results. If well-planned efforts are made through the Regional Agro-Economic Research Centres, more on the lines of I.C.C.C. study on farm costs in Akola District,³ valuable data could be built up in course of time. In addition, statistics on agricultural wages, distribution of holdings, the extent of under-employment and the extent, levels and standards of education and health in respect of agricultural population are also necessary, particularly for assessing to what extent the social objectives implicit in the plan are being met. Basic data of this type gathered at the time of formulating the plans would also be useful in deciding what special measures to achieve desired social objectives are called for in certain aspects of agriculture, in specific regions.

Some suggestions.—To broaden the range of basic statistics required for agricultural planning, e.g., land-use, area under crops, crop-wise irrigated area and a number of other facts relevant to production planning at the village level; and to secure statistics of reasonably good quality, there seem to be no alternative to strengthening the Patwari system, extending it to non-reporting areas, introducing uniform and continuous records at the village level, training the land revenue staff in the practice of keeping good and up-to-date records and ensuring that this is done through rationalised supervision of their work. Sampling procedures suffer from great limitations in regard to such statistics. If the Patwaris are overburdened with work, it would be worthwhile to add to their strength by posting additional staff at the village level. In most states there is now at the district and block levels a statistical staff consisting of an officer and one or more assistants. Their main duties should be to ensure speedy improvement in agricultural data required for planning, in accordance with a well-co-ordinated scheme prepared by the Central and State agencies dealing with agricultural planning.

Sampling techniques should be used most sparingly and only in cases where either complete enumeration is not necessary nor not

³ *Estimation of the Cost of Production of Crops*, by Dr. V. G. Panse, Indian Central Cotton Committee, Bombay, 1954.

possible for some reasons, and where the estimates required are of a more global nature. According to this criterion, planning sampling technique would be useful mainly in building up yield data through crop cutting experiments, quickly organising specific information such as ex-farm prices, agricultural wages, savings and capital formation, changes in the distribution of agricultural holdings, extent of under-employment, etc. Even so, it is important that each such item must be investigated through a separate sample enquiry, rather than combining a host of items under a multipurpose enquiry, and that each such enquiry should be decentralized at the State and even lower levels, under a well-co-ordinated and closely supervised central programme designed to secure reasonably reliable and timely data at the regional as well as national level.

SHRI V. R. RAO⁴: *Statistics Required for Agricultural Planning at Block Level.*

Ever since the inception of the Community Development Programme about a decade ago, the CD Block has been treated as the primary administrative unit for co-ordinating the developmental activities of various departments. The Block schematic funds served as the nucleus with which the funds of various departments and people's contribution in terms of money and labour were pooled together. The Block agency formulated suitable targets under each sector of activity and helped in implementing the programmes.

It is, however, only recently that a concrete shape was given to the concept of 'Block as a Unit of Planning and Development'. Early in 1960, before the formulation of the Third Five-Year Plan the Planning Commission suggested to the States that some portions of the State plans, particularly those relating to agriculture, should be formulated at the district and Block levels with a view to securing the largest measure of local participation and the full utilisation of local resources. It was also suggested that each village should prepare an annual agricultural plan. The Block plan was to consist of individual village plans and such additional programmes which are common to more than one village or for which the Block is directly responsible. Although detailed instructions were issued on the manner of preparation of Block level plans, the progress so far has not been quite satisfactory. With the exception of one or two States the Block plans did not figure in the State Third Five-Year Plans and much less in the All-India

⁴ Ministry of Community Development and Co-operation, New Delhi.

Plan. The obvious inference is that a much greater effort is required before the district and Block plans can become distinct stages in the five-year plans. One of the principal difficulties in the formulation of the Block plan is the paucity of relevant information for drawing up a realistic programme. There is also lack of appreciation on the part of the planning agency, of the vital role of statistics in planning.

The object of the present paper is (i) to review the statistical data already available in the Block that can be used for planning, (ii) to examine what additional data can be collected by the existing Block agencies, and (iii) to indicate the manner of collection and processing of such data.

Agricultural development at the Block level can be considered under two broad heads—(a) land development, and (b) improved agricultural practices for increasing crop yields. The most important programmes under land development are (i) land reclamation (to bring new areas under cultivation), (ii) better use of uncultivated land for pastures and fuel plantations, and (iii) soil conservation. Under improved agricultural practices there is a variety of programmes covering mainly (i) development of irrigation and drainage, (ii) use of improved seeds, (iii) greater use of manures and fertilizers, (iv) adoption of better cultivational practices including use of improved implements, and (v) plant protection measures. The above measures also imply an increase in the area under double cropping and a better crop pattern with a shift in favour of protective foods and fodder crops.

The Block agricultural plan can take into account only the short-term possibilities of improving agriculture, say, during a period of five years. It cannot obviously go into the wider issues such as land reform, redistribution of land holdings, consolidation, etc. These aspects are not, therefore, being dealt with here.

Any development programme has two distinct stages of planning, viz., (i) assessment of resources, (ii) fixation of targets and formulation of a detailed plan of action. It is the assessment of resources that presents the statistician with most of the problems, which may be dealt with in some detail with respect to each important item of agricultural development. The statistical requirements of the other stage of planning will be met largely by suitable processing of the basic data obtained for assessment of resources.

ASSESSMENT OF RESOURCES

(i) *Land development.*—At present village-wise statistics are available for most parts of the country in respect of (i) land under miscel-

laneous tree crops and groves; (ii) permanent pastures and other grazing lands; (iii) culturable waste and (iv) fallows other than current fallows, which together constitute the potential area that can be brought under the plough. These statistics have not, however, been of much help in preparing suitable plans for land reclamation, and other programmes of land development either owing to faulty classification of land at the time of settlement or because of lack of adequate details regarding ownership, location and the effort and cost involved in reclamation. The inadequacy of the present classification has been brought out by a number of recent studies. The Waste Land Survey and Reclamation Committee appointed by the Ministry of Food and Agriculture made a detailed investigation of the land belonging to the four categories mentioned above, and they could locate reclaimable waste land in blocks of 250 acres and more to the extent of only 1.2 million acres out of a total area of 57 million acres surveyed. The Committee observed that the concepts of culturable waste, etc., were not clearly understood leading to a mis-classification in a number of places. This finding was corroborated by the pilot sample surveys of culturable waste undertaken in Madhya Pradesh and Maharashtra.

One of the most urgent statistical tasks at the Block level, therefore, is to make a fresh inventory of all "uncultivated land other than fallows" and "old fallows" with details about ownership (public and private) location of the area in blocks of different sizes and a more detailed classification of the area according to (a) shrub or weed infested land; (b) saline and alkaline land; (c) water-logged area, etc. In addition, it is desirable to categorise the area according to potential use, viz., (i) land which can be cultivated without prior reclamation; (ii) land which requires reclamation before being cultivated and (iii) land which could be best utilised for afforestation, fuel plantation or pasturage.

Related to the problem of reclamation is that of soil conservation which comprises several techniques like contour bunding, terracing, and dry farming. While soil conservation techniques cover both cultivated and uncultivated areas (the latter being essentially a part of reclamation programme), the immediate problem is to ascertain to what extent the cultivated area requires soil conservation measures. For this purpose two basic characteristics of each individual field will have to be ascertained—the percentage of slope and the extent of soil erosion. These characteristics can be assessed by visual observation by the Patwari and the Gram Sevak after a short period of training

and experience shows that they can complete a detailed mapping of the cultivated area in the Block within a year.

Compilation of the above data is only the first, but the most essential step in the formulation of suitable schemes of land reclamation and soil conservation.

(ii) *Irrigation*.—We have now village-wise statistics of the various sources of irrigation (canals, tanks, tubewells, etc.), the net area irrigated by each source and the gross area irrigated under each crop. Unfortunately, however, these statistics are not always reliable particularly in the States where the Patwari agency does not exist. Another shortcoming of the existing irrigation statistics is that they provide no information on the actual irrigation potential of the various sources. There is a widespread feeling in the country that, owing to lack of field channels and proper maintenance of small irrigation works, etc., a substantial part of the existing irrigation potential remains unutilized. On the other hand, some surveys carried out by the I.C.A.R. and the N.S.S. revealed that the potential created by new irrigation works, particularly minor irrigation works, is usually over-estimated. It is, therefore, very important that not only the inventory of existing sources of irrigation should be carefully verified and brought up to date but also that the commanded area of each irrigation source should be assessed realistically, a task which the land records organisation in the Block can undertake without much difficulty. There is also the related question of assessing the latent irrigation potential by exploiting additional sources which remain untapped so far. This, however, falls beyond the purview of the land records agency.

While dealing with irrigation, a word has to be said about the yield rates of the crop under irrigated and unirrigated conditions, which are important in formulating the development programmes. At present normal yields for irrigated and unirrigated crops are built up at the district level. With the availability, over the recent years, of a mass of data from crop cutting surveys at the Block level, it should now be possible to formulate the normal yields for areas smaller than a district, say, a group of contiguous Blocks or even individual Blocks in some cases.

(iii) *Improved seed*.—There is great need for improvement in the present statistics on multiplication and distribution, spread and performance of improved varieties of seed. At present, only the quantity of improved seed of each crop distributed through recognised sources

is reported at the Block level. This is not enough, apart from the fact that the reported figures are not always reliable. We should know, for instance, the total quantity of improved seed used for sowing each season and how much of it is available through recognised sources and how much through mutual exchange by farmers. Indeed, for effective planning of the programme, it is necessary to ascertain (i) the quantity of foundation seed produced on the seed farms in the Block and obtained otherwise, (ii) the number of registered seed growers, the area sown, and the total quantity of improved seed produced by them, and (iii) the manner of disposal of seed by the registered growers, *viz.*, the quantity sold to depots, co-operatives, etc. and the quantity sold directly to cultivators. Such statistics should preferably be maintained not merely for each crop but also for each important strain of the crop.

At the second stage it is necessary to have a fairly reliable idea of the percentage area under each crop sown with improved seed. A system of complete enumeration of crop growing fields is the most effective way of obtaining this information but this may not be found immediately feasible. Since about two years ago an attempt has been made to obtain state-wise estimates of the area under improved seed through sample surveys organised with the help of the Block agency. The results available so far are quite encouraging and we can expect that these surveys will very soon become an annual feature in all States and will be developed progressively to provide estimates at the level of a district if not the Block. For Block level planning however the final solution is really a programme of complete enumeration. The extent to which the present crop inspection by the land records agency can be extended to cover in addition to the name of the crop, the variety of seed used, improved or local, needs to be examined.

The performance of improved seed in terms of yield rates is much more difficult to assess and it is possible to obtain only a rough idea of the differential response of the improved and the local strains. This has to be based on the data available from various demonstration trials and experiments carried out locally. What is urgently needed is a systematic attempt to compile and process these data.

(iv) *Chemical fertilizers and manures.*—The quantity of each important variety of chemical fertilizers distributed is now compiled by the Block agency but details are lacking on the quantity used for different crops, the dosage, and the area benefited. As supplies of chemical fertilizers are expected to improve soon, it is necessary to assess how much of each variety of fertilizer will be required in the Block in addi-

tion to how much of each is consumed at present. It is also necessary to know the area benefited under each crop.

The farmer continues to depend mostly on locally available organic manures (farm-yard manure, compost and green manure), statistics on which are at present limited to the number of new compost pits dug. It is necessary to have a much larger statistical coverage of this important programme. It is important, for instance, to ascertain the total number of pits in use for compost making and relate it to the cultivating households and the cattle they possess. It is also necessary to ascertain the number of cultivators who have taken to green manuring and the detailed arrangements for multiplication and distribution of green manure seed.

(v) *Improved agricultural practices.*—As a part of agricultural development programme several improved agricultural practices are recommended by the Block agency. No definite information is, however, available on the extent of adoption of these measures by the farmer. Secondly, use of improved implements is advocated, but the inventory of agricultural implements does not list the number of improved implements available in the Block. On plant protection measures there is hardly any useful information available for purposes of planning. We need to know the area under each important crop which is usually subject to the hazards of pests and diseases and how much of this area is benefiting from preventive measures.

These are some aspects statistics on which need not be very comprehensive. What is important is to have at least a rough idea of the existing situation and the immediate needs to be met. The data required for this purpose can be easily compiled by the Block agency without elaborate or time-consuming procedures.

(vi) *Human Resources.*—The human resources for agricultural development are perhaps even more important than the physical resources. We have in the 1961 population census village-wise information on the agricultural labour force, classified as cultivators and agricultural labourers. The 1961 census has also attempted, for the first time, to collect data on the economic characteristics of each ultimate unit of production, viz., the household. The census tabulation programme provides for a classification of the cultivating households according to the size of land held and the number of persons engaged in cultivation. Unfortunately, this tabulation is to be made on a sample basis (20% households) and the tables will be available only

at the district level. The census household data will not, therefore, be of direct use in the preparation of Block plans and much less of village plans. For this purpose, it is necessary to list the cultivating household in each village and to ascertain their principal characteristics, such as the size of land held, ownership and tenure, pattern of land use, important crops raised, the number of workers, livestock, agricultural implements, etc. Such lists are already available in a rudimentary form in many villages. These have to be brought up to date and made comprehensive to cover the above items.

FIXATION OF TARGETS

Agricultural planning at the Block level is essentially the formulation within the broad frame-work of national and State priorities, of a co-ordinated programme which results in maximum production, having regard to resources and potentialities of the area, needs of the people, and willingness and capacity of the ultimate unit of production, *viz.*, the cultivator. This involves a two-way process—the Block first laying down for the whole area production targets for different commodities and broad priorities among the available means of realising the targets; and secondly, each village specifying what it can do under each item on its own assessment of local resources and needs. The final Block and village targets will be determined by the two phases of planning.

The most obvious way of target setting in the first phase (at the Block level) is to prepare balance sheets of land utilization and crop acreages with as detailed a classification of each as possible; to study the possibilities and cost-benefit ratios of various items of development; and to make projections of acreages, yield rates and production under each crop with each type of input and combination of inputs (irrigation, improved seed and chemical fertilizer, etc.). In order to ensure that the final recommendations are capable of execution, it is necessary to have a broad idea of the impact of various programmes on different areas of the Block and different strata of cultivators. Statistics required for the first phase will thus have to be detailed in their scope, though they may deal mostly with Block aggregates. The following may be listed as the main requirements.

- (i) Land use statistics with as detailed a classification as possible and their trend over a period of years;
- (ii) Statistics of irrigated and unirrigated area under each principal crop and their trend over time;

(iii) Statistics of crop areas under various improved agricultural practices;

(iv) Yield rates of principal crops separately under irrigated and unirrigated conditions;

(v) Yardsticks of additional production due to various inputs individually and in combination; and cost benefit ratios;

(vi) Indication of the acceptance and attitudes of cultivators to various agricultural practices and

(vii) Frequency distribution of cultivating households according to the size of holding and details for each size-group of various economic characteristics such as land use, important crops raised, number of workers, number of livestock, etc.

