

Chapter 22

CROP EXPERIMENTS

Part-I

Crop Experiments by Traditional Method

22.1. The Government of India having directed tables to be prepared quinquennially showing the average produce of the crops cultivated, the Revenue Department and Agriculture Department in all districts of the State will conduct crop experiments and with the help of the results of these experiments the existing estimates of the normal rates of yield will be revised at the end of each period of five years. When a district comes under settlement, the Settlement Officer will conduct as many reliable crop experiments as he can in the manner prescribed in appendix X to the Settlement Manual and report the results to the Commissioner, who will forward them with his remarks to the Director of Land Records.

Experiments by agricultural staff

22.2. In all districts where agricultural officers are stationed, experiments will, under the order of Government, be conducted by members of the Agricultural Department. Results of experiments conducted by them shall be communicated by the Director of Agriculture after each harvest to the Director of Land Records.

Preliminary reports by revenue staff

22.3. (a) Deputy Commissioner should make preliminary reports on Table C about the arrangements made to conduct crop experiments to the Director of Land Records on the following dates each year.

Crops	Date
Toria	1st December
Mustard and Taramira	15th January
Rabi Crops	1st March
Tobacco	21st May
Kharif Crops	15th September

(b) Two crop experiments should be made in each harvest by each Naib-Tehsildar, Tehsildar, Statistical Assistant, Sub-Divisional Officer and Distt. Revenue Officer. The Revenue Department will conduct crop experiments in all the districts of the State, in respect of the crops indicated against each in the accompanying table B, and report the result in table A, of each such crop.

Preliminary reports by agricultural staff

22.4. (a) Each Deputy Director of Agriculture, Statistical Officials of Agriculture and Assistant Development Officers Agriculture shall conduct seven experiments in Kharif and seven experiments in the Rabi harvest out of the crops shown in table B as follows:

Kharif: Cotton, Rice, Maize, Potato, Sugarcane, Ragi, Ginger, Blackgram (Mash), Rajmash, Groundnut, Sesamum and any other crop.

Rabi: Wheat, Barley, Gram, Toria, Sarson (Mustard), Linseed, Masur (Lentil), Tobacco and any other crop.

Table-B attached shows the crops and the kind of land on which experiments are to be made.

Note: The crops allotted to each member should be distributed in such a way that the major and minor crops are covered to an equal extent approximately for the District.

(b) On the following dates each year, the officer in charge of the experiment should make a preliminary report in table C to the Director of Agriculture, stating in what villages and in what zamindars lands he will conduct the experiment for the crop then ripening. The assessment circle in which the villages in question are situated should also be stated. This can be ascertained without any difficulty by enquiry from the tehsil:

Crops	Date
Toria	1st December
Mustard and Taramira	15th January
Rabi Crops	1st March
Tobacco	21st May
Kharif Crops	15th September

Instructions as to how experiments are to be carried out:

22.5. The plots on which experiments are to be undertaken should be selected at random from the average field.

22.6. As far as possible the plots selected for experiments should be long narrow strips, at least five times as long as broad, of which the areas should be not less than 1/20th of an hectare and not more than 1/10th of an hectare. *In the case of cane the area should be 1/80th of an hectare. In case the plot in an estate in which the crop experiment is likely to be conducted is not available of the minimum size prescribed above, the plot of lesser size may be selected for experiment but it should not be less than 100 Sq. Meters in any case.*

22.7. The field selected should be an average field in an average village in the assessment circle concerned. By irrigated crops are meant crops in which water has been supplied by the ordinary methods in use in the district, as by water channel, canals, wells etc. The kind of irrigation applied to each crop experimented on should be noted. Experiments in crops which are specially noted as unirrigated should of course only be made in rainfed crops. At the time of selection the officer deputed to conduct the experiment should invariably record what the zamindars associated with him in the selection calculate the outturn and whether they consider it average of the harvest for the crop and soil under experiment. Their opinion should be noted in the column of remarks of table A. The particulars regarding the history and circumstances of the holding and other information required in the printed form of report should be stated intelligently, but in the briefest form.

22.8. With all the crops specified, excepting Cotton, Tobacco and Cane, the process of conducting the experiment is simple and easy. The crop should be dead ripe. It may then be cut and exposed to the sun till it is fit for threshing. The produce should then be trodden out or threshed in the way common in the neighbourhood. Care must of course be taken that grain is not lost during threshing or winnowing. In weighing the grain and Tobacco a deduction of five per cent, will usually be sufficient for dryage, but, if the grain and tobacco seem at all moist, five kilograms of them should be thoroughly dried and weighed again, and the resulting deduction applied proportionately to the whole quantity.

22.9. Cotton is picked several times at intervals of several days as the pods ripen. In the case of Tobacco the crop after cutting is exposed to the sun for about a week and then buried under ground for as similar period after which it is taken out. The leaves are then dried, twisted into ropes, and weighed to fix the yield per hectare. It will, therefore, generally be difficult for an officer to supervise the whole of the experiment on these two crops personally. He should see the first and at least one of the subsequent pickings performed in case of cotton, and the cutting and weighing operations in case of Tobacco, and must depute the remainder of the work to a trustworthy subordinate. In the case of Sugarcane it may not be possible to get the canes crushed at once and the juice boiled within a reasonable time. It may, however be possible either to obtain a correct result by weighing the cut cane after removal of the trash and tops, and by then ascertaining what weight of gur or rah is produced from a given weight of similar cane; or else the area of the experiment may be sufficiently reduced to permit of a complete direct experiment being carried out.

22.10. The agricultural officer incharge of the experiment should at the end of each harvest submit, to the Director of Agriculture, a report of the result of the experiments in the form of table A. Separate forms should be used for each district experimented on. Printed copies of this form will be supplied by the Director of Agriculture's office. In filling up the form care should be taken that the instructions printed thereunder as foot-notes are correctly carried out.

22.11. After each harvest all experiments made during it, by the agricultural staff, should be carefully examined in detail by the Directors of Agriculture and of Land Records, sitting together, and any experiment they consider unreliable, for reasons to be briefly recorded, should be discarded.

22.12. The Director of Land Records should, after each harvest, write a short note for the information of the Financial Commissioner, showing for each crop experimented on in each district the results of the experiments made by the Agricultural Department and by Settlement Officers separately in the proceeding crop, the number of experiments, area experimented on and the like. It should also show the outturn assumed at last settlement. To this note should be appended a statement in the following form:-

District	Tehsil	Assessment circle	Number of Experiments conducted	Outturn per hectare of all accepted experiments on		Total area experimented on	Remark
				Irrigated land	Unirrigated land		
1	2	3	4	5	6	7	8

22.13. Crop experiment returns should be kept till next settlement and then made over to the Settlement Officers.

Table A

Statement of results of crop experiments in the _____ district for _____ Season 19

1	1(a)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Serial No.	Tehsil	Assessment Circle	Village	Kind of crop	Area sown with the crop with Khasra No.	Irrigated/un-irrigated	Status and resources of cultivator	Details of cultivation in three preceding seasons	Details of manuring and watering of crop under experiment	Name and rank of officers and date of making the experiment	Area cut	Weight of produce in kilogram		Produce per hectare in kilogram		Quinquennial average outturn per hect. of grain in kilogram	Average outturn per hect. assumed at last settlement of grain in kilogram	Remarks
												Grain	Straw	Grain	Straw			

- Notes:**
- In column 6 enter the class of irrigation of the crop experimented upon whether irrigated or unirrigated according to girdawari.
 - In column 7 state whether the cultivator is man of good, average or insufficient resources as regards cattle, labour, etc., extent of his holdings, whether indebted or not; if considered relevant.
 - In column 8 enter crops according to girdwari, specifying class of irrigation and whether matured or failed.
 - In column 9 if a proceeding crop was manured, as, for instance, when wheat follows manured maize, mention this, give number of ploughings, weeding etc., etc., also in case of rabi crop whether ploughed before or after rainy season; if only one watering was given, mention whether it was before or after sowing.
 - In columns 12 and 14 enter the weight of the main produce in its marketable form. In the case of cotton enter weight of cleaned cotton. In case of tobacco enter the weight of dry leaf ordinarily marked by the cultivator. In case of sugarcane, enter weight of gur or rab.
 - In case of maize enter weight of grain removed from cob.
 - In columns 13 and 15 enter the weight of other marketable products giving their names. In case of cotton, enter weight of seed. In case of tobacco enter weight of stalks. In case of jowar, straw, etc., enter weight of straw dried.
 - In column 16 enter the outturn given in the latest quinquennial statement issued by the Director of Land Records, showing the approximate yield per hectare in kilograms of the principal crops in each district of the HP.
 - Important variations of column 14 as compared with those of 16 and 17 should be explained.
 - In column 18 state the reasons for the selection of the site of the experiment, mention any other circumstances affecting the value of the result, and give probable reason for any specially good or bad yield, as for instance whether the crop was sown late or early; nature of soil whether light or heavy, high or low; whether the season suited such soil; whether any damage occurred from wind, hail, frost, vermin or other causes.
 - If more than one experiment has been made in any class of crop, enter each separately, it is not necessary to give an average for the whole. The weight of "cane" for the area under experiment as well as the yield per hectare of "cane" in addition to the weight of gur shown in columns 12 and 14 should also be noted in this column.

