

A SURVEY OF FOOD GARDENS IN THREE COUNTIES
OF TRINIDAD.

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INTRODUCTION

The survey was carried out by a group of eight post-graduate students of the Imperial College of Tropical Agriculture as an exercise in statistical sampling and as part fulfilment of the regulations governing the Diploma in Tropical Agriculture of the College.

The writer supervised the selection of the sample and the subsequent analysis; as a result, this report is based mainly on the statistical and associated administrative work of the survey.

CHOICE OF THE SURVEY

After considerable discussion it was decided not to repeat work similar to that covered by previous teams, which consisted of a land utilization survey (Buckler et al 1956; Castle et al 1955), but instead to consider a topic that allowed different information to be collected and the application of different sampling methods to those used in the previous surveys. The subject decided upon was an investigation to determine the composition and hence the possible productivity of food crops grown in peasant gardens on the island of Trinidad.

A factor which influenced this decision was that the Government Central Statistical Office had recently (June 1956) carried out an Agricultural Survey of Trinidad and Tobago and the Department was willing to allow the team to use the data already collected.

AGRICULTURAL STATISTICS IN THE COLONIES

In the Report of the First Conference of Colonial Government Statisticians (1950) it is noted that "there was complete agreement on the urgent need for the fullest possible information on agricultural output. The dependence of the people in most Colonial territories on agricultural resources makes it essential that every endeavour should be made to ensure that adequate statistics are available for planning the development of

these resources".

The Conference divided the problem into three parts:

- (a) the output of estate plantations and farms from which individual returns could be obtained;
- (b) peasant-grown commercial crops; and
- (c) subsistence crops and livestock numbers.

The Conference recommended that a dual approach be made to the problem,

- "(i) detailed studies of a limited number of small areas; and
- (ii) extensive sample surveys of areas under the more important crops."

Whilst returns of a reasonably accurate nature can be expected from operators in section (a), and from the marketing organisations on section (b), the obtaining of accurate data on section (c) can only be gained, in even the most advanced territories, by a survey carried out by Government trained enumerators.

In the latter case a complete census would be too costly and would take far too great a period of time to complete. A sample survey is considerably less demanding on financial and labour resources; estimates are available much sooner; and whereas the results of a complete census can only be average figures over the whole period, due to the changing crop patterns from season to season, the estimates from a sample survey are more precise in that they refer to a definite time of the year.

Throughout the published Agricultural Survey Reports of the various Colonies, it is noted that little or no attempt has been made to evaluate the production of food crops on peasant holdings. The Second Conference of Colonial Government Statisticians (1953) recognised the difficulties of

- (i) recording crops in peasant gardens especially in areas where mixed or double cropping was practised; and
- (ii) making estimates of yields of such crops.

Though certain recommendations were made, it was con-

sidered that a relatively large amount of work was needed to be carried out in the field.

Finally, with industrial competition for labour and capital in Trinidad, it is essential that some definite policy be formed if the island is to have an economically sound agriculture. Jolly (1954) has stated that if only the idle resources of labour in the Caribbean can be combined with capital wisely invested in productive farming systems, the area can be turned from a wilderness into a garden.

The present survey may thus be considered in the light of the two Colonial Office Conferences, i.e. any work done on the surveying of peasant crops is a useful stepping-stone in devising methods of enumeration, etc.; and also as an advance in the formulation of agricultural and marketing policies in order to assist the local peasant farmer.

SECTION A - PRELIMINARY WORK

THE SAMPLE OF THE AGRICULTURAL SURVEY (1956).

The Malarial Division of the Health Department had, in the course of their colony-wide campaign, drawn maps plotting every dwelling house in the colony, and their officers had recorded the number of people dwelling within each building.

The Statistical Office had listed this information for every administrative county and had divided each county into clusters, such that each cluster contained approximately 150 persons over 15 years of age. The clusters formed the frame of the Agricultural Survey (1956).

A random sample (approximately 1 in 10) of the clusters was selected by the Statistical Office. The actual selection of the sample had been in three stages, viz:-

(a) A 1:20 sample of the clusters had been taken for the Labour Force Survey of 1955. Half of this sample was taken (in fact every other cluster), thus giving a sample of 1:40.

(b) Another sample equivalent to 1:20 of the whole was taken with the idea of splitting this in half to give a combined sample of 1:20.

It was determined, however, that if a sampling error of the order of 5% was to be obtained, the sampling fraction would have to be 1:10.

Thus (b) was taken in toto.

(c) A final sample equivalent to 1:40 of the whole was taken from the remaining clusters, in order to bring the sampling fraction to 1:10.

