Proceedings of the Symposium on
"Statistics of Horticultural Crops : Problems and Issues"

The symposium on "Statistics of Horticultural Crops: Problems and Issues" was held during the 54th Annual Conference of Indian Society of Agricultural Statistics at NDUA&T, Kumarganj, Faizabad during November 28-30, 2000. The symposium was held on 29th November, 2000 under the Chairmanship of Shri V.R. Rao, Former Director General, Central Statistical Organisation, Dr. H.V.L. Bathla, Head of Division of Sample Survey, Indian Agricultural Statistics Research Institute, New Delhi was Convenor and Director of Horticulture, U.P. was Discussant for the Symposium. In all, nine papers were received for the symposium. Out of these, the following six papers were presented by the officers from the concerned organisations as follows:

1. Horticultural statistics - Source, system and status of information (Shri Mohan Rao, NSSO, FOD, New Delhi).

2. Status of estimation of statistics on horticultural crops in the Karnataka state (S. Nanjinda Rao, Deptt. of Eco. & Stat., Karnataka).

3. Statistics of horticulture - Some issues for consideration (T. Baskaran, National Statistical Commission).

4. Methodological aspects of horticultural crops - Problems and prospectus (G.K. Jha and H.V.L. Bathla, IASRI, New Delhi).

5. Status of horticultural crops in the state of Punjab (H.S. Cheema, Deptt. of Horticulture, Punjab).

6. Status of horticultural crops in U.P. (S.P. Joshi, Deptt. of Horticulture, U.P.).

The two papers contributed by NAD (CSO) and DES were presented on their behalf by T. Baskaran, Jt. Director, NSC and Dr. H.V.L. Bathla, Head of Division (Sample Survey), IASRI as follows:

1. Statistics of horticultural crops - Data collection and organisational problems (ESA paper) - presented by H.V.L. Bathla.

2. Statistics on horticultural crops, availability and gaps in the context of National Accounts (NAD, CSO paper) - presented by T. Baskaran.

The presentations highlighted the problems and issues related to development of methodology, its implementation and users of statistics so

generated. After detailed discussions, the following recommendations were made:

1. The current system of crop inspection and reporting (girdawari) should continue to be the basis of estimates of area under fruits and vegetables despite present shortcomings as this alone is capable of providing the data at the local level of Panchayats.

    Urgent measures are required to improve the present system by (i) rationalising land records, (ii) reducing the work-load of the village officer (patwari), (iii) ensuring that girdawari is given high priority and the patwari carried it according to prescribed procedures, and (iv) making higher level officials accountable for satisfactory conduct of this work.

2. Simultaneously urgent attention needs to be paid to use the potential of remote sensing and GIS for estimation of area under horticulture crops.

3. Discrepancies in the statistics produced by DES and NHB need to be resolved by joint studies.

4. IASRI along with experts from Horticulture and Marketing departments should try to evolve a simplified methodology for estimation of production of major horticultural crops. Alternative methods for estimation of production like using data of arrivals in the primary market, etc.

5. Suitable methodology for estimation of production in case of floriculture, mushroom, herbs, etc. needs to be evolved.

Horticultural Statistics — Source, System and Status of Information

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1. Introduction

1.1 Horticulture, which has gained commercial tone in the recent years, is an important component of Agriculture, having very significant share in the economy of the country. A wide variety of soil and climate of India permits growing of diverse horticultural crops numbering about 100 in different parts of the country. These put together cover approximately 5.23% of the total

cropped area (8.7 million hectares) with an annual production of about 114 million tons making an over all contribution of more than 18% in the gross agricultural out-put of the country. During 8th and 9th five-year plans, the development of horticulture has been given higher priority. Due to implementation of various programmes, there has been tremendous progress in the production of fruits and vegetables in terms of both quality and quantity. India has emerged as the 2nd largest producer of fruits and vegetables after China in the World. It has high potential to grow further as reported in Ministry of Agriculture Publication.

1.2 In spite of India being a major producer of horticulture crops, the data base on this aspect is found to be inadequate. The present status of compilation and availability of horticultural statistics by various agencies in respect of area, production, prices, consumption etc. are described in succeeding paragraphs.

2. State Government

2.1 States conduct General Crop Estimation Survey (GCES) for obtaining estimates of average yield rates of various food and non-food crops. Under this survey only 9 fruits and 13 vegetables crops are covered. As such, data on average yield rates for these horticulture crops are available regularly alongwith those of food and non-food crops covered by the survey. Due to special features, estimation of the extent of cultivation and production for other horticulture crops is somewhat different from that of others and the methodology being followed under GCES does not suit for most of the horticulture crops.