The statistics required for planning at the village level need cover only a few of the above items particularly (i), (ii) and (vii). An implementation of the programmes will ultimately be the responsibility of the village, it will require, however, a more detailed break-up of these statistics which in some cases may mean getting information for individual households and fields.

It will be seen that most of the above requirements will be met by a suitable retabulation of statistics obtained for assessment of resources. Information about yardsticks and cost-benefit ratios alone has to be obtained separately. This requires special studies which have to be initiated in various parts of the country in a co-ordinated manner so that independent estimates become available for homogeneous agricultural regions within each state.

MANNER OF COLLECTION OF DATA

The earlier sections have dealt with the information that should be collected and the manner it should be processed for planning. We may now consider the arrangements required for collection of data. It may be observed that all the data need not be collected with the same intervals of time. In fact a substantial part of the information needs to be compiled only once in 5 years, a part of it has to be obtained every year while the rest will flow directly from the day-to-day operational records maintained by the Block agency.

Statistics of land use and irrigation (*vide* paras 7-10) and the inventory of cultivating households (para 19) will fall in the category of quinquennial statistics as the changes, if any, in these items are likely to be small and infrequent. The best way to obtain them is

through a complete agricultural census. Most of the information is already available from one source or another and it has to be suitably augmented, collated and processed. This will no doubt mean some additional effort but it is well within the competence of the village and Block agencies which can handle the census operations without much upset of their normal work provided they are planned carefully. The time and effort involved will be more than adequately compensated by the usefulness of the results.

Statistics of crop areas and yields and of the area benefited by improved agricultural practices have to be collected every year. Of these, statistics of crop area are the most basic and they should continue to be obtained through a complete enumeration of cultivated fields. Wherever this system does not exist immediate steps should be taken to create the requisite fields agency. The crop-cutting surveys which now provide yield estimates at the State, and sometimes, district levels should be made more intensive to obtain independent estimates for smaller areas. Owing to the difficult nature and short duration of field-work the number of crop-cutting experiments cannot be increased beyond a limit. It is, therefore, necessary to investigate whether by a judicious combination of crop-cutting experiments on a limited scale and eye-estimates of yield on a larger scale, it will be possible to obtain dependable estimates of crop yields at the Block level. At the instance of the Ministry of Community Development the Institute of Agricultural Research Statistics is soon to undertake a pilot study for this purpose. The result of the study will be awaited with interest.

An attempt is now being made to obtain estimates of area benefited by various improved agricultural practices through a sample survey with the help of the Block agency. The survey collects data also on the attitude to and acceptance of improved practices by cultivators. It is necessary to continue these surveys on a more intensive scale. Each Block should be involved in this programme and a systematic attempt should be made to compile information from a few cultivators with holdings of different sizes. These data compiled over a period of years will throw very useful light on the spread and future needs of various inputs individually and in combination. Simultaneously, a study should be made to see whether data on improved practices cannot be collected on a field to field basis at the time of crop inspection by the land records agency.

Some information on the yardsticks of additional production and cost-benefit ratios is available from the records of demonstration

and experimental trials carried out by the Block agency as a part of agricultural extension. It is necessary to reorganise these trials with the object of deriving from them coherent information on the technological ratios required for planning.

Finally, the records of the Block agency should be streamlined to provide information on the arrangements for supply of various inputs and the quantity consumed of each.

In conclusion, it has to be emphasized once again that a deliberate orientation should be given to the village statistics to meet the current planning needs. They have so far been designed to meet the administrative requirements, particularly those of revenue administration. These statistics were put to little use at the village level with the result that they have come to be maintained perfunctorily almost as a matter of ritual. The preoccupation of the land records agency with other work and lack of effective supervision have also led to a number of defects in them. This situation can no longer be allowed to continue if the pressing problem of intensive agricultural planning at the ground level has to be tackled realistically and successfully. The current village statistics have to be made, reliable and comprehensive and remodelled in the manner indicated to meet the planning needs of the country. This is an urgent task and should be undertaken immediately, atleast in all those areas possessing a land records agency at the village level, so that by the time of the preparation of the fourth Plan, the requisite data are available in most parts of the country to build the plan from the village upward.

SHRI S. G. TIWARI⁵: *Statistics for National Income Estimation in Agriculture*

Introduction.—The national income statistics are essentially derived statistics and hence the order of their reliability depends mainly on the extent of reliability of the basic statistics which go into these estimates. It is by inspiring faith in the basic statistics relating to the actual performance of various sectors of the economy that one can inspire confidence in national income estimates whose importance is increasingly being felt in the context of planned economic development. The national income from the agriculture sector is estimated mainly by following the 'value added' approach which comprises of estimating the gross value of agricultural production (including by-products and the income arising from various ancillary activities included (under

the boundary of gross production) and deducting from it the value of various raw materials, service inputs and depreciation of assets used up in the process of gross production. The choice of method of measurement of net income from this sector, like the methods pursued in any other field of applied statistics, depends, among other things, on the availability of statistical data on the subject. The absence of other related items such as its distribution by factor shares, the accumulation of assets, stocks held by the producers, labour productivity, etc., should not be construed to signify that they are less important, but rather reflecting the lack of statistical material for their measurement. Unless adequate attention is given to fill up these gaps, the present estimates may continue to be uninspiring for actual use in day-to-day planning is concerned. This note attempts to describe briefly qualitative as well as quantitative the shortcomings in the existing agricultural statistics aspects in the context of national and State income estimation.

Agriculture (Proper crop cultivation).—The existing limitations of the basic statistics needed for national income estimation purposes may be classified into six distinct groups, viz., (i) area statistics, (ii) yield rates, (iii) prices, (iv) disposal of commodities over time and by type of use, (v) cost of cultivation and (vi) value of fixed capital assets and capital formation. These are discussed in the following paragraphs along with suitable suggestions directed towards the improvement of basic statistics.

Area.—Two main problems deserving careful consideration are (a) the lack of complete coverage of the Agricultural Statistics and (b) the lack of year-to-year comparability of the data on purposewise land utilisation as reported. Both these are important from the point of view of their usefulness for a realistic assessment of the production estimates for the non-reporting areas—non-reporting from the crop forecasting point of view. As regards (a) it is gratifying to note that the Ministry of Food and Agriculture have as a result of their untiring efforts during the past few years, been able to enhance considerably the coverage. As regards (b) as the reporting of area for the Agricultural Statistics has been increasing gradually the observed increase in the area under cultivation as a whole or under individual crops does not represent the real increase but may largely represent statistical increase. To overcome this difficulty it is suggested that the details pertaining to the classification of area reported for the Agricultural Statistics should be given separately for comparable areas for a given year and the previous year and for areas newly reported during the year. Unless the land use statistics are presented in this manner no

satisfactory analysis can be undertaken of the trends in area under cultivation. Such an approach should provide a satisfactory basis for compiling the index numbers of area under cultivation as a whole as well as by individual crops so very necessary for measuring the changes in average productivity per acre of land cultivated.

Yield rates.—At present the Ministry of Food and Agriculture are preparing regular crop forecasts for 27 principal crops. The revised estimates which are published annually are, by and large, based on the results of the random crop cutting experiments conducted by appropriate State agencies. Even though, these estimates are considered to be of a high degree of reliability, sufficient controversy has, of late, been brought to the fore regarding the accuracy of the overall level of food production in the country. The reference is to the estimates of seven major cereals, which have been formulated by the N.S.S. on the basis of independent crop cutting surveys and according to which the corresponding official estimates are under-estimated by about 30-40%. As regards revised adjusted estimates of foodgrains worked out by the Ministry of Food and Agriculture on the basis of index numbers, it is suggested that such adjustments should be carried out only at the State level wherefrom the all-India totals may be built up subsequently. This is necessary since the national income estimates in respect of the agriculture sector are prepared at the State level. Besides, the State Statistical Bureaus would also need similar estimates for compilation of State income estimates. The estimates of outturn of minor crops are still more unsatisfactory based as they are on the yield rates determined through eye estimation methods of the State revenue agencies. It is high time that the Ministry of Food and Agriculture extend the scope of their crop forecasts to bring a number of these minor crops within the ambit of forecasting. To start with, however, only the more important of these minor crops could be covered. The estimates in respect of these minor crops should preferably be based on the actual crop cutting experiments and in this regard the experience gained by the I.C.A.R. should prove of immense value. Besides the minor crops there are a large number of by-products such as stalks and straw, sticks (such as of cotton, arhar, jute, sesamum), sugarcane tufts, the production estimates of which are not presently available with any degree of reliability. In this connection it is suggested that their output per acre may be estimated on the basis of a smaller sub-sample of the experiments that are conducted for assessing the yield per acre of the principal products, e.g., paddy, wheat, cotton, jute, jowar, etc.

Prices.—Among the different types of prices available in the country, the choice of selecting any one type is beset with the conceptual as well as practical difficulties. Conceptually in estimating the income at factor cost the agricultural output should be evaluated at the prices accruing to the producers. Whether such a price should be the one prevailing at the farm site or prevailing at the first point of sale depends primarily on the definition of the boundary of production. Accordingly the prices prevailing at the farm site, *viz.*, ex-farm prices would be relevant for the evaluation of (i) quantities retained by the producers for household consumption or for purposes of other future use (*e.g.*, seed, cattle food, etc.), as well as (ii) the quantities disposed of in bulk to the itinerant dealers and commission agents directly at the farm site. Quantities disposed of by producers in the nearby primary wholesale markets should be evaluated at the wholesale prices ruling in these markets. As the transactions by the producer at the farm site need not necessarily be confined to the harvesting periods of individual crops, the present farm harvest prices are not relevant for the purpose in view; in fact only a small part of the marketable surplus is sold by the producers during the harvest periods. It is, therefore, suggested that prices received by the producer should be collected regularly every fortnight throughout the year. Further these prices should also cover as many minor crops as possible. The coverage of the wholesale prices on the other hand happens to be quite satisfactory.

Disposal of commodities over time and by type of use.—The Ministry of Food and Agriculture should collect data on the weekly/fortnightly market arrivals of all the principal crops in respect of the primary wholesale markets within each State. Further the data on these weekly/fortnightly market arrivals should be separately recorded and presented for the two types of markets, *viz.*, (i) those between the primary producers and the wholesale traders and (ii) those between the wholesale dealers and their commission agents who make bulk purchases from the villages on their behalf. The existing data on utilisation of different farm products, as contained in the various Marketing Reports, are mostly out of date. Not based on any scientifically planned surveys, they seem to be notional in character and relate mostly to a distant past year which limits their use for purposes of national income estimates which attempt to measure year-to-year changes in the actual performance of various sectors of the economy. The different broad heads under which the data on disposal of various principal crops and by-products need be collected are (i) quantity retained for household

consumption, (ii) quantity disbursed in exchange of money and goods and services, (iii) quantity used for purposes of household enterprises such as seed, cattle feed, etc., (iv) quantity paid to landlords as rent, (v) other disbursement in kind and (vi) net change in the stocks with the producer at the end of the year. These data are the essential prerequisites for any attempt to estimate the private consumption expenditure through the commodity flow approach, the preparation of input-output tables and for measuring the extent of non-monetisation and variations therein from year to year.

Cost of cultivation.—The data collected at present through the Farm Management Surveys and those collected in some of the past rounds by the N.S.S. have provided an improved basis for arriving at the estimates of various cost deductions which were hitherto based on very flimsy and rather out-of-date results of some highly localised studies. The Farm Management Survey data suffer from the lack of representativeness because of the wide variations in climate, soil and cropping conditions prevailing in a State as a whole. Further the results are mostly in value terms rather than in terms of physical input rates. It is, therefore, necessary that the requirements of data for national and State income estimation should be appreciated and future surveys designed to provide the necessary data for building up various cost estimates. It is also necessary that such studies are repeated at an interval of five years and to the extent possible, the reference period of these studies should be the same year for all the States. As regards the data on the value of fixed capital, assets and the capital formation in the agriculture sector, the feasibility of their collection through the Farm Management Surveys needs to be examined. On the other hand, data on the actual employment in the agricultural sector, the occupational shifts of the agricultural population, their levels of living, the nature and composition of their incomes and its distribution by various income groups may have to be collected through properly organised socio-economic surveys rather than through the administrative agencies.

Animal husbandry.—At present there is no official agency responsible for framing the estimates of output of milk and other livestock products. The *Ad Hoc* estimates prepared by the Directorate of Marketing and Inspection do not seem to be reliable as they are not based on any well-planned surveys. For example, the estimates of yield rates of milk are based either on some informed opinions or on the experience of the staff of the State Animal Husbandry Departments. The annual production estimates so formulated are based on a number of

factors which are not all unambiguous. A closer examination of the formula used by the D.M.I. reveals that the formula at best attempts to estimate the lactational yield of the animals in milk on the day of the livestock census rather than the total annual milk production. This follows from the fact that the proportion of milk-bearing animals to total breeding animals relates to the date of census and not to the entire year. Similarly, the lactational yield is worked out on the basis of average calving interval which hardly bears any correspondence with the one year period as envisaged in the D.M.I. formula. Under these circumstances, it would be desirable to extend the scope of the I.C.A.R. pilot enquiries to estimating surveys which may be undertaken throughout the country. Similarly the estimates of meat production could be worked out on a more satisfactory basis provided slaughter house statistics are maintained in a proper form and published regularly by the Ministry of Food and Agriculture. The surveys designed to provide the level estimates may, if possible, be followed by sample surveys which should yield information on the change in the number of animals yielding various livestock products as also the annual changes in the yield rates. In order to be able to estimate the various costs of production it may similarly be necessary to extend the scope of the present I.C.A.R. cost of milk production pilot enquiries to make them estimating surveys which need to be repeated after intervals of say five years. Data on the utilisation and the disposal of the livestock products could be collected through the detailed enquiries on cost of production.

Forestry.—The present value estimates of various forest products as contained in the Indian Forest Statistics do not represent their economic value but merely their lease value or the government revenue from royalties paid by the private agencies who exploit such forest resources on contract basis. Such shortcomings could be overcome by intensifying the work of collection of wholesale prices of major products like timber, fuelwood and charcoal prevailing in the wholesale assembling markets on the outskirts of the forest areas. It has also been observed that a good deal of forest resources are exploited by the local population which completely escape at the time of the official reporting of the production figures. In this connection it will be desirable to organise the follow up surveys of the kind conducted a few years ago by the Inspector-General of Forests at the instance of the F.A.O. Gradually the methods of reporting may be improved so as to ensure complete reporting of the production originating from the forestry sector. It would also be worthwhile if the Indian Forest

Research Institute, Dehra Dun, could conduct an intensive survey on the cost of forest exploitation by important institutions.

