

THE NATIONAL SAMPLE SURVEY

NUMBER 125

TECHNICAL PAPER
ON
SAMPLE DESIGN

NINETEENTH ROUND
JULY 1964—JUNE 1965



सत्यमेव जयते

Issued by

THE CABINET SECRETARIAT : GOVERNMENT OF INDIA

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Staggered Survey and Moving Reference Period

1-9. In any survey, whether on a sampling basis or not, we are concerned with two periods, viz., the 'survey period' i.e., the period to be taken for field work, and the 'reference period', i.e., the period to which the collected data will refer. Before the survey is started we have to decide on the length and the end-point of these two periods.

Now the Indian economy being largely dependent on agriculture is subject to pronounced seasonal fluctuations, and hence the survey period of the recent rounds has been made one complete year so that all the seasons are fully covered by the survey. Staggering the survey over a long period like a year has one more advantage, viz., it requires a lesser number of investigators than would be required with a shorter survey period. For a survey of given dimensions, a smaller number of investigators is usually more desirable from the point of efficient recruitment, training and organisation of the field staff.

1-10. But in a survey spread over a long period, if information is collected for a fixed reference period, the period in between the fixed reference period as the time of data collection also becomes quite long as the survey makes some progress even though the chosen reference period might immediately precede the start of the survey. The longer this gap, the greater is the error due to recall lapse i.e., lapses due to forgetfulness. Further, estimates obtained on the basis of a fixed reference period of length less than a year will be greatly influenced by the characteristics of the season to which the reference period belongs.

1-11. To obviate this difficulty, the reference period in the NSS is usually taken as a period of fixed length just preceding the date of survey of a sample unit. So the reference period is not fixed in time but is different for units surveyed on different dates, and it moves in time over the entire survey period. This mode of survey has helped in reducing recall lapse and in obtaining estimates of the averages of the characteristics over the survey period. That is why the survey period of the NSS rounds has been made one complete year since 1958-59 so that all the seasons are equally represented through the moving reference period.

1-12. The length of a moving reference period varies from item to item depending on their frequency of occurrence, manner of accounting and memory factor. For example, the usual reference periods for enquiries on employment, consumer expenditure and demography are a week, a month and a year respectively preceding the date of survey. For crop survey, the reference period is the crop season containing or preceding the date of survey. Sometimes the moving reference period is a moving day viz., the date of survey for items like household size, debt, saving, number of cattle etc.

Methods of Data Collection

1-13. In the NSS, the household and the crop plot form the ultimate stage units for socio-economic enquiries and crop survey respectively. The work of data collection is done by a team of specially trained, permanent, full-time investigators who collect data on socio-economic characteristics by personally interviewing the sample households or persons. In the case of crop survey, the acreage data are obtained for the selected plots (parcels of land) by direct physical observation and the yield-rate is obtained by actually harvesting crop standing in randomly located circular cuts in sample plots. As regards rural prices, the price quotations are collected by visiting a sample of representative shops in the village markets. Some general particulars of the sample villages and urban blocks are collected partly by observation and partly by enquiring from some knowledgeable persons of the locality.

Permanent Survey Organisation

1-14. From the start of the NSS, the Directorate of National Sample Survey set up by the Government of India and the Indian Statistical Institute (ISI) had been conducting the field and the technical work respectively of the successive rounds of the NSS as well as any other *ad-hoc* enquiry entrusted to the NSS. The Directorate is manned by a team of full-time and mostly permanent investigators and supervisory staff especially trained in survey work. Similarly, the ISI is also equipped with a team of full-time, experienced and qualified survey personnel.

1-15. A permanent survey organisation is in a position to undertake continuing research needed for improving the quality of survey data, for evolving more efficient sampling schemes and data processing methods. In short, it can take sustained and effective steps for control of sampling and non-sampling errors. A permanent organisation is more meaningful with a team of permanent and wholtime staff. Such a staff will have an incentive for improving themselves, and the experience and efficiency attained by them can be utilised for future surveys.

Multi-subject and Integrated Survey

1-16. As per the United Nations paper titled "Recommendations for the preparation of sample survey reports (provisional issue)" (Statistical Papers: Series C. No. 1, Rev. 2) the definitions of a "multi-subject survey" and an "integrated survey" are as follows :

"Multi-subject survey : When in a single survey operation several subjects, not necessarily very closely related, are simultaneously investigated for the sake of economy and convenience, the investigation may be called a multi-subject survey. The data on different subjects need not necessarily be obtained for the same set of sampling units, or even for the same type of units (e.g., households, fields, schools etc.)".

"Integrated survey : In an integrated survey, data on several subjects (or items, or topics) are collected for the same set of sampling units for studying the relationship among items belonging to different subject fields. Such surveys are of special importance in studies on levels of living. Integrated surveys of consumer

1.17. One major feature of the NSS is its multi-subject and integrated nature. The NSS is a multi-subject integrated survey in the sense that in each round of the survey, several enquiries are conducted simultaneously in the same set of sample first-stage units, viz., villages and blocks. For instance, in the present rounds the rural socio-economic enquiries and crop surveys are integrated to the extent that they are carried out in the same set of sample villages. Similarly the urban socio-economic enquiries are integrated by canvassing them in a common set of sample blocks. Complete integration of household enquiries could be achieved by canvassing all the household schedules of enquiry of a round in the same set of sample households. But this was not done because (i) different enquiries require different kinds of sampling frames, and (ii) this will have increased pressure on the informants. Multi-subject integrated surveys are generally recognised to be more economical than a series of uni-subject non-integrated surveys. The main advantage of the former is that there is better utilisation of available resources especially when the overhead cost is an appreciable portion of the total cost of the survey and the time taken for the journey and camp-setting accounts for a considerable portion of the total time spent on the survey. Further, grouping of different subjects of enquiry in the same sample of first-stage units helps in increasing the sample size at the first stage, which means greater accuracy in the final results. In other words the precision attainable by separate uni-subject surveys may be achieved by incurring a much smaller expenditure in a multi-subject and integrated survey.

General Sample Design

1.18. Similar but independent sample designs are followed for the rural and the urban sectors of India. The general sample design for the rural sector in recent rounds has been stratified two-stage with villages as first-stage units for all surveys, and households and clusters of plots as second-stage units for socio-economic (SE) enquiries and land utilisation (crop area) survey respectively. The design is four-stage for crop yield survey (crop-cutting experiment), with crop plots and circular cuts as third and fourth stage units respectively. The sample design for the urban sector having SE enquiries only is also stratified two-stage with urban blocks as first stage units and house holds as second-stage units. In both the sectors, the total sample of first-stage units are selected in the form of two or more independent sub-samples known as interpenetrating sub-samples as described below.

Interpenetrating Network of Sub-samples (IPNS)

1.19. One of the most important features of the NSS has been the use of interpenetrating sub-samples for the purpose of assessment and control of sampling and non-sampling errors. The technique of IPNS, which was originally proposed by Mahalanobis as early as 1938 in its general form, consists in drawing the total sample in the form of two or more parallel samples (called sub-samples). The sub-samples, usually of the same size, are selected by the same process of selection and each of them is capable of providing a valid estimate of the population characteristics. The sub-samples may or may not be drawn independently, linked interpenetrating sub-samples being an example of the latter. Two sub-samples of the same size are linked if there is a one-to-one correspondence between their respective sample units. In the recent rounds the state sub-samples are linked with the corresponding central sub-samples although within the state or central sample, the constituent sub-samples are independent.

1.20. Usually the sub-samples are surveyed and processed by different teams of survey personnel in a prescribed manner. For example, in the 19th round, the field work of different sub-samples have been assigned to different batches (known as parties) of investigators. For the last few years, the data collected for different sub-samples are also being processed and analysed separately at different operating centres. In this way interpenetration has been arranged at different stages of sampling, data collection and tabulation. This procedure serves as a broad check on the results and also helps in analysing the total variation into its different components such as sampling errors, variations due to investigating parties, due to processing centres, and various interactions among these factors.

Responsibility

1.21. A Programme Advisory Committee consisting of the representatives of the Planning Commission, Central Ministries, State Governments, the Central Statistical Organisation (CSO), NSS Directorate and the Indian Statistical Institute (ISI) advises the Department of Statistics under Cabinet Secretariat on the over-all planning, subject coverage, methodology, tabulation programme, fixation of priorities, and other related matters of the NSS. The final decisions of these points are taken by the Department of Statistics and are communicated to the ISI for starting the preparatory work for the ensuing round and for analysing the data of the previous rounds.

1.22. The detailed technical work relating to planning of the survey, formulation of the sample design, selection of first-stage units, designing of schedules, writing of instructions and providing technical guidance to the field workers, processing and tabulation of the data, and preparation of the final reports is done by the ISI. The major part of the central sample field work in this large-scale sample survey is conducted by the Directorate of NSS which is under the jurisdiction of the Cabinet Secretariat. The field work in West Bengal and Bombay City is being done by the field branches of the ISI.

Participation by States

1.23. The NSS was started as Central Government agency for the collection of statistics. It was considered desirable that the State Statistical Bureaus also should participate in the NSS work on a matching basis. According to this participation scheme, the concerned States survey an additional matching sample (selected in an identical manner) with the same concepts and definitions and according to the same survey plan. They also process and analyse their own data. The sample surveyed by the Central Government agency is known as the 'central sample' whereas the matching sample surveyed by the State Government agency is known as the 'state sample'. The central and state samples are usually 'linked' members in a system of interpenetrating sub-samples.

1.24. State participation first started in the eighth round of the NSS and since then it has become a regular feature. This participation by States has proved useful for obtaining better estimates (by combining

TABLE (1.1).—Period of survey, sample size (villages and blocks in the central sample) and subjects of enquiry for different rounds of the NSS.

round	survey period	total number of sample			subjects of enquiry
		rural villages		urban blocks	
		SE ¹	crop ²		
(1)	(2)	(3)	(4)	(5)	(6)
1	October, 1950 — March, 1951	1,833	1,833		consumer expenditure, household enterprises, prices, wages, land utilisation.
2	April — July, 1951	1,160			consumer expenditure, household enterprises, village statistics.
3	August — November, 1951	290		490	consumer expenditure, household enterprises.
4	April — September, 1952	960	960	406	consumer expenditure, household enterprises, village statistics, land utilisation.
5	December, 1952 — March, 1953	960	960	406	consumer expenditure, household enterprises, prices, non-household manufacturing establishment, land utilisation.
6	May — September, 1953	960	960	444	in addition to 5th round subjects, village statistics, opinion of newspaper readers about newspaper reading.
7	November, 1953 — March, 1954	960	960	444	cons. expd., hh. enterprises, non-hh. estab., opinion on outturn of rice in villages, land utilisation.
8	July, 1954 — March, 1955	1,424	1,424	468	cons. expd., hh. enterprises, land holdings with reference to operational holdings, trend of self-management of agr. holdings, hh. indebtedness, farming practices, land utilisation.
9	May — September, 1955	1,624	1,624	2,108	cons. expd., income & expenditure, hh. enterprises, vital statistics, employment & unemployment, prices, land utilisation.
10	December, 1955 — May, 1956	1,624	4,884	1,328	income & expenditure, hh. enterprises, employment & unemployment, village statistics, prices, land utilisation and yield survey.
11	August, 1956 — February, 1957	1,848	6,336	584	income & expenditure, employment, unemployment & indebtedness of agr. labour hhs., employment & unemployment of hhs. other than agr. labour, agriculture & animal husbandry, village statistics, weights & measures, prices, land utilisation, yield survey.
12	March — August, 1957	1,848	6,288	584	11th round subjects (except agriculture & animal husbandry) and housing & vital statistics, production of milk, production & utilisation of cowdung.

contd.

NSS round	survey period	total number of sample			subjects of enquiry
		rural villages		urban blocks	
		SE ¹	crop ²		
(1)	(2)	(3)	(4)	(5)	(6)
13	September, 1957 — June, 1958 .	2,072	2,260	1,224	income & expd., empl. & unempl., vital statistics, village statistics, prices, man-power utilisation, readers preference, land utilisation and yield survey.
14	July, 1958 — June, 1959	2,616	2,616	2,216	income & expd., small scale manf. & handicrafts, village statistics, prices, population - births & deaths, land utilisation and yield survey.
15	July, 1959 — June, 1960	2,616	2,616	2,228	consumer expenditure & housing conditions, non-mechanised transport and utilisation of working animals, non-registered trade, employment & unemployment, prices, disposal of cereals by producer hhs., capital formation & building construction, livestock products, population, births & deaths, land utilisation, yield survey.
16	July, 1960 — August, 1961	3,798	2,532	2,272	consumer expenditure, hh. indebtedness, employment & unemployment, urban labour force, ownership of land & operational holdings in rural only, prices, family planning, population, births & deaths, land utilisation, yield survey.
17	September, 1961 — August, 1962	3,888 (price : 422)	3,888	2,237	consumer expenditure, employment & unemployment, urban labour force, capital formation, prices, ownership of land & operational holdings, morbidity, population, births & deaths, land utilisation, yield survey.
18	February, 1963 — January, 1964 .	8,472 (price : 399)	4,236 (1962-63); 8,472 (1963-64)	4,572 (construction: 270)	consumer expenditure, income of rural labour hhs., earnings from professions & liberal arts, village statistics, prices (monthly & weekly), urban labour force, migration, population, birth & deaths, construction, land utilisation, yield survey.
19	July, 1964 — June, 1965 . . .	8,472 (price : 419)	8,472	4,572	integrated hh. schedule — detailed, abridged, land utilisation employment, unemployment & indebtedness of rural labour hhs., urban labour force, prices, village statistics, block statistics, population, births & deaths, land utilisation, yield survey.

1 SE means socio-economic enquiries.

2 crop : column (4) gives the sample sizes for land utilisation survey : usually one-fourth of these villages were taken up for yield-rate survey.

CHAPTER TWO

NINETEENTH ROUND

Introduction

2.1. The Central Statistical Organisation had invited suggestions regarding the subjects to be undertaken in the nineteenth round from the Planning Commission, different Ministries of the Government of India and the States participating in the work of the NSS. A number of suggestions were received and these suggestions were carefully examined with a view to accommodating as many of them as possible with the existing resources. Based on these, a draft programme for the nineteenth round, prepared by the ISI, was circulated to the members of the NSS Programme Committee. The draft proposals were considered in the meeting of the NSS Programme Committee held in the CSO, New Delhi on the 2nd and 3rd November, 1962. Subsequently, at the suggestion of the Planning Commission, the Department of Statistics and the Planning Commission reviewed some of the recommendations made by the NSS Programme Committee regarding the item coverage of the 19th round; the final programme was intimated to the ISI by the Department of Statistics on 15th of April, 1964.

Geographical Coverage

2.2. The geographical coverage for the survey consisted of all-India excluding a few specific areas* omitted from the coverage. The excluded areas accounted for less than 0.5 per cent of the total population. The exclusion of these areas was necessitated due to operational considerations.

Subject Coverage

2.3. At the recommendation of the Working Group on Vital and Health Statistics of the Planning Commission, Government of India, an enquiry on the estimation of the rates of birth, death and growth of the population was taken up in the fourteenth round (1958-59) of the NSS. Till then firm estimates of these rates, which are essential for the developmental planning of the national economy, were not available; hence this survey filled an important gap in the field of Indian population statistics. Starting with the rural areas in the fourteenth round, this enquiry (commonly known as the *population enquiry*) has been repeated in all the subsequent rounds bringing in the urban sector in its fold since the sixteenth round (1960-61). The population enquiry forms an integral part of the nineteenth round also.

2.4. Another enquiry which has enjoyed continued emphasis like the previous one is that on *employment and unemployment*. Because of its immediate appeal in the context of economic planning of the country, this enquiry has been conducted at least in either of the rural and the urban sectors regularly since the ninth round of the NSS (May-September, 1955). However, the employment pattern of the rural sector being structurally different from that in the urban sector, the approaches to this employment enquiry have been appropriately different for the two sectors. As regards the 19th round, we have this enquiry in both the sectors but with orientations in different directions. The *urban labour force enquiry*, for that is the name when in urban areas, aims at measuring the labour force participation rates, labour time disposition, average earnings in different occupations, incidence of unemployment and extent of under-employment in urban areas. As for the rural sector, the emphasis is on collecting particulars of employment, unemployment and indebtedness of rural labourers which include both agricultural and non-agricultural wage-paid manual labourers. This stress on rural labourers is at the instance of the Labour Bureau, Ministry of Labour & Employment, Government of India.

2.5. So far in the history of the NSS, the practice has been to canvass a separate schedule of enquiry for each distinct subject. For example, we have had schedule 1.0 for consumer expenditure, schedule 2.3 for household enterprise in trade (with other schedules for other enterprises), schedule 10 for employment particulars, schedule 12 for population characteristics, and so on. Since all the above enquiries are canvassed through a sample of households, one may visualize the possibility of accommodating all the enquiries relating to the socio-economic characteristics of a household in a single compact schedule. It is believed that this procedure would lead to a more effective measurement of the different characters and a better evaluation of the inter-relations amongst them. An attempt to appraise this procedure has been made in this round. In Indian households, specially in rural areas, the expenditure (and such other items) on one enterprise is so inextricably mixed up with that on another enterprise or profession or on household consumption that it is extremely difficult to evaluate separately the amounts attributable to different factors. In such cases, attempts to collect data on all the factors from the same set of households may yield more accurate information than the normal practice of collecting data on different aspects from different sets of households.

At the suggestion of Prof. P. C. Mahalanobis, the Honorary Statistical Advisor, Government of India on the above lines, the NSS has introduced in this round a compact, composite schedule termed *integrated household schedule*. This schedule is intended to yield a comprehensive and over-all picture of the socio-economic activities of a household.

Being so exhaustive, this schedule has naturally become somewhat lengthy and time-consuming. Hence an abridged version of the same has also been introduced in this round. A comparative study of the results thrown up by these two schedules promises to be an interesting feature of this round.

2.6. To build up a series of cost of living indices for the rural agricultural labour population, the Ministry of Labour & Employment are in need of *retail price data in rural areas*. At their instance, rural retail prices of some selected commodities and services are being collected from the thirteenth round (September, 1957—May, 1958). Especially since the sixteenth round (July 1960—August 1961), these retail prices are being collected every month from a fixed set of sample villages known as *price villages*.

*Andaman and Nicobar Islands, Laccadive, Amindive and Minicoy Islands, the union territories of Goa, Daman, Diu, Dadra, Nagar Haveli and Pondicherry, Naga land, North East Frontier Agency, the Ladakh district of Jammu and Kashmir, the Lungleh sub-division (Mizo Hills) of Assam, Mao, Ukhrul and Tamenglong sub-divisions of Manipur.

2.7 Since the tenth round of NSS, intensive exploratory work has been undertaken with a view to estimating crop acreage and yield rates on the basis of an all-India sample by the method of direct physical observation and actual harvesting operation (known as crop-cutting experiment). Chronic shortage of cereal production has made this enquiry vital, and crop survey continues to be an essential item in the subject coverage of the last few rounds. In this round also, a crop survey was undertaken for providing estimates of the acreage and production of all the major cereal crops taken together at the all-India level. Further an attempt was made to collect information on land utilisation (i.e., area under different crops) by interview method through a small sample of households, the object being to compare its utility with that of the detailed crop schedule based on physical observation. For this purpose a supplementary to integrated household schedule abridged was canvassed in one-sixth of the sample villages on an exploratory basis.

2.8 Besides the above enquiries, statistics relating to the availability of educational, medical and other social amenities, transport, conveyance and communication facilities, existence of household and non-household industrial establishments etc. in the sample villages and blocks were also collected through the general schedules 0.1 and 0.2.

2.9 The sampling of households for different enquiries was done on the field by the investigators themselves. For this purpose an investigator, after having reached the sample village/block, prepared a list of all the households residing in that sample village/block and collected information about the identification, particulars, number of members (i.e., household size), and means of livelihood of those households. This list constituted the sampling frame for selection of households. The schedule meant for listing of households was termed the *general schedule* as it contained some general information about sample villages and blocks as mentioned above.

2.10 In addition to all these, there were two *time record schedules* (4.1 and 4.2) for keeping daily record of time spent on different survey operations by the investigators; 4.1 was meant for socio-economic enquiries and 4.2 for crop surveys. In these two schedules detailed information was collected regarding time requirement for every stage of the field work e.g., journey, camp-setting, contacting local officials and sample households, actual filling-up of different schedules, preparing copies of schedules, other office work to be done by an investigator and wastage of time due to various reasons. The purpose of collecting such data was to provide an objective idea of time requirements which could be utilised for planning of subsequent rounds.

2.11 Lastly, there was a *field progress report card* (of the size of a post card) which an investigator posted to the ISI after having completed his work in a sample village or block. In it were recorded the dates of arrival and departure for that village/block, number of sample households/plots selected for different enquiries, reasons for early/late survey etc. This card served two purposes, first of having a watch over the progress of field-work and taking necessary action when the progress of an investigator was far below the target. Secondly, it helped to examine whether the desired number of households were being selected on the field i.e., whether the self-weighting scheme of selection was properly working on the field. The card was also utilised by the NSS Directorate for their administrative purposes.