Table B
Crops in which experiments will be made by the Officers of the Revenue and Agriculture Departments

Serial No.	District	Sugarcane		Potato	Ragi	Cotton	
		Planted	Ratoon			American	Desi
		Irrigated		Irrigated		Irrigated	
		Unirrigated		Unirrigated		Unirrigated	
		Irrigated		Irrigated		Irrigated	
		Unirrigated		Unirrigated		Unirrigated	
		Irrigated		Irrigated		Irrigated	
		Unirrigated		Unirrigated		Unirrigated	

Rice	Maize	Ginger	Mash	Rajmash	Groundnut	Sesamum	Other Crops
Irrigated							
Unirrigated							
Irrigated							
Unirrigated							
Irrigated							
Unirrigated							
Irrigated							
Unirrigated							
Irrigated							
Unirrigated							

Rabi

Wheat	Barely	Gram	Tobacco		Toria and Sarson	Linseed	Masur	Other crops
			Irrigated	Unirrigated				
Irrigated			N. Rustica		Irrigated			
Unirrigated			N. tobacum Virginia type		Unirrigated			
Irrigated			N. Tobacum Desi type					
Unirrigated								
Irrigated								
Unirrigated								
Irrigated								
Unirrigated								
Irrigated								
Unirrigated								

Table C

Preliminary Report on crop experiments proposed to be conducted in the _____ District for _____
Season 19 _____

Serial No.	Kind of crop	Name of village	Assessment Circle and Tehsil	Owner's name and description	Class of soil	Area of field	Estimated outturn per hectare	Remarks
1	2	3	4	5	6	7	8	9

Part II

Crop Experiments by Random Sampling Method

22.14. In addition to Crop experiments by traditional Method, the Govt. of Himachal Pradesh have directed that Crop Cutting experiments by random sampling method on four main crops namely Maize, Rice, Wheat and Barley be carried out through field agencies of Revenue and Agriculture departments. The aim of these experiments is to estimate the average yield and total production of these crops at State level with reasonable degree of precision.

22.15. Random sampling method shall be used for these experiments. Certain villages shall be selected from each Kanungo Circle/Development Block and in each selected village two fields shall be selected at random. In each selected field under the experimental crop a rectangular plot of size 10 x 2 meters shall be marked at random and crop cutting experiment carried out in these plots. Crop cutting experiments on these plots require that the produce from these plots shall be harvested, threshed, grains taken out dried, cleaned and weighed. The grain shall not be completely dry on the date of its harvesting and threshing. In order to calculate the dry weight of the produce, separate experiment for drriage shall also be conducted. The procedure for selection of fields and conduct of these experiments are explained in the subsequent paragraphs.

22.16. The experiments shall be conducted through the field agencies of Revenue and Agriculture department. These experiments shall be conducted under the over-all control of the Secretary (Agr.) to the Government of Himachal Pradesh. The Director of Land Records and Director of Agriculture shall have day-to-day control of this work and shall convey the necessary instructions to the field staff. The planning, analysis and distribution of forms and instructions shall be done by the Dept. of Agriculture, Himachal Pradesh, Shimla. The selection of fields, marking of the Plot, harvesting and threshing etc. etc. shall be done by the Field Kanungo and Assistant Development Officers (Agr.) (A.D.O.) in the Development Blocks. The Patwari shall help this field staff in the location of fields and getting the co-operation of the cultivators in whose fields the experiments are conducted. Before reaching the selected village it is necessary that the Field Kanungo or Agricultural Inspector or ADO should timely inform the Patwari so that he is available in the village at the time of his visit to the village.

22.17. The higher Revenue and Agriculture field staff i.e. Tehsildars, Naib Tehsildars and District Level Officers of Agriculture Department shall conduct inspections of these experiments at least in two villages in their jurisdiction and report the results of their inspection on the prescribed form to the Director Agriculture HP. The Director of Land Records, Deputy Commissioners and the Director of Agriculture

shall conduct inspections in as many villages as possible. The inspection should be carried out preferably at the harvest stage. The post-harvest stage inspection is also helpful to know if the experiment was actually carried out by the field staff or not.

22.18. If the inspection is carried out at post-harvest stage the grain kept for drriage should be got weighed personally and reported in the form. These experiments being of scientific nature it is necessary that the equipment for crop cutting experiments with the primary worker should be checked. The technical control of these experiments rests with the National Sample Survey Organisation, Government of India. This Organisation has their Regional Offices also. A part of inspection of crop cutting experiments and area enumeration shall also be carried out by the staff of this Regional Office.

22.19. The selection of the villages shall be made by the Director of Agriculture HP. The list of selected villages shall be sent to the district officers well in time so that the girdawari is completed before the harvesting of the crop in these villages. Common villages shall be selected for both the crop seasons. The list of villages shall be circulated once in a year in the months of June-July before the harvesting of Kharif Crops. Correspondence should be done with the Director Agriculture HP if the list of villages, forms and instructions are not received in time. The training for the conduct of these experiments shall also be arranged by the Director Agriculture at each district headquarter. It is necessary that the attendance of the field staff at the time of training should be complete and the supervisory officers of both the Revenue and Agriculture departments should attend this training.

22.20. As mentioned above, certain villages shall be selected from each Kanungo Circle/Block in which the experimental crops are grown. In addition to these villages there shall be some additional villages under the heading "additional". The experiment should only be conducted in the selected village, but if there is no experimental crop in the selected village or two khasra numbers in which these experiments can be conducted are not available, the village then be rejected and a village in the additional list selected in turn i.e. the first village in the additional list be taken, and if this first additional village also does not grow the experimental crop, the next additional village be taken. The substitution of additional village can only be done with the consultation of Tehsildars/Naib Tehsildars or the District Agricultural Officers and the Director of Agriculture be informed, giving reasons for the substitution of the additional village from the list. In order that Primary Worker should visit minimum numbers of villages for these experiments, the list of selected villages contain an astrick* against certain villages. The village with astrick* mark should be substituted first, when there is need for additional village for the reason that the experiment cannot be conducted in the selected village e.g. suppose that three villages are selected for experiments on maize crop and two villages for experiments on rice crop in a particular Kanungo Circle during Kharif season, if experiments on rice crop cannot be conducted in one of the village due to non-availability of the crop in this village, the third village for maize crop experiments marked with* can be substituted for the rejected village for Rice experiments. In this case the Primary Worker shall have to visit the same three villages since he is required to conduct experiments on both crops. In case a village for maize experiment is rejected there is no alternative except to select the first village from the additional list, in which the Primary Worker may have to visit four villages, one common village for rice and maize experiments, second village for rice experiment only and third & fourth (additional) villages, for experiment on maize crop.

22.21. After obtaining the list of villages the Primary Workers shall visit the selected villages in turn well before the harvesting of crops in these villages and select field for experiments according to the instructions that follow in the subsequent paragraphs under the heading "selection of fields". The Primary Worker shall take the help of the Patwari in getting cooperation from the cultivators politely that these experiments are to be conducted at Govt. cost and the produce shall be returned to them after harvesting, threshing and weighing. It shall be explained to the cultivators that these experiments have nothing to do with assessment of land revenue. In this way they shall get the desired cooperation from the cultivators. After this, they should fill in columns given in Form No. 1, after inquiry and visual inspection according to the instructions in the foot-notes. (Appended) Since two experiments are to be conducted in each

village for an experimental crop, the form No. 1 provides entry for both experiments. The Primary Worker shall also fix the harvesting date of each experiment in the village and inform the Tehsildars/Naib-Tehsildar/Deputy Director of Agriculture to this effect.

22.22. On the date fixed for harvesting, the Primary Worker shall visit these villages and mark a plot of the required size within the selected field with the help of a pair of random number, harvest, thresh, weigh the produce, make entries in Form No. 2 about the weight and fill in other informations required. (Appended) In order to estimate the dry weight of the produce, it shall be necessary to conduct driage experiments after the harvest according to the instructions contained under the heading "harvesting and threshing". These driage experiments are to be conducted in both the fields in the first selected village in the list of selected villages for each Kanungo Circle and development block. The results of driage experiments alongwith other details shall be filled in Form No. 3. (Appended) It is necessary that the filled in form should be despatched immediately without waiting for the experiments to be conducted in the rest of the villages, so that some estimates of the average yield of different crops are made available to the Govt. immediately after the harvesting season is over.

22.23. After the completion of the experiments, the produce shall be returned to the cultivators in every case. The Primary Worker shall prepare two copies of each form. The office copy should be retained with them for the months for replies to the enquiries made by the District Officers as well as the Director Agriculture HP. After a period of two months, the Primary Worker shall deposit the office copies with the Tehsil/Block office. It can now be concluded that each form is to be filled in duplicate out of which one copy is to be despatched immediately to the Director of Agriculture HP and other copies retained with the Primary Worker for replies to any queries that shall be made by different offices. The forms should be filled in completely, dots and dashes avoided and answers given with yes/no clearly.

22.24. A separate form has been prescribed for inspection of crop cutting experiments by random sampling method. (Appended) The inspecting officers are required to fill in this form in detail and sent to the Director of Agriculture HP. The inspection should be done, preferably at harvest stage or post-harvest stage. Pre-harvest stage inspection has also been provided in the form for inspection. The mistakes made by the Primary Worker should be pointed out clearly and the facts brought to the notice of Primary Worker, so that these mistakes are not repeated in future. The inspection forms shall be available with the Director of Agriculture HP for supply to the inspecting officers of both the Agriculture and Revenue departments.

22.25. The following equipment should be made available to the primary field staff to conduct the experiments according to the instructions:-

1. Balance and standard weights.
2. 40 to 50 cms. long, strong and straight pegs with one pointing edge on one side each.
3. Sutli 25 meters long.
4. Measuring tape 20 meters.
5. Bags.
6. Hessian cloth 4 x 4 meters.
7. Copies of the forms, instructions, stamps and blank paper sheets.

It shall be the duty of Director of Agriculture and District Agricultural Officers to supply these equipments to the field staff, arrange for repair and replacement and maintain proper record of supply.