Fishery sector.—Immediate attention need be given to the annual collection of data on the landings of inland fish. The present estimates prepared by the D.M.I. are again *Ad Hoc* in nature and need replacement by estimates based on carefully planned surveys. The wholesale and retail prices which are collected at the moment are not relevant for the purpose of estimating the income accruing to the fishermen. It is, therefore, suggested that the Ministry of Food and Agriculture should, through their own market intelligence, collect the monthly wholesale prices of marine and inland fish prevailing in the wholesale markets situated near about the actual landing places. Further, the Central Marine Fisheries Research Institute and the Inland Fisheries Institute may be requested to conduct suitable surveys for estimating various costs of operation.

It would, therefore, appear that it is essential not only to widen the coverage of statistics relating to the broad sector of agriculture but also to increase the reliability of the already available data for reliable estimates of national income.

SHRI D. S. RANGA RAO⁶: *Coverage and Comprehensiveness of Agricultural Statistics*

It is almost two decades ago in 1943 when India was in the midst of World War II and famine threatened the entire Province of Bengal. The country needed accurate statistics of food urgently for internal distribution and for policy decisions in regard to imports from abroad. It is against this background that a concerted action for scientific improvement of agricultural statistics through the application of modern statistical techniques both for collection and interpretation of data was initiated. The principal improvements brought about are summarised below:

1. Introduction of random sample surveys all over the country as a basis for scientific and objective estimation of production of principal food and non-food crops.

2. Increase in the coverage of the reported area by 167 million acres or from 69% in 1948-49 to 90% in 1958-59 by:

(a) carrying out cadastral surveys in unsurveyed areas, and

⁶ Department of Agriculture, Maharashtra State, Poona,

(b) establishing reporting agencies in the States of Bihar and Orissa.

3. Improvement in the reliability of area statistics through (the operation of the scheme of) rationalized supervision over the work of primary reporting agency.

4. Finalisation of techniques for estimation of:

(i) Cost of production of

(a) milk (in Delhi State),

(b) cotton and its rotational crops (in Maharashtra, Gujerat, Punjab and Mysore States),

(c) arecanut and cocoanut (in Kerala and Mysore) and

(d) sugarcane (in Uttar Pradesh, Bihar, Andhra and Maharashtra).

(ii) Sheep husbandry practices and wool production (in Gujerat, Rajasthan and Andhra).

(iii) Marine fish production (in Malabar, Madras, Andhra, South Canara and North Bombay Coasts).

(iv) Production of fruit and vegetables such as oranges, grapes, bananas and onions (in Maharashtra), mangoes and guava (in Uttar Pradesh) and lime (in Andhra Pradesh).

(v) Fertiliser practices survey (in Andhra Pradesh, Uttar Pradesh Punjab and Madras) for ascertaining cropwise area under different kinds of fertilisers and quantity of fertilisers used.

(vi) Pre-harvest estimates of crop acreages all over the country.

(vii) Surveys for estimating benefits of irrigation in Rajasthan, Bihar, Uttar Pradesh and Punjab.

5. Introduction of uniform and agreed concepts and definitions of land utilisation, crop areas and other related topics and inclusion of larger number of crops under forecast reports.

6. Trials in cultivators' fields under their own farming conditions to assess response to improve strains and different doses and kinds of fertilisers with a view to making practical and economic recommendations in different areas of the country to maximise production at minimum cost.

7. Pilot studies for:

(a) Assessing response to various improved agricultural measures advocated under different schemes of Grow More Food Campaign and (b) loss due to insect pests and diseases.

Much of the credit for these improvements would undoubtedly go to the Statistical Wing of the Indian Council of Agricultural Research (The present Indian Institute of Agricultural Research Statistics) and the Directorate of Economics and Statistics in the Ministry of Food and Agriculture, Government of India. The former, as a result of years of devoted and persevering research and considerable foresight, developed techniques which are simple, practicable and capable of implementation by the concerned agencies in the course of their normal duties for estimation of production of crops and live-stock and collection of other much needed agricultural data. The latter have, through tireless efforts, brought about increase in the coverage of reported areas, introduced random survey techniques over the entire country and systematised the procedure in regard to (a) crop mixture, (b) area under bunds, (c) area of crops extending over two crop seasons and have suggested various additions and modifications in respect of basic and current agricultural statistics in order to ensure their collection on a uniform and rational basis all over the country.

In recent years the Planning Commission, Directorate of National Sample Survey, the Central Statistical Organisation, the Indian Statistical Institute and the Statistics Branch of the Agricultural Departments and Statistical Bureaus in the States have also played a notable role in bringing about the desired improvements in the field of agricultural statistics in co-operation with the Central agencies. As a result of these efforts, there is generally an increased awareness at higher administrative levels of an urgent need for improvement of statistics as a prerequisite to any realistic programme of agricultural development.

Considerable as these improvements are, a lot more remains to be done to cater to the ever-increasing needs for more precise and detailed statistics in the context of the Five-Year Plans of the Central and State Governments. There are a number of gaps to be filled and the findings of pilot surveys carried out till now await extension over large areas. What gaps are to be filled, what items need extension and what organisational efforts are needed to bring about the desired results are mentioned under the heading "Tasks Ahead" in the following paragraph.

Tasks Ahead:

1. *Gaps to be filled:*

(1) Well determined estimates of yields of irrigated crops in States where the percentage of irrigated area to the cropped area is relatively small and the present design of surveys cannot provide such information.

(2) Estimates of (a) damage caused due to pests and diseases, (b) food requirements and marketable surplus at the district level, (c) area under (i) different improved strains of crops, (ii) manure, (iii) contour bunding and (iv) land reclamation.

(3) Ascertaining the extent and causes of fallow areas.

(4) Collection of data on non-utilisation of irrigation facilities and causes responsible for it.

(5) Assessment of area brought under and additional production resulting from intensive manures of cultivation.

(6) Collection of basic information for undertaking research studies in the field of agricultural economics.

2. The items which require extension over large areas are:

(1) Extension of crop surveys to obtain in (a) Reliable estimates of production:

(i) at the Block level and (ii) of crops which have smaller acreage but are commercially important and are good foreign exchange earners, such as cashewnut, turmeric, ginger, etc.,

(b) cost of cultivation surveys of crops other than those already covered.

Besides organising the work of collection of fresh statistics and improving the existing ones, attention has also to be paid to the processing and analysis of the data already available through the various sample surveys, as only through such analysis the utility of the data whether they be those of production or of prices is enhanced. Hence if agricultural statistics should prove useful as primary data for evaluating the agricultural economy over time, more emphasis has to be given to analysis of the existing data in the Third and subsequent Five-Year Plans. The analysis may consist of assessment of demand for food-grains and other agricultural commodities, trend in production, prices, etc., effects of changes in prices on production and consumption, study of cropping patterns and consumption habits.

Hitherto planning in Agriculture had been for relatively larger administrative units, e.g., for the State as a whole or for different administrative divisions of a State. This approach had to be resorted to due to limitations of the available data. In future the emphasis has to shift to the district and lower levels, say the block, as ere long the block will be our planning unit. For this purpose whether the approach of agricultural census is more suitable would have to be

seriously considered. We are glad to know that the Indian Council of Agricultural Research and the Directorate of Economics and Statistics have already thought along these lines and are trying to collect reliable statistics at the Block level both for developing appropriate agricultural programmes and in evaluating in turn the results achieved in one district in each of the five States, *viz.*, Punjab, Uttar Pradesh, Maharashtra, Bihar and Madras.

To consolidate the improvements already achieved, to bridge the gaps as pointed out above, to extend the surveys to different sectors of agriculture on a countrywide scale and to collect fresh information as the need arises, it is essential to organise in each State a separate division of Agricultural Statistics in Departments of Agriculture where there is none at present and to expand its scope where it exists. As processing and interpretation of agricultural statistics are essentially an applied part of statistics it would be in the fitness of things to have a team of trained personnel headed by a suitably qualified statistician with rich field experience in different sectors of agricultural activity. The team should consist of well-trained statisticians with good experience of field-work and scientists specialised in one or two major disciplines of agriculture, such as agricultural economics, agronomy and plant breeding with adequate training in statistical methodology. As the work to be carried out in the statistical field would be of a delicate nature, the head of the division should be in a position to put forth his views without fear or favour and further as the statistical personnel have to come in contact with higher officers of different departments of Government, commodity committees and research institutes, etc., it is essential that the status and pay-scales of these personnel should be commensurate with the responsibilities developing on them and for the efficient discharge of their duties. At the highest level not only the statisticians should work in an advisory capacity but should also have a say in the actual formation of policies in regard to the improvement of agriculture, particularly in the field of research and production.

For the efficient collection of data it is essential to ensure that the services of the existing agencies connected with the collection of the data as a part of their normal duties, should be fully utilised, as these have a great deal of practical experience in the field; where necessary the field staff should be given training for doing their work more efficiently or to undertake the work which may be new to them hereafter. Their work will obviously have to be supervised by exercising timely and effective checks by field officers also trained adequately

for this purpose. Utilisation of *Ad Hoc* staff for collection of data particularly at the level of smaller units would at best be of limited utility as data required to be collected are season-bound and time-limited. Besides, as the work extends, which is bound to happen against the background of increasing requirements of agricultural statistics for the Five-Year Plans, it would be impossible for the existing *Ad Hoc* staff to cope with this increased work and it would be prohibitively costly to engage more and more *Ad Hoc* staff, nor is there any need for this.

From what has been stated above it is clear that considerable improvement has already been achieved in the field of Agricultural Statistics and trend of thinking at higher administrative and technical levels appears to be such that there is great scope for further expansion of programme for its development along useful lines. It is, however, being increasingly recognised that in practice the importance of statistics grows in proportion to the degree of satisfaction it offers to its consumers and this is particularly so with reference to Agriculture. It is, therefore, necessary to stress that the pattern of organisation for future development should be one in which the full understanding and co-operation of the departments using these statistics are ensured rather than working in isolation divorced from the day-to-day touch and needs of these departments and the public which deprives the various advantages that may be ensured as a result of co-operation, experience and understanding with the departments.

Judging from the past performance of the agricultural statisticians and the degree of enthusiasm and confidence they have already created in the minds of both the administrators and leaders of public opinion, there is no doubt that they will stand up to the high expectations of consumers of these statistics and in so doing contribute their bit to the agricultural development programme of the nation along sound and scientific lines.

SHRI R. GIRI⁷: *Statistics of Area and Yield*

During the last decade and a half, considerable improvements has taken place in the field of area and yield statistics in the country mainly as a result of the efforts of the Directorate of Economics and Statistics and the Institute of Agricultural Research Statistics in the Ministry of Food and Agriculture. We shall review these achievements briefly and make an attempt to chart out the tasks ahead.

⁷ Directorate of Economics and Statistics, Ministry of Food and Agriculture, New Delhi.

Extension of reporting area.—We shall first take area statistics which, we know, flow mostly as a bye-product of the land records prepared all over the country excepting what were called permanently settled areas, on field-to-field enumeration basis, primarily for the purposes of periodical assessment of land revenue and its day-to-day administration. The two essential pre-requisites for carrying out this census are (a) the cadastral survey and the village map prepared thereafter, showing the field boundaries and (b) the existence of appropriate agency at the village level to undertake field-to-field inspection. In 1948-49 the area reporting land use and crop area statistics on complete enumeration basis with the help of cadastral maps and primary reporting agency was 376.8 million acres or 46.7% of the total area, 806.3 million acres of the country. In the absence of appropriate reporting agency in the permanently settled States of Bihar, West Bengal and Orissa and of cadastral surveyor adequate reporting agency or both in parts of other States, the area statistics were based on rough estimates in respect of 180.0 million acres or 22.3% of the country's total area. In respect of the balance of 249.5 million acres or 31.0%, no area statistics were reported.

In view of the importance of complete and reliable area statistics for agricultural development programmes efforts have been made in recent years to extend the cadastral survey to unsurveyed tracts and to institute the primary reporting agencies in the areas not so equipped. Large tracts in Assam, Gujarat, Mysore and Uttar Pradesh and some other States have been cadastrally surveyed or re-surveyed and the reporting agency has been established. These operations are in progress in Manipur and Tripura and in other areas. Among the permanently settled States, Bihar has employed the agencies set up for implementation of land reforms and various social welfare and developmental activities of the State, for field-to-field area enumeration. West Bengal has adopted sample survey as a means to build up area statistics. In Orissa, these statistics are still based on rough estimates framed by conventional methods, except in the case of rice and jute crops for which sample survey has recently been adopted. The State of Kerala, where the cadastral maps have become out of date and the Travancore region which had no well-organised system of complete enumeration, has also adopted the system of sample survey for building up area statistics.

As a result of these measures, reporting area based on complete enumeration increased to 603.4 million acres or 74.8% of the total area of the country. Estimates in respect of 27.3 million acres (3.4%)

have become available by the sample survey. Rough *Ad Hoc* estimate based on conventional methods are also framed in respect of 90.0 million acres (11.2%) comprising 38.4 million acres in Orissa, 12.3 in Rajasthan, 10.2 in hill districts of U.P., 6.0 in Gujarat, 5.6 in Assam, Manipur and Tripura, 4.9 in Madras, 4.3 in West Bengal, 2.7 in Andhra Pradesh and the rest in other States. The extent on non-reporting area has shrunk to 85.6 million acres (10.6%) the bulk of which lies in Jammu & Kashmir (49.1), Assam and Manipur (18.5), and Himachal Pradesh (4.0).

With the completion of cadastral survey and institution of adequate reporting agency in the hill districts of U.P., Manipur, Tripura and other areas where this work is in progress, the extent of non-reporting area and area for which only conventional estimates are available, is likely to shrink further. The bulk of the non-reporting area is covered with dense forests and hills and is sparsely cultivated, where cadastral survey will be both difficult and prohibitive in cost. For such areas suitable sampling techniques like the one recently tried in the hill districts of U.P., may be adopted to frame the estimates. However, the sample survey in extensively cultivated areas of West Bengal, Orissa and Kerala which are also cadastrally surveyed and have now revenue and other agencies at the village level, does not meet the requirements of comprehensive data for planning and administrative purposes, as it provides useable estimates for major land-use categories and crops only and that also for the state as a whole or at most for the major districts. Considering the importance of dependable statistics for lower levels for both planning and operational purposes, these States now propose to utilise the revenue and development agencies set up in recent years at the village level, to build up area statistics on complete enumeration basis.