2.2 IASRI has developed a methodology for estimation of area and production of fruits and vegetables in the country. This methodology has been perfected and recommended to the states for adoption in estimation of yield rates and production of these crops. Eleven states have adopted this methodology under the central sector scheme for "crop estimation survey on fruits and vegetables" on pilot basis and prepare estimates only for 7 fruits (Apple, Mango, Citrus fruits, Pine apple, Grapes and Guava) and 7 vegetables (Potato, Cabbage, Cauliflower, Onion, Tomato, Ginger & Turmeric) crops. These states are AP, Gujarat, Haryana, HP, Karnataka, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu and UP. The scheme does not cover other states and other horticultural crops. Under the present scope of the scheme, therefore, All India estimates of area and production of various fruits and vegetables cannot be generated as all of the states are not covered. Moreover, the scheme is not being implemented properly due to difficulties in following the methodology suggested

by IASRI. Some of the difficulties reported by states implementing the pilot scheme are given below.

(i)   Total area under fruit crops is not recorded by the village level primary workers as fruits are also grown on canal banks, field bunds, road sides, backyard of houses and even stray trees.

(ii) It is difficult for the staff who conducts crop cutting experiments to be present at time of every picking as harvesting of fruits and many vegetables is done in a number of pickings extending over several weeks.

(iii) Short duration crops of vegetables which are sown and harvested between two Girdawari periods are missed and therefore their area and production goes unreported.

(iv) Land record manual in many states does not provide for recording of all important crops of fruits and vegetables and recording is done for many of the crops taken together.

(v)   Even in case of the crops of fruits and vegetables wherever land record manual provide for recording of certain crops, Girdawari is not done correctly by the primary workers and therefore it does not give correct picture of area under that crop.

(vi) Crops grown on Government land/ unauthorised land are not included in Girdawari.

(vii) The area under vegetable and fruit crops grown in backyard/ fore-yard of houses remains unreported in the present system.

2.3 Recently, Ministry of Agriculture has consolidated the results of the Pilot Scheme from various states and brought out the publication "Report & Data Base of Pilot Scheme on Major Fruits and Vegetables (1982-83 to 1997-98)". The publication contains state-wise, crop-wise data, to the extent possible, on area and production of major fruits and vegetables for the period from 1982-83 to 1997-98. Data on area and production of important fruits & vegetables is available through the pilot scheme for 1997-98.

3. National Horticultural Board (NHB)

3.1 Horticulture produce being perishable in nature have very short shelf life and therefore have to be traded immediately. The farmers usually find it difficult to decide about the specific market and take quick decision regarding disposal of their produce. In order to redress this problem NHB launched "Market Information Service" in 1988 to generate useful information on price and arrival trends in various markets of the country for important fruits and vegetables. For this purpose, the NHB identified twenty two centres and eleven

sub-centres located in important cities of the country. The state-wise major market centres are : Andhra Pradesh — Hyderabad, Vijayawada; Assam — Guwahati; Bihar — Patna, Ranchi; Gujarat — Ahemdabad, Surat; Himachal Pradesh — Shimla; J&K — Srinagar, Jammu; Karnataka — Bangalore; Kerala — Trivandrum; M.P. — Bhopal, Indore; Maharashtra — Mumbai, Nagpur, Nasik, Pune; Orissa — Bhubaneshwar; Punjab — Chandigarh, Jalandhar, Abohar, Amritsar; Rajasthan — Jaipur; Tamil Nadu — Chennai, Madurai; U.P. — Lucknow, Agra, Kanpur; West Bengal — Kolkata; Delhi — Delhi. From these centres, data on whole sale and retail prices and arrivals of important fruits and vegetables are collected. The information so obtained is disseminated through its monthly publication "Horticulture Information Service". The publication reveals whole sale average price and arrival trend of fruits & vegetables of commercial importance in major Indian whole sale market and also information on retail prices in metropolitan markets.

3.2 The NHB also issues "Daily Market Information Bulletin" containing market information on fruits and vegetables traded on the same day in major whole sale fruits & vegetables markets in India. The daily information is published in 218 news papers in Hindi/English/ local languages and is broadcasted to 22 All India Radio Stations and 8 Doordarshan Kendras. Data on retail prices and arrivals for important fruits and vegetables in metropolitan cities for Sept., 1999 is available.

Limitations of Data of NHB

3.3 Estimation of production of fruits and vegetables crops on the basis of market arrivals, however, can not be relied in view of the deficiencies in the coverage of arrival data as given below:

(i)   the approach does not capture the produce supplied directly to factories from field,

(ii) the approach misses farmer's household consumption,

(iii) the produce going to markets located at places other than identified centres and sub-centres is not covered in the arrival data.