Selection of Fields

22.26. Two fields growing pure or mixed experimental crop are to be selected in each selected village. For fields in which experimental crop is sown in mixture, it is necessary that the experimental crop should be to the extent of 10 per cent or more in the mixture. If the experimental crop is less than 10 per cent in the mixture, this field shall be excluded from the selection. If a village does not contain two khasra numbers in which the experiments can be carried out on the experimental crop, for which this village has been selected, it should be rejected and a village from the additional list taken in consultation with the Tehsildar/Naib-Tehsildar or the Deputy Director Agriculture. This does not mean that any village from the additional list is to be taken. The Primary Worker shall see if the experiments can be carried out in the first village of the additional list. If the first additional village has already been taken for substitution or the experiments are not possible to be carried out in the first additional village, the next village in the additional list should be selected. In short, the selection of villages from the additional list is to be made in turn, in the order listed.

22.27. A field is a patch of land growing the experimental crop pure or in mixture with other crops, which is demarcated either by bunds or land not growing any crop or a patch of land growing some other crop and there should not be any bund within it except water channels for irrigation purposes. By a patch of land not growing any crop means fallow land or land not available for cultivation recorded by the Patwari at the time of Girdawari. This does not mean that small patches of stony land or land growing trees within the field or on the side of it should be excluded from the field. If these patches are recorded separately by the Patwaris as fallow or land growing miscellaneous tree crops, only then these patches should be excluded from the field. Generally, the cultivator thinks that seed shall not germinate in stony or shady patches and as such he may exclude the small patches, shady or otherwise for sowing of seed. These small patches even if no seed is sown should be included in the field. Generally a khasra number may contain batta numbers and batta number may contain a number of fields. Accordingly the selection of fields can be divided into three parts.

- (i) selection of khasra number
- (ii) selection of batta number within the selected khasra number and
- (iii) selection of a field under the experimental crop from a number of fields growing this crop in the batta number.

Since two experiments are to be conducted in a village, it shall require selection of two independent fields growing the crop, within which a rectangular plot size of 10 x 2 meters can be accommodated.

22.28. If a village has only two khasra number growing the experimental crop and there is a minimum of one field in each khasra number which grows the experimental crop and can accommodate the plot size (10 x 2 metres) as well, it is obvious that there is no other choice except to select these two khasra numbers for conducting the experiments. If there are more than two khasra numbers growing the crop in a village the selection of two khasra numbers should be made in the following manners:-

Two random numbers are given against each village in the list under the experimental crop. The khasra numbers corresponding to these random numbers should be selected for experiments. If one or both of these random numbers are greater than the last khasra number (settlement) then these random numbers should be divided by the last khasra number of the village and the khasra numbers (settlement) corresponding to the remainders should be selected. If the remainder is "0" this shall mean that the last khasra number shall be selected. If any of these khasra numbers corresponding to the remainder obtained does not grow the experimental crop in any of its batta numbers and fields or all the fields under the experimental crop cannot accommodate the plot of required size, it is clear that this khasra number shall

have to be rejected. In this case select the next higher khasra number and in this way go on searching the next higher khasra number till the khasra number which grows the experimental crop, pure or mixed, and contains fields which can accommodate the required size of plot is obtained. In this way if you exhaust all the khasra numbers including the last one, then start from the 1st khasra number of the village in the khasra register i.e. the selection of a khasra number is to be made on the basis of remainder obtained by dividing the random number given against the village and proceed in a cyclic order till the suitable khasra number is obtained for the experiment. The khasra number should not be rejected on the consideration that the condition of the experimental crop is bad or the crop has been damaged after sowing or in the extreme case the grain formation was poor and the crop has been fed to cattle.

Since two experiments are to be conducted on the experimental crop in the selected village it may happen that a khasra number selected for the 1st experiment may be repeated for the 2nd experiment. In this case the khasra number already selected should also be excluded as if it does not grow the experimental crop. It should be clear that two experiments of the same crop are not to be conducted in one khasra number.

Some times it may happen that two or more khasra numbers combine to form a field (see definition of field). If the random number or the remainder is one of these khasra numbers which combine to form a field then select this field for experiment. If both the remainders are such that this field is selected twice then select the combined field for one experiment and see khasra numbers next to the khasra numbers combined in a field for the selection of field for the 2nd experiment. This means that two experiments on the same crop are also not to be conducted in one field. It should be understood now that a khasra number can be rejected only on the consideration (i) either it is not growing the experimental crop, pure or mixed or (ii) the fields within khasra number though growing the crop are such that the required plot size of 10 x 2 meters can not be accommodated in any of its fields, howsoever one may try.

The following example, if carefully followed, explains the procedure of selection of khasra numbers.
Examples:-1 Suppose that the selected village is Bhojpur and its last khasra number at the time of settlement was 1253 and the two random numbers for the selection of field against this village are given as 0839, 5012.

- A. Name of village: Bhojpur
- B. Random Numbers: 0839, 5012
- C. Last Khasra number of the village : 1253

These random numbers when divided by the last khasra number give remainders 839 and "0" respectively. Accordingly settlement khasra number 839 and 1253 should be selected for experiments provided these khasra numbers contains batta number or fields under the experimental crop, sown pure or mixed, it should also be ensured that the fields in this settlement khasra number are such that the plot of required size can be accommodated in one of them. Suppose, khasra number 839 fulfills these two conditions but khasra number 1253 does not grow the experimental crop, select khasra number 839 for the 1st experiment. For 2nd experiment reject khasra number 1253 and search khasra number next to 1253 fulfilling the two required conditions. Since 1253 is the last khasra number of the village, the next khasra number for consideration shall be number-1. Suppose khasra numbers 1 to 3 do not grow the experimental crop, but the khasra number 4 does grow the experimental crop and the fields contained in this khasra number are so small that the plot of required size can not be accommodated in any of the fields it should also be rejected alongwith khasra number 1 to 3. The next khasra number is five which grows the experimental crop as well as fulfills the 2nd condition also. So khasra number 5 shall be finally selected on the basis of random number 5012.

Example No. II.

22.29. Suppose that a village with highest settlement khasra number 907 has been selected for experiments on Maize crop and the random numbers for the selection of khasra numbers given against this village are 3631 and 2727. Both these random numbers are greater than the highest khasra number in the village. The remainders when these random numbers are divided by 907 are 3 and 6 respectively. When these khasra numbers grow the Maize crop and the fields within these khasra numbers are big enough to accommodate the required plot size, these khasra numbers shall be finally selected. Suppose on enquiry it is revealed that the maize has not been sown from khasra Numbers 3 to 8 and khasra numbers 9, 10, 11, 12 have been amalgamated to form one big field in which maize is sown, in this case the combined group of khasra numbers 9, 10, 11, 12 shall be selected on the basis of remainder 3. For selection of the 2nd khasra number on the basis of remainder 6, it is known that there is no maize crop from khasra numbers 6 to 8 and combined group of khasra numbers 9, 10, 11, 12 has already been selected for 1st experiment. The primary worker shall search for a suitable khasra number next to khasra number 12. Suppose khasra number 13 grows the maize crop and the fields within this khasra numbers are big enough to accommodate the required plot size it should be selected on the basis of remainder 6. In this way the two finally selected khasra numbers shall be khasra numbers (9 to 12 combined) and 13.

Note: The division by the highest khasra number at the time of settlement is desirable only when the khasra numbers in the village start from 1 at the time of settlement. In few cases the first khasra number in the village may not be 1. Suppose it starts with 309 and ends with 907. In this case the division of the random numbers against this village should not be done by 907. It shall be desirable to relist the khasra numbers from 1 to 599. This contingency can be avoided. The total khasra numbers (settlement) in the village are $907 - 309 + 1 = 599$. The divisor for this village shall be 599. To get the appropriate khasra numbers add 308 ($309 - 1$) to the remainders for the selection of finally selected khasra numbers in the village, taking "O" remainder as 599.

It may also happen that the khasra numbers in the village are not contiguous e.g. 1 to 198 and again starting from 1 and ending with 8. The division in this case shall be $206 (198 + 8)$. If the remainders are less than or equal to 198 there is no difficulty in the selection of khasra number. If the remainder exceeds 198 this figure should be subtracted from the remainder to select the appropriate khasra number from the second set (1-8) taking "O" remainder as 206. This procedure again correspond to the selecting of the khasra numbers in the village from 1 to 206. A careful study shall bring out that a similar procedure can be involved when there are more than two sets of khasra numbers in the village.

22.30. According to the instructions given above, two settlement khasra numbers have been selected in the selected village. Since settlement takes place after 30 to 40 years, it is likely that these settlement khasra numbers have been sub-divided and the girdawari is done on sub-number basis. Select the first batta numbers in the selected khasra numbers provided the conditions for conducting the experiments are fulfilled. If these conditions are not satisfied then select the next batta number and so on. Indicate this batta number in the bracket alongwith the selected khasra number (settlement) in the appropriate column of form number-I. Also show the fields in the khasra number alongwith the crops grown. This map of the khasra number/batta number can be easily prepared by standing in the south-west direction of this khasra number/batta number. It is clear when there are no batta numbers in the selected khasras there is no question of selecting the batta number. The experiment should be conducted in the khasra number itself and its map prepared.

22.31. According to the definition given above there shall be a number of fields in the finally selected khasra numbers/batta numbers. We have to select a field at random for the experimental crops amongst the number of field constituting the selected khasra/batta number. The field growing the experimental crop in the south-west direction should be selected. If in the opinion of the primary worker there are two fields suitable for the selection according to south-west direction criteria, the field which is in the southern direction should be selected.

22.32. After the selection of the field a pair of random number is selected for locating the plot within this field according to the instructions contained in succeeding paragraphs. The primary worker shall fix the harvest date in consultation with the cultivators and send form No. I duly filled to the Director of Agriculture, HP. It should be remembered that each column of the form should be filled correctly so that reasons for low or high yield in the experimental plot are known.