The build up of the sample gives an explanation of the numbering of the clusters in the Agricultural Survey and the apparent haphazard numbering of the clusters on the map.

Exceptions were made to the above sampling procedure as follows:-

(1) Clusters occurring in the administrative areas of

Port of Spain and San Fernando were omitted.

(2) In the clusters occurring in the highly populated area bordering the Eastern Main Road, the sampling fraction was approximately 1:20.

The clusters were later grouped into six groups or zones. Five of the zones were based on the main cash crops grown in the cluster, whilst the sixth was termed the Urban Zone. The above procedure may be regarded as stratification after sampling.

The five crop zones were:-

1. Cocoa area in the north of the island.
2. Cocoa area in the centre of the island.
3. Cocoa area in the south of the island.
4. Sugar cane region.
5. Coconut areas.

INFORMATION COLLECTED BY THE AGRICULTURAL SURVEY.

Enumerators had visited each building within the clusters selected and had filled in the questionnaires shown in Appendix I.

Form 1 (Control Sheet) had been completed for every household* within the cluster.

Form 2 was completed for each operator† who controlled land (other than land let out) of a total acreage of less than one acre.

Forms 3, 4 and 5 were completed for holdings** of 1-99 acres. Holdings over 99 acres were not included in the survey.

* A household was not synonymous with a building. There may have been two or more households within a building.

† An operator was the person in charge of a holding. Being in charge meant that the person made all or most of the decisions concerning the day to day operations of the holding. The operator may have been the owner, tenant or manager, so long as he/she made all or most of the decisions with respect to the farming activities.

** A holding consisted of an area of land occupied by one operator and which was used in part or wholly for planting of crops and/or the raising of livestock including poultry. A holding may have consisted of one parcel or several parcels, each parcel being a continuous piece of land held under one form of tenure. For example, if two pieces of land were joined to each other and they were both owned, then the whole was combined as one parcel; if, on the other hand, one piece was owned while the other piece rented, then they were regarded as two parcels. A single parcel may have had two or more areas exhibiting different cropping policies. Each area was considered as a plot.

On forms 4 and 5 information was obtained separately for each parcel of land, and was in turn punched onto separate cards in the first stage of the analysis.

The enumerators had used sketch maps provided by the Malarial Division. These plotted all roads, traces, quarter mile posts and buildings within a cluster. As the cluster was surveyed the enumerator had entered the building number onto both the control sheets and the sketch maps.

SCOPE OF THE FOOD CROP SURVEY.

It was decided to limit the survey to those clusters that were in the counties of Caroni, St. David and St. Andrew. (Appendix III). This gave a reasonable distribution over three zones and gave an area that the team would be expected to cover in the limited time available, during the Christmas Vacation.

COUNTY	Caroni		St. David and St. Andrew*			Total
ZONE	2	4	1	2	5	
No. of clusters in the county	51	227	21	97	5	401
No. of clusters in the sample	4	24	4	9	-	41

In the preliminary discussions the possibility of including food crops, which were growing under cocoa, was considered. A reconnaissance survey was made and the members reported that although such a category existed, the difficulties in estimating the plant populations would be great. On the basis of this report these were not included in the present survey.

INFORMATION FROM THE AGRICULTURAL SURVEY USED BY THE FOOD CROP SURVEY.

From the data on form 5, a list of parcels of land growing food crops, (items 23 - 32), on holdings of 1-99 acres in the

* For administrative purposes these are regarded as one county.

two counties, was obtained from the Central Statistical Office. This showed County, Cluster and Building numbers for each parcel, a code for the main crop (as on Form 5), whether a pure or mixed stand, the number of main crop plants to the nearest 10 and a code for the subsidiary crops.

The list for holdings of less than one acre was compiled by hand sorting of the original questionnaires (Form 2). Although this was time consuming, it did not prove an arduous task. The reason for the manual sorting was that the sorting machine was engaged with routine work, and would not have been available for a considerable period.

Tracings were made of the maps (quoted above) but only enough detail was entered to enable the enumerators to identify the buildings included in the sample of the Food Crop Survey.

A special case arose with cluster 08 in the County of St. David and St. Andrew. The list for the holdings over one acre included this cluster, but the questionnaires were not available for listing the holdings under one acre. Hence a preliminary survey had to be carried out to determine the answers to the following questions:-

- (a) Have you any land?
- (b) What size is the holding?
- (c) Do you grow any food crops?

This gave the information which had been tabulated from the questionnaires and was the best approach to the Agricultural Survey that could be devised at short notice.

THE FRAME FOR THE FOOD CROP SURVEY.

This was composed of the operators of holdings up to 99 acres, who had parcels of land growing food crops, and who resided in the selected clusters (approximately 1 in 10) occurring in the Counties of Caroni, St. David and St. Andrew, in the island of Trinidad.