2.12 A complete list of the different schedules canvassed in this survey is being given in the following table.

TABLE (2.1).—Schedules canvassed in the NSS 19th Round

seri. no.	schedule number	description	sector
(1)	(2)	(3)	(4)
1	0.1	general schedule	rural.
2	0.2	general schedule	urban.
3	3.01	rural retail price (monthly)	rural.
4	4.1	investigator's time record for socio-economic enquiry	rural & urban.
5	4.2	investigator's time record for crop surveys and price enquiry	rural.
6	5.0	land utilisation survey	rural.
7	5.1	crop cutting experiments	rural.
8	5.2	dripage experiment	rural.
9	10	urban labour force	urban.
10	10.1	employment, unemployment and indebtedness of rural labour households	rural.
11	12	population, births and deaths	rural & urban.
12	16	integrated household schedule (detailed)	rural & urban.
13	17	integrated household schedule (abridged)	rural & urban.
14	17(suppl.)	integrated household survey (abridged)—land utilisation	rural

2.13 Although production of estimates at the all-India level has naturally received the greatest attention in the NSS, the case for statistics for regions, that is, for areas smaller than the whole country has not been lost sight of. In point of fact from the very inception of the NSS there has been a steadily growing demand for estimates by regions of smaller sizes. Broadly speaking there are two classes of objectives for obtaining regional statistics. In one, which may be termed enumerative, summary information on several items is obtained for direct use in *ad-hoc* policy formulation and quick implementation. In the second, which is of an investigational or research nature, the emphasis is on making comparisons and on studying relationships for ultimate use in better planning and long term policy decisions. The NSS is fast growing up to meet both these objectives satisfactorily for more and more concentrated regions. Actually the choice of suitable regions has much to do with the fulfilment of the above objectives. The principles governing the choice of regions for building up estimates have been : (a) precedence and general acceptability, (b) availability of background information for interpreting the survey results, and (c) adequacy of sample size for obtaining sufficiently precise estimates. Let us now examine the evolution in the formation of regions in the NSS.

2.14 In the first few rounds in addition to the usual all-India estimates, zonal estimates were presented for some characters, relating to consumption pattern and household enterprise. These zones in question (*viz.*, North-India, East-India, South-India, West-India, Central India and North-West India) were the six population zones (of the 1951 census) formed by grouping contiguous states lying in different parts of India.

2.15 With the passage of time, increasing pressure was being put on the NSS to supply more and more precise estimates not only at the state level but also at the district* (or groups of districts) level. The NSS tried to cope up with this challenge by gradually increasing the sample size and improving the survey design. It was found out at this time that estimates for district groups could be had more conveniently if the strata were formed within such groups, *i.e.*, the strata did not cut across such groups. This principle has been adopted in the NSS on two occasions when estimates for small regions were called for.

2.16 The first occasion arose during the Second Agricultural Labour Enquiry (ALE) conducted by the NSS in 1956-57. The country was divided into 38 zones (states or parts of states) by suitably combining the 75 ALE zones of the First Agricultural Labour Enquiry (1950-51) conducted by the Labour Bureau. Ultimately 72 strata were formed within the 38 zones.

2.17 Secondly, in connection with the 1960 World Agricultural Census, a large-scale land holding survey was conducted by the NSS during the 16th and the 17th round (1960-61 and 1961-62 respectively). The land holding survey called for a system of fresh, agriculture-oriented regions for which estimates were desired. Accordingly, in consultation with the State Statistical Bureaus, the Central Ministry of Food and Agriculture, and the CSO, a system of 48 regions was evolved. The regions were formed by grouping contiguous districts within a state mainly on the basis of the latest available information on typography, crop pattern and population density. The ultimate rural strata were formed within these regions.

2.18 There are some distinct advantages in sticking to the same system of regions round after round. Firstly, regional estimates for the successive rounds become comparable and hence compilable. Secondly, the idea of sampling errors gained on the basis of one round can be applied to improve the sample designs of the future rounds. Thirdly, considering the fact that the country is basically agricultural and that a given system of regions is based on broad agricultural and general characteristics in a multi-subject survey like the NSS, it may be unwise to hurriedly adopt any other system unless there is some strong reason to do so. Because of these reasons the system of 48 regions mentioned above have been continued in the 18th and 19th rounds also with some minor modifications, desired by the concerned State Statistical Bureaus. The composition of the 19th round regions has been given in the Appendices.

Sample Design

2.19 It will be desirable at this stage to have some broad idea of the sample design in order to have a fuller understanding of the practical aspects of the survey plan. Only a gist is being given here ; details of the sample design have been described in the next two chapters.

The sample design is similar but completely independent for the rural areas and the urban areas. These areas are also known as the 'rural sector' and the 'urban sector' respectively.

2.20 *Household Enquiries.*—Briefly speaking, the sampling scheme was stratified and two-stage within each stratum in both the sectors with villages† as first-stage units in the rural sector and with blocks‡ as first-stage units in the urban sector. Households form the second-stage units in both the sectors. The first-stage units were selected circular systematically with probability proportional to size (pps), the measure of size being related to the population, and the second-stage units were selected linear systematically with equal probability. The sample design was self-weighting for the household enquiries—at the state level for the rural sector and at the stratum level for the urban sector.

2.21 *Crop Survey.*—The sampling scheme was stratified two-stage for land utilisation (*i.e.*, crop area) survey and four-stage for crop-cutting experiments (yield-rate survey). The sampling units at the successive stages were villages, clusters of plots, crop plots and circular cuts respectively. The crop survey was integrated with household enquiries in the sense that both were conducted in the same set of sample villages.

2.22 *Place of Sampling.*—The first-stage units (villages and blocks) were sampled at the ISI whereas the households, clusters of plots etc. were sampled on the field by the investigators themselves.

2.23 *Interpenetrating sub-samples.*—From each rural stratum, 24 sample villages were selected in the form of four independent sub-samples of 6 villages each. The six villages of a sub-sample were numbered as 1, 2, 3, 4, 5 and 6 in the order of their selection. Similarly, the allocated number of sample blocks were selected in the form of four independent sub-samples of equal size. The blocks within each sub-sample of a State were serially numbered from 1 in the order of their selection. These orders of selection are known as 'sample village numbers' and 'sample block numbers' respectively.

*Districts are major administrative regions within a State, each district comprising an average of about 1900 villages. There are about 330 districts in the whole of India.

†Villages are the smallest administrative units in the rural sector of India. Urban blocks, or simply blocks, are convenient areal divisions of a town or city. The average number of households in a typical village or block is 120 and 160 respectively.

Sample Size and Field Strength

2.24 A very natural question to ask is how the sample size has been determined. Actually, the fixation of sample size poses a theoretical problem when either the desired precisions of the different estimates are well specified and the problem is to minimise the total survey expenditure subject to those specifications, or when the total expenditure is specified and the problem is to optimise the precisions of the final results for the allotted budget. Evidently, the factor sample size enters in the solution of these problems not singly but in conjunction with selection and estimation procedures.

2.25 In the NSS, a number of factors such as the existing field staff, the variabilities of different characters, emphasis on some chosen items, operational conditions in different areas etc. are to be considered in determining the sample size. Apart from these considerations, a vast multi-subject, integrated survey has its own complex pattern of cost and variance functions. Considering all these aspects the problem of determination of sample sizes for the different enquiries might appear to be intractable on first thought. It was certainly so in the first few rounds of the NSS which was at that time the first survey of its kind. With the accumulation of experience of several rounds, a broad pattern for an efficient sample design has slowly emerged. Moreover, we have been able to form some useful idea about the allocation of the all-India sample size (first stage units) to the different strata as well as the allocation of second-stage units for different types of enquiries. The main problem therefore hinges on the fixation of the all-India sample size. With the increasing demand for reliable estimates at the region level (a region being part of a state) the need for bigger sample sizes also has been accentuated. Hence consistent efforts in this direction has been made in the past few rounds.

2.26 In general, the total sample size is the product of total number of investigators and the number of villages, blocks that can be surveyed by an investigator during the whole survey period. Since the sample quota per investigator has a natural limitation from work-load and journey point of view, it is the number of investigators that has been steadily increased. The total number of investigators of the 19th round was 752 (net) for the central sample. Apart from this net field strength there was a reserve of 10% meant to fill up leave vacancies, so that progress did not hamper due to lack of investigators. Among these 752 (net) investigators, 706 were to survey both rural and urban samples whereas the remaining 46 were meant for urban samples only. Considering the work-load per investigator (see next paragraphs) the sample size was set at 8472 villages and 4572 blocks for the central sample. The corresponding state sample size was 7872 villages and 4008 blocks which were surveyed by 690 (net) investigators).

Survey Period

2.27 Indian economy being mostly dependent on agriculture is subject to pronounced seasonal fluctuations especially in the rural sector. Hence the survey period was made *one complete year* so that seasonal fluctuations could be taken into account and studied not only in case of crop survey but also in case of socio-economic enquiries like employment, household enterprises and income and expenditure, capital formation etc. Actually the total survey period of one year was divided into six equal sub-periods (called *sub-rounds*) of two months each and equal number of villages and blocks (which were random sub-sets of the whole sample) were surveyed in each sub-round. Such a scheme achieved the twin purpose of spreading the sample units uniformly over the whole survey period so that a smooth and regular progress of work could be assured, and of fairly representing all the seasons which are of 3 to 4 months' duration.

Fixation of Work-load

2.28 The field staff available for the central sample was 752 (net) investigators together with the necessary supervisory staff. While planning the survey, this strength of the existing field staff had to be born in mind as it would have been difficult from both administrative and operational point of view to recruit and train any additional field staff in a considerably short time.

2.29 Another consideration that was taken into account was the sample size needed for giving fairly reliable estimates for the different characteristics that had been proposed to be surveyed. An idea regarding the sample sizes needed for different enquiries was obtained on the basis of the results of the previous rounds of the NSS.

2.30 Fixing up of the work-load for an investigator had to be done taking into consideration the sample sizes needed for the different enquiries, the operational difficulties involved and the time requirement for canvassing the various schedules. If one had choice regarding the number of investigators, then the procedure of fixing up the work-load would have been done taking into consideration the period, the scope and the dimension of the survey. In this way we would have determined the number of investigators required for this survey. Since the number of available investigators was not to be changed in this round, it was the scope of the enquiry which had to be adjusted.

2.31 From the fourteenth round (July 1958— June 1959) of the NSS, the practice had been to integrate the household enquiries and the crop surveys, that is, to conduct both the enquiries in a common set of villages. This helped in reducing the over-all time taken for journey and camp-setting and the number of sample villages could be increased for all the enquiries. This meant greater precision for estimates since usually the contribution to the total variation from the first units (i.e., sample villages and blocks here) is large for many characteristics. As a result of this integration, land utilisation survey was conducted in all the sample villages although crop-cutting experiment was done in only one-fourth of sample villages mainly because (a) the yield-rate survey required a smaller sample than the area survey, and (b) the yield-rate survey was more time-consuming than the area survey.

2.32 In the eighteenth round (1963-64), most of the investigators did survey work in both the rural and the urban sectors while a few (purely urban) investigators posted in big cities did urban work only. This type of allotment had three advantages. First, this saved some journey time because an investigator, while going from one sample village to another, frequently passed through some towns when he could conveniently

survey the sample blocks in those towns. Secondly, a larger number of investigators could be engaged on crop cutting experiments — which is an important consideration in view of the short length of the harvesting period of crops. Thirdly, the investigators could enjoy some urban life and could probably stay with their families more often than when they were restricted to rural areas only. The big cities containing a large number of sample blocks could provide sufficient work-load for 2 or more 'purely urban' investigators who were allotted urban samples only. The scheme had worked out satisfactorily in the last round and it was decided to continue it in this round also. Hence this point also had to be kept in mind while drawing up the work programme of an investigator.

2.33 The problem regarding the fixation of work-load for investigators may be stated as follows. The number of (net) investigators available for the survey is fixed at 752. The period of survey is given to be one year. The numbers of sample villages and blocks are 8472 and 4572 respectively. The investigators are to survey both rural and urban samples with integration of (rural) socio-economic work and crop surveys. The time requirements for various stages of field-work including those for canvassing the different schedules are fixed on the basis of the previous round. Taking into account all the above constraints, one had to determine how to achieve the maximum utilisation of the available resources. The approach had to be, of necessity—one of trial and success.

2.34 The number of working days available in a year was taken as 270 days (number of Sundays 52, number of second Saturdays 13, number of public holidays 18, casual leave 12 days). Privilege or earned leave was not considered because there is a reserve of 10% investigators in the field to take account of such leave vacancies. The average all-India gross time requirements for the various schedules as obtained on the basis of the time-record schedule (schedule 4.0) of the eighteenth round are given below. In case of the integrated household schedules (schedules 16 and 17) the time requirements were based on a try-out of those schedules during the period (February 1964—June 1964) just preceding the 19th round.

TABLE (2.2).—Average time-requirements for different schedules and journey between villages/blocks

sl. no.	schedule number	enquiry	time standard
(1)	(2)	(3)	(4)
1	0.1	general schedule (rural)	2.5 days/village.
2	0.2	general schedule (urban)	3.5 days/block.
3	3.01	rural retail prices	1.5 days/village per visit.
4	5.0	land utilisation survey	30 plots/day
5	5.1	crop-cutting experiment	2 plots/day.
6	10	urban labour force	8 households per day
7	10.1	employment, unemployment and indebtedness of rural labour households	8 " "
8	12	population, births and deaths	25 " "
9	16	integrated schedule (detailed)	1 " "
10	17	integrated schedule (abridged)	2 " "
11	17(s)	integrated schedule (land use)	1 " "
12		journey to a village/block	1 day per village/block.

2.35 Since the sample design and work-programme of the eighteenth round were very much similar to those of the nineteenth round, the time standards obtained on the basis of the former could be very well utilised for the latter. It would have been more desirable of course to fix the work-load on the basis of time requirement in the different states and if possible even at lower levels since there is significant variation in time requirement from region to region. Actually the idea of regional planning (including sample design, work-programme, and work-load) has been uppermost in our mind for the past few years. Still we have been hesitant to give effect to it till a satisfactory solution is available for the optimum degree and kind of regional planning. Too much of it may affect the uniformity and consistency of the NSS data all over India that exist now. Theoretically a separate sample design for each region (or for a set of nearby regions) would mean more complication, caution and cost for obtaining state and all-India estimates. Further this would require considerable preparatory work. All this would of course be worthwhile if it is commensurate with the increase in precision of the final estimates. But that may not be the case in reality because any proposed sample design for a region has to be such that it can be fitted in the general pattern of the NSS designs; secondly, almost the same type of frame and supplementary information is available for different parts of India.

2.36 From the practical view point, regional planning would mean equal work-load for the investigators in terms of time-requirement and not in terms of sample allotment (i.e., number of first stage and second stage sampling units allotted to an investigator). Somehow "equal number of sampling units per investigator" is not only convenient for distribution of work in a large scale survey but carries also a peculiar sense of 'impartial treatment to all investigators'. Hence this practice has found favour with the NSS system and there is no rationale to discard it completely unless a much better alternative is found out. Moreover, even with regional planning, the ultimate work-load would differ from one investigator to another in the same region because the work-load for a particular investigator depends much on the actual villages, blocks, households, plots, climate of the place, conveyance facilities, co-operation of local officials, hospitality of the people etc. Lastly, there was some amount of regional planning in matters of size-fixation, stratification and work-

Let us now examine some of the simplifying procedures adopted in order to cut down time on both journey and enquiry aspects of the survey. Even the smallest saving of time was of importance because the cumulative effect was worth having it. The importance of this is more easily appreciated when we realise that because of these savings we could attain the sample size we aimed for and at the same time we could give some physical relief to our investigators.

2.38 One of the major factors of a sample survey is Journey—journey from head-quarters to first stage units (village/blocks), journey within first-stage units etc. It is a necessary evil—in terms of time and money both. Hence our attention was first drawn to this item. It has been observed that the journey time (for journeys between villages/blocks) which accounts for an appreciable portion of the total time in a large-scale survey, largely depends on the 'area of operation' of the investigator, number of sample villages and blocks in that area, and general transport and travel facilities existing there.

2.39 In the rural sector an investigator's area of operation was the rural stratum in which he was posted. Most of these strata were less than 4,000 square miles in area and this was considered to be a manageable size for an investigator. When a stratum-area exceeded this figure, that stratum was subdivided into two or more parts known as 'investigation zones' and the sample villages to be surveyed by an investigator were selected from one of these parts. As regards number of sample villages in the area of operation, an investigator was allotted 12 villages in his stratum. More villages per stratum would have meant lesser journey time per village but increased 'total journey time'. This would have left lesser time for proper enquiries whereas the main idea in a multi-subject survey is to extract as much time as possible for actual enquiries. Further a larger number of sample villages per stratum would have been physically strenuous for the investigator. Regarding transport and travel facilities, of course, we could not improve the existing situation but tried to make best use of what was available. While forming the strata, we took added care to ensure that the different parts of a stratum were well-connected by railways, roadways etc., but evidently this could not be fully achieved in undeveloped, forest and hilly areas. One redeeming feature was that sample villages situated in 'difficult' or 'interior' areas were usually sparsely populated and hence required much less enquiry time than the villages situated in developed areas. This fact partially compensated for the time and trouble spent on visiting the inaccessible villages.

2.40 What has been said above of the villages hold good for urban blocks also but to a lesser degree. This is because (a) the urban blocks being situated in town and cities could be reached speedily and comfortably, (b) each big town contained several sample urban blocks, and journey between such blocks required little time (say one hour at the most), and (c) the allotment of urban blocks to the investigators was done by the field offices themselves laying emphasis on operational convenience. The point to stress here is that concrete steps were taken in respect of stratification, allotment of samples and programme of work in order to reduce the overall journey time as much as possible.

2.41 A corresponding reduction in total enquiry time was however, not at all easy. This is because excepting the integrated household schedules 16 and 17, all the other schedules had been continued from the earlier rounds and they had to be kept basically unchanged in form and content in order to maintain comparability; so there was no scope for simplification and condensation of these schedules in respect of their coverage and approach. Then again, the number of schedules to be filled-up was tied up with the ultimate sample size (in terms of households and plots) and therefore could not be decreased without a consequent decrease in the precision.

2.42 Hence attempts could be aimed at some *marginal* savings only in enquiry time. For socio-economic enquiries this was achieved by simplifying the preparation of sampling frames for selection of households and canvassing one schedule in a sub-set of sample households selected for another schedule. This naturally resulted in saving time for visiting and contacting the sample households. As regards crop-survey the usual procedure in the NSS had been to select and survey a sample of clusters of plots instead of a sample of individual plots. This is because the time taken for identification of a plot is comparatively large compared to the time taken for noting down the actual land utilisation of such plots so that it is usually worth-while to survey a compact block of plots instead of an equal number of scattered single plots. The same fact had influenced another common practice *viz.* to survey the same sample of clusters in all the crop seasons instead of surveying fresh clusters each season. Both these procedures were continued in the nineteenth round also.

2.43 Finally, in case of some big villages and blocks, the investigators were allowed to confine the survey to a part only of the sample villages/blocks so that their individual work-load remained within limits. This procedure is known as hamlet group selection for villages and sub-block selection for blocks respectively. And as a token form of regional planning, the number of urban blocks to be surveyed by an investigator was kept as a variable in contrast to his rural work-load of a fixed number of sample villages. The quota of urban blocks was adjusted depending on his rural work-load so that his total work-load was nearabout the mark of 270 days.

Programme of Work

2.44 Before drawing up the final work programme, we had to taken into account all the different conditions that it was intended to fulfil. In order to refresh the memory these are being summarised below :

(i) *Equal and Mixed Work-load.*—It was imperative from operational and administrative considerations that all the investigators should have equal and mixed work-load. By 'mixed' we meant allotment of both rural and urban samples, and this could be arranged for 706 investigators (known as 'general investigators'). But the remaining 46 investigators ('purely urban investigators') could be assigned urban work only. Equality of work-load was achieved by resorting to hamlet group/sub-block selection, and by keeping the number of urban blocks to be surveyed by an investigator a flexible quantity. If the rural work-load of an investigator was too heavy he was allotted fewer sample blocks; and vice-versa.

(ii) *Uniform spread of work.*—The total survey period of one year was divided into six sub-rounds of two months each. The object was to allot equal number of first-stage units (villages and blocks) to the different sub-rounds, the composition of which was as follows :

sub-round number	period in calendar month
1	July 1964 — August 1964.
2	September, 1964—October 1964
3	November 1964 — December, 1964.
4	January 1965—February 1965.
5	March 1965—April 1965.
6	May 1965—June 1965.

(iii) *Stratum restriction.*—Since the journey factor in rural areas claims a large part of investigator's time and energy we had to devise ways and means to control it as far as possible. This was partly achieved by posting a general investigator in one rural stratum and by limiting his area of operation to that stratum only. Such a restriction, however, was not very meaningful for the urban sector as the urban strata were not compact areal divisions but were spread over the whole state.

(iv) *Sub-sample and Party restriction.*—All the investigators were equally divided into two parties, viz/ party 1 and party 2. Party 1 investigators were to survey villages and blocks in sub-samples 1 and 3, and party 2 was intended for sub-samples 2 and 4.

party of investigators	villages & blocks in sub-samples	
1	for	1 and 3
2	for	2 and 4

By having four independent sub-samples and two parties with one party for a pair of sub-samples, a provision was made for making a meaningful analysis of variance. A study of the variations between sub-samples, between parties and within parties would bring out the components of the total margin of error.