4. NSSO

4.1 National Sample Survey Organisation (NSSO) under Ministry of Statistics and Programme Implementation is another source of data for this sector with regard to prices as well as consumption. NSSO has been collecting prices of selected commodities including fruits and vegetables since its first round (1950-51) under the Socio Economic Survey. Wholesale and retail prices were

being collected by the NSSO till 1957-58. Prices were collected from randomly selected centres located in rural and urban areas. NSSO discontinued collection of wholesale as well as retail prices in urban areas since 1958-59. However, rural retail prices continued to be collected every month. In the year 1961-62 the schedule design and number of villages for collection of rural retail prices were modified. Accordingly, prices were collected under the scheme of Rural Price Collection (RPC) from a fixed set of 419 villages till 1984-85 in respect of items generally consumed by agricultural labourers in rural areas on behalf of Labour Bureau. These price data are also used for construction of consumer price index for agricultural labour. With a view to reflecting the price changes in respect of the consumption pattern of the agricultural labourers, a new commodity basket of 260 commodities has been adopted. The collection of price data for the new basket of commodities are now being done every month from a fixed set of 603 village markets spread over 21 states. The procedure being followed for collection of prices is briefly given below.

4.2 In some of the rural samples surveyed under socio-economic survey, primary enquiry is conducted regarding the markets most popular among the rural labour population, particularly in the sample village as well as about the commodities with specifications which are mostly consumed by it. The most popular markets catering to the needs of this class of population are selected. Then in the selected markets popular shops are listed and selected for price collection. Two most popular shops are selected for each of the commodity group. The first is named as primary shop and other as reserve shop. Thus, the frame for price collection is prepared and is revised from time to time with respect to popularity and disappearance of commodities and markets as also emergence of new markets/items. Prices are collected from the selected shops once in every month, the date being first Saturday of the month where the market is daily one or the first market day where it is non-daily market.

4.3 From urban sector, retail prices of commodities including fruits and vegetables are collected under Middle Class Price Collection (MCPC) scheme. The data collected under the survey is primarily used for construction of consumer price index number for urban non-manual employees by CSO, New Delhi. Through this scheme, the prices are collected from 59 centres spread all over the country. The centres are allocated to different states in proportion to their urban population subject to maximum of 5 centres in a state. All the state capital are compulsorily selected. The remaining centres allotted to state are selected on the joint consideration of regional representation, population content and middle class concentration.

4.4 For collection of prices, more or less similar procedure as adopted for Rural Price Collection (RPC) is followed for this sector. However, unlike rural price collection where the prices are collected once in every month, in the urban sector, the number of price quotations for each centre are worked out broadly on consideration of the population of the centre and the workload for investigator. Selected centres are then classified as single, double & triple Investigator centres numbering 48, 8 and 3 respectively. 12 quotations, 24 quotations and 36 quotations respectively are collected from single, double & triple Investigator centres each month.

4.5 NSSO conducts consumer expenditure survey (CES) once in every five years. Item coverage includes quantity and value of consumption of fruits and vegetables by the household during reference period. More than one lakh households in the country, are covered in the quinquennial rounds. The consumer expenditure survey is also carried out annually in a thin sample of around 30,000 households.

4.6 The geographical coverage of the survey is the whole of Indian union except the Ladakh and Kargil districts of Jammu & Kashmir, 768 interior villages of Nagaland and 172 villages in Andaman & Nicobar Islands which remain inaccessible throughout the year.

4.7 Under this survey, data on quantity and value of consumption of 30 vegetables (potato, onion, radish, carrot, turnip, beat, pumpkin, gourd, bitter gourd, cucumber, parwal, jhinga, snake gourd, papaya (green), cauliflower, cabbage, brinjal, lady's finger, palak, french beans, tomato, peas, chillie (green), capsicum, plantain (green), jackfruit (green), lemon, other vegetables), 17 fresh fruits (banana, jackfruit, watermelon, pineapple, coconut, guava, singun, orange, papaya, mango, kharbooza, pears, berries, leechi, apple, grapes, other fruits) and 8 dry fruits/nuts (coconut (copra), groundnut, dates, cashewnut, walnut, other nuts, raisin, other dry fruits) are collected from the selected households for last 30 days from the date of survey.

4.8 Value of consumption out of purchase is evaluated at the purchase price. Consumption out of home produce is evaluated at ex-farm or ex-factory prices. Value of consumption out of gifts, loans, free collection and goods received in exchange of goods and services is imputed at the rate of average local retail prices prevailing during the reference period. Results of the latest consumer expenditure survey (55th Round of NSSO) conducted during 1999-2000 are expected to be available shortly.

4.9 State-wise average monthly expenditure per person on consumption of fruits and vegetables in rural and urban area based on the data collected

during 1993-94 and quantity and value of consumption of important fruits & vegetables per person for a period of 30 days at all India level are available. Similar consumption data is also available for each state.

5.0 It is evident from the above that various agencies are involved in collecting various types of data relating to fruits and vegetables. However, reliable estimates of area and production at all India level for these crops are not available from any source. In view of difficulties faced by the states in implementing the pilot scheme on fruits and vegetables there is a need for re-examining the present methodology for effective further improvements. Accordingly, an alternative approach for estimation of production of Horticulture Crops is attempted below for consideration.