The frame was in two strata, based on the information provided by the Agricultural Survey.

(1) Operators controlling holdings over one acre in size; for brevity these will hereafter be referred to as the large stratum.

(2) Operators controlling holdings under one acre in size, which for brevity will hereafter be referred to as the small stratum.

The zonal grouping remained as in the Agricultural Survey and was here considered as stratification after selection.

It should be noted that parcels were not taken as the basic units because of the inability to determine, from the data of the Agricultural Survey, the number of food parcels in the small stratum. The list for the large stratum was corrected, by referring to Forms 1 and 5 in cases where more than one operator resided in the same building.

THEORY OF SAMPLING.

Whilst it is apparent that a sample survey gives greatest coverage in a given period of time than a complete census, it is worth discussing, at this point, the general considerations to be applied to sampling in a survey. This is dealt with fully by Yates (1953), but may be summarised as follows:

A sample must be a proportion of the population selected in the belief that it is representative of the whole population. Whatever process of selection is used a sample cannot be exactly representative of the whole aggregate, but provided that a statistically sound process of selection is used, the inevitable errors which then occur in the results, can be estimated and are termed the random sampling errors of these results.

The two methods of selection most commonly used are termed random and systematic sampling. Hansen, Hurwitz and Madow (1953) define a simple random sample as a sample of n elements selected from a population, such that each combination of n

elements has the same chance of being selected as every other combination. A method employing random numbers is generally adopted to achieve this end.

In a systematic sample every k th unit is selected from a list of units.

Both methods relieve the investigator of the responsibility of trying to minimize his personal bias. Providing the units of the population do not occur in a regular pattern, systematic sampling tends to give a better miniature of the whole than a simple or stratified random sample; but a point in favour of the random sample is that the methods of testing the reliability of the results are thoroughly established. Moreover lists from diverse sources may be used for the selection of a random sample without knowing their peculiarities and without introducing bias due to those factors.

Hunt (1952) states that it is often a difficult choice to make and that whilst random sampling methods are more foolproof and the reliability of the results can be more closely assessed, one must aim at realising a reasonable, if approximate, balance between the conflicting aims of maximizing accuracy and minimizing pressure on limited financial and labour resources.

Once the absence of any important bias has been ensured, attention can be turned to the random sampling errors. Whether or not a sample will give results which are sufficiently representative of the population, depends primarily on whether the errors introduced by the sampling process are sufficiently small not to invalidate the results for the purposes for which they are required.

Apart from errors due to bias, the simplest way of increasing the accuracy of the sample is to increase its size. Other things being constant, the random sampling error is approximately inversely proportioned to the square root of the number of units included in the sample. The accuracy attained will,

however, depend not only on the number of units included in the sample, but also on that part of the variability per unit which contributes to the sampling error. By imposing restrictions on a fully random selection, which do not introduce bias into the results, the part of the variability per unit which contributes to the sampling error can be reduced and the size of the sample required for a given degree of accuracy thereby diminished.

The restrictions employed are:-

- (1) Stratification.
- (2) Use of supplementary information.
- (3) Variable sampling fraction.
- (4) Multi-stage sampling.

(1) Stratification.

The population is divided into groups termed strata, such that units in each stratum are as similar as possible. Each of the strata is then sampled at random.

(2) Use of supplementary information.

This is the use of data collected from sources other than the sampling scheme and may be used in estimating the population total.

(3) Variable sampling fraction.

This is the inclusion of different proportions of the different strata in the sample, such that the more important, or more variable, parts of the population are sampled more intensely.

(4) Multi-stage sampling.

Here the population is divided into a number of first stage sampling units, which are randomly sampled. The selected first stage units are then sub-divided into smaller second stage units, which are also sampled. This process may be extended to build up a complex hierarchy. *Reduces error?*

SELECTION OF THE SAMPLE.

As the Agricultural Survey sampling unit was the cluster (here considered the first stage sampling unit), the second stage

sampling must be within each cluster. Thus systematic sampling from the lists of the individual operators as a whole would not have been legitimate.

Taking all of the above considerations into account, the writer decided to adopt a method of random sampling from within each cluster. It was decided that the overall sampling fractions would be 1 in 2 for the large stratum and 1 in 3 for the small stratum. This gave a sampling fraction of approximately 1:20 and 1:30 respectively for the whole population. These sampling fractions were determined purely on the estimated capacity of the survey team.

With the above fractions taken into consideration, the following method was used.

(a) Large Stratum: A random sample with a sampling fraction of 1 in 2.

(b) Small Stratum: A random sample with a sampling fraction of 1 in 2.