Considering all these aspects the work programme was finalised as follows :

2.45. *Household Enquiries.*—Each sample village and block was visited and surveyed only once during the whole round. The sub-round in which a village/block was to be visited was associated with its village/block number as shown below.

sub-round	period	sample village	sample block
1	July 1964 — August 1964 .	1	1, 7, 13.
2	September 1964 — October 1964	4	2, 8, 14,
3	November 1964 — December 1964	3	3, 9, 15.
4	January 1965 — February 1965 .	6	4, 10, 16,
5	March 1965 — April 1965	5	5, 11, 17,
6	May 1965 — June 1965 .	2	6, 12, 18

2.46. *Crop Survey.*—The crop survey was conducted in each of the four crop seasons : autumn, winter, spring and summer. The land utilisation (i.e., crop area) survey was conducted in all the 24 sample villages of a rural stratum whereas the crop yield survey (crop-cutting experiments) was taken up in sample villages, 1, 3 and 6 of sub-samples 1 and 2 only. These will be referred to as 'crop-cutting villages' in the next paragraphs.

2.47. *Price Enquiry.*—This relates to schedule 3.01 which is meant for monthly collection of retail prices of some selected commodities in the rural areas. This enquiry has been conducted in a fixed set of sample villages on a continuing basis since the sixteenth round (July 1960—June 1961) of the NSS. This fixed set of villages known as price villages (419 in number) were completely independent of the general sample villages (8,472 in number) of the 19th round. In this round also the price enquiry was conducted in the rice villages in the first week of every month. This fixed set of villages which was a bit inconvenient for distribution of work was at the insistence of the Labour Bureau.

2.48. As regards the programme of work within a sample village/block it was same for all village blocks except for villages 1, 3 and 6 of sub-samples 1 and 2. But even apart from this, the work-load varied considerably from one village/block to another. This was mainly because the sample design in both rural and the urban sectors was *self-weighting* for all the household enquiries. While this definitely reduced the volume of tabulation work, it introduced a new practical problem viz., the work-load within

individual sample villages or blocks became a variable quantity. The actual number of sample households to be surveyed in a particular sample village/block depended largely on the total number of households in that village/block. As regards controlling this variation in work-load, the design could only ensure that for the state as a whole the average number of households selected per village/block would be a fixed quantity for each schedule. In contrast to this, the sample size (in terms of plots) for crop survey could be fixed before hand for each sample village since the corresponding sample design was not self-weighting. An account of the average work-load within a village/block is being given in the following table.

TABLE (2.3).—Average work-load within a sample village/block

serl. no.	schedule number	sample size	remarks
(1)	(2)	(3)	(4)
1	0.1	120 households	average per village.
2	0.2	160 households	average per block.
3	10	6.7 households	average per block.
4	10.1	8 households	average per village.
5	12	20 households	average per village/block.
6	16	2 households	average per village/block.
7	17	1 household	average per village/block.
8	17 (Suppl.)	1 households	average per village no. 1.
9	5.0	60 plots	fixed per crop-cutting village.
10	5.0	20 plots	fixed per non-crop-cutting village.
11	5.1	6 cuts	fixed per crop-cutting village.
12	5.2	6 cuts	fixed per crop-cutting village.

N.B.—(1) Items 8 to 11 were taken up in each crop season.

(2) In item 11, sample size may go upto 12 cuts depending upon pure and mixed crops.

Work Allotment

2.49. In each rural stratum two 'general' investigators were posted for the whole survey period of one year. One investigator (party 1) did survey work (both socio-economic enquiries and crop surveys) in the 12 sample villages of sub-samples 1 and 3, while the other investigator (party 2) did the same thing in sub-samples 2 and 4. In addition to this, an investigator canvassed the monthly price schedule if there was any price village in his stratum. Apart from rural work, each 'general' investigator surveyed 4 to 5 urban blocks (on the average) obeying the party and sub-sample restrictions. Unlike the rural areas there was no stratum restriction in urban areas. The same investigator could and did survey sample blocks belonging to different urban strata. The actual number of urban blocks surveyed by an investigator depended on his total rural work-load (including price enquiry, if applicable for him). Each 'purely urban' investigator was allotted about 27 urban blocks belonging to the sub-samples assigned to him.

Participation by States

2.50. As stated earlier, participation by State Statistical Bureaus (which really means conduct of the NSS by two independent agencies, viz., the central government and the state government) forms an important feature of the NSS. The sample allotted to a state is also selected in the form of four independent sub-samples which are, however, linked with the corresponding sub-samples of the central sample. That is, from any stratum (rural or urban), $2n$ sample villages/blocks are selected systematically for each sub-sample where n is the sample size planned for a sub-sample. Of these $2n$ samples, those with orders of selection 1, 3, 5,, $(2n-1)$ constitute the 'central sample' and the remaining samples with orders of selection 2, 4, 6,, $2n$ constitute the 'state sample'. The procedure of linking ensures a better spread of samples over the whole stratum and consequently a better estimate when the central sample and the state sample are pooled together. This participation scheme has found favour with the states and is being followed with increased intensity.

2.51. The union territories of Manipur and Tripura and all the states excepting West Bengal have participated in the 19th round programme on a full-matching basis. In addition to the allocated quota of samples, Maharashtra State surveyed an extra sample of urban blocks since they decided to canvass the urban labour force and the integrated schedules on an extended scale.

Table (2.4) : Statewise number of sample villages, blocks and net investigation requirements in the central and state samples of the NSS 19th Round

srl. no.	state/union territory	central sample				state sample			
		villages		blocks	investigators (net)	villages		blocks	investigators (net)
		s.e. & lus*	price			s.e. & lus*	price		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Andhra Pradesh	672	34	384	60	672		384	60
2	Assam	360	16	144	30	360	16	144	30
3	Bihar	768	40	312	64	768	40	312	64
4	Gujarat	360	16	192	32	360		192	32
5	Jammu & Kashmir	360	23	144	30	360	23	144	30
6	Kerala	360	16	144	30	360	16	144	30
7	Madhya Pradesh	720	38	288	60	720	38	288	60
8	Madras	624	28	360	56	624		360	56
9	Maharashtra	696	32	600	70	696	32	600	70
10	Mysore	408	20	216	36	408		216	36
11	Orissa	360	20	144	30	360		144	30
12	Punjab	360	16	168	32	360		168	32
13	Rajasthan	384	18	216	34	384		216	34
14	Uttar Pradesh	1,056	52	576	94	1,056		576	94
15	West Bengal	552	26	432	54	..			
16	Delhi	24	6	120	6	..		..	..
17	Himachal Pradesh	24	2	12	2	..			..
18	Manipur	192	8	48	16	192		48	16
19	Tripura	192	8	72	16	192		72	16
20	ALL-INDIA	8,472	419	4,572	752	7,872	165	4,008	690

N.B.—(i) s.e. : socio-economic enquiry.

(ii) lus : land utilisation survey.

(iii) sample size for crop-cutting experiment is one-fourth that of lus.

CHAPTER THREE

RURAL SECTOR

Sample Design (Broad Aspects)

3.1. The general sampling scheme for socio-economic enquiries was stratified two-stage with villages as first-stage units and with households as second-stage units. Strata were formed by grouping contiguous tehsils* similar with respect to population density, altitude and crop pattern. From each stratum 4 independent and interpenetrating sub-samples of 6 villages each were selected circular systematically with probability proportional to size (size being related to population as described in para 3.7). Within each selected village, households for different enquiries were selected linear systematically with intervals and random starts provided by the ISI. Village selection was done at the ISI whereas household selection was done by the investigators themselves on the field. The design was made self-weighting for all the household enquiries.

3.2. The sampling scheme for crop survey was stratified two-stage for land utilisation surveys and four-stage for crop-cutting experiments. The sampling units at the successive stages were villages, clusters of crop plots, crop plots and circular cuts respectively. Some integration between socio-economic and crop surveys was achieved by having both the surveys in the same set of sample villages. Clusters of plots were selected circular systematically with equal probability; crop plots were selected with probability proportional to area under the specified cereal crops; and circular cuts were located at random in the selected plots. Selection of cluster onwards was done by the investigators themselves after having reached the sample villages. Details of the sample design are being given in the following paragraphs.

Sampling Frame

3.3. The sampling frame used for selection of villages (first-stage units) was the Primary Census Abstract (PCA) of the 1961 Population Census. The PCA has two parts—rural and urban. For the present we are concerned with the rural part. The rural PCA provided a complete list of all the 1961 census villages along with their identification particulars as well as several items of supplementary information e.g., population, area, number of houses and households, number of literates, number of workers in different occupational groups like agriculture, industry etc. The PCA was available in the form of booklets (manuscript copy)—each booklet giving the list of villages for one tehsil/taluk/thana of a State. Within each tehsil, villages were given a fresh serial numbering starting from one. The manuscript copy of the PCA was supplied to us by the Registrar General of India. The PCA constitutes the main statistical tables of the printed District Census Handbooks now being published. A specimen page of the PCA has been given in the Appendices. The PCA was taken as the sampling frame mainly because no other complete list of villages was (or still is) available for the whole of India. But apart from this compelling reason, the PCA was satisfactory in other respects also. First, the major part of the PCA related to a fixed point of time, viz., 1st March, 1961 so that no adjustments were required on that account. Second, the concepts, definitions and procedures of census taking were fairly uniform throughout India; hence the PCA represented a uniform and consistent body of data. Third and the last, the PCA gave a lot of supplementary information which promised to be useful for this round as well as future rounds. One of the main objectives of the NSS is to compare and/or compile the results thrown up by successive rounds, and the fulfilment of this objective is more valid when the same frame is used for the concerned series of rounds.

3.4. From the foregoing discussion one should not get the impression that as our sampling frame the PCA was flawless which really it was not. It had in fact several drawbacks from the NSS point of view. First, area figures were not available for many villages especially for those in cadastrally unsurveyed areas. Second, some of the figures recorded in the PCA were found to be wrong in several cases during actual visits to those villages. Third, in some cases the census villages were artificially demarcated by slipshod boundaries and such census villages tend to become unidentifiable on the field with the passage of time. An attempt was made to obviate this identification difficulty by taking the revenue village as the unit of survey. Fourth, a few urban tracts occurred in the list of villages. These impurities had to be eliminated during a preliminary scrutiny of the PCA. Finally, the PCA did not give cultivated area of villages. With this information the PCA would have been more suitable for the purpose of the NSS which involves both socio-economic and crop surveys.

Scrutiny of PCA

3.5. The rural PCA was scrutinised to exclude the ineffective villages and urban tracts occurring in the list of villages. Villages with remarks 'included in urban area', 'urbanised', 'non-city urban', 'merged in another village' etc., were omitted. In a few cases the auxiliary items of information e.g., area, population etc. were given in the PCA for a group of villages combined and not separately for each of the villages so grouped. Such villages were treated as separate villages and for subsequent calculations, total area, population etc. were assumed to be equally distributed among all the villages put in one group.

Size Measure

3.6. As stated earlier, villages were selected with probability proportional to 'size' where 'size' of a village was related to its population. Each village was assigned a size in such a way so that the size became a simple indicator of the village population and also an integer. The idea behind this size-fixation was to strike a balance between selection with equal probability and selection with probability proportional to actual village population itself (ppp). The strict ppp sampling was not favoured mainly because it would have (a) involved a large amount of computational work at the selection stage, (b) been unnecessary for those items not strongly related to population, and (c) made it extremely complicated to achieve a self-weighting scheme. The size measure adopted for selection eliminated these disadvantages while retaining the efficiency of ppp sampling to a large extent. To reap its full benefit, size fixation was done in the following manner.

*Tehsils are administrative regions below the district level in a State, each tehsil containing an average of about 300 villages. The equivalence of tehsil is known as a taluk or thana in some States.

3.7. The average populations of villages having populations (i) 0 to 499, (ii) 500 to 999, (iii) 1,000 to 1,999, (iv) 2,000 to 2,999, and so on were computed for each of these population classes separately for each state and union territory. Size fixation was done independently for each state and union territory. The size 1 was assigned to villages having population less than 500 i.e., villages belonging to the first population class 0 to 499. The size of a village in any other population class was taken as the ratio of the average population (say \bar{X}_i) of that class to the average population \bar{X}_1 (say) of villages in the first class, rounded off to a suitable integer. That is, size of a village in the i^{th} population class was the ratio (\bar{X}_i/\bar{X}_1) rounded off to the nearest convenient integer. (By convenient we mean that usually prime numbers excepting 1, 2 and 3 were avoided as sizes).

3.8. The total size of a tehsil was obtained by cumulating the sizes of all the villages contained in that tehsil. Similarly, the total size of a region was obtained by cumulating the sizes of all tehsils contained in that region. The statewide allotment of sizes to the different population classes has been given in Table (3.1).

Allocation (Central Sample)

3.9. The all-India sample size of 8,472 villages was allocated to the different states and union territories on a joint consideration of their rural populations, areas under food crops and investigator strengths. This allocation was modified to ensure a minimum sample size of 360 villages in each state and 192 villages in the union territories of Manipur and Tripura and to make them a multiple of 24 to facilitate having 4 sub-samples of 6 villages each per stratum. The sample size for a state was further allocated to the agricultural regions in it in proportion to their total 'size' and these allocations were also made multiples of 24. The allocations to the different strata in a state could be made equal since the strata were formed so as to equalise their 'size content'. Actually the allocation to any rural stratum was always 24 sample villages in order to achieve uniform work-programme for the investigators all over India. This was in keeping with the general principle of allocation because it was the number of strata that was adjusted to bring the region/state sample size upto the desired level.

Stratification

3.10. The total number of sample villages allocated to a state/union territory was divided by 24 (the allocation was made a multiple of 24 in all cases) to get the total number of strata to be formed in the state/territory. The number (say K) was allocated to the regions in that state/territory in proportion to their total sizes. The proportional allocations were adjusted to obtain an integral number of strata in all the regions. After deciding the number of strata, the next step was to determine the stratum sizes for a state/territory.

3.11. From the very beginning it was settled that the stratum size (=sum of the sizes of villages contained in the stratum) should be same for all the strata within a state/territory. Equilisation of stratum sizes was necessitated by two considerations. First, it would justify having equal allocation of sample size per stratum; secondly it would considerably help to implement the self-weighting scheme. With this idea in view, the total size of a state (i.e., sum of the sizes of all villages in that state) was divided by the proposed number of strata (K above) to yield the average stratum size (Z' say) for that state. However, this original value of Z' involving a fractional portion in most cases was not suitable as the average stratum size as it would have been extremely inconvenient for the operational part of sample selection. Hence Z' was rounded off and made a multiple of 12 in order to attain an integral interval at the selection stage. (12 villages were selected systematically in each sub-sample of a rural stratum). The adjusted average stratum size will be denoted by Z. The effect of this adjustment on the individual village sizes will be clear when we examine the actual formation of strata. Now the physical formation of strata had several requirements to satisfy. These were as follows:

- (1) Each stratum should be a geographically compact area.
- (2) The strata boundaries should not cut across agricultural regions since estimates were required to be obtained separately for each region. (Region-wise estimates can be built up even if the regions contain some part strata but such estimates are liable to large sampling error due to the 'randomness' of sample size on which they are based).
- (3) The strata boundaries should not cut across the state-blocks which were compact groups of districts in a big state. Each state block was an administrative unit of the NSS Directorate and there arose some administrative difficulties of travelling allowance, inspection, supervision, etc. if the investigators under the charge of one state-block had to survey sample villages falling in another state-block which could happen without this. The states of Andhra Pradesh, Bihar, Jammu & Kashmir, Madhya Pradesh, Madras and Maharashtra had 2 state-blocks each and Uttar Pradesh had 3 state-blocks. The remaining states were one block each.
- (4) Different parts of a stratum should be similar with respect to population densities and altitude.
- (5) There should be good transport and communication facilities among different parts of a stratum so that an investigator posted in that stratum could travel throughout it without much difficulty.
- (6) The original size (say Z') of a stratum (i.e., sum of the sizes of villages in it) should not differ by more than 10 per cent from the planned average figure Z. Because otherwise the large adjustment to be done in order to equalise this Z' to Z would lower the sampling efficiency of the pps. design.

3.12. From the list of requirements mentioned above it may appear at first that formation of satisfactory strata was simply an impossible task. Fortunately it was not so in most of the cases. However, conditions (3), (4) and (5) had to be relaxed in some cases especially in those states having too many undeveloped and inaccessible areas.

3.13. To describe the actual procedure, compact strata were formed by grouping contiguous tehsils such that conditions (1), (2) and (6) were completely fulfilled and conditions (3), (4) and (5) to the extent possible. Finally, the original stratum size Z' was made equal to Z by slightly increasing (if $Z > Z'$), or decreasing (if $Z < Z'$) the sizes of the villages belonging to the stratum. This adjustment of sizes was confined

to the large villages so that the relative disturbance on size was small. In spite of so much care some of the strata became rather elongated in shape or too big in area. Such strata, for reducing journey within them, had to be sub-divided into smaller convenient areas known as investigation zones (see next para for details).

Investigation Zone

3.14. According to the rural work-programme an investigator was to survey a set of sample villages scattered throughout the stratum in which he was posted. Hence it was imperative that the area of a stratum should not be too large so as to be unmanageable for the investigator, and the stratum area could be successfully controlled in most of the cases. In a few cases, however, the stratum area became too large especially in sparsely populated areas—mainly due to ensuring the other two criteria viz., compactness of a stratum and equalisation of stratum-sizes. In Assam, the agricultural regions being discontinuous, the strata formed were also discontinuous in a few cases. In several other cases, the transport facilities available within a stratum were not satisfactory due to general inadequacy of transport in those areas (hilly, forest or undeveloped areas). In all such cases the original strata were sub-divided into two or more compact, small or medium-area zones with as good transport system as available within them. Further, the total size of a zone was made a multiple of 12 by suitably adjusting the village sizes so that sum of the adjusted zone sizes in a stratum was equal to Z , the fixed stratum size. The field of operation of an investigator was confined to only one such zone, and hence these zones have been termed investigation zones.

3.15. In all other cases the stratum itself was taken as an investigation zone. Thus each stratum consisted of one or more investigation zones. The distribution of strata by the number of investigation zones formed in them is shown in Table (3.2).

Selection of Villages

3.16. In each stratum four independent sub-samples of 12 villages each were selected circular systematically with probability proportional to size, size being as defined earlier. Out of these 12 villages in a sub-sample, those 6 with odd order of selection constituted the 'central sample' and these 6 with even order of selection the 'state sample'. The interval for systematic selection was obtained as $I=Z/12$; the interval I , an integer, was same for all the strata in a state since stratum-sizes were equalised during formation of strata. The successive stages of the selection procedure are being described below:

(1) For each tehsil/taluk/thana, the census serial numbers of the villages in it were recorded in ascending order with corresponding village sizes noted against them. Then these sizes, adjusted wherever necessary, were cumulated, the last cumulative total being equal to the total size of that tehsil/taluk/thana. This was done in proforma A (see Table 3.3).

(2) In the working sheet for selection the tehsils/taluks/thanas within each stratum were arranged in a serpentine order according to their geographical location and corresponding sizes were recorded against their names. Next the tehsil sizes were cumulated, the last cumulative total being equal to Z for all the strata in a state.

(3) Procedure of circular systematic selection.—If sample size = 12, interval = I and random start = R then the circular systematic sample consists of numbers corresponding to $R + K \cdot I$ ($K=0, 1, 2, \dots, 11$). In case $R + K \cdot I$ exceeds Z for some K then $R + K \cdot I - Z$ is to be considered as the selected number. For selecting the first sub-sample, a random start (say R_1) was selected between 1 to Z . Then the 12 numbers $R_1, R_1 + I, R_1 + 2I, R_1 + 3I, \dots, R_1 + 11I$ represented the sub-sample of 12 villages. Among these, the odd-ordered numbers viz., $R_1, R_1 + 2I, R_1 + 4I, R_1 + 6I, R_1 + 8I$ and $R_1 + 10I$ constituted the central sample and the even ordered numbers $R_1 + I, R_1 + 3I, R_1 + 5I, R_1 + 7I, R_1 + 9I$ and $R_1 + 11I$ constituted the state sample corresponding to the orders of selection 1, 2, 3, 4, 5 and 6 respectively.

(4) The above selected numbers were associated with the corresponding villages in the following way. The number R_1 was posted against the tehsil (T say) whose cumulative size just exceeded R_1 or was equal to it. Then the cumulative size (S_1 say) of the previous tehsil was subtracted from R_1 to obtain ($R_1 - S_1$) as the cumulative size of the desired sample village in tehsil T . (If T happened to be the first tehsil in the arranged list, then R_1 itself was taken as the cumulative size of the related sample village). The village corresponding to this cumulative size $R_1 - S_1$ was picked out from proforma A for tehsil T . The other eleven villages of sub-sample 1 were located in the same manner.

(5) With three more independent random starts R_2, R_3 and R_4 sample villages for sub-samples 2, 3 and 4 were selected in a similar manner.

(6) In case a stratum consisted of two or more investigation zones, two investigation zones were selected circular systematically with interval equal to $Z/2$ and with probability proportional to total size of a zone. Then sub-samples 1 and 3 of villages were selected from the zone selected first and sub-samples 2 and 4 of villages from the zone selected second. The procedure of selection was same as described above with the only difference that the interval for village selection was taken as one-twelfth of the corresponding zone-size.

3.17. An example illustrating the procedure of village selection from a stratum is being given in Table (3.4) showing the working sheet used.

Unit of Survey

3.18. Although the unit of selection was the 1961 census village, the unit of survey both for socio-economic and crop surveys was the revenue village corresponding to the selected census village. In most cases a census village coincides with the corresponding revenue village. They do differ however in about 5% cases there being two types of non-coincidence. In one type a selected census village may contain two or more revenue villages wholly or partly; in such a case one of these revenue villages was selected with equal probability and the survey was confined to that village. In the other type, the selected census village may be wholly included within a bigger revenue village which contains other census villages as well; in such a case the entire revenue village was considered for survey. This situation occurred mainly in South India where the revenue villages are usually very big.