METHOD OF LOCATING PLOT WITHIN THE SELECTED FIELD:

22.33. In each selected field a rectangular plot size of 10 meters long and two meters wide is to be fixed at random. The random number pair for locating the plot shall be selected on the day on which selection of the field has been made but the actual plot shall be marked on the date of harvesting. For locating the plot the procedure is as follows:-

Fix four prominent corners of this irregular field, even three prominent corners shall also do in case it is not possible to fix four prominent corners. If you are standing on one of these corners facing north or approximately north with the field in front of you and to the right, this is the south-west corner of the field. This South-west corner shall be taken as the starting point for the measurement of length and breadth of the field. Fix a peg at this corner. The fields in the hills are usually irregular and as such the length of the field should be taken as the longer side out of the two sides meeting at the starting corner, irrespective of the other two sides. Measure the irregular length of the field in steps along the bund. Subtract 13 steps from the length measured in steps. The Primary worker has been supplied with a book of random number containing one digit, two digit and three digit random numbers (Annexure A) and the list of villages also fixes a column for each Primary Worker to be consulted for locating the plot. Only this column of the book should be consulted for both the crop seasons and if it is exhausted then next column should be consulted and so on. See that the remainder after subtracting 13 from the length is of one digit, two digit or three digit number. In the appropriate column of the random number book find a random number which is less or equal to the remainder. Circle this random number and strike out the random numbers which are greater than the remainder. From the South-West corner measure steps equal to the random number selected for the length and fix a peg at this point. We have now to measure the breadth of the field at this point. Since the field is irregular measure the breadth in meters perpendicular to the direction obtained by joining the two corners of the field constituting the length. Subtract two meters from this breadth and see again the random number book for the selection of the random number for the breadth, less or equal to the remainder. Care should be taken to see that "0" is not to be ignored, from the random number column and if the same column is to be consulted separately proceed ahead from the random number selected last time and encircled. From the peg fixed for length, take breadth equal to random number of breadth in meters and fix a peg at this point. This point is the starting point and South-West corner of the plot.

Example

Suppose the length of the field is 80 steps. The remainder after subtracting 13 is 67 which is a two digit figure and the Primary Worker has been allotted column-4 of the random number book in the list of village, he shall see Column 4 of the two digit random number list. Starting from the beginning the first number is 83 which is greater than 67 it should be struck off. The next number is 64 which is less than 67 and so it should be selected and encircled. Starting from the South-West corner of the field, measure 64 steps along the bund in the direction of the length and fix a peg at this point. Measure the breadth of the field in meters in the direction perpendicular to the direction formed by joining the two corners of the field for length. Suppose the breadth is 14 meters and the remainder after subtracting 2 meters is 12. We have to select a random number for breadth which is less than or equal to 12. Twelve is also a two digit number and select a number in Column 4 after 64 which is not greater than 12. This number is 03, encircle it and strike out all numbers between 64 and 03 in column 4 of two digit random number list. If two digit column 4 is to be consulted again next time the primary worker shall see the number in this Column next to (03). If Column 4 is exhausted then next Column shall be consulted. In this case the pair of random number for locating the plot within the selected field is (64, 03). This pair shall fix the south-west corner

of the plot and shall be the starting point for marking the plot. In this example it is clear that the starting point of the plot is 64 steps along the bund in the direction of the length and 3 meters in the direction of the breadth. For remainders less than 10 one digit Column is to be consulted.

The procedure for marking plot with the help of random number pair is explained in para 22.34 below. The plot shall be marked on the date of harvesting but it should be seen at the time of selection of this pair that the plot shall fall within the selected field. If the plot is likely to fall outside the field this pair of random number should be rejected and a fresh pair selected. The pair of random numbers should not be rejected on the consideration that the plot is likely to fall on a good or bad piece of land within the field.

PROCEDURE FOR MARKING OF PLOT

22.34. Plot should be marked on the date fixed for harvesting of the field. If the crop is not ripe another date for harvesting can be fixed. Before marking the plot it should be ascertained that the field is the one selected for the purpose of crop cutting experiment. The South-West corner of the plot should be fixed on the basis of random pair selected for length and breadth. Suppose that the random pair as in the example is (64, 03). From the South-West corner of the field take 64 steps along the bund of the field in the direction of the length and then take 3 meters perpendicular to the direction shown by two corners of length inside the field. See this way the south-west corner of the plot is arrived. Fix a peg at this point. Tie a string on this peg and take it parallel to the direction of the length away from the starting point and fix a second peg at a distance of 10 meters. This is the second corner of the plot. Fix the 3rd peg at a distance of 2 meters perpendicular to the length in the direction in which the breadth of the field is measured and measure the diagonal distance from 1st to the 3rd peg. See it is 10 meters and 20 cms. This shall ensure that the angle made at the 2nd peg is a right angle. Take a distance of 10 meters at right angle to the breadth of the plot towards the starting point and fix the fourth peg ensuring that the diagonal distance from 2nd to 4th peg is again 10 meters and 20 Cms. Finally measure the distance from peg number 4 to 1 and see that it is 2 meters. It takes lot of time to make a plot when the crops are standing in the field. It should be ensured that the plot is rectangular and its sides are correctly measured as 10 meters and 2 meters. The string be now tied from the first peg to the fourth peg so that it coincides with the boundaries of the plot. Crop plants growing within the plot are to be harvested. So the plants falling inside or outside the plot be separated by going round the plot.

HARVESTING OF THE PLOT

22.35. As stated above only these plants are to be harvested which fall within the plot. If a plant falls on the border and half of its tillers are inside the plot, it should be harvested but if less than half of the tillers fall within it, it should be excluded. So far as possible the field should not be harvested unless the crop within the plot is harvested and removed for threshing.

CROP CUTTING EXPERIMENT ON WHEAT, BARLEY AND PADDY CROPS:-

22.36. So far as possible, the crop should be harvested before noon. All earheads should be collected from the ground. The produce should be spread on Hessian cloth or any other thick cloth to be dried in the sun for sometime. Then the primary worker should get it threshed in his presence according to the convenience of the cultivator. All the grains should be removed from the earheads. Since the crop is not completely dry, this process may take some more time in which the rest of the grains are removed by crushing the left over pieces of earheads manually. Remove 'Bhusa' and other extraneous matter to get cleaned grain. Care should be taken to see that there is no loss of grain in the process from harvesting to cleaning. Weigh the cleaned grain with the help of standard weights and scale upto 20 gms. correctly and enter this weight in form No-2. Fill in other columns of this form, giving appropriate replies without dots and dashes and send a copy of this form immediately to the Director of Agriculture, HP and retain its duplicate copy for subsequent enquiries by the Director of Agriculture/Statistical Officer or the District Officers. If the crop sown in the plot is in mixture with other crops, only the experimental crop should be

harvested, threshed and grain weight recorded, giving the proportion of constituent crop in the mixture in the appropriate column of form No-2. Wheat/Barley mixture cannot be separated, and as such the mixture should be harvested together and weight given for the combined grain of Barley and Wheat.

22.37. Both the experiments in the first village of the list of villages for the Kanungo Circle/Block shall be subjected to driage experiments. In the other villages, the grains shall be returned to the cultivators after weighing and without drying the produce.

22.38. Crops cutting experiments on Maize crop:- Remove the cobs from the plants falling with in the plot fixed. Remove the sheath and the stalk. Count the number of cobs harvested and weigh them correctly upto 20 gms. with the help of standard weights and scale supplied to the primary worker. Enter this weight, fill other details in the columns provided and send a copy of this form immediately to the Director of Agriculture, HP. After weighing the cobs these should be returned to the cultivators. The produce of both the experiments in the first village of the list shall be kept with the primary worker for driage experiments.

DRIAGE EXPERIMENTS

22.39. The driage experiments shall be conducted on these four crops in each of the first village allotted for experiments in each Kanungo Circle/Block. These experiments shall be carried out for both the experiments in the village. The first village is the one which has been listed as such in the list for each primary worker. If the first village in the list has been replaced by an additional village, the driage experiment should be conducted in 2nd village of the original list. But in case, the crop has been totally destroyed in the first village, the driage experiment should be conducted in the next village. It does not mean that the crop cutting experiments shall not be conducted in the village in which the experimental crop has been totally damaged. The primary worker shall enter whatever grains has been harvested in form No.-2. This yield may be zero in one or both of the plots, as an extreme case. Only the driage experiments shall be conducted in the second village, instead of the first one in the list. Further the primary worker should not wait for the harvesting in the first village. He can proceed in any order depending on the maturity of the crop. But form No-3 should be filled for the first village only.

METHOD OF DRIAGE FOR WHEAT, BARLEY AND PADDY CROPS:

22.40. Put the grains separately in the bags after it has been weighed after harvesting and threshing for each plot. Write the name of the cultivator with khasra number harvested on a piece of paper and put it in the bag for identification. The primary worker should take these bags at his headquarters and put these bags for driage in the sun daily for at least fifteen days till its weight is constant. Care should be taken that the grains are not lost in this process of driage. If the primary worker is required to be away from the headquarters for the official duty, the bags for driage should be entrusted to some other person, who is prepared to look after the grain without any loss in the process of its being dried. In the last day of driage the grain should be weighed at an interval of two days to see if the weight has come down to constant. This constant weight is the dried weight of the harvested grains which should be entered in form No-3 alongwith other details required in the remaining columns. A copy of this form No-3 should be despatched immediately to the Director of Agriculture, HP. Care should again be taken that this weight is determined with the help of standard weights and scale used at the time of earlier weighing. The weighing should be done correctly upto 20 gms. The produce then be returned to the cultivators.