In both cases where the quotient was not a whole number the following whole number was the number of operators to be included in the sample.

The sample may be described as a random multi-stage sample, with multi-stratification, having a variable sampling fraction and without control of sub-strata.

The stages of sampling were within:-

(1) Administrative areas.

(2) Clusters.

The strata were:-

(a) before selection - size of holding;

(b) after selection - zones.

SAMPLE LISTS.

When the sample had been drawn, lists were prepared showing the county, cluster, building number, name and address of each operator, together with the available details of the parcels

of land. A summary of the sample is given in Appendix II.

For use of transfer and tabulation of data at later stages, instructions were issued before the field work commenced, for renumbering the county and cluster numbers of the Agricultural Survey. Both the Agricultural and the Food Crop Survey codes are given in the summary of the sample, but throughout the text of this report, all codes refer to those of the Food Crop Survey. The building numbers were left unaltered as in the Agricultural Survey, to facilitate the direct tracing of the sketch maps.

ORGANIZATION.

A master map (Appendix III) was drawn up and the clusters were grouped into areas. Each area was allocated to a member of the team who was responsible for the general supervision of the enumeration in that area. Each supervisor was expected to fill in the preliminary data on the questionnaires and to make a preliminary survey of the area. They also had to allocate the field work to the enumerators and later to code and transfer the data to clipped cards.

The areas could not always be arranged to the best geographical advantage, partly due to the fact that until the preliminary reconnaissance of the areas had been carried out by each supervisor, the exact plotting of some of the clusters was not possible and also because it was intended that each area should have approximately the same number of operators to be interviewed.

The allocation of the clusters to the areas together with the number of operators to be interviewed in each area and the estimated date of the commencement of the field work is given below.

Area	County	Clusters	No. of Operators	Date
1	1	06, 07, 20, 21, 26	58	17th Dec.
2	1	02, 10, 15, 17, 24, 25	56	31st Dec.
3	1	04, 05, 13, 14, 16, 18, 27	64	23rd Dec.
4	1	01, 08, 09, 28	63	19th Dec.
	2	09		
5	2	01, 02, 04, 07, 08, 10, 12, 13	70	12th Dec.
6	2	03, 05, 06, 11	58	10th Dec.
7	1	03, 11, 12, 19, 22, 23	61	28th Dec.

The order of the survey was arranged at a general meeting of the team. It was decided to survey Area VI first because of its compactness. This would allow the team to meet at lunch time on the first day to discuss difficulties that had arisen during the first morning's work.

The rest of the clusters were arranged in order of distance from the teams base.

QUESTIONNAIRES.

The formulation of the questionnaires and the accompanying instructions were the responsibility of other members of the team. Although they are included in Appendix IV in order to complete this report, reference should be made to the reports of Hill, Currie and Waterworth for the details considered in their formulation.

STANDARDS FOR PLANT COUNTS AND SAMPLING IN THE FIELD.

The composition of the food gardens was based on plant counts. The standards derived for this part of the enumeration are given in the field instructions (Appendix IV).

In order to estimate the plant populations of the various species in a parcel of land, it was necessary to sample within each parcel. The preliminary work in determining the size, shape and number of such samples was undertaken by other members of the

unit (vide. Watson and Law). It should be noted however, that the main consideration influencing the number of samples to be taken, was that such sampling could be considered as third stage sampling and the variation due to this sampling (V_3) would be small when compared to that of the first two stages ($V_1 + V_2$). Furthermore, (V_3) would only be decreased in proportion to the square root of the number of samples taken. It was thus considered that for mixed plots of less than 0.1 acre, two samples were to be taken, and for plots over 0.1 acre, four samples were to be taken.

ESTIMATION OF THE EFFICIENCY OF THE SURVEY.

The writer considered that this could be obtained by a time and cost study of the team's work. Each member was asked to record the time spent on work under the following headings:-

- I Obtaining and selection of the sample.
- II Preliminary surveying of the areas.
- III Preliminary statistical analysis.
- IV Preparation of Maps.
- V Preparation of field papers (Questionnaires, etc.)
- VI General discussion.
- VII Supervisory work.

For an assessment of the time spent in field work, log sheets were prepared with accompanying instructions to supervisors and enumerators (Appendix IV).

The following classification was used:-

- VIII Travelling to and from clusters.

IX Interviewing time.

X Travelling within clusters.

Classes VIII to X were also used in the "follow-up".

Other time records consisted of:-

- XI Preparation of the analysis.
- XII Statistical Analysis.

The cost of the survey was recorded as:-

- (a) travelling costs under headings I, II, III, IV and VIII - X,
- (b) cost of stationery,
- (c) cost of non-consumable equipment.