3.19. From its start in the NSS, revenue village has been taken as the unit of survey for crop survey because the village maps for cadastrally surveyed villages or village list of plots relate to revenue villages. As regards socio-economic enquiries, the switch over to revenue villages was done during the Seventeenth Round (1961-62). This was because the 1951 census villages (selection units for the 17th round) were becoming less and less identifiable—especially when they differed from the corresponding revenue villages—with the passage of time. It happened mainly because of two reasons. Firstly, in such cases the census villages were hurriedly formed in a slipshod manner without any thought for long-range use. Secondly, no one keeps track of the census villages after the census taking is completed and the field staff is disbanded. On the other hand, revenue villages are usually well-defined, and identifiable over a long range of time. Further, they can almost always be easily located and correctly identified with the help of the revenue department which keeps a constant watch over them.

3.20. However, the census village itself was taken as the survey unit in Manipur and Tripura which have no revenue village system. Similarly in Kerala, the 'Kara' (census village) was taken as the survey unit as 'pakudhy's (revenue villages) are extremely large.

Hamlet-group Selection (Socio-economic Survey)

3.21. Population and hence number of households varies from village to village. Since villages were selected with probability proportional to size which was related to population directly, larger villages (i.e., those with bigger population) occurred more frequently in the sample. This fact resulted in two heavy work-load for some of the investigators. Clearly, this had to be controlled as both from administrative and operational considerations it was necessary that an investigator's work-load did not exceed the amount decided at the time of planning the work programme. The planned work-load involved a listing of 120 households per sample village on the average i.e., a total of 1,440 households per investigator. In case an investigator's actual work-load exceeded this figure it had to be brought down by some technique.

3.22. The technique adopted for this purpose is known as 'hamlet group selection' which, in essence consists in surveying a random part only and not the whole of a big sample village. The big villages are likely to contain some well-defined hamlets. The hamlets were grouped to form the specified number of groups having approximately the same population and one such group was selected at random with equal probability. Instead of surveying the whole sample village, the survey was confined to the selected hamlet-group only. Hamlet-group selection was done by the investigator himself after having reached the sample village, although the number of hamlet-groups to be formed in a village was specified by the ISI.

3.23. The specified number of hamlet-groups was arrived at in the following manner. The number of persons corresponding to 120 households as on 1-1-1965, the midpoint of the survey period, were computed for each State separately considering the average household size and rate of increase of population obtained on the basis of previous NSS results on 'population' surveys. Let it be P_s for s^{th} state. Whenever the average population (say P'_s) of all the sample villages in sub-samples 1 & 3 or 2 & 4 combined was less than or equal to P_s , the number of hamlet-groups to be formed was specified as 1 (i.e., the whole village was to be surveyed) for all the villages in the corresponding sub-samples, with the relaxation that very big villages might be divided into a convenient number of hamlet-groups so that the total population of a village or hamlet group should not be too large.

3.24. In case P'_s was greater than P_s , all the strata in a state were arranged for central and state sample separately, in ascending order of total population of 12 sample villages in sub-samples 1 & 3 and 2 & 4 separately. Cumulative average population per sample village was worked out at each stage starting from the first stratum arranged. So long as this cumulative average remained less than or equal to P_s , the number of hamlet groups to be formed was specified as 1 for all the sample villages in the corresponding strata subject to the restriction for the very big villages mentioned before. In all other strata, the number of hamlet-groups to be formed for each village was specified so that the total population to be surveyed in 12 villages of sub-samples 1 & 3 or 2 & 4 in any stratum was near about $12 \times P_s$.

3.25. In fixing the number of hamlet-groups to be formed in any sample village, attempt was made to make this number of hamlet-groups equal to, or a sub-multiple of size of the corresponding village, as far as practicable. The distribution of villages by number of hamlet groups is shown in Table (3.5).

3.26. For a sample village where selection of a hamlet group was required, all the hamlets comprising that village were listed alphabetically and conveniently grouped to form the specified number of hamlet groups of equal population content. In case there were no recognised hamlets in the villages, census sub-divisions in the village or distinct geographical blocks of households in the village were treated as hamlets. After forming the specified number of hamlet groups, one such group was selected with equal probability and the socio-economic survey was confined only to the selected hamlet-group.

Sub-division of Sample Village (Crop Survey)

3.27. As mentioned earlier, the selected revenue village was the unit of survey for crop surveys also. Sub-division of a revenue village was adopted when its area was more than 16 square miles.

3.28. If the revenue village consisted of a number of hamlets having separate survey maps (or village records), the hamlets were grouped to form sub-divisions of not less than 2 square miles in area and one such sub-division was selected with equal probability. In case hamlet-wise village maps were not available, but the village area was mapped in two or more map sheets, one of the map sheets (or a group of the map sheets each with area not less than 2 square miles) was selected with equal probability. In case neither the hamlet-wise maps nor village area mapped on different sheets were available, but the village map was available on one sheet, then a sub-sheet having an area of at least 2 square miles formed by folding the map sheet into different parts, was selected with equal probability. In the above mentioned cases, the crop-survey was confined to the

3.29. In cadastrally unsurveyed villages where village maps or alternative records were not available plots (parcels of land) possessed by a sample of households were surveyed. In such cases, crop survey was confined to the hamlet group selected for socio-economic survey in that village.

Arrangement of Households

3.30. Before we go to the details of household selection it would be worthwhile to say here a few words on the importance of arrangement of units in a multi-stage design with systematic sampling. One main advantage of multi-stage selection is that after selection of units of any stage we can collect some supplementary information about the next-stage units in them. For example, in a typical NSS design, after selecting the sample villages or blocks (first-stage units), we can collect some supplementary information about the households (second-stage units) existing in those sample villages or blocks. This is actually done in the NSS. This supplementary information can be utilised for either sampling of next-stage units (households here), or estimation, or both. As regards sampling of units, such information may be used for either (i) stratification of units into appropriate strata, or (ii) arrangement of units according to some meaningful criteria such that after arrangement units belonging to the same groups or categories (having a bearing on the items of enquiry) occur together in the re-arranged list. Actually the manner of arrangement may be same as the formation of strata, the only difference between the two being that in case (i) separate selections are made from the different strata (groups) whereas in case (ii) only one selection is made jointly from all the groups. Stratification no doubt improves the sampling efficiency but at the same time it creates one practical disadvantage. Stratification increases the number of inflation factors (as many as the number of groups) which means more cost and/or complication at the tabulation stage of a large-scale survey. It is true that with proportional allocation, a stratified design require only one multiplier. But this benefit is lost if the total sample size is small compared to the number of strata; because in that case the theoretical allocations to the different strata become fractional, and the consequent rounding off to integral values results in loss of the one multiplier benefit. And exactly this is the situation in our case since in the NSS a small number of households is selected in a sample village.

3.31. In contrast to this, systematic selection with proper arrangement of units ensures more or less proportional allocation to the different strata, improves the sampling efficiency considerably, and requires only one multiplier. Further, stratification within first-stage units (village here) or any subsequent stage units make it difficult and sometimes impossible to achieve a self-weighting scheme (see para 3.46 for details) which incidentally, was one of the highlights of the 19th round design. Because of these reasons, arrangement rather than stratification of households has found an increasing application in the sample designs of the recent rounds. In fact, this technique of arrangement of households has been very skilfully applied to the selection of households in the sample villages and blocks. In crop survey also, arrangement of plots by crops grown in them was resorted to before selection of plots for crop-cutting experiment. Finally, it is important to stress again that the arrangement tactics is effective only with systematic selection whether with equal probability or with probability proportional to size.

Selection of Households for SE Enquiries

3.32. A list of all the households residing in the selected revenue village/hamlet-group to be used as the frame for sampling households was prepared starting from that point where the 1961 census enumeration began and following the order adopted for the census, taking care to include all the households which had come up since the 1961 census. Even in case where the revenue village was different from the census village, attempt was made to follow the order of 1961 census enumeration. In the absence of the knowledge of the order of the 1961 census enumeration, the listing of households was taken up from approximately the north-west corner of the village. If hamlet-group selection was done in a village, the hamlets in the selected group were taken up in the alphabetical order of their names for the purpose of listing of households.

3.33. At the time of listing, the items of information collected for each household were (i) number (if any) of the house in which the household resided, (ii) name of head of the household, (iii) household size, i.e., number of normal members in the household, (iv) means of livelihood, (v) rural labourship, (vi) births, and (vii) deaths. (For definitions of the terms in (iii) to (vii) the appendix may be seen). As is obvious the first two items were meant for identification of the households at a later date. Information on the last two items were intended to improve by way of ratio method of estimation the estimates of births and deaths as obtained from Schedule 12 (population, births and deaths). Items (iii) to (v) were made use of in selecting the sample households as explained below.

3.34. After the listing was over, the households in a sample village (or hamlet-group) were arranged by the following 6 classes on the basis of their household size and means of livelihood. Both these criteria were related to most of the items of enquiry, and hence suitable as arrangement variables.

household class number	1	2	3	4	5	6
household size	1 to 4	1 to 4	1 to 4	≥ 5	≥ 5	≥ 5
means of livelihood class code*	3	2	1	1	2	3

*means of livelihood class code: agricultural labour—1; self-employed in non-agriculture—2; others—3.

3.35. This arranged list of households constituted the sampling frame for selection of households. The arrangement ensured that households having small and large sizes and belonging to different livelihood classes would be proportionally represented in the sample. The selection procedures for different enquiries were as follows:

Combined Sample.—From the sampling frame thus prepared, a sample of 22 households (on the average) was selected linear systematically with the interval and random start prescribed for this purpose. This sample was called the 'combined sample'. The interval and the random start for this combined sample were fixed in such a way as to make the sample design self-weighting with more or less equal work-load (viz.,

Schedule 16.—From the combined sample, a sub-sample of house-holds (2 on the average) was selected linear systematically with interval=11 and a specified random start for this schedule.

Schedule 17.—From the sample households selected for Schedule 16, a sub-sample of households (1 on the average) was selected linear systematically with interval=2 and random start=1 or 2. The household with sampling serial number next to that of the household thus selected was taken up for schedule 17. Evidently, the household surveyed for schedule 17 did not belong to the combined sample.

Schedule 12.—This schedule was canvassed in the remaining households (i.e., excluding those selected for Schedule 16) of the combined sample. This meant an average of 20 households per sample village.

Schedule 10·1.—This schedule was canvassed in all the "rural labour" (see appendix A for definition) households among those selected for Schedule 12. This meant an average of 10 households per village, the percentage of rural labour households being assumed to be about 50 per cent.

Use of Random Numbers

3·36. Random sampling numbers were required for selection of revenue village, hamlet group etc., and for this purpose a booklet containing 104 columns of random sampling numbers was supplied to all investigators. To avoid any possible bias regarding the selection of these numbers, specific instruction was given on which column of the booklet should be consulted for a given sample village. The instruction was to consult the n^{th} column where n was the number formed by the two rightmost digits in the serial number* of the village. For example, the 28th column was used for a village with serial number 628 or 3728 etc. The 100th column of the booklet was used when n was of the form 00.

3·37. Similarly, to avoid any possible bias in sampling of households, random starts for selection of the combined sample and also for schedules 16 and 17 were all pre-specified and applied to the investigators. Since the intervals for sub-sampling of schedules 16 and 17 were the same for all sample villages, the corresponding random starts were specified in a systematic manner in order to ensure a better spread over the villages; specification was done separately for each set of 6 villages in a sub-sample. For schedule 16, one random number from 1 to 11 was selected for village number 1 in any sub-sample. This was the random start for the first village. Then the random starts for other 5 villages in the sub-sample were obtained by adding 2 successively. Whenever this number after successive addition exceeded 11, 11 was subtracted to get the random start. Similarly, for schedule 17, one random number from 1 to 2 was selected and 1 added successively

The following example will clarify the method.

village number	sub-sampling random starts for	
	schedule 16	schedule 17
1	6	2
2	8	1
3	10	2
4	1	1
5	3	2
6	5	1

3·38. An example illustrating the sampling of households has been given at the end of this chapter.

Selection of Plots and Cuts for Crop Survey

3·39. As mentioned earlier, clusters of plots and circular cuts were the ultimate-stage units for land utilisation survey (i.e., crop acreage survey) and crop-cutting experiments (i.e., yield-rate survey) respectively. Clusters were formed by grouping a fixed number of continuous plots (contiguous as indicated by their survey numbers in the village map, or by their serial numbers in the village list of plots). The reason for resorting to cluster sampling was that time spent on travel and identification for a cluster of plots is usually much less than that for an equal number of individual plots scattered throughout the village. Selection of clusters of plots for acreage survey was done by one of the three alternative methods depending on the availability of frame for the sample village. In any of these methods, however, the same sample of clusters (or plots) were surveyed in all the four crop seasons.

3·40. Method 1.—Suppose the sample village was cadastrally surveyed and a village map showing the locations and boundaries of the plots was available without much trouble. Then clusters of size 10 (i.e., of 10 plots each) were formed by combining plots with major survey numbers 1-10, 11-20, 21-30 etc., and similarly clusters of size 5 were groups of major survey numbers, 1-5, 6-10, 11-15, 16-20 etc. Then 4 clusters of 5 plots each were selected in villages meant for land utilisation only and 6 clusters of 10 plots each were selected in sample villages meant for both acreage and yield-rate surveys. The actual procedure of selection was as follows :

Suppose N —highest survey number in a village/sub-division

n —number of clusters to be selected

c —cluster size = 5 or 10

N^1 — N increased as little as possible to become a multiple of cluster size c .

*All the sample villages of the central sample were given a continuous serial numbering from 0001 to 8,472, and those of the state sample a continuous numbering from 10,001 to 18,472 with some gaps for non-participating States.

Then n plots known as "basic plots" were selected circular systematically with interval= I and random start= R where $I = \left[\frac{N^1}{n} \right]$ and $1 \leq R \leq N^1$. Then clusters were formed around the selected basic plots e.g., if the basic plot with survey number 472 was selected, the corresponding sample cluster was taken as a group of plots with survey numbers 471-480 or 471-475 for $c=10$ and 5 respectively.

3.41. Method 2.—Village map was not available but a list of all plots in the village was available. In this case all the plots in the village were first given a continuous sampling serial number. Selection of basic plots and formation of clusters around them was exactly the same as in method 1 with the only different that survey numbers s were replaced by sampling serial numbers.

3.42. Method 3.—Suppose neither village map nor list of plots was available. In such cases plots were selected indirectly through a sample of households. A sample of 4 or 6 households was selected systematically depending on whether the village was meant for just acreage survey or both acreage and yield rate survey. All the plots possessed by these sample households within 5 miles radius of the sample village were taken up for survey.

3.43. The following example illustrates the procedure of selection in methods 1 and 2.

Suppose the highest survey number is 587 and 6 clusters of 10 plots each are to be selected in the village. Since 587 is not a multiple of 10, the next higher multiple of 10 viz. 590 is to be considered. Since 6 clusters are to be selected, interval I is to be taken as the integral part of $590/6$, viz., 98. A random start in the range 1 to 590 is to be selected. Let the random start obtained be 295. The basic plots are selected systematically and the sample clusters are formed around them as shown below :

cluster number	selected number	survey number of basic plots	survey numbers of plots in the cluster
(1)	(2)	(3)	(4)
1	R	295	291—300
2	$R + I$	393	391—400
3	$R + 2I$	491	491—500
4	$R + 3I$	589	581—590*
5	$R + 4I$	97 (=687—590)	91—100
6	$R + 5I$	195	191—200

*highest survey number is 587, hence only seven plots 581-587 are to be surveyed in this cluster. The plots 588 to 590 are 'dummy' plots with value zero for any character.

3.44. In order to relieve the strain on the investigators in some specified hilly tracts, desert areas, inaccessible regions and where average area of cultivated plot is more than 10.00 acres the work-load was reduced by allowing selection of 4 clusters of 2 plots each or all plots possessed by 3 households in villages meant for only land utilisation survey and 6 clusters of 5 plots each or all plots possessed by 3 households in villages meant for both land utilisation and yield surveys.

3.45. In the case of sample villages selected for crop-cutting work, 6 crop plots were selected from the plots selected for land utilisation survey, circular systematically with probability proportional to gross area under the crops paddy, jowar, bajra, ragi, maize, wheat and barley after arranging the sub-plots in a specified order on the basis of crops grown in them. From a selected crop-plot, yield data were collected from one circular cut (which comprised of two concentric circles of radii 2'3" and 4' located at random in each of the selected crop plots) per crop in case of paddy, ragi, wheat (grown pure), barley (grown pure) and from 2 crop cuts per crop in case of jowar, bajra, wheat (mixed), maize or barley (mixed). The crop harvested from the 4' cut is used for estimating the yield-rate whereas that from the 2'3" cut is used for estimating the 'driage factor'. The 'driage factor' is the ratio between the weights of the dried crop and of the green crop (i.e., freshly harvested); it is later applied as an adjustment factor to the production estimates of that green crop. This selection of plots and cuts was done afresh for each of the seasons—autumn, winter, spring and summer.

Self-weighting Design

3.46. A sample design is termed a *self-weighting design* if it ensures that the *inflation factors* (also known as multipliers) are the same for all the ultimate-stage sampling units. Usually a design is made self-weighting for estimating parameters like the population mean or population total. In statistical notation this means that in a self-weighting design the population total can be estimated as $C \times \Sigma y$ where C is the only multiplier for all the sampling units and Σy is the simple sum of all the sample observations. In short, C is very often called the *constant multiplier* and Σy the *sample total*. Evidently, such a design has considerable practical advantages. Firstly, it greatly simplifies and quickens the tabulation. (It may be mentioned here that in a large-scale survey utilising a complicated sample design and involving many parameters to be estimated, the task of tabulation is quite tremendous). Secondly, as a by-product of the first, it saves time and cost of tabulation and assures more accurate computation of final results. Thirdly, with proper kind of self-weighting, the design promises to be more efficient than a non-self weighting one. This advantage flows from the fact that a self-weighting scheme very often involves a *proportional allocation* of the ultimate units which may not be the case with a non-self-weighting scheme.

3.47. Because of these concrete gains, the self-weighting scheme is proving popular and is being increasingly used in the NSS. The 19th round design has been made self-weighting for all the household enquiries at the state level. That is, for any household enquiry a single multiplier was required for all the sam-

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TECHNICAL PAPER ON SAMPLE DESIGN

This report entitled 'Technical Paper on Sample Design' Nineteenth Round (July 1964—June 1965) was prepared by the Indian Statistical Institute and it is being published in the form in which it was submitted to the Government of India. The views contained in this report are not necessarily those of the Government of India.*

SUMMARY

This technical paper describes in detail the sample design of the nineteenth round of the National Sample Survey (NSS), which is a countrywide, multi-subject, integrated and continuing survey being conducted in the form of rounds, each round covering several topics of current interest. Chapter One gives an introductory account of the genesis of the NSS and its salient features. In Chapter Two is outlined the plan-frame of the nineteenth round its scope and coverage, subjects of enquiry, sample size, field arrangements and programme of work. Chapters Three and Four deal with the technical details of the sample designs adopted for the rural and the urban sector respectively. In essence, the design was stratified with two-stage selection within each stratum; the first-stage units were villages/blocks in the rural/urban sector and the second-stage units were households/clusters of plots for the socio-economic/crop survey. Chapter Five lays down the procedures adopted for estimation of parameters.

Two important features marked the design viz., (i) the sample in each stratum was drawn in the form of four independent and interpenetrating sub-samples, and (ii) the design was self-weighting for all the household enquiries.

*This draft report (No. D. 143) was submitted to the Government of India in May 1966.

CHAPTER ONE

INTRODUCTION

Historical Note

1.1. The absence of reliable and adequate statistics relating to production, consumption and other aspects of economic and social life in India has been felt for a long time. Since the advent of independence in 1947, the development of statistics has, therefore, been a continuing concern of the Government of India. In 1949, the late Prime Minister Shri Jawaharlal Nehru desired that a sample survey should be organised covering the whole country to collect essential information. An abstract scheme for organising a suitable sample survey for this purpose was immediately prepared by Professor P. C. Mahalanobis. This scheme was readily approved by the government in principle and was given a concrete shape by October 1950 when the National Sample Survey Organisation was set up.

1.2. The National Sample Survey (NSS) was started in 1950 with the object of obtaining comprehensive and continuing information relating to social, economic, demographic and agricultural characteristics through sample surveys on a country-wide basis. The information collected are utilised for planning, research and other purposes by the Central and State Ministries, the Planning Commission and other interested organisations. The NSS is a continuing, multi-subject, integrated survey being conducted in the form of successive 'rounds', each round covering some topics of current interest in a specific survey period. The scope, period, sample design and programme of each round are fixed by taking into account the requirements of its users and the resources available for that period. Since 1958-59, the survey period has been made one complete year coinciding approximately with the agricultural year. The calendar periods of the different rounds along with their sample sizes have been given in Table (1.1). The main features of the NSS, which apply to the nineteenth round also, are being given in the following paragraphs.

Subjects of Enquiry and Scope

1.3. The NSS is a multi-subject survey. Since its inception, the NSS has been collecting information, on a wide variety of topics usually covering several topics with emphasis on one or two of them in each round. The subjects covered more or less regularly in the past few rounds are as follows : household income and consumer expenditure, rural retail prices of selected commodities, employment and unemployment particulars, labour force statistics and demographic characteristics. Since the tenth round (December 1955—May 1966), crop survey (both area sown and quantity produced) for major cereal crops has also become a regular feature of the NSS.