Adequacy of reporting agency.—In the States in which area statistics are already based on complete enumeration, the jurisdictions of primary reporting agencies fixed in the past on consideration of geographical area, cultivated area, number of fields to be inspected, revenue to be collected, etc., have now proved excessive in comparison to the increased workload on account of multifarious duties they are called upon to perform in the context of welfare and development activities of the State and democratisation of administration. The need for reduction in their charges by suitably augmenting their strength have been repeatedly emphasised in the past and more recently by the National-State Agricultural Intelligence Board and the Standing Committee on Improvement of Agricultural Statistics of the Ministry of Food and

Agriculture, in order that under pressure of increased work, agricultural statistics do not become the first casualty. The State Governments are contemplating measures to remedy this situation.

Phasing area enumeration programme.—The completion of crop inspection in all the villages under the charge of a primary reporter and compilation of the data at successive levels thereafter take considerable time and the area statistics based thereon become available much after the close of the agricultural year, with the result that they cannot be used for current planning and administrative purposes and for the purpose of crop forecasts. The area figures used for these purposes are only subjective estimates based on the judgment of primary reporters and superior revenue and agricultural officers regarding weather conditions, price position, seed availability, Government policy regarding agricultural production, etc., obtaining during the sowing period. More reliable figures can be obtained if the primary reporter is required to complete the crop inspection and compilation of the data collected, in respect of different villages in different months according to a phased programme. The villages to be covered in the different months can be randomly selected. From the preliminary to the final forecast, the number of villages on which area estimates will be based, will progressively increase, adding to the precision of the estimates. Where it is not feasible to cover all the villages according to a phased programme, a fixed fraction of villages may be covered at a pre-harvest stage so that more reliable estimates are available for use in the final and pre-final forecast. Some work in this connection has been done by the National Sample Survey (Crop Survey Wing) and also by individual States like U.P. and Madhya Pradesh and these may provide guide lines for other States to follow.

Rationalised supervision.—The Land Records Manuals in the different States make adequate provision for supervision by the Superior Officers over the crop inspection work of primary reporters. But the villages and fields are generally selected for supervision by rotation according to a certain roster which gives indication to the primary reporters of the villages unlikely to be visited in a particular year, where the work can consequently be neglected. An element of surprise can be introduced in the whole supervision programme by selecting villages and fields for supervision randomly. This would also serve another important purpose, in that it would provide an assessment of the extent of unreliability of area enumeration due to neglect of this work by the primary reporter under pressure of work. So far rationalised supervision has been introduced in Madhya Pradesh, Maharashtra,

Punjab, Andhra Pradesh, etc. It needs to be adopted in other States.

Standardisation of concepts and definitions.—Consequent on the divergent systems of maintenance of land records in keeping with the varying land revenue assessment procedures the area statistics that emerge from these records, are not strictly comparable from State to State unless certain basic uniformity is enforced. To meet this need the Technical Committee on Co-ordination of Agricultural Statistics (T.C.C.A.S.) set up in 1949 by the Union Ministry of Food and Agriculture recommended standard basic and abstract village forms, uniform concepts and definitions and standardised classifications. The Committee recommended ninefold classifications of land-use in place of fivefold classification then existing with a view to providing more meaningful data on actual and potential uses of land resources to formulate plans for maximising agricultural production. The list of the crops for which separate area figures were needed, was enlarged, and groups and sub-groups into which they had to be classed were standardised.

The States accepted in principle the uniform concepts and definitions and standardized classifications regarding area statistics, but found it difficult to replace their existing forms by the standard T.C.C.A.S. forms, as certain features of the forms already in vogue has to be retained to serve the main purposes of revenue assessment and administration. The Ministry of Food & Agriculture has now appointed a Standing Committee on Improvement of Agricultural Statistics (C.I.A.S.) one of the functions of which is to suggest ways and means to ensure collection of area statistics according to uniform concepts and definitions by introducing the minimum possible change in the existing land record forms. This Committee has so far examined and suggested revisions in the forms of Andhra Pradesh, Assam, Bihar, Gujarat, Maharashtra, Madhya Pradesh, Madras, Mysore, Punjab, Rajasthan, U.P., Himachal Pradesh and Delhi, with a view to ensuring essential concept uniformity, without changing these forms drastically.

The land record forms generally follow the land classification adopted at the time of settlement; and to enable culling out of land-use data, the C.I.A.S. has worked out for each State necessary equations between the standard categories and the local land descriptions. Lack of adoption of uniform concepts and standard classification regarding crop-wise and source-wise irrigated areas, area irrigated more than once, etc., affects the completeness, accuracy and inter-

state comparability of irrigation statistics. The revisions suggested in the basic and abstract land records forms by the Committee seek to remedy these defects also.

The distinction between mixed-sown area and multiple-sown area is often not clearly understood, and the procedures followed in the different States for recording of area under mixed crops and allocation of net areas to component crops differ widely and lack objectivity. The proper accounting of areas under vegetables and other crops sown pure or mixed in one season but harvested in successive seasons, also presents special problems. Improvements are also needed with regard to the recording of area under fruit trees, standing in compact orchards or scattered. There are several other problems like recording and proper accounting of areas under various types of bunds, recording of areas of crops like cardamom and pepper cultivated in forests and fruit orchards, reconciliation of figures of forest area, irrigated area, areas of plantation crops, tobacco, etc., published by more than one agency, which need consideration from the point of view of improving the reliability and comparability over space and time of the area statistics. These represent by and large the tasks which remain to be tackled.

Extension of crop-cutting surveys.—Talking of improvements in yield statistics, the feature which comes foremost in one's mind is the extension of the crop-cutting surveys by the random sampling method as evolved by the I.C.A.R. to more and more crops and areas during the last decade. In 1960-61, about 95% of the production of cereals, 74% of pulses, 58% of oilseeds, 67% of cotton and 97% of jute were based on the results of these surveys. The crops with regard to which the coverage now needs to be improved are small millets like ragi and kodokudki; pulses like urad, moong, masoor and lytharus; oilseeds like sesamum, rape and mustard, linseed and castorseed. About one-third of cotton production accounted for by Andhra Pradesh, Madras, Mysore and Punjab, and three-fourths of sugar (gur) production coming from Madras, Maharashtra, Punjab, U.P., etc., were also not based on crop-cutting surveys in 1960-61. The coverage with regard to tobacco and potato crops was limited to a few States accounting for only about one-fourth of their production. In some States, the surveys on these crops are already being conducted, but the results are not adopted in the official estimates. In order to increase the reliability of production estimates both at the State and all-India levels, it is necessary to extend the survey to more crops and more areas and to adopt the results in the official estimates of production.

The position with regard to the availability of production estimates of fruits and vegetables and minor crops of commercial importance is much worse. Only *Ad Hoc* estimates are available for some of these crops after a time-lag of two to three years. The Institute of Agricultural Research Statistics (I.C.A.R.) has conducted pilot investigations in a few typical districts of selected States with a view to evolving suitable sampling techniques for estimation of area and output of these crops and for collection of reliable data on their cultivation practices. So far such studies have been carried out on mango and guava in U.P., orange in Maharashtra, banana, cardamom and pepper in Kerala, lime in Andhra Pradesh, and cashewnut and cardamom in Mysore. The Institute further proposes to carry out pilot sample surveys to determine the area and production of apple in Punjab, Himachal Pradesh and U.P. and of litchi in Bihar. Besides, for the last 6-7 years, the Institute has also been giving necessary technical guidance in respect of the surveys being conducted for evolving suitable sampling techniques for estimation of area and production of banana, grape, coconut and arecanut in Maharashtra, banana and papaya in Madhya Pradesh, coconut and arecanut in Andhra Pradesh, Assam, Kerala, Madras, Mysore and Orissa and protective foods and minor crops of commercial importance in Bihar. Surveys on vegetable crops like potatoes, onions and chillies are also in progress in the States of Assam, Madhya Pradesh, Maharashtra, Rajasthan, West Bengal and Himachal Pradesh. In order to obtain reliable estimates of production of fruits, vegetables and commercial crops, it is necessary to extend the yield estimation surveys on the crops for which suitable sampling techniques have been evolved, to all the principal States and areas growing them. For other crops on which pilot surveys to evolve suitable sampling techniques for estimation of yield are either not initiated or have not yielded conclusive results, necessary research work to finalise the sampling technique needs to be intensified.

Supervision over field-work.—The quality of the data collected from the crop-cutting surveys is largely dependent on the extent of supervision exercised over the field-work. Both the departmental and statistical officers of the State departments concerned with these surveys have to carry out extensive inspection of the field-work. The *Ad Hoc* supervisory staff appointed with the financial assistance from the Commodity Committees exercise intensive supervision. At the centre, the N.S.S. Directorate organises actual spot-check of the experiments with the help of its supervisory staff. The response both with regard to conduct and supervision of the experiments is, however,

not uniform in all the States. There is considerable room for improvement in many States which is possible with the strengthening of their primary and supervisory agencies. Rationalisation of supervision is also necessary to introduce an element of surprise and to provide independent estimate.

N.S.S. Series of crop surveys.—Since 1955–56, the N.S.S. has also been conducting land-use and crop-cutting surveys in the course of its normal rounds of socio-economic enquiries, with a view to obtaining independent estimates of area and yield of crops as a check on the reliability of the estimates based on complete enumeration of area and the State series of crop-cutting surveys. The N.S.S. survey covers only 7 major cereals and the sample is adequate to give estimates at the all-India level only. Due to the peripatetic nature of the field staff, a good proportion of N.S.S. experiments is not performed, and those performed are not evenly distributed over the entire harvesting period. The small plot size adopted in these experiments also tend to exaggerate the plot yield due to a border effect. The ignorance of the N.S.S. Investigators of the land records rules regarding area enumeration also contribute to the difference between the State and N.S.S. estimates of area and production of crops. The all-India total production of the 7 major cereals in 1959–60 was 85 million tons according to the N.S.S. experiments, against 61.2 million tons given in Official Estimates based on the State series of crop-cutting surveys. For all foodgrains, the comparable figures worked out to 75 million tons according to Official Estimates and 104 million tons according to N.S.S. which in 1959–60 was about 4 million tons in excess of the Plan target for 1965–66, meaning a per adult net availability of about 24.1 oz. per day.

For a number of years the question about the relative superiority of one technique over the other has been a subject of discussion at various levels. This question was last discussed by the Central Technical Advisory Council on Statistics at its second meeting held at Hyderabad in October, 1962. Having examined the relative merits of the two techniques, the Council recommended that the State estimates which provide figures of production of almost all crops at the State and lower levels should be the only series for the purpose of crop estimation and should be strengthened and improved; and that the N.S.S. series should be discontinued and the savings utilised for building up a system of independent checks into the State series itself, such that an independent all-India estimate might also be arrived at.

Improvement in crop forecasts.—With the improvements in area and yield statistics, the scope of crop forecasts has been gradually extended to more crops and larger areas. In 1947-49 when the Directorate of Economics and Statistics in the Ministry of Food and Agriculture took over Crop Forecasts from the Directorate-General of Commercial Intelligence and Statistics, the forecasts were issued for only 13 crops, viz., rice, jowar, bajra, maize, wheat, sugarcane, groundnut, castorseed, sesamum, rape and mustard, linseed, cotton and jute. To these crops have been added till to-day 14 crops or groups of crops, viz., ragi, barley, gram, small millets, tur (arhar), other *kharif* pulses, other *rabi* pulses, potatoes, chillies, ginger, pepper, mesta, sannhemp and tobacco. In addition to these crops, *Ad Hoc* estimates are also issued for 11 crops, viz., banana, papaya, coconut, cashewnut, sweet potatoes, tapioca, betelnut, turmeric, cardamom, indigo and opium. In view of the importance of protective food crops in the dietary of the people and of crops of commercial importance in the national economy, it is necessary to issue detailed regular forecasts on coconut, cashewnut, banana, arecanut, turmeric, safflower, nigerseed, cardamom, etc.

Besides extending the coverage of forecasts, it is imperative to make measures to enhance the reliability of these forecasts particularly the prefinal forecasts. The area estimates can be improved by properly phasing the crop inspection programme as suggested earlier, and the yield estimates by the extension of crop-cutting surveys. These improvements may, however, take some time to materialise. To meet the immediate need of fixing production targets more realistically, even interim measures to formulate and furnish in time *Ad Hoc* estimates of production of these crops by the traditional method involving use of normal yield and condition factor would be welcome.

Certain methodological studies are also called for to improve the value of forecasts of long-duration crops like cotton, the yield of which is obtained in a number of harvests. Suitable methods to estimate the total yield on the basis of some initial harvests only need to be evolved to improve the reliability and timeliness of the forecasts on such crops. The usefulness of the forecasts to the trade and Government can be enhanced if the yield estimates of the different varieties of a crop harvested at different times of the year, e.g., paddy are prepared soon after their harvest without waiting for the completion of the harvest of all the varieties.

Statistics of improved cultivation practices.—Institute of Agricultural Research Statistics has also conducted pilot investigations

in selected areas primarily to evolve suitable sampling techniques for assessment of the extent of introduction of improved agricultural practices and of benefits derived. The N.S.S. Directorate has adopted these techniques on larger scale in some States. These surveys are, however, localised and exploratory in nature and need to be adopted on more extensive scale such as to provide adequate dependable data for purposes of formulating and executing programmes of increased agricultural production through improved cultivation practices.

SHRI B. V. SUKHATME⁸: *Present Status of Area and Yield Statistics of Fruit Crops*

Comprehensive and reliable statistics of area and yield of different types of fruits are essential for proper planning and execution of programmes for increased fruit production and for assessing the progress of various developmental schemes relating to these crops. They are also required to assess the contribution of fruit crops towards the national income of the country. Barring a few States, area statistics for individual fruit crops are not available at present. Moreover, nothing is known about their reliability. So far as yield statistics are concerned, no reliable data is available for any part of the country. Thus, at present, the statistics of area and yield of fruits are incomplete and inadequate and lack the desired degree of accuracy and inter-State comparability.

More recently, the problem of obtaining reliable estimates of area and yield statistics of fruits was considered by the Committee for Improvement of Agricultural Statistics appointed by the Ministry of Food & Agriculture. The Committee recommended that in those States which are cadastrally surveyed and possess primary reporting agency at the village level, the areas under fruits of regional importance should be recorded separately along with the number of trees in the basic village form. Besides this, the Committee also recommended several other measures to ensure proper estimation of areas under individual fruits in the case of mixed orchards and avoid under-estimation of areas under fruit crops. These recommendations, if implemented, are expected to improve considerably the statistics of area under fruit crops. But so long as these recommendations are not adopted as a normal routine, it will be necessary to conduct sample surveys for estimating area statistics of fruit crops for which suitable sampling techniques will have to be developed. In the case of those

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States which are not cadastrally surveyed and do not have any reporting agency, it will be necessary to conduct periodically a sample survey or a census to obtain estimates of area under fruit crops. In areas where fruits are grown extensively, it may be desirable to conduct sample surveys as recommended by the Committee. In those areas where fruit cultivation is not extensive, it will serve the purpose if a census of fruit trees is conducted periodically.