THE "FOLLOW-UP".

Arrangements were made for the "follow-up" to be done as soon as the data had been tabulated, in order that any queries concerning the questionnaires could be answered at the same time as the interviewing of operators who had not been visited during the initial field work.

Each supervisor was responsible for the "follow-up" in his area.

	Commenced	Date Completed	No. of days	Field Unit days
I	12.12.56	13.12.56	2	4
II	15.12.56	19.12.56	2	6
III	17.12.56	19.12.56	2	4
IV	15.12.56	18.12.56	4	12
V	11.12.56	2.1.57	4	5
VI	10.12.56	11.12.56	2	6
VII	19.12.56	19.12.56	1	3

Each "field unit" consisted of two enumerators. Generally one enumerator interviewed the operator, whilst the other one measured the plot and took sample counts for the estimation of the plant population. No calculations were made in the field; these were completed each evening after the unit had finished its task for the day.

For the methods of sampling and the details of the field work reference should be made to the reports of the other members of the team.

DEFECTS OF THE FRAME.

As the field work progressed, certain defects of the frame became apparent. These could be classified thus:-

SECTION B - FIELD WORK

ENUMERATION.

This was carried out by the whole team. The field work commenced on the 10th December 1956 and finished on the 19th December 1956, except for the enumeration of cluster 08 in County 2, which was surveyed on the 6th January 1957.

The major portion of the field work was completed well ahead of schedule, mainly due to the fact that the number of interviews completed each day far exceeded the original estimate.

The following table gives some details of the enumeration in the seven areas.

Area	Date commenced	Date Completed	No.of days	Field Unit days
I	12.12.56	13.12.56	2	4½
II	18.12.56	19.12.56	2	6
III	17.12.56	18.12.56	2	4
IV	13.12.56	18.12.56	4	4½
V	11.12.56	6. 1.57	4	5½
VI	10.12.56	11.12.56	2	5
VII	19.12.56	19.12.56	1	3

Each "field unit" consisted of two enumerators.

Generally one enumerator interviewed the operator, whilst the other one measured the plot and took sample counts for the estimation of the plant population. No calculations were made in the field; these were completed each evening after the unit had finished its task for the day.

For the methods of sampling and the details of the field work reference should be made to the reports of the other members of the team.

DEFECTS OF THE FRAME.

As the field work progressed, certain defects of the frame became apparent. These could be classified thus:-

I. Inaccuracy of the frame not due to lapse of time:

(a) Wrong Definition. On several occasions it was found on visiting a holding, that the food crops were grown beneath cocoa or citrus trees. In the large stratum the error appeared to be due to faulty enumeration of the parcel in the Agricultural Survey. It would appear that the enumerators had made an estimate of the area of land that the food crop plants would have covered had they been in a separate parcel with no tree crop. This estimate had been recorded separately.

In the small stratum the fault, that such parcels were included in the frame, was due to the inability to differentiate between them and those parcels that were strictly food gardens, on the simple question "Do you grow food crops?"

(b) Non-existent gardens. A number of cases occurred where an operator had never had a garden.

(c) Non-existent operators. In one or two cases no operator or building was found. In all such cases diligent enquiries were made in order to eliminate the possibility of the operator having moved or of the condemnation of the building.

II. Inaccuracy of the frame due to lapse of time:

(a) Garden not cultivated. Since the Agricultural Survey several operators no longer cultivated their parcels of land. This was especially noticeable where the garden was some distance away from the building.

(b) Operator moved. Such cases fell into three classes:-

(i) Operator moved but the building was occupied by another person. In this case the present occupier was interviewed.

(ii) Operator moved and no new occupier. This was taken as "no garden", since the crops that were growing could not be said to be utilized.

(iii) Operator moved and building condemned.

In all the cases under the last three headings, the previous operator had moved outside of the cluster boundary.

Except for those falling into II (b) (1), all operators in the above classes were rejected from the sample in the analysis.

"FOLLOW-UP".

This was carried out between 20th December 1956 and 27th January 1957. The following table gives a summary of the enumeration.

Area	No. of Operators	Commenced	Completed	Days	Unit Days
I	8	14. 1.57	16. 1.57	1	1
II	1				
III	3	15. 1.57	15. 1.57	$\frac{1}{2}$	$\frac{1}{2}$
IV	5	15. 1.57	15. 1.57	$\frac{1}{2}$	$\frac{1}{2}$
V	5	20.12.56	20.12.56	1	1
VI	4	20. 1.57	20. 1.57	$\frac{1}{2}$	$\frac{1}{2}$
VII	5	27. 1.57	27. 1.57	$\frac{1}{2}$	$\frac{1}{2}$

PARCELS OUTSIDE CLUSTER BOUNDARY.