1.4. Data on small scale enterprises (manufacture, transport and trade), professions and services, village statistics, landholdings, savings and indebtedness are collected periodically according to the needs of the users. Subjects such as vital statistics, morbidity, disposal of cereals by producer households, capital formation, building construction, production of milk, systems of weights and measures, farming practices, economic condition of agricultural labourers, condition of rural labourers, book-readers' preference, animal husbandry, live-stock products, family planning and migration have also been taken up in some rounds of the NSS.

1.5. Besides these, the NSS has also undertaken special *ad-hoc* surveys by temporarily expanding its investigation strength. Two important examples of such surveys are provided by the Family Living Survey of the Middle Class and the Working Class (1958-59) and the Post Census Surveys of Population and Live-stock (April-June 1961). Pilot Studies and exploratory surveys are also taken up from time to time to study the problems of data collection in new fields; to try out new questionnaires and schedules, to evolve suitable sample designs and to make time and cost studies.

1.6. In the NSS the general approach has been to collect information relating to socio-economic enquiries from a sample of households¹ or families situated in a sample of villages² and blocks³, information on prices from a sample of shops and markets, information about village/block particulars from the knowledgeable local people, information on crop particulars from a sample of crop plots, and so on.

Schedules of Enquiry

1.7. In the NSS, schedules of enquiry and not questionnaires, are used for the purposes of collecting information from the respondents and recording that information. A questionnaire consists of a set of questions which the investigator is expected to put to the informant verbatim and in the precise order in which the questions are given in the questionnaire. A schedule of enquiry, on the other hand, consists of a list of items on which information is to be collected; the exact form of the questions to be asked are not standardised and the method of questioning is left to the discretion of the investigator. Instructions (both written and verbal) are, however, given to the investigators about the concepts and definitions involved.

1.8. The questionnaire approach is suitable for asking very simple and direct questions as occurring in for example, 'opinion and attitude' surveys. It may not be convenient for an enquiry a bounding in numerous and interlinked items. But the NSS enquiries usually involve a large number of items many of which cannot be put in simple question forms; in this respect a schedule is more compact and flexible than a questionnaire. Moreover, it is not possible at the time of framing the questionnaires to visualise all types of cases that one might come across at the time of actual enquiry and prepare standard questions which would suit all such cases. Given the items on which information is sought to be collected and given the necessary instructions regarding the concepts and definitions involved, the investigator is in a better position to frame questions to elicit the required information according to the exigencies of the situation.

1 A 'household' for the purpose of NSS has been usually defined as 'a group of persons normally living together and generally taking food from the same kitchen'.

2 'Villages' are the smallest administrative areal units having an average population of 600 nearly in the rural areas of India.

3 'Blocks' are convenient areal sub-divisions of a town/city having an average population of 800 nearly.

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Actually, to start with, the design was made self-weighting for the combined sample mentioned earlier where after it became automatically self-weighting for the individual enquiries (schedule 10, 12, 16 and 17) because a constant fraction of the combined sample was sub-sampled for each of these enquiries. In order to find out how the scheme was derived, let us start from the estimating formula for the combined sample assuming the design to be non-self-weighting.

3.48. Notations

Let s : subscript for stratum

i : subscript for village

j : subscript for household

κ : total number of strata in the State

n_s : no. of sample villages in any sub-sample of s^{th} stratum $n_s=6$ for all s .

Z : total size of a stratum.

Z_{si} : size of i^{th} sample village in s^{th} stratum

D_{si} : no. of hamlet groups formed in the i^{th} sample village in s^{th} stratum ($D_{si}=1$ if the whole village was surveyed)

I_{si} : interval for selecting the combined sample in i^{th} village of s^{th} stratum

y_{sij} : value of the character y for a sample household

Y : State total for y

h_{si} : no. of households in the combined sample in i^{th} village of s^{th} stratum

f : adjustment factor for revenue village selection*.

3.49. Then an unbiased estimator of Y based on any sub-sample would be given by \hat{Y} where

$$\begin{aligned}\hat{Y} &= \sum_{s=1}^{\kappa} \frac{1}{6} \sum_{i=1}^6 \frac{Z}{Z_{si}} f_{si} D_{si} I_{si} \sum_{j=1}^{h_{si}} y_{sij} \\ &= \sum_{s=1}^{\kappa} \sum_{i=1}^6 \frac{h_{si}}{Z_{si}} M_{sij} y_{sij}\end{aligned}\quad (1)$$

where $M_{sij} = \frac{Z}{6Z_{si}} f_{si} D_{si} I_{si}$ is the multiplier for y_{sij} . Our object is to make M_{sij} a constant figure equal to C , say. Now $Z = \sum Z_{si}$ is same for all strata within a State. And determination of Z_{si} and D_{si} have been explained earlier. So the only item that can be properly chosen so as to equalize all M_{sij} is I_{si} , the interval for selecting the combined sample. Putting $M_{sij}=C$ and equating for I_{si} we get

$$I_{si} = \frac{6C}{Z} \frac{Z_{si}}{D_{si}} \frac{1}{f_{si}} \quad (2)$$

The above equation shows that once C is fixed, the desired I_{si} can be easily determined for each and every sample village by using this relation.

And then equation (1) simplifies, as planned, to

$$\hat{Y} = C \sum_{s=1}^{\kappa} \sum_{i=1}^6 \frac{h_{si}}{Z_{si}} y_{sij} \quad (3)$$

It may be noted here that h_{si} is not a fixed number but a random variable due to linear systematic selection of households with interval I_{si} .

3.50. The problem now reduces to finding an appropriate C that will assure the desired sample size in terms of households. The fact that the chosen value of C will govern the total sample size (households) for the whole State will be evident if we try to estimate the total number of households in the State. In that case the value of $\sum y_{sij}$ becomes h_{si} itself since the sample total in this case is nothing but the number of sample households. Equation (3) therefore becomes

$$\hat{Y} = C \sum_{s=1}^{\kappa} \sum_{i=1}^6 h_{si} = Ch \quad (4)$$

where h is the total number of sample households per sub-sample in the whole State and Y is the unbiased estimator of the total number of households in the State, both of course, relating to the rural sector. To be more precise about the value of C , we can replace \hat{Y} by its true value Y and write

$$C = \frac{Y}{h} \quad (5)$$

= $\frac{\text{total number of households in the State}}{\text{number of sample households per sub-sample in the State}}$
= reciprocal of the over-all sampling fraction.

Since the 19th round continued for a full year (July 1964—June 1965), Y here should relate to the mid-point of the survey period i.e., to 1st January 1965. The value of Y being a fixed quantity (population parameter), C is found to be inversely proportional to h . That is why, the desired sample size (households) has to be kept in view in choosing an appropriate value for C .

* $f=1$ when the surveyed revenue village coincides with the sample census village.

$f < 1$ when the surveyed revenue village is one of the r revenue villages which are contained in the sample census village.

3.51. Hence, for the purpose in hand, we shall be using for h the stipulated sample size for the whole State which is equal to nm , where n is the number of sample villages (in any sub-sample) for the whole State and m is the average number of households planned to be selected per sample village. In this particular case, $n=6K$ (K total number of rural strata in the State), and $m=22$. As regards the true value Y being unknown, we replace it by its estimate Y_0 obtained by first estimating the rural population of the State as on 1st January, 1965 and then by dividing that by the average household size (rural sector) of that State.

Thus finally C works out as

$$C = \frac{Y_0}{nm} \quad (6)$$

where Y_0 , n and m are as defined before.

So in the procedure for self-weighting, C for each State was determined first according to equation (6); and then I_{si} 's for individual villages were obtained by equation (2). Actually the operational procedure for calculation of I_{si} was slightly different. The factor $6C/Z$ ($=I_s$, say) in equation (2) was the same for all villages in a State and this was first calculated. I_s may be regarded as the general interval for household selection in the concerned State. The interval I_{si} for any individual sample village was then obtained as

$$I_{si} = I_s \times \frac{Z_{vi}}{D_{si}} \times \frac{1}{f_{si}} \quad (7)$$

The problem of self-weighting was now completely solved except for a small hitch, *viz.*, the value of I_{si} turned out to be fractional in many cases. A fractional interval was clearly inadmissible from practical point of view as in that case the selection of households would have been complicated for the investigator. Hence some thing had to be done to avoid fractional intervals. This was tackled in the following way.

3.52. Suppose, as per equation (7), I_{si} became $A+B$ where A was the integral and B was the decimal part in I_{si} . Then I_{si} was rounded off to either A or $(A+1)$ with probabilities p and q ($=1-p$) respectively such that the expected number of sample households remained the same. That is, the equation

$$\frac{1}{A+B} = p \frac{1}{A} + q \frac{1}{A+1} \quad (8)$$

was to be satisfied. This gave

$$p = \frac{A(1-B)}{A+B} \quad \text{and} \quad q = \frac{(A+1)B}{A+B} \quad (9)$$

For example, if $I_{si}=1.8$ then it was rounded off to 1 with probability $1/9$ and to 2 with probability $8/9$. It may be mentioned here that it was the rounded off values of I_{si} which were supplied to the investigators. For simplicity's sake, the rounded off value of I_{si} will be henceforward denoted by I . Such rounding off led to slight increase in the sampling variance of the estimators.

Revision of original I

3.53. In case the original D (as specified by the ISI) of a sample village was changed to D' on the field because of an abnormal increase or decrease in its present population from the 1961 census figure, the corresponding I was also modified to I' in order to maintain self-weighting property of the design. The relation connecting I' to I was

$$I' = \frac{D \times I}{D'} \quad (10)$$

I' , if fractional, was rounded off as described above.

Control of Work-load

3.54. The intervals obtained by equations (7) or (10) assure that the total sample size (households) for the whole State would be near the desired value nm ($=6K \times 22$), but they do not ensure anything for individual sample villages. As per the work programme each investigator was allotted a fixed set of 12 sample villages. It so happened that some investigators got too many big villages in their quota, and the total sample size (households) for them was much larger than the planned figure of 12×22 . To provide relief to them in such cases, the investigators were allowed to survey a smaller number of households than was strictly necessary for self-weighting. The deficit was corrected at the scrutiny stage by repeating some of the filled-in schedules.

3.55. As mentioned earlier, once the design was made self-weighting for the combined sample, it became automatically so for the other household enquiries. This is because a constant fraction of the combined sample was surveyed for each of these enquiries (e.g., schedules 10, 12, 16 and 17).

TABLE (3-1)—Sizes given to villages (for NSS 19th round sample selection) classified by population groups and states

1961 census population	Assam		Bihar	Gujarat	Jammu & Kashmir	Kerala	Madhya Pradesh	Madras	Maharashtra	Mysore	Orissa	Punjab	Rajasthan	Uttar Pradesh	West Bengal	Delhi	Himachal Pradesh	Manipur	Tripura		
	Andhra Pradesh	region 1 (plains)																		region 2 (hills)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
0— 499	1	1	*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
500— 999	4	4	8	4	3	3	3	3	3	3	3	3	4	3	3	3	3	3	5	3	3
1,000— 1,999	8	7	14	7	6	6	6	6	6	6	6	6	8	6	6	6	6	10	6	6	
2,000— 2,999	14	12	24	12	10	10	10	12	10	10	10	10	15	10	12	10	10	20	10	10	
3,000— 3,999	18	18	36	18	15	16	12	16	16	16	16	16	20	16	16	16	16	20	16	16	
4,000— 4,999	24	22	44	22	18	20	16	20	20	20	20	20	26	20	20	20	20	20	20	20	
5,000— 5,999	30	28	56	28	21	24	20	25	24	24	24	24	32	24	25	24	24	..	..	24
6,000— 6,999	36	32	64	32	25	28	24	30	28	28	28	28	36	28	30	28	28	..	..	28
7,000— 7,999	42	36	72	36	30	32	28	35	32	32	32	32	44	32	35	32	32	..	..	32
8,000— 8,999	48	42	84	42	35	36	32	40	36	36	36	36	50	36	40	36	36	..	..	36
9,000— 9,999	54	48	96	48	40	40	36	45	40	40	40	40	55	40	44	40	40	..	..	40
10,000—10,999	60	..	..	52	44	..	40	..	44	44	..	..	44	..	44	44	..	..	..	..
11,000—11,999	66	..	..	56	48	..	44	..	48	48	..	..	48	..	48	48	..	..	..	..
12,000—12,999	72	..	..	60	52	..	48	..	52	52	..	..	52	..	52	52	..	..	..	..
13,000—13,999	78	..	..	66	55	..	52	..	56	56	..	..	56	..	56	56	..	..	..	..
14,000—14,999	84	..	..	72	60	..	56	..	60	60	..	..	60	..	60	60	..	..	..	..
15,000—15,999	90	..	..	78	64	..	60	..	64	64	..	..	64	..	64	64	..	..	..	..
16,000—16,999	96	..	..	84	68	..	64	..	68	68	..	..	68	..	68	68	..	..	..	..

*Size s for Assam region 2 (hills) having population 0 to 499 : 0 to 49—1 ; 50-99—2 ; 100-299—4 ; 300-499—6.

TABLE (3.2).—State-wise distribution of rural strata by the number of investigation zones formed in them for the NSS 19th round

srl. no.	state/union territory	number of strata			
		total	by investigation zones		
			1	2	3
(1)	(2)	(3)	(4)	(5)	(6)
1	Andhra Pradesh	28	28	..	..
2	Assam	15	13	2	..
3	Bihar	32	31	1	..
4	Gujarat	15	15	..	..
5	Jammu & Kashmir	15	15	..	..
6	Kerala	15	15	..	..
7	Madhya Pradesh	30	25	5	..
8	Madras	26	25	1	..
9	Maharashtra	29	27	2	..
10	Mysore	17	15	2	..
11	Orissa	15	12	3	..
12	Punjab	15	14	1	..
13	Rajasthan	16	13	3	..
14	Uttar Pradesh	44	42	1	1
15	West Bengal	23	23	..	..
16	Delhi	1	1	..	..
17	Himachal Pradesh	1	1	..	..
18	Manipur	8	7	1	..
19	Tripura	8	8	..	..
TOTAL		353	330	22	1

NSS, 19th Round : Rural (1964-65)

TABLE (3.3).—Proforma A used for posting of sizes against villages, adjustments and cumulation

State : Rajasthan ;		District : Jalore ;				Tehsil : Ahore					
village sri. no.	popula- tion	size	adjust- ment	adjust- ed size	cumula- tive adj. size	village sri. no.	popula- tion	size	adjust- ment	adjust- ed size	cumu- lative adj. size
(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
1	680	3		3	3	26	D.P.	1		1	75
2	1,171	6		6	9	27	D.P.	1		1	76
3	440	1		1	10	28	408	1		1	77
4	153	1		1	11	29	599	3		3	80
5	340	1		1	12	30	19	1		1	81
6	470	1		1	13	31	1,103	6		6	87
7	471	3		3	16	32	662	3		3	90
8	1,869	6		6	22	33	1,280	6		6	96
9	337	1		1	23	34	214	1		1	97
10	1,249	6		6	29	35	231	1		1	98
11	511	3		3	32	36	1,433	6		6	104
12	203	1		1	33	37	46	1		1	105
13	1,570	6		6	39	38	996	3		3	108
14	73	1		1	40	39	828	3		3	111
15	378	1		1	41	40	548	3		3	114
16	372	1		1	42	41	3,029	16	+4	20	134
17	2,493	12		15	57	42	2,138	12	+3	15	149
18	D.P.	1		1	58	43	592	3		3	152
19	389	1		1	59	44	1,031	6		6	158
20	660	3		3	62	45	1,468	6		6	164
21	D.P.	1		1	63	46	1,278	6		6	170
22	1,211	6		6	69	47	717	3		3	173
23	95	1		1	70	48	411	1		1	174
24	782	3		3	73	49	488	1		1	175
25	100	1		1	74	50	606	3		3	178
				
		
101	842	3		3	409	113	816	3		3	452
102	2,481	12	+3	15	424	114	3,738	16	+4	20	472
103	468	1		1	425	115	882	3		3	475
104	1,722	6	+2	8	433	116	136	1		1	476
105	621	3		3	436	117	383	1		1	477
106	369	1		1	437	118	1,075	6	+2	8	485
107	908	3		3	440	119	226	1		1	486
108	244	1		1	441	120	1,000	6	+2	8	494
109	119	1		1	442	121	1,079	6	+2	8	502
110	338	1		1	443	122	728	3		3	505
111	664	3		3	446	123	446	1		1	506
112	574	3		3	449	124	504	3		3	509

Table (3-4) Working sheet for selection for villagers in the 19th round, NSS.

State : Punjab

Z=4,800; I=400

region	state block	stratum no.	district		tehsil		total size	cumulative size	random numbers selected (order of selection) [serial number of sample Village in P.C.A.]							
			name	code	name	code			sub-sample 1 (R ₁ =3281)		sub-sample 2 (R ₂ =2220)		sub-sample 3 (R ₃ =1677)		sub-sample 4 (R ₄ =3537)	
									central	state	central	state	central	state	central	state
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1		1	Gurgaon	03	Palwal	4	761	663	81(3)	481(3)	620(5)	220(4)	77(5)	477(5)	337(3)	
							-98		81	481	620	220	77	477	337	
					Ferozepore Jhirka	6	602	1,220	881(4)		1,020(5)	877(6)		1,137(4)	737(3)	
							-45		218		357	214		474	74	
					Nuh	5	750	1,892	1,681(5)	1,281(4)	1,420(6)	1,820(6)	1,677(1)	1,277(6)		1,537(4)
							-78		461	61	200	600	457	57		317
					Ballabhgarh	3	552	2,444		2,081(5)	2,220(1)			2,077(1)	1937(5)	2,337(5)
										189	328			185	45	445
					Gurgaon	2	758	3,122	2,481(6)	2,881(6)	3,020(2)	3,620(1)	2,477(2)	2,877(2)	2,737(6)	
							-80		37	437	576	176	33	433	293	
					Rewari	1	1,086	4,185	3,281(1)	3,681(1)	3,820(3)	3,420(2)	3,277(3)	3,677(3)	3,537(1)	3,137(6)
							-23		159	559	698	298	155	555	415	15
									4,081(2)				4,077(4)		3,937(1)	
									959				955		815	
			Mohindergarh	18	Narnaul	3	692	4,800		4,481(2)	4,620(4)	4,220(4)		4,477(4)	4,337(2)	4,737(2)
							-77			296	435	35		292	152	552

total Size (Original) : 5201
 adjustment made : -401
 adjusted size : 4800

4.1. The general sample design was a stratified two-stage one with urban blocks (or simply blocks) as the first stage units and households as the second-stage units respectively. As in the case of villages, urban blocks also were selected circularly systematically with probability proportional to size in the form of four independent and interpenetrating sub-samples. Within each selected block (or sample block), households for different enquiries were selected linearly systematically with intervals and random starts specific for the purpose. Block selection was done at the ISI whereas household selection was done on the field by the investigators themselves. The design was made self-weighting for all the household enquiries. Details of various aspects of the design are being given in the following paragraphs.

Stratification

4.2. The urban survey was confined to the cities and towns so declared during the 1961 census. As per the 1961 census, the 2703 towns of India were divided into 6 population classes as shown below. Out of these towns, 2680 towns were covered by the 19th round the remaining towns falling outside the geographical coverage of the survey.

class	population	number of towns	total population	percent to all India population
(1)	(2)	(3)	(4)	(5)
I	100,000 and more	107	35,110,251	44
II	50,000 to 99,999	141	9,625,724	12
III	20,000 to 49,999	516	15,685,887	19
IV	10,000 to 19,999	818	11,272,944	14
V	5,000 to 9,999	846	6,329,964	8
VI	less than 5,000	275	904,985	1
ALL-INDIA		2,703	78,929,755	100.0

In each State, cities and towns with population 50,000 or more in the 1961 census i.e. class I and II towns formed one stratum (called 'sector 1'), and rest of the 1961 census towns i.e. class III to VI towns formed another stratum (called 'sector 2'). Thus there were two strata in each State except in Maharashtra which had three strata: Bombay city formed one stratum (called 'sector 0'), other class I and II towns formed the second stratum (sector 1), and the remaining towns the third stratum (sector 2). This departure was made because Bombay city was allotted a comparatively large sample to be surveyed by the field staff of the ISI whereas sample blocks falling in other towns of Maharashtra were surveyed by the field-staff of the NSS Directorate. As regards the union territories, Delhi and Tripura had two strata each formed as described above. Himachal Pradesh, did not have any sector 1 towns while Manipur had only one sector 1 town viz. Imphal, so they had only one stratum each. There were in all 37 urban strata.

Allocation of Sample Size

4.3. The total sample size of 4,572 blocks (central sample) was allocated to the states and union territories in proportion to their 1961 census urban populations with twice the weight to sector 1 towns. That is, if the urban population of a state was P of which P_1 was accounted by sector 1 towns and $P_2 = (P - P_1)$ by sector 2 towns then the allocation for that state was proportional to $(2P_1 + P_2)$. The allocations were modified to ensure a minimum of 144 sample blocks in each state and were rounded off to multiples of 24. In finalising the allocations the available investigator strength and rural work-load were also kept in view. As regards the union territories, the staff strength in Manipur and Tripura was large compared to the total number of blocks in them and hence 50 per cent of the blocks were selected in the central sample, the remaining 50 per cent being covered by the corresponding state samples.