Yield rates and total production in the case of field crops are at present determined on the basis of random sample surveys for crop cutting as the traditional method of determining yield rates was not based on any scientific approach. A similar technique will have to be developed in the case of fruit crops as well. Fruit crops differ very much from field crops in several respects. Unlike field crops where fresh planting is done every year, fruit trees continue to remain standing for a number of years. Whereas field crops are mostly grown in fields reserved for field crops alone, fruit trees are grown not only in orchards but on any suitable land, such as, canal banks, field bunds, roadside, back yards of houses, etc. It is also a common practice to grow different types of fruit trees in the same orchard. Unlike field crops, fruit trees take quite a few years before they start bearing fruit. The age at which a tree starts bearing fruit varies considerably from fruit to fruit. As in the case of field crops, all the trees in an orchard are generally not of the same age. In fact, it is quite frequent to find in the same orchard trees of bearing age and young immature trees. Again, all the trees of bearing age need not necessarily bear fruit. The proportion of trees of bearing age failing to bear fruit varies with age and differs from fruit to fruit. The harvesting of an orchard may extend over several weeks which is generally not the case with field crops. Again, there are several fruits, such as, lime, guava, etc., where there are two or more harvesting seasons in a year. All these factors will, therefore, have to be carefully considered while evolving the sampling technique to estimate area and yield statistics of fruit crops.

On the initiative of the Ministry of Food & Agriculture, the Institute of Agricultural Research Statistics, therefore, initiated a series of sampling investigations on a co-ordinated basis on important fruit crops, such as, mango, guava, banana, orange, lime, etc., with the following broad objectives in view:

- (1) To evolve a suitable sampling technique for estimating with a desired degree of precision the area, the yield rate and annual production of the fruit under study.

(2) To collect reliable data on manurial and cultivation practices of the crop as practised by the orchardists and to determine the incidence of pests and diseases.

The sampling design adopted for fruit surveys is two-phase multi-stage stratified random sampling with tehsils or groups of adjacent tehsils being taken as strata. Within each stratum, a specified number of villages roughly in proportion to area under fruits are selected at random according to a probability scheme of sampling. The probability scheme of sampling to be used in a survey depends upon the auxiliary information that is available concerning the fruit under study. For example, in the case of lime survey in Andhra Pradesh, information was available in respect of area under lime for each village. In this survey, villages were, therefore, selected with probability proportional to area under lime. In the case of surveys on mango and guava in Uttar Pradesh, information was available concerning area under fresh fruits for each village. Consequently, villages were selected with probability proportional to area under fruit. If no auxiliary information is available, villages are generally selected with equal probability. All the selected villages are completely surveyed to obtain information concerning the extent of cultivation of the fruit under study as indicated by number of orchards, area under fruit and number of trees according to variety under bearing and non-bearing categories. A sub-sample of the selected villages is randomly taken for the purpose of yield study. For this purpose, a specified number of orchards growing the fruit under study are selected in each of the selected villages in the sub-sample. Within each selected orchard, a specified number of bearing trees are selected at random to collect data on the yield of the fruit.

The data collected under the various pilot surveys have been statistically analysed and some of the important conclusions emerging from these pilot surveys are:

(1) As stated earlier, stratification was carried out on the basis of geographical proximity. This has also been found to be convenient from the point of view of supervision of field-work and other administrative considerations. Since the pilot surveys have been carried out mostly in single districts having more or less uniform soil and climatic conditions, only moderate gains were obtained due to stratification. If the survey is carried out on a State-wide scale, stratification based on geographical proximity is expected to give appreciable gains in the precision of the estimate.

(2) The scheme of selecting villages with probability proportional to area under fruit has not only resulted in simplified statistical analysis but also proved statistically efficient as compared to simple random sampling. Thus, in the case of the mango survey in Varanasi District, the gain due to sampling with probability proportional to area under fresh fruits over simple random sampling was estimated to be 235%.

(3) It was observed that there was considerable variation between villages in regard to area under the crop and number of bearing trees. On the basis of the results obtained so far, about 300 villages will be required to obtain an estimate of the total number of bearing trees with 5% standard error, the exact number depending upon the fruit under study and the scheme of probability sampling for selecting villages.

(4) The contribution to the standard error of the estimated average yield per tree arises from three different sources: (a) variation between villages; (b) variation between orchards within villages; (c) variation between trees within orchard. Of these, the variation between villages is the most important one. This has been found to vary from fruit to fruit.

The number of orchards per village and the number of trees per orchard required to estimate the average yield per tree depend on the variation between orchards and variation between trees within orchards. It has been found that for the purpose of estimating the average yield per tree, it is enough to select 3-5 orchards per village. Increasing the number of orchards beyond five, does not seem to decrease appreciably the standard error of the estimate. Similarly, it has been found that it is sufficient to select 9-12 trees per orchard. On the basis of this result, it has been found that a sample of 130 villages with five orchards per village and 12 trees per orchard will be necessary to estimate the average yield per tree with 5% standard error, the exact number depending upon the fruit under study and the scheme of probability sampling for selecting villages. If the villages are selected with probability proportional to area under the fruit as reported in the previous year, a much smaller number of villages will be required to estimate the average yield per tree.

(5) As noted earlier, the number of villages required to estimate the average yield per tree is considerably less than that required to estimate the total number of bearing trees. As both the average yield per tree and the total number of bearing trees have to be estimated with sufficient degree of precision to obtain reliable estimate of the

total production, it follows that a larger sample of villages will have to be selected for estimating the total number of bearing trees while a sub-sample of these villages may be selected for estimating the average yield per tree. The method of double sampling can, therefore, be used with advantage in fruit surveys. This method has been found to be statistically efficient and has resulted in gain in efficiency ranging from 40-100% depending upon the fruit under study.

(6) The pilot sample surveys have clearly demonstrated the feasibility of obtaining reliable estimates of acreage and production of fruit crops through sample surveys. Besides, the surveys have also provided useful and reliable information on (i) total number of fruit trees according to variety under bearing and non-bearing categories, (ii) number of fruit trees in different age groups, (iii) number of orchards and the average size of an orchard, (iv) yield rates according to variety and (v) yield rates according to age group.

Even though the pilot surveys have demonstrated the feasibility of conducting state-wide surveys to obtain reliable estimates of area and yield of fruit crops, the extension of the survey to the whole state is not straight-forward. This will give rise to new problems both technical and organizational which will have to be tackled before the technique can be recommended for adoption on a routine basis. Two possibilities suggest themselves. One way would be to divide the whole State in a large number of strata on the basis of geographical proximity and soil and climatic conditions and adopt the sampling technique described earlier in each of the strata. Alternatively, the whole State can be divided into three or four homogeneous zones on the basis of soil and climatic conditions. Within each zone, a certain number of tehsils can be selected with probability proportional to area under fruit. Within each tehsil, a certain number of villages will be selected at random. These will be completely surveyed to obtain estimate of the extent of cultivation of the fruit under study. A sub-sample of these villages will be selected for the purpose of yield study. In the absence of any idea concerning the variability between tehsils, it is not possible to discuss the merits and demerits of these two different schemes. It will, therefore, be necessary to carry out a State-wide survey with tehsil as the primary unit of sampling, village as the secondary unit of sampling and cluster of trees as the ultimate unit of sampling.

So far attention has been concentrated mainly on evolving sampling techniques to obtain reliable statistics of area and yield of some important fruit crops. Considering, however, the fact that the *per*

capita availability and production of fruits is so low, it is necessary to have a reliable idea about the total area under fruits and their annual production with individual figures for some important fruits so that the development of fruit crops can be planned on a sound basis. Since different fruit crops differ in several respects such as manurial and cultivation practices, the harvesting period, the bearing age, etc., the sampling technique evolved to collect reliable statistics of area and yield of a single fruit crop will not give reliable statistics for all the fruit crops. Certain modifications will be necessary. It is, therefore, of the utmost importance to carry out pilot surveys with a view to evolve sampling technique to obtain reliable estimates of area and yield of fruit crops grown in a given region. As a first step, it is proposed to restrict to temperate fruits grown in Punjab, Himachal Pradesh, and Uttar Pradesh. The most important temperate fruits grown in this region are apple, plum, peach, apricot, walnut, cherry. It is now proposed to have a two-stage design as compared to three-stage design followed so far. From each of the villages selected for collecting yield data, it is now proposed to stratify all the fruit trees of bearing age according to the type of fruit grown in the village. A certain number of trees in the form of clusters will be selected from each group to collect yield data for different fruits. It is expected that a sample survey with this type of design will provide reliable estimates of total area under temperate fruits and estimates of yield rates and production for some of the important temperate fruits.

SHRI D. SINGH⁹: *Status of Livestock and Fisheries Statistics in India Livestock Statistics.*

Demand of comprehensive and reliable statistics of a certain economy is itself an index of development programmes. In recent years, due to shortage of cereal and other agricultural commodities national plans have paid serious attention to the developmental programmes for increasing agricultural production. Consequently, demands for more detailed and comprehensive data relating to agriculture have increased, especially in case of food and important commercial crops. If we consider, in the same context, the demand of statistics relating to livestock numbers and their products we find that there is practically lull in that sector. Administrators and the planners have not given the same serious thinking to the planning of livestock development as they have given to the crop production. Consequently, development of statistical system relating to livestock has been very slow in India.

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For a scientific and detailed programme of livestock development, statistics relating to broadly three items, namely (1) livestock number, (2) livestock keeping and management practices and (3) livestock products will be needed. Statistics on livestock numbers are considered the most important for planning developmental programme. At present, these statistics are collected on the basis of quinquennial livestock censuses. Although, livestock census itself is useful operation for providing comprehensive statistics on livestock numbers category-wise and for the smallest administrative unit like village, it may not be sufficient and adequate for detailed planning of livestock development. There is a large fluctuation in the livestock numbers from year to year and in some cases even within a year there is a fluctuation from season to season. In some cases where life of the animal is less than five years the livestock censuses at the interval of five years becomes of limited utility. Since, in case of most of the livestock developmental programmes, number itself will be the main indicator of the progress, information on numbers should be available at much shorter intervals than five years as at present. For this purpose certain methods should be evolved for obtaining livestock numbers at much smaller interval. The I.A.R.S. has demonstrated by conducting a number of pilot surveys for estimating livestock numbers that it is possible to obtain this information on random sampling basis during the inter-censal period. Such sample surveys were conducted in Etawah District* of Uttar Pradesh, Vardha District of Madhya Pradesh, and the entire old Bombay State. These surveys were planned with the object of examining the feasibility of using sampling methods for estimating livestock numbers of major categories with reasonable precision for administrative units like districts. Results have indicated that sampling can be utilised usefully and successfully for estimating livestock numbers with reasonable precision annually.

A study of the data collected in these surveys has indicated that the stratification by size of villages (size being defined by the total number of households in the village) is most effective in reducing the sampling variance. Tehsilwise stratification has not proved very useful in reducing the sampling variance. Hence, wherever it is feasible, stratification by size of villages within a district or a taluk, whichever is administratively convenient for field operation should be adopted. A number of characters as auxiliary variates was used for calculating the ratio estimate of livestock numbers. It was found

* Sample surveys for improvement of livestock statistics, Indian Council of Agricultural Research,

that the total number of households as auxiliary information is most effective in reducing the sampling error. Next to that was the agricultural area. The analysis of the survey data for the Bombay State has indicated that the selection of about 20 talukas and 12 villages per selected taluk and 6 clusters of five households each per selected village, which accounts for less than 1% of the total number of households in the State could be the most appropriate design (giving only 2% sampling error) to be adopted in any Statewide survey for estimating bovine number. However, this sample size will slightly increase if estimates are to be obtained for important categories of livestock separately.

The results of these sampling enquiries can also be used for organising the rationalised supervision of livestock census. If, during the census year, the supervision is organised on a suitable sampling plan it will serve two purposes, (1) rationalisation of supervision over the work of the basic field-workers engaged in census, and (2) building up independent estimate of livestock number much more quickly than the census data will provide.

The findings and the usefulness of these investigations were brought to the notice of the State Governments several times but there has been little progress in adoption of the methods for obtaining estimate of livestock numbers on sampling basis annually. The result is that except for the census year, the estimate of livestock numbers for other years are only guess figures.

The knowledge on livestock number is a means to obtain the information on livestock products. Not much effort has been made in this country to collect information on livestock products on a systematic and scientific line. Whatever information is available at present on livestock products is due to efforts made by the Marketing Department of the Ministry of Food and Agriculture. However, it will be observed that information drawn out from the marketing reports would not be adequate for knowing levels of livestock productivity with details in the country which might be useful for planning. The Directorate of National Sample Survey have also attempted to collect information on production, consumption and utilization of milk during their several rounds. The method followed by the N.S.S. is the method of interview, and the enquiries confined in most of the cases to a small period of the year. Because of the seasonal variations in production of milk and the interview method followed the data collected by N.S.S. on various livestock products may not be considered reliable and free from bias. Moreover, these estimates

even if they are available they are useful as an estimate for the country as a whole. Consequently, the utility of such data for planning is of a limited value.

The main problem which is faced in the collection of data on the livestock products is the lack of suitable method to be followed up. The I.A.R.S. which has been continuously studying the sampling methods for the improvement of agricultural statistics in this country for the last two decades has recently attempted to develop appropriate sampling method for estimation of important livestock products like milk, poultry and eggs, wool, etc. Although, studies made by the Institute are limited in scope with respect to coverage they have provided useful results which might be the basis for preparing suitable programmes for collection of data on livestock products and on livestock rearing practices on a regular and systematic basis in future. In other words, the proper scientific method of sampling, the absence of which was considered to be the main reason for not obtaining the reliable statistics on Livestock products is now available. It is for the organizations responsible for the development of livestock to see that efforts are made by adopting the method evolved by the Institute to collect statistics on livestock products. The method provide not only the average rate of livestock product but also the estimate of numbers. The use of the two will provide the production. It is essential to know the two factors (yield rate and number) simultaneously as there is a large variation from season to season in the livestock numbers as well as in the level of productivity.

The survey for studying the milk yield and management practices of cattle and buffaloes in Punjab State conducted during 1956-57 has indicated that there is a considerable variation in number of animals in milk from season to season. For example, it was observed that the percentage of cows in milk in different seasons was 63 in summer, 51 in rainy season and 38 in winter. Similarly, in case of buffaloes the corresponding figures were 57, 50 and 72. Similar variation was observed in daily milk yield rate also. For cows, highest daily milk yield rate was in summer, while for buffaloes it was during the winter. Similar results were observed in the surveys conducted in Eastern districts of U.P. (1957-58), in Gujarat State (1958-59), Coastal Districts of Andhra Pradesh (1959-60) and Coastal Districts of Orissa State (1960-61). These results substantiate the need of continuing the survey for estimation of milk production for the whole year. A critical examination of the results has indicated that in a sample survey to estimate the milk production with 3-4% sampling error at the State

level a sample of about 20 tehsils/talukas with a sub-sample of 5-6 villages would be needed.