The gardens of some operators, notably in County 2, were a considerable distance from the buildings, often well out of the cluster boundary and even, in some cases, outside of the County boundary.

Wherever possible information was obtained on the parcels by careful questioning. However, a number of cases occurred where the operator himself could not be interviewed and the information given was extremely scanty.

Although these could not strictly be classified as "No Responses", the writer decided that provided three attempts had been made to interview the operator, the parcels would be regarded in that category.

"NO RESPONSE"

In addition to the above operators, 5 cases of no response were recorded. These were defined as operators whom enumerators

were unable to contact after three visits to their dwellings. These, being only a small percentage of the sample, were excluded from the analysis.

The following table is a summary of the number of operators excluded from the analyses.

	No garden	Under Tree Crops	House Con-demned	Operator moved	Operator unknown	Food Parcel outside cluster	No Response	Total
Large Stratum	13	5	-	-	1	4	2	25
Small Stratum	37	3	3	1	1	1	3	49
Total	50	8	3	1	2	5	5	74

SECTION C - TABULATION OF DATA AND

THEORY OF THE ANALYSES.

ORGANISATION.

The writer considered that the best approach to the analyses would be the tabulation of the data by means of clip-cards. The Economics Department of the College had used clip-cards since 1940 and, in fact, it is now routine to handle all data requiring analysis on clip-cards. Jolly (1950) strongly recommends the system for analyses of isolated small surveys and research schemes. That many members of the team may later find themselves engaged in such work was an added, though secondary, consideration for the adoption of clip-cards for this analysis.

The advantages of a clip-card system for handling a mass of data are not generally realised until a person has had practice in its use. The two greatest advantages appear to be that by systematically arranging the data collected in the field and with suitable coding, a large amount of material can be entered on a relatively small piece of paper. The data is thus easily stored and can readily be sorted with the simplest of apparatus - one sorting needle.

The second advantage is that a large number of comparisons can easily be made. For example, if five observations are made, 10 single factor comparisons and ten comparisons of combinations of factors can be made with equal ease. Any system of tabular entry of the observations can conveniently be used for only a few selected comparisons.

The ^{main} / disadvantage of the system in the present analysis was that the clip-cards available were cards that were not used by the Economics Department and hence the coding was not directly applicable to this analysis.

This was overcome by making out a detailed master card for each member of the team together with a comprehensive set of instructions.

The clipping of the data was a "direct" system throughout i.e. a V section was made whenever a given crop or attribute had been recorded on the questionnaires.

The aim was to use a **separate** card for each parcel of land worked by an operator, except in the case where a definite plot within the parcel was growing a crop as a pure stand, in which case a separate card was used for each pure stand area.

An example was where an operator had a parcel that was partly in maize, partly in a mixture of cassava and pigeon peas and a third area under beans, tannia, dasheen and pigeon peas all mixed together. In this case two cards would have been used, one for the maize area and one for the rest of the parcel.

When the analysis was being made, it was discovered that the system had a great disadvantage. The analysis was based on operators; therefore when two or more cards were made out for the same operator, care had to be taken in counting the number of operators with a given attribute, and the crop counts for all the cards of one operator had to be summed together.

The data for a crop in a pure stand was entered on a separate card in order that some measure could be made of the acreage required by the crops had they all been in pure stands.

In the light of this experience, the writer would advocate a method where-by all the data relating to one operator was entered on one card, and a "pure stand" plot would be entered on a separate card which would not be used in the analysis.

No method was devised for defacing and retaining spoilt cards; they were merely torn up and placed in the waste paper basket. Though no card was mislaid throughout the analysis, a method whereby spoilt cards can be retained is desirable, especially where junior staff are employed in the transference of the data to the cards.

After the cards had been checked, they were marked off against the entry on the original sample lists and then filed.

To ensure that no card was mislaid after this stage had been reached, it was thought essential to make a ruling that no card was to be removed from the machine room.

CODING OF THE DATA.

Each supervisor was asked to check each pair of questionnaires and was advised to code the data before transferring it to the cards. All written entries on the card were made in ink.

(a) Identification.

(i) Size groups. Blue cards were used for parcels in the large stratum and pink cards for those in the small stratum.

Using the holes to the right-hand side of the card, the following code was used for:-

(ii) County Number. The hole marked "0" was clipped for County 1 and hole "1" was clipped for County 2.

(iii) Cluster Number. A unique coding system was adopted. The remaining eight holes were valued as shown overleaf, one of the holes 2,3 or 4 being clipped for the tens of the number, two of the holes 5,6,7,8 and 9 being used for the unit digit, with the proviso that the holes valued 4 and 7 together equalled zero.