Sampling Frame

4.4. Upto the fifteenth round (July 1959—June 1960) of the NSS, the sampling frame used in the urban sector was the list of 1951 census enumeration blocks. Being prepared exclusively for conducting the decennial census—a short-period job—the census blocks were not meant to be lasting and further track of them was kept by the census authorities after the census was over. As a result the census blocks became less and less identifiable with the passage of time. Moreover since the census blocks were not usually compact identifiable area units there was a possibility of missing new constructions coming up after the census leading to under-coverage of the blocks. For these reasons the list of census blocks was proved to be unsatisfactory to be used as a sampling frame for the NSS. The need for a better frame led to the initiation of the Urban Frame Survey (UFS) which was intended to demarcate the area of a city/town into urban

block that would remain identifiable over a long period of time and that would minimise the risk of under-coverage. The UFS was started by the NSS Directorate in 1960 in order to form compact areal block bounded by well-defined and more or less permanent boundaries like streets, lanes, canals, big buildings etc. and clearly identifiable on the field with an average population of 800 per block. After demarcating the blocks (known as UFS blocks) on the field, a set of maps and schedules was prepared, the maps showing the location and boundary of the blocks and the schedules giving detailed description of these boundaries.

4.5. The UFS has been completed for nearly 2000 towns out of the 2,703 towns of 1961 census. The remaining 700 towns which account for about 6 per cent of the total urban population are expected to be covered by the UFS in due course. Because of the non-availability of the UFS material for all towns, two types of frame were used for urban sampling viz. (i) the UFS list of blocks for the towns covered by the UFS, and (ii) the 1961 census list of blocks for the towns not covered by the UFS.

Classification and Arrangement of Towns

4.6. Since the socio-economic characteristics are likely to be related to the principal means of livelihood of a region, all the sector 2 towns were classified according to their means of livelihood pattern. The 1961 Primary Census Abstract (PCA) of any district gives a complete list of villages and urban blocks in that district with 20 items of information for each village/block (specimen given in the appendices). In the PCA, the total number of workers in a village/block were classified into 9 livelihood into 9 livelihood classes as described below.

class	class description
I	workers employed as cultivator.
II	workers employed as agricultural labourer.
III	workers employed in mining, quarrying, livestock, forestry, fishing, hunting and plantations, orchard and allied activities.
IV	workers employed at household industry.
V	workers employed in manufacturing other than household industry.
VI	workers employed in construction.
VII	workers employed in trade and commerce.
VIII	workers employed in transport, storage and communications.
IX	workers employed in other services.

Total number of workers in classes I to III (agricultural), IV to VIII (industrial) and IX (others, mainly service) were computed for each town. Towns were then classified as belonging to one of the above three means of livelihood classes, viz, agricultural, industrial and others according to the maximum workers content. In case the total workers content was almost equal in any two classes, preference was given to that class containing lesser number of towns. The state-wise distribution of the sector 2 towns by the above 3 classes may be seen in Table (4.1).

TABLE (4.1).—Distribution of sector 2 towns by means of livelihood class and by states

serial no.	state	no. of sector 2 towns with means of livelihood class			
		total	1 (agricultural)	2 (industrial)	3 (others)
(1)	(2)	(3)	(4)	(5)	(6)
1	Andhra Pradesh	203	68	124	11
2	Assam	57	..	48	9
3	Bihar	139	35	89	15
4	Gujarat	166	38	113	15
5	Jammu & Kashmir	41	16	9	16
6	Kerala	83	12	48	23
7	Madhya Pradesh	207	45	145	17
8	Madras	310	79	197	34
9	Maharashtra	238	100	116	22
10	Mysore	214	88	115	11
11	Orissa	58	6	16	36
12	Punjab	169	18	127	24
13	Rajasthan	135	36	86	13
14	Uttar Pradesh	240	5	179	56
15	West Bengal	153	7	129	17
16	Delhi	1	..	..	1
17	Himachal Pradesh	13	2	2	9
18	Manipur	..	..	..	..
19	Tripura	5	2	..	3
	ALL-INDIA	2,432	557	1,543	332

4.7. Within each state/union territory, the cities and towns were first arranged by sector. Then all the sector 1 towns were arranged in descending order of their 1961 census population; and all the sector 2 towns were arranged first by regions and then by means of livelihood classes. Within each region and means of livelihood class combination, sector 2 towns were arranged in descending order of their 1961 populations. The urban blocks within a town were arranged according to geographical nearness as far as possible.

4.8. All these arrangements were effected to assure that towns belonging to different sectors, regions and livelihood classes and the different localities of these towns would be duly represented in the sample while selecting a circular systematic sample of urban blocks. With proper arrangement of units, a pps sample selected systematically is expected to fare quite efficiently when compared to pps sample with replacement.

Size Measure

4.9. Similar to the case of villages, each urban block also was assigned a 'size' depending on its population (UFS population if it was a UFS block, otherwise 1961 census population). However, there were some major points of distinction between villages and urban blocks regarding their populations. For example, (a) the variation in urban block populations was much less than that of villages, (b) the village populations referred to a fixed point of time viz. 1st March 1961 whereas the block populations referred to different time-points because of the conduct of UFS of various towns being staggered over a fairly long period viz. November 1959 to March 1964, (c) the village population figures (being census data) were fairly accurate whereas the population figures of UFS blocks which formed the majority were rough estimate only, and (d) number of blocks in any population class was much less than the corresponding number of villages. Because of these reasons there was not much point in following a sensitive rule for size-fixation in the case of urban block. As shown below, a much simpler procedure was adopted to relate size to block population.

population class	size measure
(1)	(2)
0— 999	1
1,000—1,999	2
2,000—2,999	3
3,000—3,999	4
..... and so on	

Selection of Blocks

4.10. Urban blocks were selected circular systematically with probability proportional to size, size being as defined above. Selection was actually done jointly from the two sectors in each state with twice the weightage to blocks of sector 1 towns except in Delhi where the total size of the sector 1 towns was much larger than that of the sector 2 towns, and in Tripura where 100 per cent sampling was done. This additional weightage was effected by doubling the sizes of the blocks of sector 1 towns at the selection stage with a view to placing more emphasis on the sector 1 town. The interval for systematic selection was calculated in the following way.

Let $2N_1$ = total size (after doubling) of all blocks in sector 1 of a state

N_2 = total size of all blocks in sector 2 of the state

n = allocation for the state i.e. number of blocks to be selected for the central sample as well as for the state sample.

Then $m = \frac{n+n}{4} = \frac{n}{2}$ = number of sample blocks to be selected in a sub-sample, considering

central and state samples together.

Then $2N_1 + N_2$ (= total size of the state) was made an even multiple of m by slightly adjusting (increasing or decreasing) the sizes of a few large blocks and suppose the total of adjusted sizes was N^1 . The interval for selection was obtained as

$$I = \frac{N^1}{m} = (\text{an even integer})$$

Due to doubling of sizes, the interval for block selection in sector 1 may be regarded as $I/2$. This means more blocks were selected from sector 1 which really was the objective. Table 4.2 shows the total number of cities and towns total number of blocks total size, number of sample blocks per sub-sample, adjustments, intervals etc. by sector and state.

4.11. The selection work was carried out in the following stages :—

Stage 1 :—All the cities and towns of a state/union territory and the urban blocks in these cities and towns were arranged as mentioned in para 4.7 and against each block the corresponding population and size were recorded.

Stage 2 :—Block sizes were added to produce town totals and state total.

Table (4.2): Total number of towns, blocks, total size, number of sample blocks per sub-sample, adjustments, intervals etc. by sector and state

sl. no.	state/union territory	number of towns			number of blocks		total size		total weighted size ($2N_1 + N_2$)	no. of sample blocks per s.s. central and state samples together	total adjusted size			adjustments made in size		interval (I) for blocks selection	
		sector 1	sector 2	total	sector 1	sector 2	sector 1 (N_1)	sector 2 (N_2)			sector 1 (N_1)	sector 2 (N_2)	total ($2N_1 + N_2$)	sector 1	sector 2	sector 1	sector 2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1	Andhra Pradesh	20	203	223	3,507	4,273	4,234	4,681	13,149	192	4,234	4,972	13,440	..	+291	35	70
2	Assam	3	57	60	286	949	317	1,057	1,691	72	317	1,094	1,728	..	+37	12	24
3	Bihar	14	139	153	2,373	3,695	2,634	3,347	8,615	156	2,634	3,468	8,736	..	+121	28	56
4	Gujarat	15	166	181	2,691	3,469	3,608	3,917	11,133	96	3,608	3,920	1,136	..	+3	58	116
5	Jammu & Kashmir	2	41	43	394	273	474	323	1,271	72	474	348	1,296	..	+25	9	18
6	Kerala	9	83	92	891	1,486	1,369	1,997	4,735	72	1,372	2,008	4,752	+3	-11	33	66
7	Madhya Pradesh	12	207	219	2,418	4,050	2,728	4,125	9,581	144	2,718	4,068	9,504	-10	-57	33	66
8	Madras	28	310	338	5,135	6,442	6,517	7,267	20,301	180	6,517	7,446	20,520	..	+219	57	114
9.1	Maharashtra	26	238	264	3,628	4,154	4,710	4,884	14,304	156	4,710	4,932	14,352	..	+48	46	92
9.2	Bombay City	1	..	1	3,564	..	5,758	..	*5,758	144	5,760	..	5,760	+2	..	40	..
10	Mysore	16	214	230	2,984	3,668	3,382	3,994	10,758	108	3,382	4,036	10,800	..	+42	50	100
11	Orissa	4	58	62	574	1,198	666	1,250	2,582	72	666	1,260	2,592	..	+10	18	36
12	Punjab	18	169	187	2,239	3,464	2,735	3,682	9,152	84	2,735	3,770	9,240	..	+88	55	110
13	Rajasthan	10	135	145	1,689	2,595	2,036	2,730	6,800	108	2,036	2,840	6,912	..	+110	32	64
14	Uttar Pradesh	35	240	275	7,249	4,930	8,599	5,205	22,403	288	8,599	5,266	22,464	..	+61	39	78
15	West Bengal	31	153	184	8,522	4,465	9,866	4,595	24,327	108**	9,866	4,676	24,408	..	+81	113	226
16	Delhi	2	1	3	2,318	20	3,247	21	*3,268	30**	3,279	21	3,300	+32	..	110	110
17	Himachal Pradesh	..	13	13	..	97	..	116	*116	3**	..	114	114	..	-2	..	38
18	Manipur	1	..	1	88	..	97	..	*97	24	96	..	96	-1	..	4	..
19	Tripura	1	5	6	64	61	71	63	*134	36	80	64	144	+9	+1	4	4
20	TOTAL	248	2,432	2,680	50,614	48,689	63,048	49,907						..	..	..	..

* $N_1 + N_2$ (and not $2N_1 + N_2$).
 ** Central Sample only.

Table (4-3) : Working Sheet for selection of sample blocks : NSS 19th round (urban)

TOTAL SIZE : Sector 1—666 (N₁), sector 2—1260(N₂), 2N₁+ N₂=2592 ; Interval (I) Sector 1—18, Sector 2—36

TE—Orissa

district (code)	town (code)	region	frame*	ward charge no.	iv. unit/ circle no.	block no.	popula- tion (app- rox.)	size	adjusted size	cumula- tive adj. size	random numbers (orders of selection)										
											s.s. 1 (R ₁ =1499)		s.s. 2 (R ₂ =1337)		s.s. 3 (R ₃ =1476)		s.s. 4 (R ₄ =613)				
											central	state	central	state	central	state	central	state			
(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)			
Puri (09)	Puri (04)	1	1	3	3	2	655	1	1	143				143(21)							
								3	1,260	2	2	145									
								4	560	1	1	146								145(24)	
Bundargarh (07)	Rourkela (02)	4	1		1	10	580	1	1	440	440(27)										
								11	600	1	1	441									
								12	620	1	1	442									
								13	650	1	1	443									
								14	600	1	1	444									
								15	600	1	1	445									
Balasore (13)	Balasore (07)	1	1		13	11	945	1	1	499								446(27)			
								12	994	1	2	501			501(6)						
							12 & 13	13	830	1	1	502									
								10	614	1	1	503									
								7	876	1	1	504									
								7	665	1	1	505									
Balasore (13)	Chandbali (37)	1	2		1	A	1904	2	2	537			537(7)								
								2	280	1	1	538									
								3	408	1	1	539									
								4	776	1	1	540									

*frame:—1—U.F.S. 2—1961 Census.

Stage 5 :—Four circular systematic samples of m block each were selected with same interval I but with independent random starts (between 1 and N^4) with a view to obtaining four independent sub-samples. Within each sub-sample, blocks with odd orders of selection constituted the 'central sample' and blocks with even orders of selection the 'state sample'.

While presenting in the sample list, however, these orders of selection were re-numbered starting from unity and in a continuous fashion for the central and the state sample separately. These were then termed as 'sample block numbers'.

As regards Maharashtra, selection was done independently for Bombay city and the rest of Maharashtra, the later including both sector 1 and sector 2 towns. Since Bombay city fully belongs to sector 1, there was no question of doubling the sizes of blocks in it. As an illustration, Table (4.3) is being given showing sampling of blocks in Orissa state.

Selection of Sub-block

4.12. This is analogous to the selection of hamlet-groups in the sample villages and has the same objective viz. to reduce the work-load of listing of households in very large blocks (large in terms of population). The technique consisted in sub-dividing a large sample block into a specified (by the ISI) number of parts called sub-blocks—compact in area and more or less equal in population content, and then in selecting one of these sub-blocks at random with equal probability. Listing and sampling of households was confined to the selected sub-block only. Formation and selection of sub-blocks was done by the investigator himself after he had reached the sample block.

4.13. The specification of the number of sub-blocks into which a sample block was to be divided was done in two instalments. First, for sample blocks having population 1,200 or more; the numbers of sub-blocks were specified as equal to the sizes of the corresponding sample blocks. Taking account of these sub-blocks the average population per sample block was computed separately for each state/union territory. If this average was less than 700, the number of sub-blocks to be formed in any one of the remaining sample blocks was specified as one i.e. the whole sample block was to be surveyed. If however, the average was 700 or more than the bigger blocks (among those with population less than 1,200) were instructed to be divided into 2 sub-blocks each till the average became less than 700.

4.14. The following table (4.4) shows the state-wise distribution of sample blocks by the number of sub-blocks formed in them. It may be seen that sub-block formation was not required in 71 per cent of sample blocks and that only 7 per cent blocks required formation of 3 or more sub-blocks.

TABLE (4.4) : Percentage distribution of 19th round sample blocks by number of sub-blocks (central and state samples combined)

serial no.	state/union territory	total no. of sample blocks	percentage of sample blocks by number of sub-blocks			
			1	2	3	4 & above
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Andhra Pradesh	769	72	24	3	1
2	Assam	288	84	14	1	1
3	Bihar	624	80	17	2	1
4	Gujarat	384	63	25	5	7
5	Jammu & Kashmir	288	78	19	3	
6	Kerala	288	40	43	12	5
7	Madhya Pradesh	576	86	12	1	1
8	Madras	720	68	25	5	2
9	Maharashtra	1,200	51	33	7	9
10	Mysore	432	77	20	1	2
11	Orissa	288	82	18		
12	Punjab	336	75	16	7	2
13	Rajasthan	432	76	22	1	1
14	Uttar Pradesh	1,152	74	20	2	4
15	West Bengal*	432	79	22	1	1
16	Delhi*	120	54	18	11	17
17	Himachal Pradesh*	12	84	8	8	
18	Manipur	96	83	17		
19	Tripura	144	77	15	8	
20	TOTAL	8,580	71	22	4	3
21	cumulative total percentage		71	93	97	100

* Central Sample only.

Selection of Households

4.15. The procedure of household selection in sample blocks was very much similar to that adopted for sample villages. Here also the benefit of 'arrangement of households' was fully reaped, the simplicity of systematic selection was made use of, and finally the merits of a self-weighting design were amply exploited. The details, excepting for arrangement of households, are almost identical with those elaborated in the previous chapter, and hence are being briefly summarised in the following paragraphs.

4.16. After properly identifying the sample block with the help of block boundaries given in the UFS or census records (and after formation and selection of sub-block, if necessary), the investigator proceeded to list all the households residing in that block (or selected sub block) in a thorough manner. At the time of listing, the items of information collected for each household were (i) number (if any) of the house in which the household resided, (ii) name of head of the household (iii) household size, (iv) number of unemployed persons, (v) number of self-employed persons, (vi) births, and deaths. Among these items (iii) to (v) were utilised for arranging the households before systematic selection. After the listing was over, the households in a sample block (or sub-block) were arranged by the following 6 household classes on the basis of the information collected at the time of listing, viz., household size, numbers of the unemployed persons and self-employed persons. This arranged list constituted the sampling frame for selection of households.

household class number	1	2	3	4	5	6
household class code	11	12	020	021	011	010
number unemployed	1 or more	1 or more	0	0	0	0
household size	1 to 3	4 or more	4 or more	4 or more	1 to 3	1 to 3
number self-employed . . . . .	..	..	0	1 or more	1 or more	0

N.B., Household classes 1 and 2 may or may not contain any self-employed persons.

4.17. The selection procedures for different enquiries were as follows :

Combined sample :—From the sampling frame thus prepared a sample of 22 households per block (on the average) was selected linear systematically with the interval and random start specified in the sample list. This sample was called the 'combined sample'.

The interval and the random start for the combined sample were fixed in such a way as to make the sample design self-weighting with nearly equal work-load in all the sample blocks.

Schedule 16.—From the combined sample, a sub-sample of 2 households (on the average) was selected linear systematically with interval = 11 and a specified random start.

Schedule 17.—From the sample households selected for schedule 16, a sub-sample of 1 household (on the average) was selected linear systematically with interval = 2 and random start = 1 or 2. The household with sampling serial number next to that of the selected household was taken up for schedule 17. That is the household surveyed for schedule 17 did not belong to the combined sample.

Schedule 12.—This schedule was canvassed in all the remaining households (i.e., excluding those selected for schedule 16) of the combined sample. This meant an average of 20 households per sample blocks.

Schedule 10.—From the households selected for schedule 12, a sub-sample of 6.7 (= 20 ÷ 3, households (on the average) was selected linear systematically with interval = 3 and random start = 1 or 2 or 3.

An example showing selection of households for different enquiries is given in Table (4.5).

4.18. **Random Numbers**.—The random number table was required only for selecting sub-block wherever necessary. As in the rural sector, the column in the random number table was consulted wherein was the number formed by the digits in the ten's and unit's place in the serial number of the sample block. (All the 4,572 sample blocks of the central sample were given a continuous serial numbering from 0001 to 4,572, and those of the state sample from 5,001 to 9,572 with some gaps for non-participating States. If n was of the form 00 then the 100th column was consulted.

4.19. **Random start**.—The random starts for sub-sampling of households for schedules 16, 17 and 10 were specified in the following manner.

4.20. Since the intervals for sub-sampling of schedules 16, 17 and 10 were the same for all sample blocks, the corresponding random starts were specified in a systematic manner in order to ensure a better spread over the blocks; specification was done separately for each set of 6 blocks in a sub-sample of a state/state-block. Random numbers from 1 to 11, 1 to 2 and 1 to 3, one number from each group, were selected as the random start for the first blocks of the set of 6 blocks for schedules 16, 17 and 10 respectively. Then the random starts for the other 5 blocks of the same set were obtained by adding successively 2, 1 and 1 for schedules 16, 17 and 10 respectively. Whenever this number after successive addition exceeded interval for the respective schedules, the excess was taken as the random start. The following example will clarify the method

block number	sub-sampling random starts		
	schedule 16	schedule 17	schedule 10
1	5	1	3
2	7	2	1
3	9	1	2
4	11	2	3
5	2	1	1
6	4	2	2
7	10	2	1
8	1	1	2
9	3	2	3

Self-weighting Design

4.21. The urban sample design was made self-weighting for all the household enquiries at the sector level within each State. Hence for each of the schedules 10, 12 16 and 17 only two multipliers were required for each state—one for sample blocks belonging to sector 1 towns of the state and the other for the sample blocks of sector 2 towns. Maharashtra, of course, had three multipliers for each schedule as it had three sectors. As regards the union territories, only one multiplier per schedule was needed for Himachal Pradesh and Manipur since they had only one sector each, and also for Delhi and Tripura since the same weight was given to sector 1 and sector 2 blocks during selection.

4.22. The principle of self-weighting was exactly similar to that adopted for the rural sector as described in para 3.46. Here also the constant multipliers of the self-weighting scheme could be applied for estimating 'population totals' only and not for 'population ratios'. The estimate of state total of any 'household based character' was obtained as the sum of the estimates of totals of sectors 1 and 2 (of that state) for that character. The estimate of a population ratio was obtained as the ratio of the estimates of the numerator and the denominator occurring in that ratio. For details of the estimation procedure we can now pass on to the next Chapter.

TABLE (4.5).—Illustrating the selection of households for different enquiries in a sample block as done in block 6 of the listing schedule 0.2.