Alternate Approach

6.0 The proposal is to arrive at a reasonable estimate of production of major fruits and vegetables other than through normal Patwari records or through household surveys. For this purpose, possibly one could consider largely the market arrival data by evolving a suitable mechanism of collection of such data. Besides this source one has to take into account the home consumption from home grown produce, consumption by food processing establishments, exports and lastly loss of produce, as the crops are perishable in nature. As the present system of market arrival data collected by Agriculture Produce Marketing Committees and also by National Horticulture Board suffer from both completeness and reliability, it is necessary to consider ways and means of evolving a suitable mechanism to overcome these deficiencies. As regards household consumption from home-grown produce, necessary information is available through Consumer Expenditure Survey of NSSO. In addition to these, the information on consumption by various food processing industries and post-harvest loss may have to be estimated through type studies. While evolving the methodology care has to be taken to avoid accounting of production more than once. As the production of the crop is sum total of these items, a fairly precise estimate of the production can be obtained in respect of these crops through the above approach.

Statistics of Horticulture Crops — Data Collection and Organizational Problems

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Agriculture is the mainstay in the Indian economy and one of its most crucial components is horticulture. During 8th and 9th five-year Plans, the development of horticulture has been given high priority. Various programmes implemented in the field of horticulture have resulted in improved production in terms of both quality as well as quantity.

2. Due to assignment of high priority to horticulture, in 9th five-year Plan period, horticulture sector is emerging as an important segment in Indian economy. India is at present the second largest producer of fruits and vegetables in the world. It has a high potential to grow further.

3. In spite of India being a major producer in the field of horticulture crops, the database is very weak and does not provide significant support for developmental strategies. Strengthening the database in horticulture with respect of area, productivity and production of horticulture crops both for impact assessment and interventions needs a major thrust. At present, we do not have the single scheme, which may be able to provide national estimates of area production and productivity on various horticultural crops.

4. In Directorate of Economics & Statistics, a scheme namely, "Crop Estimation Survey on Fruits and Vegetables" is being implemented on a pilot basis. This scheme is being implemented in 11 States namely Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Orissa, Punjab, Rajasthan, Tamilnadu and Uttar Pradesh (as central scheme with 100% central assistance) and covers 14 fruits and vegetables namely, Apple, Banana, Grapes, Guava, Citrus fruits, Pineapple, Mango, Cauliflower, Potato, Onion, Tomato, Cabbage, Ginger and Turmeric. None of the Flowers crop is, however, covered under this scheme. The area, production and productivity of crops covered under the scheme are estimated following Stratified Multistage Random Sampling Techniques. Indian Agricultural Statistics Research Institute, New Delhi, has provided the methodology. Main features of the sampling methodology are as below:

(a)   Sampling design for estimation of extent of cultivation and production of fruit crops in a state

The important fruit crops whose production is to be estimated are first identified. Since the cultivation of fruits is usually not so evenly spread and may in fact be concentrated in a few districts/regions, the first step in the planning of fruit survey is to identify the important growing regions for different fruits. A district is considered too large a unit of area for this purpose. However, taluks or sub divisions or equivalent areas in a district are considered appropriate. Thus, taluks that are important at least for one of the fruit crops, are identified as important fruit growing taluks. Importance of a taluk with respect to a fruit is determined on the basis of area under that fruit and thus a taluk important for a given fruit may not be important for other fruits.

All taluks/sub divisions as described above are taken as strata. The remaining area of taluks are further classified or grouped into 4 to 5 strata with respect to importance of individual fruit crops taking into account the geographical contiguity. Taluks may be considered as primary sampling units. Thus survey would then cover all important fruit growing taluks i.e. taluks in which fruit cultivation is concentrated as well as the selected taluks out of the rest.

In the selected taluks also, all the villages may not be growing all the fruits. A frame of villages growing different fruits in a stratum is, therefore, prepared. Accordingly, villages in a stratum may be classified into two-categories (i) growing at least one fruit and (ii) growing no fruit at all. In category (i) on the basis of village wise area under fruits, villages may be identified as "reporting" or "non reporting" for individual fruits. If the reported areas are considered as reliable, efforts may be concentrated only in the reporting villages for each fruit. However, experience shows that faulty reporting is not uncommon and, therefore, adequate representation may be given to non-reporting group. From the reporting group for a given fruit crop four villages are selected with replacement and with probability proportional to area reported under the fruit crop. From the non-reporting group of villages (in which other fruits are grown), a sample of two villages is selected in each stratum with Simple Random Sampling With Replacement (SRSWR).