Surveys for estimation of egg production were conducted in Andhra Pradesh (1959-60) and Kerala (1960-61). Results obtained in these surveys have indicated that variation in egg production per bird is considerable and for estimating the annual egg production with reasonable accuracy much larger sample of tehsils and villages would be needed than what is needed for estimation of milk production. Since in both the surveys ultimate sampling unit is household it may be desirable to combine the two enquiries for obtaining annual milk production and egg production in a State. The resources available for the two surveys may enable to increase the sample size adequately in order to obtain highly accurate estimate. Such a combined survey is being planned in the States of Gujarat and Maharashtra.

Other statistics on livestock which are not at present available relate to employment in the livestock rearing, cost of production of livestock products, input and output ratio in livestock products, etc. These statistics would be useful for studying the economics of livestock rearing. Work on this subject has been done on a limited scale by the Institute especially in relation to cost of milk production. However, similar work will be useful in case of other important livestock products like wool, egg and meat.

Fishery statistics.—Data regarding total catch of marine fish, marketable surplus of freshwater fish and other related details are published in the report on 'Marketing of Fish in India' issued by the Directorate of Marketing and Inspection of the Ministry of Food and Agriculture. Mostly, these estimates are obtained on the basis of figures supplied by the Fish Curing Yards. Data are neither complete nor strictly accurate and only serve to indicate the dimensional magnitude of the quantities under study rather than to measure them in accurate estimates. Thus, the existing fishery statistics suffer from gaps in coverages not only geographically but also in respect of many useful items of fisheries economy, deficiency in compilation, lack of planning and co-ordination, etc. The Central Marine Fish Research Station at Mandapam collects some statistics on marine fish. The Central Inland Fisheries Research Station, Calcutta, has also initiated collection of details of fish catch from certain rivers, acturaries and Chilka Lake. However, these statistics do not provide a true picture of the present availability of the fish production in the country. They do not give sufficient details useful for developmental programmes.

As pointed out earlier, the Institute has been playing a great role in this country for developing suitable sampling technique for collection of agricultural data. In the field of fishery also, the Institute conducted a series of pilot sampling investigations to develop appropriate scientific method for collection of data on marine fishery during 1950-55. These investigations demonstrated the feasibility of using sampling method in collection of data on fish catch on a regular and systematic basis. The results obtained in these enquiries have indicated that Fish Curing Yards wherever they are already established might be taken as strata and the departmental staff in these yards utilised for field work. In the coastal length not covered by the existing wards *Ad Hoc* field staff might be needed for the purpose of sampling work. In fact, at present, the method is being followed to some extent in the present surveys conducted by the Central Marine Fishery Research Station, Mandapam, for the collection of data on marine fish catch. The station is also collecting data on several biological aspects useful for biological research. However, the surveys conducted by the Mandapam Research Station need further intensification to obtain data with necessary breakup with respect to region and other economic indicators. The coastal States have not shown sufficient interest in developing proper fishery statistics system. It may not be possible for the Mandapam Station alone to meet the demand of statistics required by the fishery planners. It is necessary that States should be encouraged to develop their own statistics system.

In case of statistics relating to inland fisheries, position is still worse. There is no appropriate method which can be suggested to the organisations interested in the development of inland fisheries. The Directorate of N.S.S. has started some pilot investigations to evolve suitable sampling technique for collection of statistics on inland fisheries. Considering the problems involved it may not be possible for the N.S.S. alone to solve the problem of collection of inland fishery statistics satisfactorily. A number of pilot investigations will have to be conducted suiting the conditions for different types of inland fisheries like riverine fishery, lake and pond fishery, etc. In several parts of the country fish culture is considered a home industry and the production axis mostly consumed by the householders. A separate sampling method will have to be evolved for collection of data of production of this type of fishery.

In addition to developing a suitable method it will also be necessary, particularly in case of freshwater fishery to know the potentiality of development. For this purpose it may perhaps be necessary to conduct

periodical census for knowing the water area which can be exploited for culturing fish.

Data on economic aspect of the fishery statistics may relate to economics of various fishery operations, different methods of fish catching, employment provided by fishery industry, cost of production of inland fishery, etc. No data are at present available on these aspects. The Fishery Department in the Maharashtra Government has started some useful work with the financial assistance of I.C.A.R. for making a comparative study of mechanised fishing against traditional methods prevalent among the fishermen. A number of such studies would be necessary in order to make useful beginning for proper planning of fishery industries in the country.

Finally, to implement the suggestions made earlier it will be necessary to establish statistical cells in the departments in the States responsible for development of livestock, and fishery industry. Most of the State Governments have already included among their Third Five-Year Plan Schemes a programme for establishing statistical sections in their Departments of Animal Husbandry and Fishery. This needs following up. The schemes for the improvement of livestock and fishery statistics will not make headway without a proper statistical section in the respective departments.

SHRI S. C. CHAUDHRI¹⁰: *Agricultural Prices*

Farm Prices

Harvest season Prices.—Weekly wholesale prices of principal crops during the prescribed harvesting period of 6–8 weeks for each crop are reported by the branches of the State Bank of India from about a hundred selected market centres. A simple average of the weekly quotations is taken to represent that 'Harvest Season Price' for the concerned commodity at the given centre.

Index numbers of harvest prices.—These harvest season prices are utilised for construction of index numbers of harvest prices of principal crops in India. They are published in the *Agricultural Situation in India and Agricultural Prices in India*. The base period of the series is the agricultural year 1938–39. A system of double weighting has been adopted in working out the index numbers. Firstly, to work out a commodity index, moving weights have been used for

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combining the price relatives for different States into commodity price relative, taking their weighted geometric mean. Current year's production in the different States covered by the index is used as weights. Secondly, to work out the all-commodity index, weights have been assigned to the different crops in proportion to the average value of production of each crop in the States covered by the index during the three years ending 1938-39. The multiplier to arrive at the value of production is the annual average harvest price prevailing in the concerned State during the period under reference. The index covers 15 crops grouped into (i) foodgrains, (ii) oilseeds, and (iii) miscellaneous crops. The States covered by the index are the former Part A States and the Union Territories, accounting for 60% of the total geographical area of the country. Chain base method is used in the construction of the index.

Limitations.—The centre-coverage in the harvest season price series is limited and in some centres, the variety does not remain uniform over the years. In the index number of harvest prices, the spatial-coverage and the commodity-coverage is inadequate inasmuch as only 60% of the geographical area and 54% of the total cultivated area are covered. The base year of the index number series is too remote. It is intended, however, to replace this series by another based on more scientific series of farm harvest prices.

Farm (Harvest) prices.—In 1948, a scheme for collection of farm (harvest) prices on a uniform basis all over the country was formulated. For this scheme, the farm 'price' is defined as 'the average wholesale price at which the commodity is disposed of by the producer at the village site during the specified harvesting period. Under this scheme, the farm (harvest) prices are collected every week, from a selected number of villages, selected on a purposive basis, during the specified harvest period of 6-8 weeks in respect of the important crops. The weekly prices are averaged into tehsil and district averages by taking their simple mean; and the State average is worked out as a weighted average of the district prices with the production of the crop in the districts as base. Generally 10 villages are selected in each district.

Present position.—Farm (harvest) prices are being reported by most of the States. The States which have not yet undertaken reporting are: Assam, Orissa and Jammu and Kashmir. The time lag in the receipt of these prices is considerable. Some State Governments have not yet specified varieties and qualities in respect of each commodity. The period for which farm (harvest) prices are reported does

not necessarily coincide with the period of disposal of the produce by the farmer in many cases.

Tasks ahead.—The harvest season prices reported by the Branches of the State Bank of India should be continued even after satisfactory progress has been made for the collection of the farm (harvest) prices in order to ensure continuity of the availability of the former time series. Since, however, with the opening of new branches of the State Bank of India, the centre-coverage of the series has improved and since the commodity-coverage of the series has also been increased, the scope of the index number of harvest prices should be suitably enlarged. The base year of the series should also be changed to the year 1960-61 which is now to be adopted uniformly as the base year for many economic indicators. An attempt should also be made to secure uniformity in varieties and qualities for which prices are reported from different Centres.

In the case of farm (harvest) prices, it is necessary to extend their reporting to the States which have not yet started collecting them. Time-lag also requires to be reduced. Specification of varieties and qualities of all the commodities for which farm (harvest) prices are collected is necessary. To enhance the utility of these prices data, the period of reporting of these prices should synchronise with the peak marketing periods. Computation of index numbers of harvest prices on the basis of the farm (harvest) prices needs to be started as soon as feasible.

Wholesale Prices

Price collecting authority.—An important recommendation of the Committee on Collection of Agricultural Prices in India, 1954, was that duplication, or multiplication of the agency for collection of prices in the different States should be avoided and in each State only one agency should be designated as the Price-Collecting Authority. Following this recommendation, the different States have named their respective price collecting authorities. These authorities are either the State Agricultural Marketing Officer or the State Director of the Bureau of Economics and Statistics. The spirit underlying the Committee's recommendation is, however, not being fully adhered to in some States. The Committee had said that the single price collecting authority should collect and compile prices to satisfy all the regular requirements of the State. If any other agency required information, it should first explore the possibility of utilising the data collected by the Authority. If this was not adequate, it should request the Authority

to enlarge the scope. Only when this was not possible, it might arrange for independent collection to suit its own purposes. The example that the Committee cited was that of the Civil Supplies Department utilising the information collected by the Marketing Department where the latter had an elaborate reporting agency and was also the Price Collecting Authority. In practice, in some States there are several price reporting agencies at the market level.

Definition.—The connotation of the term wholesale price for the State Price Collecting Authority is as under:

(i) The wholesale price is generally taken as the rate at which relatively large transaction of purchase usually for further sale is effected.

(ii) The quotation generally relates to the actual price at which the transaction takes place irrespective of the terms of contract and without excluding the different incidentals if they are normally included in the price quoted.

(iii) The quotation is the modal price, that is, the price at which most of the transactions take place during the peak period of marketing on the day of reporting.

(iv) The variety and quality of the commodity to which the price quotation relates is specified for each commodity and, as far as practicable, the price reported relates to the same variety and quality. The variety and quality are indicated in the price return. When a commodity belonging to both old and new crops is marketed concurrently, the prices of both are quoted simultaneously for four to six weeks in the case of weekly prices and for seven days in the case of daily prices.

(v) The weekly wholesale price is collected as on Friday every week. Where, however, the markets are held only on specified days of the week and that day is not a Friday, the weekly price reported relates to the market day preceding the Friday.

Primary and secondary prices.—Primary wholesale price is reported from a primary market and secondary wholesale price from a secondary market. A market is designated as a primary market for a commodity if the bulk of the arrivals in that market is from villages or from village hats. A secondary market is one where bulk of the arrivals are from other markets.

In a primary market it may sometimes be found that transactions between producer or village merchant and wholesalers take place in the morning while in the afternoon transactions take place between

wholesalers themselves or between wholesalers and retailers. In such cases, primary prices reported are those which prevail during the morning transactions only.

When there are no transactions between the producer and wholesaler in a primary market during the lean part of a year, then secondary prices, that is the prices at which wholesalers transact business among themselves, are reported. In the case of processed commodities such as milled rice, cotton lint, oil, the price at which transaction takes place between the miller and the wholesaler is treated as secondary price. In those regions, however, where the general practice is for the cultivator to get the commodity processed through a mill or a gin and then to sell the processed commodity to the wholesaler, the price at which such transactions takes place between the producer and the wholesaler is treated as primary price.

The fact whether a quotation is primary or secondary is indicated in the return.

Supervision.—The prices collected are recorded in a register maintained by the price reporter. A column is provided in the register for recording reasons for increase or decrease in prices. The price register is periodically checked by supervising officers including the Inspecting Officers of the Government of India.

Training.—The price reporters and supervisors when, newly appointed, are given an intensive course of training by the Price Collecting Authority before being sent out to the field. Refresher Courses are also organised periodically in different regions of a State for a group of price reporters and supervisory officers. In this training also, the Inspecting Officers of the Government of India take part.

Processing.—Some States use wholesale prices data for construction of index numbers. Prices in respect of some agricultural commodities are also used by the Economic Adviser, Ministry of Commerce and Industry, Government of India, for construction of All-India Index numbers of wholesale prices. Of course, the users of these data process them from time to time for their specified needs.

Dissemination.—The various publications brought out by the State Authorities vary from daily to annual. A daily Market News Bulletin is prepared by the State Authorities and passed on to the Regional Stations of All-India Radio for broadcast the same evening in the rural programme as part of the Market News Service. A weekly market review of the price position is also broadcast through the

Regional Stations of All-India Radio. A Weekly/Fortnightly Bulletin on wholesale prices (including also the data on market arrivals, etc., is prepared and issued. Some States also issue a monthly market review. Annual publications are also brought out. The Ministry of Food & Agriculture compiles for official use, a daily bulletin on wholesale prices of major foodgrains, a weekly bulletin of wholesale prices of foodgrains for a larger number of markets and for publication of a weekly bulletin of agricultural prices and an annual agricultural prices in India. The data are also studied and analysed in the *Economic Survey of Indian Agriculture* annually and in the commodity series brought out by the Ministry of Food & Agriculture.

Market intelligence.—For developing suitable price policy and for taking suitable administrative measures and for maintaining prices at reasonable levels, information is needed not only on prices but also on other allied items such as market arrivals, market sales, trade stocks, crop outlook, market sentiment and factors influencing prices from time to time. All these data and information are now being collected by the State Governments under the Scheme for Improvement of Market Intelligence sponsored by the Ministry of Food & Agriculture. Some 250 wholetime reporters now exist in the non-regulated markets in addition to about 700 in the regulated markets for furnishing weekly market intelligence returns. The Ministry of Food & Agriculture has set up 8 Regional Offices—in Calcutta, Bombay, Madras, Delhi, Jaipur, Bhopal, Shillong and Lucknow. These Officers undertake regular tours of the markets in their respective regions and besides furnishing their own appraisal of the market situation, also supervise the work of the State Price Reporters and impart them on the spot guidance for proper reporting. Weekly market intelligence is studied, on a regular basis, in relation to price behaviour to assist Government in policy-making and policy execution.

Market margins.—Studies on market margins have been organised in the Ministry of Food & Agriculture recently. For the purposes of this study, a pair of markets—one primary and the other secondary to which the bulk of the supplies move from the selected primary market—has been selected from some States. The method employed is that of comparing prices at different levels of marketing, at a particular point of time and calculating market margins by deducting the producer's price from the consumer's price. Market margins comprise costs some of which are in the nature of fixed charges inasmuch as they are linked with the commodity marketed, while others are variable being linked with the value of the commodity. Most of the fixed

charges are ascertainable. The same is, however, not true of variable charges. In particular, the margin of profit (or loss) which is also an item of variable nature is not capable of being ascertained with precision. Accordingly, an attempt is made first to collect information on those market charges which are ascertainable—whether fixed or variable—and then an idea of the profit (or loss) and other non-ascertainable charges is had from the difference in prices at successive levels of marketing.