Suppose the total number of households in the sample block is 64 and that the prescribed intervals (I) and the random starts (R) are, for the combined sample (I=5, R=2) for schedule 16 (I=11, R=1), for schedule 17 (I=2, R=2), and for schedule 10 (I=6, R=3). Column (16) of block 6 shows the orders of selection for the combined sample households.

columns in block 6, schedule 0.2																									
hh. prl. no.	hh. class code	sampling serial numbers						sample hh. no.				hh. prl. no.	hh. class code	sampling serial number						sample hh. no.					
		household class code						schedule						household class code						schedule					
		11	12	020	021	011	010	16	17	12	10			11	12	020	021	011	010	16	17	10			
2	9	10	11	12	13	14	15	16	17	18	19	20	2	9	10	11	12	13	14	15	16	17	18	19	20
1	020			7				2			1		33	12		5									
2	010						46						34	011					41						
3	010						47	10			9	2	35	020			16								
4	010						48						36	020			17				4			3	1
5	011					35							37	010					57	12	2	(1)			
6	021				25								38	010					58			1			
7	020			8									39	011				42		9			8		
8	11	1											40	11	3										
9	010						49						41	010					59						
10	020			9									42	021				28							
11	021				26								43	021				29							
12	020			10									44	020			18								
13	020			11									45	010					60						
14	011					36							46	010					61						

2	9	10	11	12	13	14	15	16	17	18	19	20	2	9	10	11	12	13	14	15	16	17	18	19	20
15	12		4										47	020			19								
16	010						50						48	021				30							
17	010						51						49	011					43						
18	010						52	11			10		50	010						62	13			11	
19	011					37		8			7		51	020			20								
20	021				27			6			5		52	12		6									
21	020			12				3			2		53	011					44						
22	11	2						1	1				54	020			21								
23	011						38						55	020			22				5			4	
24	010						53						56	021				31							
25	020			13									57	021				32			7			6	
26	020			14									58	011					45						
27	020			15									59	010							63				
28	010						54						60	020			23								
29	010						55						61	020			24								
30	010						56						62	021				33							
31	011						39						63	021				34							
32	011						40						64	010						64					

CHAPTER FIVE ESTIMATION PROCEDURE

5.1. Notations

- s : subscript for s^{th} stratum/sector
 i : subscript for i^{th} sample village/block/selected part of village or block
 j : subscript for j^{th} sample household
 k : number of strata/sectors in the State
 z : village/block size (used for selection)
 $Z_{s,i}$: size of the i^{th} sample village/block in s^{th} stratum/sector
 Z_s : sum of the village/block sizes in the s^{th} stratum/sector
 I_s : interval used for selection of villages/blocks in the s^{th} stratum/sector
 n_s : number of sample villages/blocks selected in a stratum/sector and in a sub-sample for the whole round.
 D : number of hamlet-groups/sub-blocks formed in the village/block ($D=1$ if no such division was made)
 f : adjustment factor for revenue village selection*
 H : total number of households in the frame for the enquiry
 h : number of households selected for the enquiry
 y : value of the characteristic

In the following, \hat{Y} stands for the estimate of the State total for the characteristic in the corresponding schedule from a sub-sample for the whole round. When sub-roundwise estimates were required the multipliers in the following estimators were multiplied by 6, since one-sixth of the total sample was surveyed in each sub-round for all household enquiries.

RURAL SECTOR

5.2. In the rural sector, $Z_s=Z$ for all s (within a State/Union Territory), $n_s=6$ uniformly, and $I_s=Z_s/n_s=Z/6=I$ say.

Schedule 0.1 :

$$\hat{Y} = I \sum_{s=1}^k \sum_{i=1}^6 D_{s,i} f_{s,i} \frac{y_{s,i}}{Z_{s,i}} \quad (1)$$

For items relating to the whole revenue village, $D_{s,i}$ was taken as unity.

Schedules 10.1, 12, 16 and 17

$$Y = M \sum_{s=1}^k \sum_{i=1}^6 \frac{h_{s,i}}{\sum_{j=1}^h y_{s,i,j}} \quad (2)$$

where M was the constant multiplier for the corresponding schedule

(a) For Schedule 10.1, the multiplier is same as that for Schedule 12 but $y_{s,i,j}$ relates to the 'labour-households' only.

(b) For characteristics belonging to the fertility block (Block 9) of Schedule 12, the multiplier is five times that for schedule 12

$$\hat{Y} = 5 M \sum_{s=1}^k \sum_{i=1}^6 \frac{h_{s,i}}{\sum_{j=1}^h y_{s,i,j}} \quad (3)$$

Since data for 'floating population' were collected at the village/hamlet level, the total estimator for any characteristic relating to it was the same as that for Schedule 0.1.

Schedule 3.01 : An estimator of the average price P of a commodity was given by

$$\hat{P} = \frac{1}{k'} \sum_{s=1}^k y_s \quad (4)$$

where k' was the number of reporting villages in the State and sub-sample considered.

* $f=1$, when the surveyed revenue village coincides with the selected census village, or when the sample census village has been taken as the unit of survey although census and revenue villages do not coincide.

$=r$, when the surveyed revenue village is one of the r revenue villages which are wholly contained in the selected census village.

$=1/r$, when the surveyed revenue village contains r census villages wholly, one amongst which is the sampled census village.

URBAN SECTOR

5.3. In the urban sector we have $s=0, 1, 2$ for Maharashtra State
 $= 1, 2$ for all other States

Schedule 0.2 :

$$\hat{Y} = \sum_s I_s \sum_{i=1}^{n_{si}} D_{si} \frac{y_{si}}{Z_{si}} \quad (5)$$

For items relating to the whole sample block, D_{si} was taken as unity.

Schedules 10, 12, 16 and 17 :

$$\hat{Y} = \sum_s M_s \sum_{j=1}^{n_{sj}} \sum_{i=1}^{h_{sj}} y_{sij} \quad (6)$$

where M_s was the constant multiplier for the corresponding schedule for the s^{th} sector

(a) For characteristics belonging to the fertility block (Block 9) of Schedule 12, the multiplier is five times that for schedule 12.

$$\hat{Y} = 5 \sum_s M_s \sum_{i=1}^{n_{si}} \sum_{j=1}^{h_{sj}} y_{sij} \quad (7)$$

For characteristics relating to the 'floating population' the total estimator \hat{Y} was the same as for Schedule 0.2 since data for floating population were collected at the block/sub-block level.

(b) The multiplier for Schedule 10 is 3 times that for Schedule 12.

CROP SURVEY

5.4. Estimates of acreage, yield-rate and production were obtained separately for 'pure' and 'mixed' crop.

Schedules 5.0, 5.1 and 5.2.—An unbiased estimator of the acreage (State total) under any particular cereal crop in a season from a sub-sample is given by

$$\hat{A} = \sum_{s=1}^K \hat{A}_s \quad (8)$$

$$\text{where } \hat{A}_s = I_s \sum_{i=1}^{n_{si}} D_{si} \frac{f_{si}}{Z_{si}} \frac{N'_{si}}{n_{si}} \sum_{j=1}^{n_{sij}} a_{sij} \quad (9)$$

where N'_{si} is the adjusted highest survey number/sampling serial number (method 1 or 2) or total number of households (method 3) in the i^{th} sample village of the s^{th} stratum, n_{si} is the number of sample plots or households planned for survey and a_{sij} is the area under the specified cereal crop for the j^{th} sample plot in the i^{th} sample village. An estimator of the yield rate (Schedule 5.1) for any cereal crop in a season from sub-sample 1 or 2 is given by

$$\hat{Y} = \frac{\sum_{s=1}^K \hat{A}_s \bar{y}_s}{\sum_{s=1}^K \hat{A}_s} \quad (10)$$

where \hat{A}_s is the estimate of acreage for the s^{th} stratum and \bar{y}_s is the simple average of the yield rates over the crop cuts taken for the crop in the s^{th} stratum. The summation Σ' extends over all strata reporting crop-cutting experiments. The yield rates are to be obtained on the basis of the sample cuts of radius 4' feet. The yield of crop from 4' circle is taken as the sum of the yields from all the plants inside the circle together with half the yield of border plants of 4' circle.

While calculating the production estimates, the estimate of yield rate for sub-sample 1 was multiplied by the corresponding area estimate, pooled over sub-samples 1 and 3, and the estimate of yield rate for sub-sample 2 was multiplied by the corresponding area estimate, pooled over sub-samples 2 and 4. The total production for a crop was the sum of production of the pure crop and of the crop grown mixed. Thus two independent estimates \hat{P}_1 and \hat{P}_2 of total production were obtained. For obtaining the dry weights, these two production estimates were multiplied by the drirage factors based on sub-samples 1 and 2 respectively. The drirage factor was obtained on the basis of the sample cuts of radius 2'3" including full border. If d and g were the weights of dry crop and green crop respectively, the drirage factor was given by $\Sigma d / \Sigma g$ where Σ denotes summation over all cuts taken on that crop in all strata. For paddy crop, the production figure related to 'clean rice' and for this the figure for dry paddy was multiplied by 0.662.

Schedule 17 Supplementary.—An estimator of the acreage (state total) under a given crop in a season from a sub-sample was given by

$$\hat{A} = 6M \sum_{s=1}^K \sum_{j=1}^{n_{sj}} a_{sij} \quad (11)$$

where (i) M was the multiplier for Schedule 17 in the State, (ii) n_{sj} was the number of plots possessed by the household (s) selected for Schedule 17. There is no summation over i (village) since only one village (sample

Substitution of Casualties

5.5. For socio-economic enquiries, all casualty households, villages and blocks are substituted. Similarly for crop survey, all casualty plots/clusters/households/villages are substituted by the previous surveyed corresponding units in the same sub-sample and stratum.

Combined Estimators

5.6. If \hat{Y}_i ($i=1, 2, 3, 4$) be the i^{th} sub-sample estimate of the total of a characteristic, the combined estimate is given by

$$\hat{Y} = \frac{1}{4}(\hat{Y}_1 + \hat{Y}_2 + \hat{Y}_3 + \hat{Y}_4) = \frac{1}{4} \sum_{s=1}^K (\hat{Y}_{s1} + \hat{Y}_{s2} + \hat{Y}_{s3} + \hat{Y}_{s4}) \quad (12)$$

where \hat{Y}_{si} is the i^{th} sub-sample estimate of the s^{th} stratum total. The ratio $R = \frac{Y}{X}$ can be estimated by $\hat{R}_i = \frac{\hat{Y}_i}{\hat{X}_i}$ from the i^{th} sub-sample. The combined estimate is given by

$$\hat{R} = \frac{\hat{Y}}{\hat{X}} = \frac{(\hat{Y}_1 + \hat{Y}_2 + \hat{Y}_3 + \hat{Y}_4)}{(\hat{X}_1 + \hat{X}_2 + \hat{X}_3 + \hat{X}_4)} \quad (13)$$

The combined area estimate is the mean of the four sub-sample estimates. The combined production estimate \hat{P} for a season is the mean of the two production estimates \hat{P}_1 and \hat{P}_2 . Whenever season-wise total crop estimates are obtained, the estimate for the year is the sum of the season-wise estimates.

Error Estimators

5.7. Two unbiased estimators of the variance of \hat{Y} are given by

$$V_1(\hat{Y}) = \frac{1}{12} \sum_{s=1}^K \sum_{i=1}^4 (\hat{Y}_{si} - \hat{Y}_s)^2 \quad \text{where} \quad \hat{Y}_s = \frac{1}{4} \sum_{i=1}^4 \hat{Y}_{si} \quad (14)$$

$$\text{and} \quad V_2(\hat{Y}) = \frac{1}{12} \sum_{i=1}^4 (\hat{Y}_i - \hat{Y})^2 \quad (15)$$

the latter being easier to compute but less efficient than the former. The estimate of variance of \hat{A} is obtained in the same manner.

Two estimators of the variance of \hat{R}^2 are given by

$$V_1 = \frac{1}{12} \frac{1}{\hat{X}^2} \sum_{s=1}^K \sum_{i=1}^4 \left[(\hat{Y}_{si} - \hat{Y}_s)^2 + \hat{R}^2 (\hat{X}_{si} - \hat{X}_s)^2 - 2\hat{R} (\hat{Y}_{si} - \hat{Y}_s)(\hat{X}_{si} - \hat{X}_s) \right] \quad (16)$$

and

$$V_2 = \frac{1}{12} \sum_{i=1}^4 (\hat{R}_i - \hat{R})^2 \quad (17)$$

the latter being easier to compute but less efficient than the former,

An estimate of the variance of \hat{P} is given by

$$V(\hat{P}) = \frac{1}{4} (\hat{P}_1 - \hat{P}_2)^2 \quad (18)$$

Calculation of Multipliers

5.8. The State-wise constant multipliers for the different household enquiries of the rural sector were calculated by the following formulas :

- Combined sample : $M = I \times I_2$
- Schedule 16 : $M = I \times I_2 \times 11$
- Schedule 17 : $M = I \times I_2 \times 11 \times 2$
- Schedule 12 : $M = I \times I_2 \times 11 \div 10$

where $I = Z/6 =$ interval for selection of a subsample of villages in any rural stratum.

$I_2 = 6C/Z =$ general interval for selection of the combined sample households

Since I and I_2 were constants for a given state or union territory the multipliers based on them were also

APPENDIX I

Specimen of 1961 Primary Census Abstract (Rural)

District : Hooghly,
Thana : Chinsura

srl. no.	name of village	area (acres)	residential houses		total no. of persons			scheduled castes		scheduled tribes		houseless population		institutional population		literate persons		total workers (I—IX)		I	
			houses	hhs.	P	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1	Krishnapur-Chandanpur	382.38	116	116	640	325	315	68	76	40	40	x	x	1	x	164	85	196	56	85	9
2	Iswarbaha	139.50	108	105	619	326	293	40	32	x	x	x	x	2	x	224	129	174	4	16	x
3	Debanandapur	345.22	158	154	852	451	401	144	140	32	12	x	x	x	x	230	158	233	36	83	3
4	Manushpur	411.99	944	953	3,960	2,307	1,653	161	142	14	7	98	38	x	x	425	497	1,163	13	32	1
5	Kazidanga	118.34	64	64	350	196	154	42	44	2	x	x	x	7	x	134	68	98	2	8	1
6	Naldanga	453.83	1,185	1,010	5,326	3,266	2,060	208	192	30	25	3	1	18	5	1,594	680	1,816	32	12	x
7	Keota	937.59	653	653	2,653	1,523	1,130	130	129	3	4	x	x	x	x	697	236	866	48	18	x
8	Kodalia	169.72	182	180	868	481	384	154	135	x	x	x	x	x	x	195	85	247	7	1	x
9	Kanagar	184.74	141	142	620	336	284	197	174	6	8	x	x	x	x	170	60	174	2	29	x
10	Akna	171.84	38	38	218	117	101	14	12	21	15	x	x	x	x	53	31	61	3	34	x

srl. no.	name of village	area	II		III		IV		V		VI		VII		VIII		IX		X	
			M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
(1)	(2)	(3)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(29)	(40)
1	Krishnapur-Chandanpur	382.38	104	47	x	x	x	x	2	x	x	x	1	x	x	x	4	x	129	259
2	Iswarbaha	139.50	11	x	1	x	x	x	48	1	27	x	7	x	6	x	58	3	152	289
3	Debanandapur	345.22	92	17	x	x	x	1	11	x	1	x	5	x	11	x	30	15	218	365
4	Manushpur	411.99	6	x	1	x	x	x	527	3	8	x	33	x	412	7	144	2	1,144	1,640
5	Kazidanga	118.34	1	x	x	x	x	x	13	x	1	x	22	x	11	x	42	1	98	152
6	Naldanga	453.83	14	x	5	x	18	1	178	x	83	x	428	4	611	13	467	14	1,450	2,028
7	Keota	937.59	1	x	6	x	53	22	206	4	90	8	153	11	179	x	160	3	657	1,082
8	Kodalia	169.72	36	1	x	x	x	x	25	x	15	x	76	5	34	x	60	1	237	377
9	Kanagar	184.74	53	x	x	x	x	x	13	x	3	x	4	x	61	x	11	2	162	282
10	Akna	171.84	23	3	x	x	x	x	1	x	1	x	1	x	x	x	1	x	56	98

N.B.—Occupational classes : cultivator-I ; agricultural labourer-II ; mining & quarrying-III ; household industry-IV ; manufacturing (other than IV)-V ; construction-VI ; trade & commerce-VII ; transport, storage & communication-VIII ; other services-IX ; non-workers-X.

APPENDIX I

Specimen of 1961 Primary Census Abstract (Urban)

District : Hooghly
Town : Pandua

no. of ward and block	area	residential houses		total no. of persons			scheduled castes		scheduled tribes		houseless population		institutional population		literate persons		total workers (I—IX)		I	
		houses	hhs.	P	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Block 1, Ward 1	N.A.	176	176	824	562	262	16	18	..	..	..	..	151	23	210	61	371	30	..	..
Block 2, Ward 1	N.A.	79	79	342	200	142	39	32	..	..	..	..	..	..	101	16	145	38	3	..
Block 3, Ward 1	N.A.	178	178	620	375	245	56	43	..	..	..	..	..	..	201	87	236	14	..	..
Block 4, Ward 1	N.A.	108	108	582	337	245	53	39	15	..	..	..	..	..	189	116	180	13	..	..
Block 5, Ward 1	N.A.	147	147	781	417	364	39	37	122	95	..	..	..	..	147	56	194	59	..	..
Block 6, Ward 1	N.A.	87	95	446	227	219	9	7	8	9	..	..	..	..	120	57	88	..	..	..
Block 7, Ward 1	N.A.	102	102	618	319	299	7	13	..	..	..	..	..	..	214	135	146	9	..	..
Block 8, Ward 1	N.A.	102	102	471	243	228	6	5	..	..	..	..	..	..	115	57	117	37	10	..
Block 9, Ward 1	N.A.	103	103	590	297	293	22	35	42	34	..	..	..	..	168	111	135	25	..	..
Block 10, Ward 1	N.A.	49	53	318	176	142	21	15	..	..	..	..	..	..	112	66	65	2	..	..

no. of ward and block	II		III		IV		V		VI		VII		VIII		IX		X	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
(2)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
Block 1, Ward 1	..	..	1	..	1	..	163	11	27	..	86	10	32	1	61	8	191	232
Block 2, Ward 1	..	..	..	..	..	..	103	37	..	..	6	..	11	..	22	1	55	104
Block 3, Ward 1	9	6	2	..	..	..	92	1	46	..	31	1	23	..	33	6	139	231
Block 4, Ward 1	14	..	2	..	1	3	27	..	12	..	67	..	30	..	27	10	157	232
Block 5, Ward 1	115	56	14	..	..	..	23	..	5	..	27	..	4	..	6	3	223	305
Block 6, Ward 1	..	..	..	..	..	..	7	..	2	..	51	..	9	..	19	..	139	219
Block 7, Ward 1	..	..	1	..	..	..	25	..	11	..	62	..	9	1	38	8	173	290
Block 8, Ward 1	4	..	..	..	..	..	34	14	6	..	33	18	6	..	24	5	126	197
Block 9, Ward 1	25	21	..	..	..	..	15	..	1	..	60	..	6	..	29	4	161	268
Block 10, Ward 1	..	..	1	..	..	..	9	..	..	..	29	..	4	..	22	2	111	140

APPENDIX II
NSS 19th Round : 1964-65
List of regions with details of their composition by districts

state	region code	description	districts
(1)	(2)	(3)	(4)
Andhra Pradesh	1	Coastal	Srikakulam, Vishakapatnam, East Godavari, West Godavari, Krishna, Guntur, Nellore.
	2	Inland, Northern	Medak, Nizamabad, Adilabad, Karimnagar, Warangal, Khammam.
	3	Inland, Southern	Chittoor, Anantapur, Cuddapah, Kurnool, Mehbubnagar, Nalgonda, Hyderabad.
Assam	1	Plains	Goalpara, Kamrup, Darrang, Sibsagar, Lakhimpur, Nowgong, Cachar.
	2	Hills	Mizo Hills, United Mikir and North Cachar Hills, United Khasi and Jaintia Hills, Garo Hills.
Bihar	1	Southern	Singbhum, Ranchi, Palamau, Dhanbad, Santal Parganas, Hazaribagh.
	2	Northern	Saran, Champaran, Muzaffarpur, Darbhanga, Saharsa, Purnea.
	3	Central	Bhagalpur, Monghyr, Patna, Gaya, Shahabad.
Gujarat	1	Coastal	Surat, Broach, Baroda, Panchmahal, Danga.
	2	Northern	Banaskantha, Mehsana, Kaira, Ahmedabad, Sabarkantha.
	3	Western	Rajkot, Jamnagar, Surendranagar, Bhavnagar, Amreli, Junagadh, Kutch.
Jammu & Kashmir	1	Mountainous	Jammu, Kathua.
	2	Outer Hills	Udhampur, Poonch—Rajouri, Doda.
	3	Jhelum Valley	Srinagar, Anantnag, Baramulla.
Kerala	1	Northern	Palghat, Kozhikode, Cannanore.
	2	Southern	Trivandrum, Quilon, Alleppey, Kottayam, Ernakulam, Trichur.
Madhya Pradesh	1	Eastern	Bastar, Raipur, Raigarh, Surguja, Bilaspur, Durg, Balaghat.
	2	Northern	Tikamgarh, Chhatarpur, Panna, Satna, Rewa, Sidhi, Shahdol, Datia.
	3	Southern	East Nimar, Betal, Chhindwara, Seoni, Narsimhapur, Raisen, Hoshangabad, Sehore, Sagar, Damoh, Mandla, Jabalpur.
	4	Madhya Bharat	West Nimar, Jhabua, Dewas, Shajapur, Rajgarh, Guna, Shivpuri, Ujjain, Mandasaur, Ratlam, Dhar, Indore, Bhind, Morena, Gwalior, Vidisha.
Madras	1	Coastal	Kanyakumari, Tirunelveli, Ramanathapuram, Thanjavur, Tiruchirapalli, South Arcot, Chingleput, Madras.
	2	Inland	Madurai, Coimbatore, Salem, North Arcot, The Nilgiris.
Maharashtra	1	Coastal	Thana, Kolaba, Ratnagiri, Kolhapur, Greater Bombay.
	2	Inland	Sangli, Satara, Sholapur, Poona, Ahmednagar, Nasik, Dhulia, Jalgaon.
	3	Inland, Central	Aurangabad, Bhir, Osmanabad, Parbhani, Nanded.
	4	Inland, Eastern	Amravati, Akola, Buldhana, Yeotmal, Wardha, Nagpur, Bhandara, Chanda.
Mysore	1	Coastal and Ghats	North Kanara, South Kanara, Shimoga, Chikmagalur, Coorg.