For yield estimation, a sub sample of two villages out of four reporting villages is retained in all the major fruit growing taluks/strata and from each village 5 orchards and 3 clusters of 4 trees each of bearing age are selected for this purpose. The selected clusters of trees are observed for entire harvest. Exceptions to this procedure are made for certain crops like banana and grapes.

(b) Sampling methodology for estimation of area and production of vegetable crops

The sampling design is a stratified multistage random sampling. Taluks or equivalent areas are taken as main strata. Further, since area under vegetables varies considerably from one village to another in a taluk, sub stratification is done on the basis of village wise area under vegetables. For this purpose 3 to 4 sub strata with equal area under vegetables are formed. The area figures are available in revenue records. If not available, then a preliminary survey is conducted to obtain village wise area under vegetables. Within the strata, clusters of three villages are taken as primary sampling units. The allocation of clusters of villages to different strata is done in proportion to area under vegetables. The allocated number of clusters in different strata are selected with Simple Random Sampling Without Replacement (SRSWOR). For yield study, 50% of the clusters selected for area are retained and fields growing vegetables are selected in these clusters.

The selected clusters of villages are completely enumerated for area under vegetables. This will also provide a frame of vegetable fields for estimation of yield rates. For estimation of production, 6 to 8 fields of each important vegetables are selected in each of the clusters selected for yield study. In each of the selected fields, a randomly located plot of 5m × 5m is demarcated and observed for all the pickings in the respective periods.

5. The scheme has so far not yielded the desired results as India is a vast country and cropping pattern differs from State to State. The States in many cases collect the data based on distribution of planting materials by Government and private sources. Moreover vegetable crops are also sown on a small area in patches and even in the backyard and front of houses and produce from this area is not covered in the available statistics.

Organizational Problems

6. The experience of the existing pilot scheme "Crop Estimation Survey on Fruits & Vegetables" reveal that implementing agencies face many difficulties in implementation which results in non-availability of adequate, correct and timely statistics on crops covered under the scheme. Some of the issues in collection of adequate, correct and timely statistics on fruits & vegetables are mentioned below :

(a) Total area under fruits crop is not recorded by the village level primary worker as fruits are also grown on canal banks, field bunds, road sides, backyard of houses and even stray trees. The existing Land Record System does not provide recording of area under crops on canal banks, roadsides etc.

(b) Present methodology for collection of production statistics provides for the presence of the staff who conduct crop cutting experiments at time of every picking for recording quantity of produce. It is very difficult as harvesting of fruits and many vegetables is done in a number of pickings extending over several weeks.

(c) The area of short duration crops of vegetables which are sown after one Girdawari and harvested before second Girdawari is missed and therefore total area of that crop in a particular State remains under estimated. This has a bearing on production statistics also as in case of vegetables production is calculated by multiplying area with average yield.

(d) Land record manual in many States does not provide for recording of all important crops of fruits and vegetables and recording is done for many of the crops taken together. Therefore, area under individual fruit or vegetable crop is not available from revenue records.

(e) Even in case of the crops of fruits and vegetables wherever land record manual provide for recording of certain crops, Girdawari is not done correctly by the primary workers and therefore it does not give correct picture of area under that crop.

(f) Crops grown on Government land/unauthorised land are not included in Girdawari. Therefore, this part is uncovered in available statistics.

(g) In most of the States primary workers engaged in Girdawari work are much more overburdened with the other work and therefore are not able to attach due importance to the Girdawari work.

7. According to the system of collection of area statistics presently in practice, the States and Union Territories can be classified into three broad categories:

(i) States where area statistics are collected by complete enumeration (normally known as land record States). The system of land record is being followed in 14 States namely, Andhra Pradesh, Assam, Gujarat, Haryana, Himachal Pradesh, J&K, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh and Pondichherry. These States account for 85 per cent of all India area.

(ii) The States where area statistics are collected from the basis of sample surveys (normally known as non-land record States or permanent settled States) such as Kerala, Orissa and West Bengal.

(iii) North East States and hilly districts of Assam where no agency exists.

8. The existing pilot scheme on collection of area, production and productivity statistics on fruits and vegetables in selected 11 States and for

selected crops (7 fruits and 7 vegetables) does not give any idea regarding statistics of the production of even crops covered in the scheme at national level. To obtain estimates of area and production of any crop we need related statistics from all the States in the country growing that crop whereas in present scheme only 11 States out of 32 States/Union Territories are being covered. Moreover the area figures are taken from the Girdawari conducted by primary workers of Revenue Department posted at village level. These primary workers are overburdened with multifarious jobs assigned by different State Governments and therefore attach least priority to timely and accurate Girdawari. As production of vegetables is calculated by multiplying area under a particular crop by average yield of that crop, it gives incorrect figure of production if area figure is not correct.

Strategies

9. In order to build All India estimates of area and production of fruits and vegetables, a proposal for extending scheme in more States is under formulation in the Directorate of Economics & Statistics.