Thus each cluster number and the appropriate county number was identified by four out of the ten holes being clipped; e.g.

County No./Cluster No.	Holes Clipped
1/01	0, 2, 5, 6
1/15	0, 3, 6, 8
2/09	1, 2, 7, 9
2/10	1, 3, 8, 9

(iv) Building Number. This was entered on the top of the card as shown.

(v) Zone. The appropriate hole, as indicated on the master card, was clipped.

All the above coding was made in batches for each cluster.

(b) Details of the parcel. If the card referred to a plot, the hole marked sub-plot was clipped out.

No Sale

																				Pepper		Green Veg.		Others		Artificial		Organic		Cutlass		Fork		Plough		Other		W.I.		E.I.		Zone		Pure Stand		Combination		Sub Plot													
																				00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	00	01	02	03	04	05	06	07	08	09	10										
																				BUILDING NO. 5 AREA																				7		4		2		1		0		20		10		00		2		1		County	
																				Casual Sales																				7		0		6		5		4		3		2		1		0		Cluster			
																				Marketed																				6		0		5		4		3		2		1		0		Cluster					
																				Organics																				5		0		4		3		2		1		0		Cluster							
																				Artificials																				4		0		3		2		1		0		Cluster									
																				COMBINATION																				3		0		2		1		0		Cluster											
																				A I B																				2		1		0		Cluster															
																																								1		0		Cluster																	
																																								0		Cluster																			

Fig	Cassava	Dasheen	Tannia	Eddo	Pigeon Pea	Okra	Egg Plant	Beans	Yam	Tomatoes	Cane	Corn	Cucumber	Pumpkin	Sweet Potato	T. Tamboo	Pineapple			
00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20

Where the crop on the parcel or plot was in a "pure stand" or where a definite combination of crops appeared, the appropriate hole was clipped. The crop codes for the combinations were entered on the bottom line of the table, e.g. where pigeon peas and maize were interplanted it was recorded as 05 x 13.

The area of the parcel or plot to which the card referred was entered on the top right-hand corner of the card. The figure entered at "A" referred to the size of the parcel as estimated by the Agricultural Survey, whilst the entry at "B" referred to the area of the parcel as measured in the present Survey. Where one or more cards were used for a parcel of land, only one set of entries for "A" and "B" were made. All areas were calculated in square yards.

(c) Nationality. In an attempt to ascertain any preference for growing crops, the operators interviewed were recorded as East Indian, West Indian (Creole) or other. The appropriate hole was clipped as shown and in the case of "other", the Nationality was recorded along the left-hand side of the card.

(d) Cultivation and Marketing data.

(i) Manures. If any artificial or organic manures were used, the appropriate hole was clipped, and the codes of the crops receiving manures were entered in the table, using line 3 for those crops to which "organics" were applied and line 4 for those to which "artificials" were applied.

(ii) Cultivations. The appropriate holes were clipped. No indication was made to show the differentiation in treatment between the crops.

(iii) Sales. If no crops were sold off the holding, the dollar sign on the left-hand side of the card was clipped out. In the analysis it was thus assumed that all food crops were consumed by the operator and his family, i.e. "home consumed".

If any crops were sold, no clip was made but the appropriate crop codes were entered on the first and second lines of the

card as shown. The term "marketed" was defined as referring to the regular sale of crops at a recognised marketing centre or to a whole sale operative; casual sales were defined as referring to the occasional sale of crops to a passing wholesale operative, generally in "times of plenty".

(e) Crops. Clippings were made for each crop recorded as growing on the parcel or plot of land.

The crops were coded as follows:

<u>Code</u>	<u>Crop</u>	<u>Code</u>	<u>Crop</u>
00	Banana	311	Peppers
01	Cassava	310	"Green Vegetables"
02	Dasheen	These were sub-coded:-	
03	Tannia	312	Cabbage
04	Eddo	313	Lettuce
05	Pigeon Pea	314	Mustard
06	Okra	315	Pack Ts'oi
07	Melongene	316	
08	Beans		
09	Yams	21	"Others"
11	Tomato	These were sub-coded	
12	Sugar Cane	2101	Arrowroot
13	Corn	2102	Groundnuts
14	Cucumber	2103	Seim Beans
15	Pumpkin	2104	Saffron
16	Sweet Potato	2105	Carrots
17	Topee tambu	2106	Water Melon
18	Pineapple	2107	Christophine
		2108	Ginger.

Crops coded 00 to 18 and 311 were clipped directly on to the cards, and the estimated number of plants was recorded on the reverse side of the card along-side the V clipping, care being taken to ensure that the clipped corner was at the bottom left-hand corner of the card.