(1)	(2)	(3)	(4)
Mysore	2	Inland, Southern	Mysore, Mandya, Bangalore, Kolar, Hassan, Tumkur, Chitradurga, Bellary.
	3	Inland, Northern	Dharwar, Belgaum, Raichur, Bijapur, Gulbarga, Bidar.
Orissa	1	Coastal	Ganjam (Plains), Puri, Cuttack, Balasore.
	2	Southern	Ganjam (Agency), Boudh-Khondmals (Phulbani), Koraput, Kalahandi.
	3	Central	Bolangir, Sambalpur, Dhenkanal.
	4	Northern	Mayurbhanj, Sundargarh, Keonjhar.
Punjab	1	Southern	Gurgaon, Mohindergarh, Rohtak, Hissar, Ferozepur, Bhatinda, Sangrur, Karnal, Patiala.
	2	Northern	Amritsar, Gurdaspur, Kapurthala, Jullundur, Ludhiana, Hoshiarpur, Ambala, Kangra, Simla, Lahaul & Spiti.
Rajasthan	1	Western	Jaisalmer, Barmer, Jalore, Pali, Jodhpur, Nagaur, Churu, Bikaner.
	2	North Eastern	Sawai-Madhopur, Bharatpur, Alwar, Jhunjhunu, Ganganagar, Sikara, Jaipur, Amer, Tonk, Bhilwara.
	3	South Western	Banswara, Dungarpur, Udaipur, Sirohi.
	4	Southern	Jhalawar, Kota, Bundi, Chittorgarh.
Uttar Pradesh	1	Himalayan	Nainital, Dehradun, Tehri Garhwal, Garhwal, Almora, Chamoli, Uttar Kashi, Pithoregarh.
	2	Western	Saharanpur, Musafarnagar, Meerut, Bulandshahr, Bijnor, Moradabad, Budaun, Rampur, Bareilly, Pilibhit, Shahjahanpur, Etawah, Agra, Mainpuri, Farrukhabad, Etah, Aligarh, Mathura.
	3	Central	Kheri, Sitapur, Lucknow, Barabanki, Rae-Bareilly, Fatehpur, Unnao, Kanpur, Hardoi.
	4	Eastern	Deoria, Gorakhpur, Basti, Gonda, Bahraich, Faizabad, Azamgarh, Ballia, Ghazipur, Varanasi, Jaunpur, Sultanpur, Pratapgarh, Mirzapur, Allahabad.
	5	Southern	Banda, Jhansi, Hamirpur, Jalesar.
West Bengal	1	Himalayan	Darjeeling, Jalpaiguri, Cooch-Bihar.
	2	Eastern Plains	West Dinajpur, Murshidabad, Nadia, Hooghly, 24-Parganas, Howrah, Malda, Calcutta.
	3	Western Plains	Bankura, Purulia, Birbhum, Burdwan, Midnapur.
Himachal Pradesh & Delhi	1		Chamba, Mandi, Bilaspur, Mahasu, Sirmur, Kinnaur and Delhi.
Manipur	1	Plains	Thoubal, Imphal East, Imphal West, Bishenpur (Sub-divisions).
	2	Hills	Churchandpur, Jiribam, Tengnoupal, Sadar Hills (Sub-divisions).
Tripura	1		Sadar, Khowai, Kamalpur, Kailasbar, Dharmagar, Sonamura, Udaipur, Amarput, Belonia, Sabroom.

APPENDIX III

NSS NINETEENTH ROUND : 1964-65

CONCEPTS AND DEFINITIONS

1. *House*.—Every house, structure, tent, shelter etc., irrespective of its use, will be treated as a house while listing. The concept of a house is the same as that for the eighteenth round.

2. *Household*.—A group of persons normally living together and ordinarily taking food from the same kitchen will constitute a household. Thus temporary absentees will be included as members of the household while temporary guests will be excluded. There would, of course, be some persons who live singly ; these will constitute single member households. Since in deciding the composition of a household more emphasis is to be placed on 'normally living together' than 'on ordinarily taking food from the same kitchen', in case the place of residence of a person is different from the place of boarding, he will be listed as a member of the household with whom he resides. Even though the determination of the actual composition of a household will be left to the head of the household, the following rules will be used in special cases.

(i) The inmates (including the staff) of a mess, hostel, boarding and lodging house, hotel, orphanage, vagrant house etc. will be treated as single member households. If however, among these inmates there is a group of persons who normally pool their total income and spend from this common pool, such a group will be treated as a separate household by itself, e.g., a family living in a hotel.

(ii) Inmates of hospitals, jails, nursing homes etc. will be excluded from listing. But the residential staff, for example the superintendent of the hospital and his household, will, of course, be considered for listing.

(iii) Floating population, i.e., persons without any normal residence, vagrants etc. will not be listed (they will, however, be completely enumerated in schedule 12). The concept of a household is the same as was followed in the eighteenth round.

3. *Birth*.—By birth is meant a live birth (including both 'born alive, now alive' and 'born alive, since dead') to a female member of the household in the last year, i.e., 365 days preceding the date of survey. A live birth in the last year of the type 'born alive, since dead', to a female member of the household who is dead at the time of listing will also be counted in the household.

4. *Death*.—Death will refer to death during the last year, i.e., 365 days preceding the date of listing, to a person who was a member of the household at the time of death. If a household splits up consequent to the death of a person in the last year, the death will be recorded in that split household in which the survivor of the dead person is now a member, provided of course, the survivor was a member of the same household to which the dead person belonged at the time of death. The survivor will be, in the order of preference given herein—the husband/wife, other eldest male survivor, other eldest female survivor of the dead person.

5. *Labour household*.—A household will be classified as a labour household depending on its major source of income. For this purpose, the following sources of income will be considered :

- (i) wage-paid manual labour (agricultural and/or non-agricultural),
- (ii) paid non-manual employment, and
- (iii) self-employment (own-account work and/or employment as unpaid family worker).

The household will be classified as a labour household if its major source of income is from the first of these three categories ; that is, if wage paid manual labour contributed more to its income in the 365 days preceding the date of survey than both paid non-manual employment and self-employment taken individually.

6. *Wage-paid manual labour*.—A wage-paid manual labourer is one who does manual work in return for wages in cash or kind (excluding exchange labour). The term 'wage' includes salaries also. A person who is self-employed in manual work will not be treated as a wage-paid manual labourer.

The term "manual work" broadly means a job essentially involving physical operations. A job, though essentially involving physical labour but requiring a certain level of general, professional, scientific or technical education will not be classified as manual work. On the other hand, jobs not involving much of physical labour and at the same time not requiring some educational (general, scientific, technical or otherwise) background may be treated as manual work. For example, engineers, doctors, dentists, midwives etc. will not be accounted for as manual workers even though their jobs involve some element of physical labour. Peons, chowkidars, watchmen, etc. will be treated as manual workers even if their work does not involve much of physical labour.

Manual work will include one or more of the following occupational divisions, groups or families of the Standard Occupational Classifications (CSO, 1962) :

- (i) occupational divisions 4 (except for families 402 and 403), 5, 7 and 8 ;
- (ii) occupational groups 61, 63, 64, 91, 92, 93, 94, 95 and 99 ;
- (iii) occupational families 240, 331, 662, 680, 681, 900, 903 and 909.

7. *Means of livelihood*.—The means of livelihood of the household will be that one among the following three classes from which it usually derives its earnings : (1) agricultural labour, (2) self-employment in non-agriculture, and (3) other. (The definitions of these classes are given in the paragraphs 8 and 9). If the household usually derives its earnings from more than one of these classes, its means of livelihood will be that class which contributed the maximum earnings in the 365 days preceding the date of survey. If a

household derives its income from both gainful and non-gainful occupations, only the gainful occupation will be taken into account for determining its means of livelihood. In case the household derives income only from non-gainful activities, then it will be treated as having 'others' as its means of livelihood.

8. *Agricultural labour*.—A person will be treated as an agricultural labourer if he follows one or more of the following agricultural occupations in the capacity of a labourer on hire or on exchange whether paid in cash, in kind or partly in cash and partly in kind.

- (i) farming, including the cultivation and tillage of soil etc.;
- (ii) dairy farming ;
- (iii) production, cultivation, growing and harvesting of any horticultural commodity ;
- (iv) raising of livestock, bees or poultry ; and
- (v) any practice performed on a farm as incidental to or in conjunction with the farm operations (including any forestry or timbering operations and the preparation for market and delivery to storage or to market or to carriage for transportation of farm products).

it may be noted that 'fisheries' is excluded from agricultural labour. Further, carriage for transportation in (v) above will refer only to the first stage of the transport from the farm to the first place of disposal.

9. *Self-employed (rural)*.—A person will be regarded as 'self-employed' in an occupation if he has been working as an employer or own account worker in that occupation. An own account worker may be both a single worker and/or a joint owner of an enterprise.

10. *Non-agricultural means of livelihood*.—Persons deriving their livelihood from non-agricultural occupations will be treated as having non-agricultural means of livelihood.

11. *Unemployed (urban)*.—A person who was without any job or enterprise on the day preceding the date of listing and was seeking employment will be considered as unemployed.

12. *Self-employed (urban)*.—A person will be regarded as self-employed in an occupation if he has been working as an employer or own-account worker in that occupation (an own-account worker may be both a single worker and/or a joint owner of an enterprise) and has earned the major part of his income in the 365 days preceding the date of listing from that means of employment.

NATIONAL SAMPLE SURVEY REPORTS ALREADY PUBLISHED

No	1	General Report No. 1 on the First Round (October 1950-March 1951)
	2	Tables with Notes on the Second Round (April-June 1951)
	3	Tables with Notes on the Third Round (August-November 1951)
	4	Special Report on the Survey of Persons in the "Live-Register" of Delhi Employment Exchange (August-September 1951)
	5	Technical Paper on Some Aspects of the Development of the Sample Design
	6	Survey of Faridabad Township (March-April 1954)
	7	Couple Fertility (Second Round, April-June, 1951 and Fourth Round, April-September 1952)
	8	Report on Preliminary Survey of Urban Employment (September 1953)
	9	Report on the Sample Survey of Displaced Persons in the Urban Areas of the Bombay State (July-September 1953)
	10	First Report on Land Holdings, Rural Sector (Eighth Round : July 1954-March 1955)
	11	Report on Sample Survey of Manufacturing Industries, 1949-50
	12	A Technical Note on Age Grouping
	13	Report on Household Transport Operations (Seventh Round : October 1953-March 1954)
	14	Report on Some Characteristics of the Economically Active Population (Fourth to Seventh Round : April 1952-March 1954)
	15	Report on Sample Survey of Manufacturing Industries, 1951
	16	Report on Employment and Unemployment (Ninth Round : Preliminary, May-November 1955)
	17	Report on Sample Survey of Employment in Calcutta (September 1953)
	18	Tables with Notes on Consumer Expenditure (Fourth Round : April-September 1952)
	19	Report on small Scale Manufacture : Household Enterprises smaller than Registered Factories (Seventh round : October 1953-March 1954)
	20	Report on Pattern of Consumer Expenditure (Second to Seventh Round May-November, 1955)
	21	Household Small Scale Manufacturing Establishments (Ninth Round : May-November 1955)
	22	Report on Sample Survey of Manufacturing Industries, 1952
	23	Report on Sample Survey of Manufacturing Industries, 1953
	24	Report on Household Retail Trade (Seventh to Ninth Round : October 1953-September 1956)
	25	Sample Verification Livestock Census : 1956
	26	A Preliminary Report on Housing Condition (Seventh Round : October 1953-March 1954)
	27	Technical Records of Sample Design, Instructions to Field Workers and List of Sample Villages and Urban Blocks (Ninth Round : May-November 1955)
	28	Report on Sample Survey of Manufacturing Industries, 1954(1)
	29	Notes on Some Results of the Land Utilisation Survey (Tenth Round : December 1955-May 1956)
	30	Report on Land Holdings (2) : Operational Holdings in Rural India (Eighth Round : July 1954-April 1955)
	32(I)	Some Aspects of Costs of Cultivation of Paddy, Wheat, Jowar and Bajra (Fifth to Seventh Round : October 1952-March 1954)
	32(II)	Some Aspects of Costs of Cultivation of Barley, Maize, Ragi, Gram, Small Millets, Groundnut, Cotton and Jute (Fifth to Seventh Round : October 1952-March 1954)
	32(III)	Some Aspects of Costs of Cultivation of Minor Cereals, Pulses, Sugarcane, Oil Seeds, Potato, Spices and Tobacco (Fifth to Seventh Round : October 1952-March 1954)
	33	Tables with Notes on Wages, Employment, Income and Indebtedness of Agricultural Labour Households in Rural Areas (Eleventh and Twelfth Rounds : August 1956-August 1957)
	34	Tables with Notes on Employment and Unemployment (Tenth Round : December 1955-May 1956)
	35	Tables with Notes on Livestock Products (Fifth to Seventh Round : April 1952-March 1954)
	36	Report on Land Holdings (3) : Some Aspects of Ownership Holdings (Eighth Round : July 1954-April 1955)
	37	Survey of Book Reader's Preference in India (Thirteenth Round : September 1957-May 1958)
	38	Some Results of the Land Utilisation Survey and Crop-cutting Experiments : (Thirteenth Round : September 1957-May 1958)
	39	Tables with Notes on Consumer Expenditure (Eighth Round : July 1954-March 1955)
	40	Tables with Notes on Consumer Expenditure (Ninth Round : May-November 1955)
	41	Household Retail Trade (Tenth Round : December 1955-May 1956)
	42	Report on Small Scale Manufacture : Household Enterprises smaller than Registered Factories (Seventh to Eighth Round : October 1953-April 1955)
	43	Tables with Notes on Small Scale Manufacture : Household Enterprises smaller than Registered Factories (Ninth and Tenth Rounds : May 1955-May 1956)
	44	A Note on Profession and Services (Fourth to Eighth Round : April 1952-April 1955)
	45	Report on Indian Villages : A Study of Some Social and Economic Aspects (Tenth to Twelfth Round : December August 1957)
	46	Tables with Notes on Consumer Expenditure of Agricultural Labour Households in Rural Areas (Eleventh and Twelfth Rounds : August 1956-August 1957)
	47	Tables with Notes on Consumer Expenditure (Tenth Round : December 1955-May 1956)
	48	Preliminary Estimates of Birth and Death Rates and of the Rate of Growth of Population (Fourteenth Round : July 1958-July 1959)
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	53	Tables with Notes on Internal Migration (Ninth-Eleventh, Twelfth and Thirteenth Rounds : May 1955-May 1958)
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	55	Report on Sample Survey of Manufacturing Industries, 1954(2) : Exploratory Survey of Scheduled Industries
	56	Report on Sample Survey of Manufacturing Industries, 1955(1) : Survey of Scheduled Industries
	57	Report on Sample Survey of Manufacturing Industries, 1955(2)

- 59 Tables with Notes on Pattern of Household Ownership and Possession of Land in Rural Area, 1950-51 to 1953-54 (Eighth Round : July 1954-April 1955)
- 60 Tables with Notes on Farming Condition and Practices in Rural Areas 1953-54 (Eighth Round : July 1954-April 1955)
- 61 Notes on the Results of the Land Utilisation Survey and Crop-cutting Experiments : (Eleventh Round : August 1956-February 1957)
- 62 Report on Employment and Unemployment (Ninth Round : Supplementary : May-November 1955)
- 63 Tables with Notes on Employment and Unemployment in Urban Areas (Thirteenth Round : September 1957-May 1958)
- 64 Indian Villages : A Study of Some Social and Economic Aspects (Thirteenth Round : September 1957-May 1958)
- 65 Tables with Notes on Animal Husbandry (Eleventh Round : August 1956-January 1957)
- 66 Report on Land Holdings (4) : Rural Sector, States (Eighth Round : July 1954-April 1955)
- 67 Tables with Notes on Housing Condition (Twelfth Round - March-August 1957)
- 68 Tables with Notes on Rural Indebtedness (Eighth Round : July 1954-April 1955)
- 69 Notes on the Results of the Land Utilisation Survey and Crop-cutting Experiments (Twelfth Round - March-August 1957)
- 70 Technical Paper on Sample Design (Fourteenth Round : July 1958-June 1959)
- 71 Consumer Expenditure by Levels of Household Expenditure (Thirteenth Round : September 1957-May 1958)
- 72 Tables with Notes on Milk Production (Twelfth Round : March-August 1957)
- 73 Some Results of the Land Utilisation Survey and Crop-cutting Experiments (Fourteenth Round : July 1958-June 1959)
- 74 Report on Land Holdings (5), Rural Sector (Some Aspects of Operational Holdings—Population Zones and All India) : Eighth Round, July 1954—April 1955
- 75 Report on Sample Survey of Manufacturing Industries : 1956(2)
- 76 Fertility and Mortality Rates in India (Fourteenth Round : July 1958-June 1959)
- 77 Tables with Notes on Consumer Expenditure (Eleventh Round : August 1956-February 1957)
- 78 Tables with Notes on Consumer Expenditure (Twelfth Round : March—August 1957)
- 79 Some Results of the Land Utilisation Survey and Crop-cutting Experiments (Fifteenth Round : July 1959-June 1960)
- 80 Tables with Notes on Consumer Expenditure (Thirteenth Round : September 1957—May 1958)
- 81 Report on Land Holdings : Urban Sector (Eighth Round, July 1954—April 1955)
- 82 Tables with Notes on Some Aspects of Cost of Cultivation of Paddy, Wheat, Barley, Maize, Millets, Pulses, Oil Seeds and Vegetables, Urban India (Fifth to Seventh Round, 1951—1953)
- 83 Report on Sample Survey of Manufacturing Industries, 1957(1)
- 84 Tables with Notes on Sample Survey of Manufacturing Industries : Survey of Scheduled Industries 1957
- 85 Tables with Notes on Employment and Unemployment in Urban Areas, (Fourteenth Round ; July 1958—June 1959)
- 86 Tables with Notes on Sample Survey of Manufacturing Industries, 1957(2)
- 87 Tables with Notes on Average Budget of Agricultural Labour Households in Rural Areas (Eleventh and Twelfth Rounds August 1956—August 1957)
- 88 Tables with Notes on Household Receipts and Disbursements : Fourteenth Round, July 1958—June 1959
- 89 Tables with Notes on Dwelling Habits of Occupants of the Two-room Government Residences in New Delhi, July 1960.
- 90 Tables with Notes on Survey of Scheduled Industries, 1958 : Sample Survey of Manufacturing Industries, 1958
- 91 Tables with Notes on the Annual Survey of Industries, 1959 : Sample Sector ; Summary Results
- 92 Some Results of Land Utilisation Survey and Crop-Cutting Experiments (Sixteenth Round - July 1960—June 1961)
- 93 Tables with Notes on Sample Survey of Manufacturing Industries 1958, Factory Establishments : Summary Results.
- 94 Tables with Notes on Small Scale Manufacture : Rural and Urban (Fourteenth Round, July 1958—June 1959)
- 95 Tables with Note. on Household Indebtedness (Sixteenth Round, July 1960—June 1961)
- 96 The Annual Survey of Industries, 1960 : Sample Sector, Summary Results
- 97 Tables with Notes on Capital Formation (Fifteenth Round—Rural : July 1959—June 1960)
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- 99 Tables with Notes on Household Non-Registered Trade (Fifteenth Round : July 1959—June 1960)
- 00 Tables with Notes on Rural Employment and Unemployment (Fourteenth Round : July 1958—June 1959)
- 101 Tables with Notes on Consumer Expenditure (Preliminary) : Sixteenth Round, July 1960—August 1961
- 102 Tables with Notes on Consumer Expenditure : Fourteenth Round, July 1958—June 1959
- 103 Tables with Notes on Urban Labour Force : Sixteenth Round, July 1960—June 1961
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- 107 Tables with Notes on Consumer Expenditure : Eleventh and Twelfth Round, August 1956—August 1957
- 108 Report on the Type Study on Consumption and Disposal of Cereals and Capital Formation by Households : 1959-60
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- 112 Tables with Notes on Land Utilisation and Crop-cutting Experiments : Eighteenth Round, July 1962—June 1963
- 113 Tables with Notes on Agricultural Holdings in Rural India : Sixteenth Round, July 1960—June 1961
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- 115 Tables with notes on disposal of cereals by producer household in rural areas, 15th round July 1959—June 1960.
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- 118 Tables with notes on the Annual Survey of Industries 1961—Sample Sector, Summary Results.
- 120 Tables with notes on the Annual Survey of Industries 1962—Sample Sector Summary Results.
- 121 Preliminary estimates of birth and death rates and of rate of growth of population, 18th Round February 1963—January 1964.
- 125 Technical paper on sample design—ninth Round, July 1954—June 1955.