10. Though there exists a system of working out advance estimates of crop production in case of cereals, pulses and oilseeds, none of the horticulture crops could be covered in the system due to several factors. Horticulture crops are not grown on a wider scale; rather they are grown in localized pockets and on smaller plots particularly vegetables. Moreover in case of these crops, some cropping activities, that of sowing, transplanting or harvesting takes place in some part or the other in the country hence crop monitoring is difficult. An attempt is being made to bring onion and potato under advance estimate crops to begin with.

11. A proposal for conduct of complete census on fruits and vegetables has been submitted to Department of Statistics under World Bank assisted project for modernization of statistical system. With this project, it will be possible for the Directorate of Economics & Statistics to obtain complete statistics on horticulture crops for taking a number of policy decisions regarding production, pricing, processing, procurement, storage, transport, marketing, export/import, public distribution and many other issues like investment planning in this field.

Status of Estimation of Statistics on Horticultural Crops in the Karnataka State

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Fruits and Vegetables are rich sources of vitamins, minerals, proteins and carbohydrates. Hence they play a vital role in the balanced diet of human beings. Karnataka State possesses about 15 lakh hectares of land under horticultural crops. There are nearly 25 fruit crops, 20 vegetable crops, 18 spices/plantation crops and 10 flower crops being grown in the State. The main crops covered under fruit crops are Mango, Banana, Grapes, Guava, Sapota and Lemon and main vegetable crops are Onion, Potato, Chillies, Tomato, Beans and Brinjal. The main crops covered under plantation crops are Coconut, Arecanut, etc. The collection of data on horticultural crops is difficult in view of the special features of cultivation of horticultural crops when compared to agricultural crops. Hence, the Government of India has sponsored a central sector scheme for estimating area, yield and production of important fruit and vegetable crops. This scheme is being implemented in Karnataka since 1985-86. The crops covered under the survey are Mango, Banana, Grapes, Guava, Sapota, Lemon, Onion, Potato, Chillies, Tomato, Beans, Brinjal and Turmeric.

As regards the collection of area figures on horticultural crops, the data is being collected villagewise on the basis of the pahani written by Village Accountant in all the three seasons in a year for nearly 50 crops. The Village Accountant at the village level will record survey numberwise and cropwise area grown and the same will be verified and consolidated at hobli, taluka, district and State levels. Karnataka State is having nearly 28,000 villages, 750 hoblies, 175 taluks and 27 districts. The Directorate of Economics and Statistics is considered as the State Agricultural Statistics Authority by Government of India. The Directorate collects the data from all the villages and submit the consolidated data to Government of India. The Directorate of Horticulture, Government of Karnataka which is responsible for developing the horticultural crops, also collects the data on the basis of the seedlings distributed and plants transplanted. There is always wide variation in the area figures reported by the Director of Horticulture and the Directorate of Economics and Statistics. In order to solve the discrepancy in the area figures, the Government of Karnataka has introduced the system of reconciliation of area on horticultural crops. According to this system, soon after the completion of each agricultural season, Village Accountant submits the villagewise cropped area to the

Tahsildar. The reconciliation committee consisting of the Tahsildar, Senior Assistant Director of Horticulture and the Statistical Inspector working at the Taluk level verify the data on horticultural crops threadbare and finalise the taluka level data and the same will be submitted to the District Committee. The District Committee consisting of the Deputy Commissioner from the Revenue Department, Deputy Director of Horticulture from the Horticulture Department and the District Statistical Officer from the Statistical Department will verify all talukwise data of district and finalise the district level data and the same will be sent to the State Headquarters. At the state level, after thorough check, the Directorate of Economics and Statistics prepares State consolidated report and the same will be submitted to Government of India. In view of the introduction of this system accurate data on area covered under horticultural crops are being collected by this Directorate.

Though there are nearly 50 horticultural crops being grown in the State, in view of lack of manpower and finance only 13 crops are covered under the C.E.S. on estimation of fruits and vegetables survey. The scheme of sample survey on fruits and vegetable crops is being implemented in the Karnataka since the middle of 1985-86 and continued thereafter as a central sector scheme. The survey covers six fruit crops, six vegetable crops and one minor crop. The main objective of the scheme is to estimate area, yield and production of the major fruits (only in orchards) and vegetable crops.

The statistical design adopted for area enumeration is a stratified two stage random sampling with taluka as strata, villages within the selected taluka as primary units of sampling and orchards (survey/sub-survey numberwise) are the secondary stage sampling units. Likewise the statistical design adopted for yield estimation is the stratified three stage random sampling. The taluks in the district form strata, villages within the taluka constitute primary sampling units, orchards (survey/sub-survey numberwise) are the second stage sampling units and the cluster of trees/plants in an orchard or experimental plots within survey/sub-survey numbers are the ultimate sampling units.