From the studies of market margins it has now become possible to have an idea of the producer's share in the consumer rupee, the wholesalers margin and the retailers margin. The study is at present confined to rice and wheat in about a dozen pairs of markets in the country.

Tasks ahead.—At present market prices and other related information is being obtained from some 850 markets in the country. It is intended to enlarge this number to some 1,500 markets which is estimated to be 50% of the total number of markets in the country. The training facilities have also to be improved. The programme is to organise what may be called a trainers training centrally and through these trainers to have the primary reporters trained in batches in different regions of the States. Supervision has also to be strengthened. The data need to be processed much more to yield meaningful index numbers of prices, market arrivals, market sales and trade stocks at the State and All-India levels. Steps in this direction have already been initiated. A clear-cut distinction between the primary price and the secondary price will have to be maintained from the stage of collection to that of processing and utilisation. A link between the farm prices and wholesale, primary and secondary prices will have to be established in course of time in order that one could have at least some idea of the costs and returns.

Retail prices

Retail price is the price which the ultimate consumer pays when buying from a retailer. In the reporting centre, it is generally collected from areas where the lower middle class or labour population is concentrated. Retail prices are reported generally for the same variety of a commodity for which the wholesale price of that commodity is reported even though the reporting agencies for the two sets of quotations may not be the same. The retail price is inclusive of sales tax, wherever the same is levied. Weekly retail prices are collected on Fridays. Retail prices are being reported from 79 urban centres daily, 110 urban centres weekly and 385 rural centres monthly.

Tasks ahead.—Questions of specifications, reporting agency and the localities from which retail prices are reported deserve careful consideration. Attempts should also be made by the reporters to verify with the consumer the prices as quoted by the retailers with a view to exercising a corroborative check.

SHRI J. K. PANDE¹¹: *Statistics of Agricultural Wages*

The importance and utility of statistics of agricultural wages have probably yet to be fully realised. Such data are useful in the preparation of index numbers of cost of cultivation. They are also helpful in questions connected with cost of living relating to the class of agricultural labour. In fixing minimum wages for agricultural labour, data of actual wages paid serve as one of the guiding factors. Moreover, wage-rates for agricultural labour go to determine the share of agricultural labour in agricultural industry.

Until a few years ago, data relating to agricultural wages, in fact rural wages, in different States in India used to be collected once in five years under what was called the Quinquennial Wage Census. Apart from the fact that the organisation of such a census every five years meant some difficulties, the data collected were not fully satisfactory for purposes of comparison between one State and another, not only because of lack of uniformity in concepts, definitions and other factors but also because the period for the wage census was not always simultaneous in the different States. The system also left a wide gap in information for the period between one census and another. The quinquennial census has since been discontinued in some States, and data of agricultural wages in different States in India are now being made available on a monthly basis, largely as a result of the measures initiated by the Directorate of Economics & Statistics in the Ministry of Food & Agriculture. But, although these data are better than the series they have substituted, there is a certain degree of lack of uniformity even in them, on account of which a scientific comparison of wage rates between one State and another is hindered and it is difficult to combine the data at the all-India level.

State-wise monthly data of agricultural wages in India are published in *Agricultural Wages in India*. Although that publication also reproduces a scheme for the collection of statistics of wages of agricultural labour, there is no indication of the lines on which the data are actually being collected in the various States and whether

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there are any differences in concepts, definitions and methodology or collection or of compilation and tabulation from State to State. In fact, publication of the scheme referred to in the *Agricultural Wages in India* seems to imply that all the data of wages published in that publication have been collected in accordance with that scheme and, to the extent this be not correct, it is somewhat misleading. Even as it is, there are several questions which arise in connection with the collection and tabulation of data relating to agricultural wages.

Collection of data.—Data for wage-rates of agricultural labour collected from a village may mean (1) wage-rates prevailing in the village, or (2) wage-rates obtained by agricultural labourers residing in that village by working in neighbouring villages, or (3) wage-rates paid by residents of the village to agricultural labour engaged for work actually done outside the village. It seems necessary clearly to define to which of these categories data to be collected shall belong. Normally, it should be the first of these three categories.

An important question which arises regarding the scope of collection of such data is whether data be collected for skilled agricultural labour or unskilled agriculture labour or both. At present *Agricultural Wages in India* publishes data of wage-rates for three categories of skilled labour, namely, carpenter, blacksmith and cobbler; although one State completely excludes all skilled labour and another leaves out the cobbler. Even in case of other States, quotations for wages of blacksmith are either missing or mostly identical with wage-rates of carpenter, and the question, therefore, arises whether it is worth spending time, money and labour on collection of data relating to wage-rates of blacksmith in rural areas. The question arises with added force in respect of other types, such as the cobbler, for which quotations are still more rare.

The data on wage-rates of unskilled field labourer are published separately for each of four or five different field operations, such as ploughing, sowing and transplanting, weeding, reaping and harvesting. It is interesting to observe that while in all other States reaping and harvesting are clubbed together, in one State wages for reaping are given separately from wages for harvesting and the wage-rates for the two are also different. A closer study, however, reveals that this is only because of difference in definition and in the latter case harvesting is intended to mean threshing. This only emphasises the need of an explanatory note regarding the data collected in the different States.

Another question to decide in this connection is with regard to the type of labour for which data are to be collected. Generally, data relating to wage-rates are being collected and published separately for men, women and children for each of the general classes of field labour, other agricultural labour, and herdsmen. In some States, however, data for these three types are collected separately also for the various occupations under skilled labour, but quotations against wage-rates of women and children are, in such cases, rare. Considering that when one inquires about level of wage-rates of agricultural labour, the intention generally is to refer to men, data relating to wage-rates for men only should ordinarily be sufficient. For specialised study seeking to analyse the differences between wage-rates for men, women and children, wage-rates for women and children would also be needed. In any case, if a single index of wage-rates is to be prepared and published, it should preferably relate to wage-rates for men only. A composite index seeking to combine suitably the three wage-rates presents difficulty and a simple average of the three is likely to be misleading, if not meaningless. Separate indices for men and women and children may, however, be prepared, if resources permit.

The type of wages on which data are to be collected deserves some care. In the background of our rural economy, where old traditions and customs regarding payment of wages still continue, it is a point for consideration whether data of wage-rates should be those of daily wage-rates, or of seasonal wage-rates, or of conventional wage-rates, or piece-rates as against time-rates. All these types except the first are likely to present such complex diversities that real comparison would be difficult, and, therefore, data for daily wage-rates would be the most suitable, to start with. It is, however, important to guard against the half-truths such as, for example, those which conventional wage-rates carry in them.

The type of agricultural economy which we have in our rural areas gives rise to another very important question. If wages were always paid in cash, it would be relatively easy to collect their data. Actually, however, in many cases wages of agricultural labour are paid in kind, often in cash and kind together. This leads to a certain degree of complication in so far as kind payments have to be evaluated into their money equivalent. This raises the difficulty of reliable information relating to weight of kind payment; the kind payment is practically never given after actual weighing; it is generally given in accordance with some traditional form of measurement, which may, therefore, involve variations from one employer to another. In any

case, the information obtained is not strictly factual but only an estimate of the weight of kind payment. Apart from this, the problem of evaluation raises the question whether the prices at which the money equivalent has to be worked out should be retail prices or wholesale prices or producer's prices and whether they should be current prices or prices at the harvest time. Besides, kind wage-payments have to be distinguished from what are often called perquisites. Kind payments are a part of the contractual wage-rate, even though the contract may be traditional or verbal; they are a necessary part of the wage to be paid. Perquisites, on the other hand, are understood to be different from kind-wages in so far as they are not a part of the contractual wage-rate and, therefore, they need not necessarily be paid by every employer. They thus depend on the generosity, nature, or mood of the employer. Thus, for instance, a handful of *chavena* may be a form of kind-wage, to be paid by every employer; but a *lota*-ful of *sharbat* during the hot season may replace simple cold water in case of some employers. The question thus arises whether perquisites should be included or excluded when the total wage-rate is calculated: their exclusion would bring down the more generous employer at par with others; their inclusion may introduce another undependable element of variation in wage-rates from one employer to another within the same village or area.

Another important question in the collection of such wage-rates is with regard to the periodicity of their collection. This is not merely a matter of resources. Agriculture, extending as it does over the whole year, is in a way, a seasonal industry, with its peak seasons and off seasons. Wages of agricultural labour also, therefore, record a certain degree of seasonality. It is important that the periodicity of collection should catch-hold of this seasonality. The time interval after which data are to be successively collected cannot, therefore, be permitted to be too long. For instance, quarterly collection may, in some cases, fail to register the seasonal variations actually taking place within the quarter, particularly if the period for which the seasonal variation comes into existence is short enough, such as, for instance, a fortnight or a month. It is, no doubt, true that changes in the wage-rates of agricultural labour are not frequent: even when the general price-level changes or urban wages themselves undergo changes some tradition and custom and the personal basis of relationships in rural economy tend to resist changes in agricultural wage-rates. But this basis is gradually giving place to competitive or what may be called urban relationships. Even so, changes in such wage-rates are not so frequent as to necessitate a daily or weekly collection of data. Even

a fortnightly collection may perhaps be too often. It is hoped that the monthly system of collection, which is now being followed in the various States, does not fail to register all seasonal variations in agricultural wage-rates.

The type of wage-rates to be collected having been decided, the question still remains as to what type of data to collect: whether they should be figures of actual wage-rates prevailing on a particular day or the modal or the most common wage-rates over a given reference period, such as a month. If, the data are to represent the most common wage-rates prevalent during a specified period, such as, for instance, a fortnight or a month, the investigator has necessarily to be given a certain degree of latitude. While wage-rates relating to a day tend to be nearer the standard of accuracy, they may fail to be representative enough if the frequency of collection is once in a month or a longer period. For this reason, when the periodicity is monthly, it seems desirable to ask for wage-rates which are most common during the preceding month. An alternative, which may combine the advantage of both, may be to get wage-rates as on the day preceding the day of survey, followed by close inquiries whether those rates differ from the wage-rates most common during the preceding month and, if the answer be in the affirmative, to make a note also of such later wages.

A point of great practical importance, and also of some difficulty, is with regard to the type of sample to be selected for purpose of collection of data relating to agricultural wage-rates, should the villages to be selected be selected purposively or should they be selected by the process of random sampling? The question is one of sample size and, therefore, ultimately relates to resources available. Wage-rates within the same village or area may not change frequently and may not show appreciable difference from one employer to another or one agricultural labourer to another, but between one area and another, even within the same district, variations are not infrequent or inconsiderable. Every district generally has an urban centre surrounded by a certain sub-urban area. As one moves from the urban centre to the sub-urban area and further into the interior, one is likely to find marked variations in wage-rates. A single village within a district is not likely to reflect adequately these varying wage-rates. Purposive selection of villages is, therefore, likely to lead to inaccuracy apart from the unknown bias. Random selection of villages would, on the other hand, ordinarily indicate a larger sample size, but if resources do not permit this, the alternative is to rely on the information

collected not at the district level but a sufficiently higher level where the random sample may give a fairly satisfactory answer.

A connected question is whether the sample of villages selected be fixed or changing. While there are some obvious advantages in having a fixed sample when the purpose is to measure variations over time, it is obvious that collection of data relating to agricultural wage-rates would be very costly unless it is combined with some other inquiry or unless there is a reliable and cheap local agency available to report such data. In some of the States, data for wage-rates of agricultural labour are collected as part of a socio-economic inquiry, for which the villages are selected by random sampling and remain fixed for a period of three years. When the sample villages have to be changed, it would be necessary to collect data of wage-rates from both the old sample of villages and the new sample of villages simultaneously for some period in order to connect the two series satisfactorily.

An aid to better reliability is extension of coverage. Subject to resources being available, it is, therefore, preferable to cover all the districts in a State. At the all-India level, the only important State so far left out is Rajasthan apart from Jammu and Kashmir.

The question of agency which should take up the work of collection of data of agricultural wage-rates is really not important, so long as data collected are reliable and available with a satisfactory time-lag. The various possible agencies at the State level are the Agriculture Department, the Labour Department, the Planning Department, the Finance Department, and the State Statistics Departments or Bureaus. At the field level, however, the agency is important if reliability is to be ensured. In all States there is now, a network of development blocks covering the entire State and at each development block there is a whole-time statistical agency generally designated as progress assistant. The desirability and feasibility of utilising this agency for collection and reporting of data of agricultural wage-rates with adequate frequency deserves examination in the interests of economy and reliability.

Tabulation and analysis.—If the data collected have to yield their full value, it is necessary to ensure speedy and punctual returns. This is even more important in a system of monthly collection of data. An unduly long time-lag robs the data of such of their value, apart from their value as a record. Time-lag in publication is, however, also a function of the printing process. For instance, even though data for wage-rates in the different States are collected and published

on a monthly basis the latest issue of *Agricultural Wages in India* now available is for the year 1959-60.

If the data collected at the village level are to be combined into some sort of regional or State average or index, it is important to guard against inadequate number of basic quotations in each cell. This risk increases when the data are collected for a large number of categories of agricultural labour, some of which are not generally met with in the villages. For instance, in one State, although data relating to wage-rates of the blacksmith, cobbler and brick-layer are being collected, they have to be excluded from regional and State averages or indices because quotations for these categories are too few.

The problem of missing quotations has to be handled carefully. A quotation may be found missing either because data were not collected from the village in question, for whatever reasons, or there was actually no quotation available in the village in question. The practice commonly followed when a quotation is missing is to assume that no change took place in the intervening period and to repeat the preceding quotation. This practice may not be found always to give the best results; the period for which the quotation is missing may have been the period of short-term seasonal fluctuations. A better alternative may, therefore, be to take into account the quotation available from the immediate neighbourhood. For instance, if two villages have been selected from a district and the quotation in a particular month is missing from one of them, it may be better to assume for such village a quotation which would indicate the same variation from the preceding month as is shown by the quotations from the other village in the district, than to assume that the village in question had no variation in its wage-rates during the month.

When data from the villages have to be worked into a regional or State average or index, it is important to see that such average or index avoids to record what may be called merely statistical changes. Care has to be taken that the process of calculation followed provides for sufficient safeguards in this respect. This is specially important when all the normal quotations are not actually available.