METHOD OF DRIAGE EXPERIMENTS FOR MAIZE CROP

22.41. When the Cobs have been weighed after removing the sheath and the stalk, these should be counted, put in the bags alongwith identification particulars showing number of cobs, name of the cultivator and khasra number. The bags should then be taken to the headquarter of the primary worker for drying the cobs before removing the grains. The cobs in each bag should be dried in the sun for two to

three weeks and the number of cobs ascertained at each time. When the weight is constant, the cobs should be weighed again correctly upto 20 gms. Remove the grains from the cobs, taking care that there is no loss of grain in this process. Weigh this grain correctly upto 20 gms. If the grain are not completely dry, the grains removed from the cobs be kept in the bags for drying for another ten days to find out the weight of dried grain.

Form No-3 contains four columns for recording weight in the case of Maize crop namely, (i) Weight of wet cobs removed at the time of harvesting, (ii) weight of dried cobs, (iii) weight of grains removed immediately from dried cobs, (iv) Final weight of dried grains. All these weights should be recorded correctly upto 20 gms. with the help of standard weights and scale. Form No. 3 be despatched to the Director of Agriculture, H.P., immediately after recording these weights in the appropriate columns alongwith other details.

Survey for Estimating Production in Himachal Pradesh.

Kharif/Rabi 19 _____
Form No. I (See para 22.21)

Selection of fields and details of selected fields.

District	Tehsil	Keep blank for office use Receipt Supervised Despatched Code
Kanungo Circle/Block		
Patwar circle	Headquarter	
Name and address of Girdawar Kanungo		
A.D.O. (Agr.)		
Name of the village	Hadbast No.	
Date of arrival in the village.		

1.	Name of the experimental crop.		
2.	(a) Distance of village from Tehsil Office and means of reaching the village		
	(b) Height of the village from sea level.		
3.	(a) Last Khasra No. of the village.		
	(b) Random number given against the village.		
	(c) Remainder after dividing by the last Khasra No.		
	(d) Cancelled Khasra No. or write the reasons of their cancellation in the following symbols with Khasra Nos. (a) For example No crop (b) crop less than 10% (c) plot could not be formed in the given size		
	(e) Khasra Nos. of the finally selected village.		
	(f) Name of the cultivator (alongwith parentage)		

4.	(a)	Draw map of selected khasra No./Batta No. alongwith fields and depict the crops of the fields. Indicate with symbol X the fields cancelled due to non-formation of a plot.		
	(b)	Length of the selected Plots in footsteps and breadth in metres	Length Breadth	Length Breadth
	(c)	Remainder after deducting 13 from length and 2 from the breadth	(L-13) (B-2)	(L-13) (B-2)
	(d)	Column of random number used for the determination of a plot	One digit two digit three digit	
	(e)	Combination of selected random number for the determination of a plot.		
	(f)	Average breadth of the bund in cms.		
5.	(a)	Irrigated or not?		
	(b)	If irrigated, state source of irrigation.		
	(c)	Was the source of irrigation made (Kuhl etc.) under Development Scheme?		
	(d)	How many times irrigated?		
6.		How much fertilizer given (Qtl. per hectare)	Compost Manure of Dung Fertilizer (write the name) Green manure (write the name) Other manure (write the name)	
7.	(a)	Name of the variety of seed in the experimented field (Local), (Improved) (High Yielding) and also write the number.		
	(b)	Was the seed procured from the department or from the bazar?		
	(c)	Write year alongwith date of the purchase of seed		
8.		Ratio of seed per hectare of crop sown pure only		
9.	(a)	Name of the crops sown combined with a crop for fields sown mixed.		
	(b)	Ratio of the seed in Kg. per hectare for a crop sown mixed (write separately for mixed crops)		
	(c)	Ratio of area of the mixed crop. What is the percentage for the whole field through eye estimation?	Crop/Ratio	Crop/Ratio
10.		Estimate of production of the crop (Qtl. per hectare)		

11.	Method of sowing, randomly scattering transplantation or through drilling	
12.	Date fixed for harvesting	
13.	Write if improved method is used for the production and protection of the crop.	Cultivation of Paddy by Japanese method Use of improved plough Use of other improved agricultural implements, use of pesticides
14.	Write details of the reasons which have specially damaged the crop Disease Grass or work Animals, birds rats, etc; Unusual weather conditions others	
15.	Remarks Name and designation of the inspecting officer.	Signature of the Girdawar Kanungo..... A.D.O. (Agr.)..... Date of despatch

Note: In case a field is partly irrigated and partly unirrigated then area in each case may be separately recorded. If the crop is mixed, then name and ratio of the mixed crop may be written. The details of the mixed crop must be recorded. If the mixed crop is harvested before the harvesting time then ratio of crop may be asked from the farmer. No column should be left blank.

2. If irrigation has been done only once, then write irrigated before sowing or irrigated after sowing.
3. All weights should be written in Metric system.
4. The name of the mixed crop and other details may be obtained from the farmer in case any crop is harvested before the actual time of harvest.
5. See part-2 of para 1,2 for the definition of a field.
6. Separate form may be used for each crop. This form may be filled in on day of the selection of the field. The field may be selected about one month before the harvest of the crop.
7. Write correct answers for each question written on the form. In case, there is no answer for a particular question then do not keep the column blank. Write 'No' against such a question. Prepare duplicate copies and send one copy to the Director Agriculture, H.P., Shimla-5 on the same day.
8. The relation of the question asked in 7(a) is with the field where experiment is being conducted and not with the Khasra No. of the selected field.

Crop Cutting Experiments in Himachal Pradesh

Kharif/Rabi 19.....
Form No. 2 (See para 22.22)

Result of the crop cutting experiment of the selected plots.

District	Tehsil	Keep blank for office use	
Kanungo circle/Block		Receipt	Code
Patwar circle		Supervised	
Name and address of Girdawar Kanungo/ A.D.O. (Agr.)		Despatched	
Name of the village Hadbast No.		I	II
Assessment circle			

1.	Name of the experimented crop (alongwith variety) Local, Improved or High Yielding				
2.	Khasra No./Batta No. of the selected field				
3.	(a) Length of the selected field (in foot steps)				
	(b) Breadth of the selected field (in meters)				
4.	Combination of Random Number of the determined plot				
5.	(a) Remainder after deducting 13 from the length	3(a) — 13	3(a) — 13		
	(b) Remainder after deducting two from the breadth	3(b) — 2	3(b) — 2		
6.	(a) Date fixed for harvesting (inform through card)				
	(b) Actual date of harvest (If fixed date has been changed, then reason of change)				
7.	If the experimented crop has been sown mixed then name of the crop and ratio of area in a mixture (in percentage) give separate for the whole field and the experimented plot.	First Field		Second Field	
		Crop	Ratio in %	Crop	Ratio in %
		Full Field	Exp. plot	Full Field	Exp. plot
8.	(a) No. of maize cobs				
	(b) Weight of maize cobs				
9.	Weight of grains of wheat/paddy/barley	Kg.	Kg		
10.	Date of first weighing				
11.	Write answers of the following question in neat hand.				
	(a) Give details of the fertilizer if given to the crop after filling-in the Form-I				

(b)	Did the crop damage after the selection of the field? If damaged then write the reasons (For example, rains, hails, disease, animal etc.)		
(c)	Had the farmer harvested the field or part of it without your permission		
(d)	If the production of plot given in Form-I is quite different from your estimate then write its reason such as bad growth, shade of trees, variety of road or path.		
Draw a map of selected fields in the space below and indicate the plot in it.			

	First	Second field	
13.	Remarks		
	Sign. of Girdawar Kanungo/ A.D.O.(Arg.)/Gram Sewak		
	Date		
14.	Signature of the supervising officer		
	Designation	Date	
15.	Remarks of A.D.O. (Arg.)		Accepted /Rejected
			Signature

Note

1. Prepare two copies of this form and send one copy of it on the same day to the Director Agriculture, H.P., Shimla-5.
2. Fill-in separate form for each crop. Fill-in the form on the day of harvest of crop.
3. Write correct answer to questions written on the forms. If any question does not provide correct answer then do not keep the column blank, write 'No' against such a question.

Crop Cutting Experiments in Himachal Pradesh

Kharif/Rabi 19.....
Form No. 3 (See para 22.22)

Results of Experiments of Dried Crops

District	Tehsil	Keep blank for office use	
Kanungo circle/Block		Receipt	Code
Patwar circle		Supervised	
Headquarter		Despatched	
Name and address of Girdawar Kanungo/		I	II
Name of A.D.O. (Agr.)			
Name of the village Hadbast No			

1.	Name of the experimented crop		
2.	Khasra No. and Batta No. of selected field		
3.	(a) Date of harvest (experimental Plot)		
	(b) Date of first weighment of harvested crop		
4.	(a) No. of maize cobs on the day of harvest		
	(b) Weight of maize cobs on the day of harvest.		
5.	Weight of wheat/paddy/barley grain on the day of harvest		
6.	Date of second weighment		
7.	(a) No. of maize cobs on the day of second weighment		
	(b) Weight of maize cobs on the day of second weighment.		
	(c) The weight of maize grains on the day of separating grains from maize cobs		
8.	The weight of dried wheat/paddy/barley grain on the day of second weighment		
9.	Weight of maize grains after 10 days of separation from maize cobs		
10.	Remarks:		

Name of Supervising Officer

Designation

Date

Sign. of the Official
Date

Note:

1. The weight given in column No. 4, 5, 7, 8 and 9 should be that of grains, Do not include weight of the bag in it.
2. It should be noted that there should be no loss of grains at any stage.
3. Write in remarks column whether did you notice discrepancy in the bag or production? Write reasons if dryness has been done in excess or less.
4. Prepare two copies of this Form and send one copy of it on the same day to the Director Agriculture, Shimla-5.
5. Fill-in separate form for each crop.
6. Write correct answers to the questions written on the form. If there is no correct answer for a question then reply in negative. Strike off the column which is not applicable.