The Directorate of Economics and Statistics is responsible for planning and organising survey on the area and yield estimation surveys also processing and analysing the data. The Statistical Inspectors, Enumerators of the Directorate of Economics and Statistics and Horticulture Assistants of the Horticulture Department are the primary workers for conducting the area enumeration and crop cutting experiments at field level. Supervision is being done by the District Statistical Officers and their staff.

The data received from the districts are processed and analysed and a report entitled "Crop Estimation Survey on Fruit and Vegetable Crops" is being

prepared and published annually by the Directorate of Economics and Statistics. The deficiencies noticed in collection of the data on horticultural statistics are as follows:

1. The data on horticulture crops are not being recorded properly in the RTCs just like agriculture crops for the simple reason that horticulture crops attracts more land revenue than agriculture crops.

2. The Village Accountants are overburdened with the multifarious activities of the Revenue Department and thus recording the area under horticulture crops in the RTC.

3. A large extent of area on horticulture crops are covered in the backyard/foreyard of houses and also along the streets. This does not find a place in the records and also in the RTC.

4. Some of the horticulture crops like pepper, cardamum are grown in the state on the slopes of the hills mostly in an unauthorised land, which can not be taken into records.

5. Some of the important horticulture crops like arecanut, cashewnut, pepper, cardamum, betel leaves are grown as mixed crops on the same piece of land. While writing RTC, the Village Accountant may record only one or two major crops covered and leave the other crops unaccounted.

Conclusion

In order to collect reliable data on horticulture crops, an occasional census on horticulture crops, an occasional census on horticulture crops has to be taken up.

Statistics of Horticulture — Some Issues for Consideration

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The contribution of horticultural crops in the Gross Domestic Product is quite significant. The same is increasing over the years telling the need for proper Statistics of Horticulture. Though no reliable statistics are available in our country with regard to complete horticultural crops, statistics on fruits and vegetables, forming part of horticultural crops, are available from the pilot scheme of "Crop Estimation Survey on Fruits and Vegetables (CES–F & V)"

sponsored by the Union Ministry of Agriculture. The sampling design according to which these statistics are collected, was developed by the Indian Agricultural Statistics Research Institute (IASRI). The present paper analyses this design and attempts to bring to focus some of the methodological as well as implementational issues for the consideration of the developers of the design. It also attempts to suggest some alternatives in respect of some selected issues. The author has looked at the design from the point of view of

- The availability and reliability of the area figures from village level revenue records.
- Practicability of the methodology in the prevailing field conditions
- Cost involved in getting the field operations completed
- Workload of the primary worker doing the field work and other angles

The designers may like to improve the methodology in view of the issues discussed.

Methodological Aspects of Horticultural Crops : Problems and Prospects

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India is the second largest producer of fruits as well as vegetables. However, there is a tremendous untapped potential to improve the productivity and production of fruits, vegetables and flowers with the help of recent technological advancement in the field of agriculture. In recent years, horticulture sector has emerged as an important component of the Indian economy owing to its vast export potential in the WTO regime. Consequently, new series on national accounts statistics have included some new fruits and flowers. The importance of the statistics of horticultural crops can be gauged by the fact that it is one of the priority programmes for the Planning Commission. Keeping in view the importance of horticultural crops, in this paper, current method of generation of data, existing methodology for estimation of different horticultural crops and its problems along with future prospects in context of recent changes (technological, infra-structural as well as data requirements) have been discussed.

The sample survey techniques developed for cereal crops cannot be applied directly to fruit crops due to some inherent differences in their nature and cultivation practices like, they are perennial crops, diversity of different fruit trees in the same orchard, start bearing fruits after number of years, they are scattered on canal banks, field bunds, road sides, backyard of the houses, same orchard may have trees of different ages and several fruits may have two harvesting season during a year like citrus, guava etc. All these points need to be carefully considered while planning a sample survey to estimate the extent of cultivation and yield of fruits. Unlike other crops, extent of cultivation of a fruit may be measured in terms of area under the crop or by the number of trees both bearing as well as young. However, only bearing trees contribute towards the production of the fruit. The number of young trees on the other hand provide an idea of the extent of cultivation of the crops in the future.

Indian Agricultural Statistics Research Institute (IASRI) carried out a series of surveys to estimate area and yield of fruits. There were three phases: first phase was on single fruit crop, second phase was for group of fruit crops and third phase for all important fruit crops in a state. The sampling design adopted in these surveys was broadly stratified two phase multi-stage random sampling. However, the criteria of stratification and type of sampling units at different stages keep on changing as per the situation and the crop under consideration.

Similarly, methodology of obtaining the reliable statistics for cereal crops can not be applied directly to the vegetable crops because they are of short duration, harvested through number of pickings, sowing and harvesting operations carried out simultaneously etc. IASRI also conducted a series of surveys to estimate area and production of vegetable crops. The final design adopted is broadly described as multistage random sampling.