Use.—In spite of the defects, known and unknown, existing in the present series of data of agricultural wage-rates in the different States under the various heads to which reference has been made above, there is no doubt that a great headway has been made already in the collection and publication of these data on a comparable State-wise basis. Much more has, of course, to be done. There is need for a

central initiative and drive with a view to laying down mutually acceptable standards under the various heads, and to see that data in accordance with proscribed standards are actually collected on a reliable basis in all the States. In particular, where any of the data published differ from the standards laid down, it is necessary to draw attention to them in the same publication, so that the research worker may not be misled into unsound comparison.

Data for agricultural wage-rates are already being used in some States in the preparation of what are called agricultural parity index numbers. They can perhaps be used on a wider and more uniform basis in all the States of India.

There is at present no regularly published cost-of-cultivation index for any State or region in the country. Such an index is important and would be useful. Data for agricultural wage-rates already being collected should lend themselves to use in this connection. Their scope and comparability may be further improved to make them more useful in this connection.

In view of the wide divergence between agricultural wage-rates in one part of a State and another, even between one part of a district and another in some cases, it is important to consider carefully whether data collected from villages could be combined usefully at a higher regional or State level. It would seem preferable to combine them in this manner through an index which seeks to indicate variations to combining them into averages which seek to indicate absolute level.

Finally, if data for agricultural wage-rates are available from all States of India on a comparable basis, the question whether they can be usefully and meaningfully combined into an all-India index of agricultural wage-rates deserves careful consideration. It may appear that, particularly in view of the very wide variations in wage-rates between one corner of the country and another and also of the wide differences in the purchasing power of money and in the real values of kind payments, that such an index would be meaningless. Like the all-India Consumer Price Index, however, such an all-India index of agricultural wage-rates might serve the purpose of international comparison, if it serves no other purpose. It would, however, be necessary that international standards, concepts and definitions be laid down if such purpose is to be served. It may also be necessary to provide for a bigger or a more representative sample, which can reflect correctly real variations in agricultural wage-rates, after making due allowance for sampling and other errors.

SHRI J. P. BHATTACHARJEE¹²: *Statistics of Cost of Cultivation and Farm Management*

Broadly speaking, these statistics deal with the cost of cultivation of different crops; the man-power, land and capital structure of farms; and input, output, net returns for different enterprises as well as the farm as a whole. A field defined as widely as this needs an abbreviated description. It is accordingly proposed to refer to our field of discussion as farm economic data or statistics.

The ultimate objective behind the collection and analysis of farm economic data may be one or more of the following:

- (a) To secure improvements in the resource use in agriculture or on farms through price manipulation;
- (b) To attempt an adjustment or modification in the allocation of resources on the farm through farm planning or any simpler approach to agricultural extension; and
- (c) To bring about a socially desirable redistribution of income among crucial factor classes or groups.

Another objective which usually plays a secondary role is to obtain information in some detail about particular features of the farm economy. It is to serve these objectives that farm economic surveys are carried out, and statistical and economic analyses of the survey data conducted. Such analysis involves the derivation of factor: product, product: product and other relationships, estimation of cost of production of different commodities and cost functions for different enterprises and farms, and the working out of parity ratios on crop or farm or sector basis.

In their origin, farm economic surveys in India have been essentially State endeavours. While important contributions have been made by a few research institutions, by and large, the bulk of such surveys have been carried out by Commodity Committees and the I.C.A.R. in order to estimate cost of production of important farm products. The farm management surveys carried out in the fifties have marked a departure from this line of approach, in the sense that estimation of cost of production of different farm produce was not among their primary objectives. And more recently, with the intensification of agricultural extension in the direction of farm planning in the Package districts, there has been an increasing recognition of

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the need for data on input-output ratios, enterprise-combination and substitution relationships, net returns and other indexes of farm efficiency. In short, the history of farm economic surveys in India shows that while the need for cost estimation has remained with us, there has been a phenomenal increase in the requirement of data for the administrative planning of agriculture and for the extension planning of operation and management of farms. How far have we been able to meet these needs? And what are the more important gaps?

Enterprise costs or so-called costs of cultivation of crops.—With the growing emphasis on, and the gradual emergence of a price policy, it appears that the Government will need more and more data on the cost of production not only of commodities like cotton, sugarcane, jute and other commercial crops, for which some data are either available or regularly collected, but also of rice, wheat, jowar and other foodgrains. Since the present policy is to announce floor prices, particularly in respect of foodgrains, the cost data that are needed will have to throw light on the level at which the floor can be fixed, the proportion of the total production of a particular commodity to be covered by the floor price and the distribution of the benefits of this type of price support among different classes of producers. Apart from cost data as such, the pursuit of a producer-oriented price policy will require information on the marketing margins and their fluctuations. In other words, estimates will be needed of costs of the commodity at different points from its cultivation on the farm to its ultimate destination at the consumer end.

Since cost and prices display considerable regional variation, such data will have to be obtained and analysed separately for different regions, particularly for foodgrains like rice, wheat and jowar. It is in this context that there is need to plan future cost studies with a view to deriving representative estimates for different type-of-farming areas. I am afraid the available statistics are inadequate in so far as representativeness of different type-of-farming areas is concerned. More of attention should be given in future to the delineation of different farming-type regions and planning cost studies with a view to obtaining a systematic coverage of these. I am afraid we have not yet settled the issue of the factors that should be taken into account in differentiating types of farming. Yet, this issue is basic in any discussion of not only costs of crops produced, but also of any land-use or crop-planning which is gaining in importance in our development approach.

A point that has been sometimes hotly debated is whether very small farmers should be included in any frame for the study of cost of cultivation. The available data tend to show that the holding group, below 0.5 acres, accounts for more than 30% of the farmers but less than 3% of the cultivated area in many regions. Since a very high proportion of the output of this group of holdings is consumed at home, the relevance of their cost for the purpose of price fixation can be seriously questioned. The question may justifiably be asked as to how much of an incentive the price offers to them. In any case, for this group of farmers, relief and rehabilitation measures like rural works, rural industries, etc., are likely to be more beneficial. If this point of view is agreed to, there is obviously a need for reconsidering the sampling design that we have been following in our farm economic surveys.

Farm Management.—What has been said above in respect of cost data applies with equal strength and justification to data on the resource, use, efficiency and production response aspects of farm operation. I am afraid we have not conducted enough of methodological studies to solve some of the baffling problems of specification and quantification. Even now, we do not know how best to treat or evaluate land as a factor or input so that quality differences are properly taken care of. I have been convinced that we have given a disproportionately high proportion of our time and attention to conducting multi-purpose surveys and too little to the analysis of the data and the solving of many of our outstanding methodological problems.

There is also an additional difficulty here which is not likely to be removed through more and better surveys. Even simple partial farm planning needs quantitative information on a number of input-output coefficients. In the context of Indian Farming, however, many of the new inputs round the use of which farm planning has to be based, are used by so small a proportion of farmers, and in some cases in such low quantities that analysis of survey data seldom will yield a reliable measure of such ratios. The usual approach in situations like this is to build up such ratios in a synthetic way, first by accepting those derived from agronomic or other experiments and then modifying them in the light of field situations. In any such attempt, there has to be a co-operative endeavour by agronomists, agricultural chemists, statisticians and economists. We have been emphasising this line of approach for quite some time; unfortunately, not much progress seems yet to have been made. As an illustration of the type of problems that may arise in the absence of an effective

co-ordination of the needs of economists and agronomists in planning varietal and treatment trials, etc., I may cite the frustration that some agricultural economists have felt in trying to analyse the economics of fertiliser use with special reference to combination of different types of fertilisers in different doses. The fertiliser trials conducted in different parts of the country *usually* provide for two levels of application (dosage) of N or P or K, while an economist would like to have observations on yields in response to a larger number of dosages on each type of fertiliser as well as combinations of these in different proportions. I believe that problems like this will not arise if the needs of economists are taken into account by agronomists and others before planning such trials and experiments. Agronomists may also have similar complaints against economists. The lesson is for all concerned to get together.

Another problem that is arising in the integrated approach to agricultural extension is the lack of information on response coefficients for a package of practices instead of one or two individual inputs taken separately. This raises a number of questions like how to specify packages and classify them on some basis. It is obvious that a detailed specification is out of question and one has to go by a limited number of packages that can be successfully advocated. Here also, our past experience which has been heavily weighted in the direction of bi-variate analysis does not provide us with enough data. What has been said in the concluding portion of the last paragraph applies with greater force here. It is hoped that the surveys being conducted currently in some of the package programme districts would throw more light on this question.

Finally, there is the question of yardsticks used for estimating production potential for the purpose of national planning. It is time to take a closer and more critical look not only at the yardsticks as these have been estimated, but also at the whole approach underlying them. The statistical basis of some of the yardstick estimates is known to be inadequate. Many of the States have adopted the all-India estimates without trying to adjust them in the light of the regional conditions and on the basis of local surveys. But a more fundamental objection relates to a yardstick approach that ignores the multi-variate nature of the production relationship with considerable interaction among the variables. Thus, response of fertilisers is dependent on the nature of the varieties selected, the extent of irrigation, etc. Soil conservation in the sense of contour bunding is one thing; while bunding followed by conservation farming is quite

different in its impact on productivity. Interaction is a law of nature; and not all interactions are positive or in the same direction. With a growing multi-dimensional extension programme, the statisticians and economists have a duty now to develop a multivariate approach to such response analysis.

SHRI V. G. PANSE¹³: *Comparability of Agricultural Statistics*

For valid use, agricultural statistics should be strictly comparable both in relation to time and geography. Otherwise they can be grossly misleading; as for instance, when changes due to greater coverage are misinterpreted as real changes or differences in the method of collection are mistakenly ascribed to geographical differences. Agricultural statistics in India such as those of land utilization, crop acreages, yields, prices, etc., are undergoing continued improvement as more areas become reporting and more scientific methods of collection are brought into use. As a consequence of this improvement itself, comparability is lost and it becomes necessary to restore it.

Factors affecting comparability of statistics are concepts and definitions, methods of collection and coverage. Uniform concepts and definitions are necessary for comparability of statistics geographically as well as in time. Lack of this uniformity is a widespread defect in agricultural statistics; for instance, crop acreages include bunds surrounding fields, field channels and other similar areas in some cases and exclude one or more of these in others. A mixed crop like maize and arhar which is usually treated as a crop mixture was considered a case of double cropping in Bihar. Similarly in crop yields and in prices it is important to lay down the specific point at which these are to be recorded. Yield can be recorded at the field, at the threshing floor, or in the farmer's godown. Similarly the prices can be determined at the farm gate, at the village, at the primary market and so on. If concepts and definitions change from district to district or State to State or in the same area over a period of time, resulting statistics will not be comparable. In this connection very useful work is being done by the Directorate of Economics and Statistics to introduce uniform concepts and definitions over the whole range of agricultural statistics. This was done earlier through a Committee for Co-ordination of Agricultural Statistics and now by a Standing Committee. This is a continuing task which it is hoped will be carried on uninterrupted.

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Scientific methods of collection have their own impact on the quality of agricultural statistics. We have made considerable advance in the quality of statistics and land utilization, crop acreages and yields. At the lowest level of quality are the chowkidari statistics of the old permanently settled areas in East India, which are now being improved through the use of sample surveys for enumeration of acreages and measurement of crop yields. At the other extreme, there are States which have well-established and detailed land record system, which provides accurate statistics of land utilization and crop acreages by a method of complete annual enumeration while yields are measured through crop-cutting surveys. In price statistics also there has been considerable improvement by collecting price data properly defined from an evenly spread sample of centres. All the same even today agricultural statistics are at different levels of quality in different parts of the country. For example, statistics of land utilization and crop acreages are still not based on field measurement everywhere. The system of crop-cutting surveys has yet to cover all crops and all areas.

The coverage of agricultural statistics has also increased considerably since Independence, although a few non-reporting pockets still persist even in the basic statistics of land utilization. The steadily improving coverage of area and yield statistics had presumably some effect in showing increased trends of production and it is of utmost importance that this effect should be eliminated from these trends.

The problem of loss of comparability in statistics resulting from factors mentioned above has to be tackled adjusting past statistics to bring them on par with the current level of quality. Since this level is changing all the time, it follows that this adjustment has to be made periodically. This is an inconvenient procedure in that the statistical series recorded in the past will be replaced by new series each time an adjustment is made, but this is inevitable if we wish to study statistical series that have been freed as much as possible from defects of varying degree of coverage, variable concepts and definitions and relatively unscientific methods of collection. It is suggested that various series of agricultural statistics should be adjusted every 10 years in order to bring them to the current level of quality. Actual changes resulting from adjustment will tend to become insignificant as coverage becomes practically complete and as scientific methods of collection are adopted universally on the basis of agreed concepts and definitions.

A simple chain method of adjusting past data to bring them in line with current quality has been illustrated by Panse and Menon on agricultural production ("Index Numbers of Agricultural Production

in India"—V. G. Panse and V. S. Menon—*Ind. Jr. Agri. Eco.*, 1961, 16, 18-36). According to this method if P is this year's production of a crop and P_{-1} that of previous year's and P' production of this year for the same coverage and by the same methods of collection of data as during the previous year, then adjusted production for previous year is $= (P_{-1} \times P)/P'$. This adjustment requires that for each year quantities P and P' should be available. The Directorate of Economics and Statistics was able to make these two sets of figures available over a series of years with the help of which adjusted series of production for all crops were calculated over the period of 10 years from 1949-50 to 1958-59 and are given in the above paper. The adjustments did smoothen the series for several crops, such as jowar, bajra, maize, wheat, gram, linseed and rice, but the most drastic change was brought about in the series for tur by raising the production for 1949-50 from 1 million tons to 1.8 million tons.

Adjustment by this method can be effected separately for crop acreages and yields, since adjusted production is the product of adjusted area and adjusted yield. Further, it is desirable to formulate these adjusted series for each State and for each district, if possible, so that they provide a much more accurate trend than by adjustment only at the All-India level. Part of the adjustment will be for change of coverage and part for change in the methods of collection of data as well as in concepts and definitions. All agricultural statistics series could be subjected to similar adjustments.

To ensure that the requisite data are available for adjustment in future, it is necessary to record, following the commendable example of the Directorate of Economics and Statistics, current year's statistics in both ways, namely, as those obtained on current coverage and by current methods of collection as well as those obtained by the previous year's coverage and the previous year's methods of collection. Secondly, as was recommended at an earlier Conference of the Society, the Directorate of Economics and Statistics should bring out for each year a memorandum of annual production statistics, giving details of coverage and methods of collection adopted. This memorandum should also contain decennial adjusted series of area, yield, production, etc., as being the ones latest available.

Lastly, the entire problem of improvement of agricultural statistics including introduction of uniform concepts and definitions and scientific methods of collection of data with maximum possible coverage is closely tied to the problem of strengthening the primary reporting agency. The solution of this problem does not appear to be in sight so far and renewed and sustained efforts are required to resolve it,