Himachal Pradesh Government
Department of Agriculture (Section of Agricultural Statistics)
Crop Estimation Survey (General)
INSPECTION REPORT
FORM-A

Name and designation of Inspecting Officer		Year and season
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1. Identification particulars

State	Date of visit			Crop
District	Normal harvesting period for the crop in the tract	Expt. No.	Survey No.	Stage of inspection
Tehsil		1		
Block	CD/NES	2		
Headquarters				
Village				

2. Primary Worker

2.1 Name of Primary Worker		2.5 If he did not, name and designation of actual experimenter	
2.2 Designation		2.6 Did he accompany you at the time of inspection? (Yes or No)	
2.3 Was he present at the time of inspection? (Yes or No)		2.7 Other officials if any, who accompanied you (designation)	
2.4 Did he conduct the experiments himself? (Yes or No)			

3. Selection of fields

3.1 Was the enumeration of crop acreage completed by the time of your visit? (Yes or No)		3.6 Dimensions of the selected field steps/metre						
3.2 How was the selection of Survey Nos & fields checked (consulting map, khasra register or both)		(a) as recorded by experimenter (b) as measured in your presence						
3.3 Was the selection of Survey Nos. correctly done? (Yes or No)	Expt. 1	Expt. 2	Expt.	Length	Breadth	Expt. No.	Length	Breadth
3.4 Was the selection of field within the Survey No. correctly done? (Yes or No)						1		
3.5 Was the experiment conducted in the Selected field? (Yes or No)						2		

3.7 Survey Nos. wrongly rejected, if any with remarks			3.8 Date originally fixed for harvesting			Was it changed? (Yes or No)	Was the change intimated to higher authorities in time? (Yes or No)	Actual date of Harvesting
Expt No.	Survey Nos. wrongly rejected	Remarks						
1								
2								

4. Equipment

	Tape Cross Staff	Pegs	Strings	Hessian cloth	Balances	Standard weight	Bag for driage
	Chain Optical square						
4.1 Whether supplied? (Yes or No)							
4.2 Whether used Yes or No (if locally procure write local)							
4.3 Working condition (Good or Bad)							

* Delete terms inapplicable

5. Plot Marking and Harvesting

5.1 Random Nos. (or remainders) for locating experimental plot				5.5 Dimensions of the plot as seen on spot inspection (in metres and cm.)						
Expt. No.	(a) As recorded by experimenter		(b) As should have been selected		Expt. No.	Length		Breadth		Diagonal through the S.W. corner
	Length	Breadth	Length	Breadth		1	2	1	2	
1					1					
2					2					
Expt. No.	5.2 Was the plot properly located with the pair of random Nos.? (Yes or No)	5.3 Were the sides of the plot taken in the proper directions? (Yes or No)	5.4 If the inspection is post harvest could you check the plots marking? (Yes or No)	5.6 Did the experimenter weigh the produce to the nearest 20 gms? (Yes or No)				Expt. No.	Weight	
				5.7 Weight of cobs/ grains on the date of harvesting/ threshing (if spot checked)		Kg.	gms.			
1										1
2								2		

6. Driage Experiments

	Expt. 1	Expt. 2	Expt.	6.5 Result of weighing produce in the bags in your presence				
				Expt. No.	Weight recorded on date of harvest		Weight of contents of the bag on inspection	
6.1 Was the exptl. produce taken to the experimenter's headquarters? (Yes or No)								
6.2 If not, with whom was it kept (Cultivator/Patwari etc.)					kg.	gms.	kg.	gms.
6.3 Was it kept in a bag properly sealed and labelled? (Yes or No)				1				
6.4 Did you suspect any loss of damage to the stored produce? If so state whether negligible or appreciable				2				

7. General

	Expt. 1	Expt. 2	Expt.		Expt. 1	Expt. 2	Expt.
7.1 Has any (or part) of the Bunds been given a separate survey number? If so state the number				7.4 Names of crops if shown in mixture in the selected field. Write pure, if so			
7.2 If the Bunds grow any crop name and approximate area (Hect.)				7.5 Did the experimenter report this?			
7.3 If inspection is preharvest (a) General condition of the crop in the selected field				7.6 If sown in separate rows, the No. of rows of each crop in the selected field			
(b) Eye estimate of yield of the experimental crops (kg. per hect.)				7.7 Approximate percentage of area under each crop			

8. Whether inputs applied (Yes/No)

8.1 Expt. No.	Source of data	Irrigation	Improved seed	Pesticides	Manure (kind)
1	P.W.'s entry Your findings				
2	P.W.'s entry Your findings				

8.2 General Remarks

Signature of Inspecting Officer.....

Date.....

Delete terms inapplicable.

If yes, specify kind in terms of codes: Fertilizer — 01
Other manures — 02

Annexure A

List of Random Numbers to be used for Locating Plots List of One-Digit Random Numbers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
3	3	2	6	1	6	8	0	4	5	6	0	8	0	0	7	3	5	4	5	5	4
2	7	0	7	3	6	0	7	5	1	2	4	6	1	9	9	9	7	3	8	1	8
1	3	5	5	3	8	5	8	5	9	8	8	6	7	0	0	3	7	2	6	7	1
5	7	1	2	1	0	1	4	2	1	8	8	6	5	2	2	4	2	8	6	7	3
0	6	1	8	4	4	3	2	5	3	2	3	0	9	2	7	8	5	0	0	9	4
8	7	3	5	2	0	9	6	4	3	8	4	6	7	4	2	9	6	3	7	2	7
2	1	7	6	3	3	5	0	2	5	8	3	3	0	8	7	8	6	1	0	4	8
1	2	8	6	7	3	5	8	0	7	4	4	1	7	5	5	7	3	9	5	2	5
1	5	5	1	0	0	1	3	4	2	9	9	3	2	0	0	8	2	8	0	0	4
9	0	5	2	8	4	7	7	2	7	0	8	1	3	1	3	7	5	6	9	2	9
0	6	7	6	5	0	0	3	1	0	5	5	2	6	7	2	5	1	9	2	7	5
2	0	1	4	8	5	8	8	4	5	1	0	2	3	8	1	7	0	5	0	0	3
3	2	9	8	9	4	0	7	7	2	9	3	2	0	3	4	5	9	3	4	1	4
8	0	2	4	0	2	5	3	5	3	8	6	4	0	6	6	8	9	2	0	8	7
5	4	4	2	0	6	8	7	9	8	3	5	1	7	3	1	8	8	9	2	2	9
1	7	7	6	3	7	1	3	0	4	0	7	0	0	8	8	3	8	7	9	3	1
7	0	3	3	2	4	0	3	5	4	9	7	2	4	3	3	9	3	4	8	6	6
0	4	4	3	1	8	6	6	7	9	9	4	9	7	7	2	7	8	0	5	7	3
1	2	7	2	0	7	3	4	4	5	9	9	5	1	9	9	1	3	9	5	0	9
5	2	8	5	6	6	6	0	4	4	3	8	5	7	0	0	4	5	0	5	0	9
0	4	3	3	4	6	0	9	5	2	6	8	5	0	4	2	4	2	4	6	7	7
1	3	5	8	1	8	2	4	7	6	1	5	5	8	2	7	7	4	4	7	6	2
9	6	4	6	9	2	4	2	4	5	9	7	3	2	8	5	3	8	2	7	5	7
1	0	4	5	6	5	0	4	2	6	1	1	1	2	1	8	7	7	3	4	9	6
3	4	2	5	3	0	5	7	2	7	4	0	5	1	7	2	7	5	9	5	4	1
6	0	4	7	2	1	2	9	6	8	0	2	5	4	6	7	0	2	6	5	5	4
7	6	7	0	9	0	3	0	8	6	3	8	3	9	4	7	4	8	2	5	8	7
1	6	9	2	5	3	5	6	1	6	0	2	7	6	3	9	9	2	2	5	0	4
4	0	0	1	7	4	9	1	6	2	4	8	8	6	7	4	8	3	3	1	2	7
0	0	5	2	4	3	4	8	8	5	2	7	8	4	6	4	5	9	7	9	4	9

**List of Random Numbers to be used for Locating Plots
List of Two Digit Random Numbers (Page 1)**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
51	51	00	83	63	22	55	39	65	36	63	70	77	45	85	50
68	97	87	64	81	07	83	73	71	98	16	04	29	18	94	51
30	79	20	69	22	40	98	72	20	56	20	11	72	65	71	08
81	69	40	23	72	51	39	75	17	26	99	76	89	37	20	70
90	60	73	96	53	97	86	37	48	60	82	29	81	30	15	39
46	15	38	26	61	70	04	68	08	02	80	72	83	75	46	30
99	05	48	67	26	43	18	14	23	98	61	67	70	52	85	01
98	35	55	03	36	67	68	49	08	96	21	44	25	27	99	41
11	53	44	10	13	85	57	78	37	06	05	43	63	61	62	42
06	71	95	06	79	88	54	37	21	34	17	68	86	96	83	23
83	45	19	90	70	99	00	14	29	09	34	04	83	83	07	55
49	90	65	97	38	20	46	68	43	28	06	36	49	52	83	51
39	84	51	67	11	52	49	10	43	67	29	70	80	62	80	03
16	17	17	95	70	45	80	44	38	88	39	54	86	97	37	44
13	74	63	52	52	01	41	90	59	59	19	51	85	39	52	85
68	93	60	51	97	22	61	41	47	10	25	62	97	05	31	03
01	07	98	99	46	50	47	91	94	14	63	19	75	89	11	47
74	97	76	38	03	29	63	80	06	54	18	66	09	13	94	06
19	33	58	05	70	53	30	67	72	77	63	48	84	08	31	55
43	70	02	87	40	41	45	59	40	24	13	27	79	26	88	86
95	80	35	14	97	35	33	05	90	35	89	95	31	61	16	96
82	15	94	51	33	41	67	44	43	80	69	98	46	58	05	14
65	31	01	51	80	32	44	61	81	31	96	82	00	57	25	60
85	23	65	09	29	75	63	42	88	07	10	05	24	98	66	63
65	79	20	71	53	20	25	75	94	30	05	39	28	10	99	00
81	06	01	82	77	15	12	78	83	19	76	16	94	11	68	84
00	52	53	43	37	15	26	87	76	59	61	81	43	63	64	61
50	28	11	39	03	34	25	91	43	05	96	47	55	78	99	95
53	32	40	36	40	96	76	84	97	77	72	73	09	62	06	65
69	84	99	63	22	32	98	87	41	60	76	83	44	88	96	67