With time, as the economy grows the importance of crops like floriculture, mushroom and other high valued herbs are also growing both in volume and value. A lot is needed to be done in regard to sampling methodology for estimation of area and production of floriculture, mushroom and other high-valued herbs as there does not exist any scientific methodology for all these crops.

Country level estimates are developed only for important fruits and vegetables crops under central scheme "Estimation of area and production of fruits, vegetables and minor crops". Although this scheme is in operation for the last several years, coverage in terms of fruits and vegetables as well as in terms of geographical coverage of the country, it is grossly inadequate. At the same time, the demand for including more fruits and vegetables in the groups is increasing. In absence of reliable and complete estimates users are depending

on other sources of statistics. National Horticulture Board (NHB) of the Ministry of Agriculture is bringing out the publication entitled "Indian Horticulture Database". This publication contains recent data on area, production and prices of various horticultural produce. The data provided in this book is based on the area coverage, production and productivity etc. provided by State/UT's Governments. The methodology adopted by these organisations need to be looked into. Another aspect regarding data gaps pertaining to horticulture crops is the lack of timely availability of some of the final estimates. Quite often, adjustments are needed for getting the workable estimates in time. Besides, non-availability of statistics at disaggregated level poses a serious problem for micro-level planning.

At this juncture, it is worth mentioning that for fruits, the existing methodology is good enough and infrastructure for collection of data for this purpose is also in place. Indeed, there are problems in the implementation of the methodology because of various reasons. Essentially, there is a need of strengthening and monitoring for proper implementation of this scheme. It is worth repeating that greater commitment and willingness of all concerned to strictly comply with prescribed procedures and time schedules will bring about remarkable improvements in the system.

Some of recent advances like Geographic Information System (GIS), remote sensing and global positioning system (the 3-S technology) and small area estimation techniques can serve as potential and efficient tools for the improvement of statistics related to horticultural crops. The remote sensing technology can be thought of for obtaining estimates of area under horticultural crops at the national and some regional levels. The problem of geographical coverage can be solved with he help of this technique to a great extent.

The GIS can also inherit the capability to work at smaller geographic area by incorporating the recent methods for developing small area statistics. This will help the system to provide statistics at much lower level even with small sample-sizes of the domains without going for actual survey. These statistics will play an important role in the future in the light of 73rd amendment act of the constitution. The comprehensive analysis of data can also be performed easily and accurately by linking GIS to the statistical packages like PC CARP, SUDAAN etc. Further, there is an urgent need to develop a strong data base in order to have sound and reliable statistics related to horticultural crops, which is possible now due to advances in computer technology. The development of a data warehouse is one of the recent tools in the field of information technology that can fulfil the demands of the information related to horticultural crops which is required by the planners and policy makers.

Finally it can be concluded that the recent computer intensive technologies can play a vital role in the improvement of statistics pertaining to horticultural crops. There is no doubt that these technologies are initially expensive and become cost-effective only in long run, however, reliable and efficient statistics have its own importance in the policy formulations and in the strategic planning process. Hence, efforts should be made to use these innovative techniques to the extent feasible.

Concluding Remarks

The fruits and vegetables' crops are very important for the purpose of national accounts statistics and account for a large part of agriculture sector's output. Due to the peculiar nature of these crops (short duration, several pickings in a year, large gestation period, grown also outside the area under the purview of land records, etc.), it has not been possible to develop a systematic and scientific statistical system for the horticultural crops. Since their contribution is large and the policy makers also need reliable and timely data on these crops efforts are needed to develop a statistical system for these crops. Some suggestions to fill up the data gaps on the horticulture crops are given below:

In order to improve the quality of 'fruits and vegetables' crops, it is necessary that the existing weaknesses in the land records system, are removed. For covering these crops at detailed level, it may also be necessary to modify the 'khasra' register, so that individual crops are separately shown. If possible a separate girdwari at regular periods of intervals may be conducted for the fruits and vegetables crops alone, considering their short duration nature.

The pilot scheme on horticultural crops of the DESAg, presently implemented in about 11 states, need to be extended to all the states, so as to ensure the all-India coverage of these crops. Perhaps the number of crops coming under the purview of this scheme could also be extended to other important crops.

Since many of these 'fruits and vegetables' crops are grown in areas not covered by the land records system, it may be necessary to have a separate mechanism (or possibly a type study) to assess the production and area of such crops grown in these areas.

With regard to the prices of 'fruits and vegetables' crops, a type study needs to be conducted on the various charges paid for by the farmers/producers before the produce is sent to the wholesale markets. The study can also cover the input costs of horticultural crops, on the lines of cost of cultivation studies conducted for some of the principal crops by the DESAg.