List of Random Numbers to be used for Locating Plots
List of Two Digit Random Numbers (Page 2)

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
65	87	08	13	50	63	04	23	25	47	51	91	18	52	62	24
43	65	42	78	66	28	55	80	47	46	41	90	08	55	98	78
62	60	53	51	57	32	22	27	12	72	72	27	77	44	67	32
54	96	72	66	86	65	64	60	56	59	75	36	75	46	44	33
46	96	86	19	83	52	47	53	65	00	51	93	51	30	80	05
18	08	51	51	78	57	26	17	34	87	96	23	95	89	99	93
13	37	00	79	68	96	26	60	70	39	83	66	46	62	03	55
40	25	24	73	52	93	70	50	48	21	47	74	63	17	27	27
90	65	77	63	99	25	69	02	09	04	03	35	78	19	79	95
53	09	48	86	28	30	02	35	71	30	32	06	47	93	74	21
40	69	80	97	96	47	59	97	56	33	24	87	36	17	18	16
96	06	68	93	41	69	96	07	97	50	81	79	59	42	37	13
07	76	21	40	24	74	36	42	40	33	04	46	24	35	63	02
27	78	37	06	06	16	25	98	17	78	80	36	85	26	41	77
44	66	88	97	81	26	03	89	30	46	67	21	17	91	10	39
58	91	63	65	99	59	97	84	90	14	79	61	55	56	16	88
00	97	26	16	91	21	32	41	60	22	66	72	17	31	85	33
00	51	72	62	03	89	26	32	35	27	99	18	15	78	12	03
15	00	41	92	25	73	40	38	37	11	05	75	16	98	81	99
30	92	30	45	51	94	69	04	00	84	14	36	37	95	66	39
19	94	91	67	48	57	10	25	19	64	82	84	62	74	29	92
10	70	49	92	05	12	07	23	02	41	46	04	44	31	52	43
23	13	67	95	07	76	30	85	85	66	96	28	28	30	62	55
63	71	54	50	06	44	76	68	45	19	69	59	35	14	82	56
19	29	56	23	27	19	03	69	31	46	29	85	18	88	26	95
39	79	11	28	94	15	52	37	31	61	28	98	94	61	47	03
86	57	77	55	33	62	02	66	42	19	24	94	13	13	38	69
51	26	35	96	29	00	45	33	65	78	12	35	91	59	11	38
07	21	02	84	48	51	97	76	32	06	19	35	22	95	30	19
86	33	49	90	21	60	74	43	33	42	02	59	20	39	84	95

**List of Random Numbers to be used for Locating Plots
List of Three Digit Random Numbers (Page 1)**

1	2	3	4	5	6	7	8	9	10	11	12
642	807	270	546	029	835	828	386	010	216	322	045
790	188	608	897	265	257	276	134	111	614	930	921
435	410	099	205	689	786	313	094	883	382	695	654
218	345	226	433	905	298	385	904	803	854	968	739
264	626	225	267	531	617	134	416	101	081	503	908
296	340	928	403	526	048	138	609	683	807	331	986
836	883	273	307	700	226	101	762	243	049	471	774
058	569	858	422	469	850	647	050	958	217	564	686
552	341	221	191	226	645	614	634	201	633	887	868
757	094	479	348	407	575	377	095	239	675	527	886
149	322	243	302	047	427	832	247	827	331	045	500
639	252	212	801	325	032	719	795	702	411	141	913
648	047	384	924	748	096	704	732	188	117	519	249
573	469	236	958	782	058	134	047	833	897	686	154
879	632	569	615	252	706	787	428	114	304	629	806
676	183	092	227	221	143	760	061	915	362	366	778
235	417	572	035	884	979	255	034	163	387	717	660
749	782	410	000	437	057	074	404	742	573	618	017
364	959	700	077	762	551	647	702	616	517	361	377
406	697	651	823	196	747	742	202	473	049	634	182
749	604	496	495	370	532	952	843	214	125	162	641
355	217	237	436	308	679	812	164	651	367	825	191
392	184	954	851	986	202	732	640	447	515	829	158
628	816	252	418	490	869	332	825	772	438	864	281
709	349	671	505	855	905	549	550	489	101	527	041
876	219	495	418	913	864	864	424	200	164	054	452
687	529	928	822	641	033	948	299	058	732	974	113
836	884	465	379	779	348	217	195	359	232	948	907
262	484	430	807	965	329	181	438	896	614	551	306
406	292	730	137	235	154	714	114	506	375	139	077

**List of Random Numbers to be used for Locating Plots
List of Three Digit Random Numbers (Page 2)**

Concl.

13	14	15	16	17	18	19	20	21	22	23	24
288	302	957	018	109	053	044	058	859	285	989	732
965	943	462	554	146	318	813	540	090	553	340	096
870	654	605	967	968	085	370	252	657	094	698	056
813	728	351	266	619	151	079	473	763	886	097	893
506	662	573	866	835	785	689	529	992	283	964	416
304	855	222	564	247	726	626	370	569	002	759	996
232	804	271	605	536	173	607	504	020	357	975	079
547	746	272	659	500	487	039	821	904	130	633	750
579	419	722	753	519	962	836	477	033	320	248	817
114	008	777	675	351	395	656	463	578	647	736	959
526	559	446	464	308	899	620	172	157	937	171	423
224	878	732	433	005	993	355	727	995	421	816	713
199	107	231	637	192	397	865	512	072	863	904	818
491	049	367	154	956	911	777	635	102	349	675	392
674	920	950	500	232	289	553	962	844	902	272	428
857	512	776	644	719	415	362	900	851	169	852	504
102	072	305	756	036	523	026	453	977	744	132	319
519	302	585	845	931	731	642	365	632	333	831	719
648	214	669	196	462	612	192	781	961	420	943	216
284	604	528	959	985	898	494	235	035	259	394	334
627	443	283	351	188	946	131	915	229	203	977	693
429	152	062	482	826	147	338	911	530	984	319	317
922	430	588	568	966	031	699	483	192	956	384	030
461	744	365	022	401	067	667	423	957	158	754	211
039	060	686	065	021	808	697	314	744	220	369	155
122	309	242	226	403	441	624	875	320	402	098	046
486	341	451	395	054	268	134	740	902	999	108	084
494	983	308	978	800	884	383	530	025	978	343	269
631	946	604	937	264	596	101	084	367	788	322	601
507	204	628	614	385	914	624	632	069	382	626	724

Part-III

Crop Cutting Experiments by Random Sampling Method on Vegetables and Fruits

22.42. The crop cutting experiments on vegetables shall be conducted by Random Sampling Method as approved by the Govt. of India and adopted by Himachal Pradesh Government as per Annexure 'C'.

These experiments shall be conducted by Agriculture and Revenue Department and Department of Economics and Statistics, H.P. The number of experiments shall be allotted by the Director of Agriculture, H.P. immediately after the sowing of the crops in consultation with the Director of Land Records, H.P.

The experiments on fruit crops shall be conducted by Horticulture Department of H.P. by Random Sampling Method as approved by the Govt. of India (Indian Agricultural Statistics Research Institute) (ICAR) vide letter No. JD/(SSM)-(CES)/Fruits/HP/89, dated 23.8.1989 and adopted by H.P. Govt. The note on concepts and definitions to be used in the Survey, the sampling methodology for estimation of extent of cultivation and production of vegetables and fruits are contained in Annexure B, C & D respectively. This methodology whenever changed by the Govt. of India shall be adopted by the State Govt. from time to time. The number of experiments shall be allotted by the Director of Horticulture, H.P. in consultation with the Director of Land Records well before the harvesting of the fruit crops.

The results of these experiments on vegetables shall be forwarded by the staff of Director of Economics and Statistics and Revenue Department to the Department of Agriculture, who in turn, will analyse these experiments including their own experiments and the yield rates of the experimented crops will be forwarded to the Director of Land Records, H.P. for estimation of the total production of the relevant crops of the State.

The Department of Horticulture shall also analyse the experiments conducted by them and send the yield rates of various fruit crops to the Director of Land Records for estimation of total production of the State.

The Director of Land Records shall release the area and production estimates of these crops and forward the same to the Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India, New Delhi and other concerned Departments of the State.

Annexure-B

CONCEPTS AND DEFINITIONS TO BE USED IN THE SURVEY

1. *Reporting or non-reporting villages*

A "Reporting" village for a given fruit is one in which some area under the fruit is reported according to the latest information available with the Revenue Agency. The villages not reporting any area under the fruit are classified as "non-reporting" villages for that fruit.

2. *A tree of bearing age*

A tree of a given fruit attaining the age at which a majority of trees of that fruit normally bear fruit, irrespective of the fact whether or not the tree bears fruit during the particular year/season, is defined as a tree of bearing age. For example, the bearing age is normally taken to be five years for mango, four years for citrus, two years for grapes and one year for banana.

3. *Bearing tree*

A bearing tree is defined as a tree of bearing age which has borne fruit any time in the past and also bears fruit during the season.

4. *Young tree*

A young tree is defined as a tree which has not attained the specified bearing age of the fruit.

5. *Non-bearing tree*

A non-bearing tree is defined as a tree which has reached the bearing age but is not found bearing fruit during the season, due to any reason such as disease, old age, withering of flowers or any other agro-climatic factor.

6. *Orchard*

An orchard is defined as a piece of land (managed singly or jointly) with a minimum of 12 fruit trees on it planted in a systematic fashion.

7. *Young and bearing orchard*

An orchard in which at least 10 per cent of the trees are of bearing age subject to a minimum of 6 bearing trees may be regarded as a bearing orchard, otherwise it may be taken as a young orchard.

8. *Stray trees*

The trees planted in clusters of less than 12 trees and those planted on road sides, river banks, field bunds, courtyards of houses, etc. are defined as stray trees.

Annexure-C

THE SAMPLING METHODOLOGY FOR ESTIMATION OF AREA AND PRODUCTION OF VEGETABLE CROPS

The survey approach for estimation of area and production of vegetable crops is somewhat more complex due to special features of cultivation of these crops. Some of these features are as follows:

- (i) The vegetables are short duration crops and their duration varies considerably from one vegetable to the other.
- (ii) Harvesting of vegetables involves a number of pickings.
- (iii) Vegetable cultivation is more or less a continuous process with various operations like sowing, harvesting, etc. being done simultaneously in different fields of a village.
- (iv) Vegetables are highly sensitive crops and this normally adds to the variability in the yield rates of the crops.

It is also realised that due to perishable nature of the vegetable crops, production depends on availability of marketing facilities in the area. This is why cultivation of vegetables is normally concentrated around bigger town and cities. Accordingly, the methodology for estimation of area and production of vegetable crops has been developed at the district level in different surveys conducted so far in

various States.

The sampling design for surveys for estimation of area and production of vegetables is described below.

Sampling design

The sampling design is a stratified multistage random sampling. Tehsils or equivalent areas may be taken as main strata. Further, since area under vegetables may vary considerably from one village to another in a Tehsil, sub-stratification may be done on the basis of village-wise area under vegetables. For this purpose 3 to 4 substrata with equal area under vegetables may be formed. The data figures may be available in revenue records. If not available, then a preliminary survey may be conducted to obtain village wise area under vegetables. Within the strata, clusters of three villages may be taken as primary sampling units. For determining the extent of cultivation, a sampling fraction of about 20% may be used for selection of clusters of villages. The allocation of clusters of villages to different strata may be done in proportion to area under vegetables. The allocated number of clusters in different strata may be selected with simple random sampling without replacement. (SRSWOR). For yield study, 50% of the clusters selected for area may be retained and fields growing vegetables may be selected in these clusters.

The selected clusters of villages may be completely enumerated for area under vegetables. Vegetables being short duration crops, one time enumeration in a year may not be meaningful. To account for the short duration of crops and early and late varieties a year may be divided into four periods of three month each. The area enumeration may be done in the beginning of each period. 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 vegetable may be selected in each of the clusters selected for yield study. In each of the selected fields, a randomly located plot approved vide Indian Agricultural Statistics Research Institute (ICAR) No. JD/(SSM—CES) Fruits/H.P./89 dated 23rd. August, 1989 of 10 X 2.5 or 12.5 X 2 Metres whichever feasible may be demarcated and observed for all the pickings in the respective periods. The yield of a vegetable for a selected field is obtained as the aggregate of all pickings in the period obtained from the crop cutting plot. The average yield of the vegetable for the village is obtained as a simple mean of field wise yield and when multiplied by the area under vegetable in the village give the vegetable production in the village. In this way the production for each period may be estimated separately. The average yield is then obtained from the estimated production and the area under a vegetable.

This sampling design is likely to provide estimates of average yield with less than 5% standard error and the area and production with less than 10% standard error for important vegetable crops at the district level.

Annexure-D

THE SAMPLING METHODOLOGY FOR ESTIMATION OF EXTENT OF CULTIVATION AND PRODUCTION OF FRUIT CROPS

1. In view of the special features of fruit crops, estimation of extent of cultivation and production of fruit crops is somewhat different than other crops. Some of the features are:-

- (i) As against seasonal nature of field crops, fruits are perennial crops.
- (ii) Fruit trees, besides being grown in regular orchards, are also extensively grown on canal banks, field bunds, road sides, backyard of houses and even as stray trees.
- (iii) Different fruits are frequently grown in the same orchard.
- (iv) Fruit trees take quite a few years before they start bearing fruit.

- (v) All the trees in an orchard may not be of the same age i.e. an orchard may contain both bearing and young trees.
- (vi) Harvesting of fruit trees is done in a number of pickings extending over several weeks.
- (vii) Several fruits like citrus, guava, etc. have two harvesting seasons in a year.

All these points are to be carefully considered while planning a sample survey to estimate the extent of cultivation and yield of fruits.

1.2 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.

1.3 The choice of sampling design would depend upon whether only one fruit is of interest or more than one fruits are being studied. Normally the survey may be planned to cover all important fruit crops simultaneously at the State level. However, if single fruit is to be covered for some specified area, say the district level, on the basis of importance of the crop, the sampling design for such surveys may be used. Accordingly, the sampling design for single fruit in a district and for several fruit crops at the State level are separately described below:

2. Sampling plan for surveys to estimate the extent of cultivation and production of a single fruit crop in a district.

Each village in the district may be identified as "reporting" or "non-reporting" for the crop on the basis whether the fruit is grown in the village or not. A list of "reporting" as well as "non-reporting" villages may be prepared along with area under the fruit. This information may be obtained from revenue records or from past year's data.

2.1 Sampling design

The sampling design may be broadly defined as stratified three stage random sampling. The tehsils/blocks or groups thereof in the district may be taken as strata, villages as primary sampling units, orchards as second stage units and clusters of trees as the ultimate units of sampling. The sample size of villages i.e. the number of villages to be selected in the district may be allocated to different strata in proportion to the area under the fruit in the strata. The "reporting" villages in a stratum may be regarded as primary sampling units and selection of allocated or the desired number of villages may be done by probability proportional with replacement, taking area under the fruit as the size measure. Orchards in the selected villages and clusters of trees in the orchards are then selected with SRSWOR. Also, since there may be errors in the reporting/recording of fruit cultivation or some fruit cultivation may be taken up in the "non-reporting" villages, a sample of villages may also be selected from the "non-reporting" group of villages in each stratum. For determining the extent of cultivation, the selected villages may be completely enumerated to obtain information on the area under fruit orchards and the number of trees both in the orchards as well as stray trees. The trees may also be enumerated with respect to the varieties as well as status about bearing or non-bearing fruits. Apart from estimation of extent of cultivation of fruit, complete enumeration would also provide a frame of orchards for further selection of orchards and trees for estimation of yield.

For estimation of yield of fruit, five orchards may be selected by SRSWOR to record information regarding cultivation practices such as irrigation, manuring, intercropping and other practices followed by the orchardists throughout the year. From each of the selected orchards, three clusters of four trees each of bearing age may be selected at random for recording data on yield of a fruit throughout the harvesting season.

2.2 Sample size

A total of 150-200 reporting villages (primary sampling units) may be selected in the district. As described above, this number may be allocated to different strata (Tehsils) in proportion to area under orchards and the allocated number of villages in a stratum may be selected with probability proportional with replacement. At the second stage of sampling 5 orchards may be selected at random, from each selected orchard three clusters of 4 bearing trees may be selected at the ultimate stage of sampling. Earlier surveys have shown that with this type of design and sample size, the average yield at the district level is likely to be estimated with a standard error of about 5% and the area and total production with a S.E. between 5 to 10%. However, the efficiencies of various estimators would depend upon the amount of variability in different characters. Surveys conducted during initial years will provide an idea about these variabilities and, accordingly, the number of villages and orchards selected may be modified to achieve the desired degree of precision.

3. Sampling plan for estimation of extent of cultivation and production of more than one fruit crops in a State:

The important fruit crops whose production is to be estimated should be first identified. Normally, the previous years' area figures under different fruit crops are available at the tehsil level and these may be used to determine the important fruits in the State. 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 and delimit the important growing regions or areas for different fruits. A district is considered too large a unit of area for this purpose. However, tehsils or sub-divisions or equivalent areas in a district may be considered appropriate. Thus, tehsils which are important at least for one of the fruit crops, may be identified as important fruit growing tehsils. It may be mentioned that importance of a tehsil with respect to a fruit is determined on the basis of area under that fruit and thus a tehsil important for a given fruit may not be important for other fruits. As a broad guideline, for a given fruit, the important tehsils are those which taken together cover 40-50% of the total area under that fruit in the entire State.

3.1 Sampling design and sample size

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

In the selected tehsils also, all the villages may not be growing all the fruits. A frame of villages growing different fruit in a stratum is, therefore, prepared. Accordingly, villages in a stratum may be classified into two categories (i) growing atleast 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 of villages for a given fruit crop four villages may be 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 may be selected in each stratum with SRSWOR. From the villages in category (ii) where no cultivation of fruits is reported, a sample of two villages may be selected with SRSWOR. The selected villages may be completely enumerated for the extent of cultivation and number of trees in orchards as also the stray trees.

For yield estimation, a sub-sample of two villages out of four reporting villages may be retained in all the major fruit growing tehsils/strata and from each village 5 orchards and 3 clusters of 4 trees each of bearing age may be selected for this purpose. The selected clusters of trees may be observed for entire harvest period both with respect to weight as well as number of fruit. However, exceptions to this procedure may be made for certain crops like banana and grapes. A uniform approach in this regard is essential for comparability as well as pooling of estimates over different areas.