If any of crops 312 to 316 occurred, the hole marked "Green Vegetable Crops" was clipped. The remaining crops were grouped as "Others". The estimated numbers of plants for the last two groups were recorded in the centre of the card, e.g. (2103) 89 or (312) 150.

CORRECTION OF THE CARDS.

As the cards for each cluster were completed, they were corrected.

The county, cluster and zone clippings were checked by examining the cards in a bunch, in order to facilitate the identification of wrong clippings.

The most common mistakes were made in the clipping of manurial and sales data without entering the details in the body of the card. Another common fault was the discrepancy in the parcel acreage "B", when compared with the sum of the plot acreages.

The colour of each card was checked when the mark was made against the original sample lists.

THEORY OF THE ANALYSES.

NOTATION.

This closely follows the notation given by Yates (1953, 6.2). A "super-bar" will be used to denote an average, e.g. $\bar{y}$ = the average of a series of values for y, and a "sub-bar" will be used to denote an estimate, e.g. $\underline{N}$ = the estimated number of operators in a given zone and size group.

t = total number of operators in the sample within a cluster.

n' = number of clusters in the sample within a given zone.

N' = number of clusters within a zone.

n'' = number of operators in the sample (excluding rejected classes) within a cluster.

N'' = number of operators within a cluster growing food crops.

$\underline{N}$ = estimated number of operators in a given zone - size group growing food crops.

y = plant count for each operator for a given crop.

$\bar{y}$ = estimated mean crop count per operator for a given crop.

Y = total plant count in the sample.

$\underline{Y}$ = estimated total crop count.

u = number of operators in a cluster within the sample having a given attribute.

$\underline{U}$ = estimated total number of operators having a given attribute.

p = estimated proportion of the operators within a cluster having a given attribute.

p_o = estimated overall proportion of the operators within a zone - size group having a given attribute.

$\bar{g}_o$ = overall mean raising factor.

f' = first stage sampling fraction.

f'' = second stage sampling fraction.

$\bar{f}''_o$ = overall mean second stage sampling fraction.

S' = sum of variations between first stage sampling units.

S'' = sum of variates between second stage sampling units.

s' = a factor of the variance due to the first stage sampling.

s'' = a factor of the variance due to the second stage sampling.

V = an estimated variance.

Each portion of the analysis was carried out for each crop or attribute for each size group within a zone.

(a) QUANTITATIVE ANALYSIS.

(1) Estimation of population means and totals.

Estimated mean crop count per operator.

$$\bar{y} = \frac{S' S''(y)}{S'(n'')} \quad (1)$$

Estimated number of operators in a zone-size group

$$\underline{N} = \bar{g}_o S' \{n''\} \quad (2)$$

where $\bar{g}_0 = \frac{1}{f' \bar{f}_0''}$ (3)

$f' = \frac{n'}{N'}$ (4)

$\bar{f}_0'' = \frac{S'(t'')}{S'(N'')} \checkmark$ (5)

Estimated total plant count

$\underline{Y} = \underline{N} \bar{Y}$ (6)

(2) Estimation of the sampling error

For a given crop in a given zone - size group the analysis of Variance table takes the following form. (Yates 8.11).

Variance	d.f.	S.S.	M.S.
Between first stage units (i.e. clusters)	$n' - 1$	$S'\{S''(y)\}^2 / n'' - Y^2 / S'(n'')$	$n'' s'^2 = A$
Within first stage units and between second stage units (i.e. operators)	$S'(n'' - 1)$	difference	$s''^2 = B$
Total	$S'(n'') - 1$	$S'S''(y^2) - Y^2 / S'(n'')$	

The variance of $\bar{Y}$ may be calculated thus:-

$V(\bar{Y}) = \frac{1 - f'}{n'} s'^2 + f' \cdot \frac{1 - f''}{n' n''} s''^2 \dots \dots (Y. 7.17) (7)$

However, the above presupposes that n'' is constant for all first stage units, which is not true in the present analysis.

Hence in the mean square term, n'' must be substituted by $\bar{n}_0''$, where

$\bar{n}_0'' = \frac{S'(n'') - S'(n''^2)}{S'(n'') (n' - 1) \dots \dots (Y. 8.11d) (8)$

Further f'' is not constant and $\bar{f}_0''$ must be substituted, (5).

With these modifications and substituting for s'^2 and s''^2 from the analysis of variance, one may rewrite (7) as

$(\bar{Y}) = \frac{1 - f'}{n'} \cdot \frac{A}{\bar{n}_0''} + f' \cdot \frac{1 - \bar{f}_0''}{n' \bar{n}_0''} \cdot B$ (9)

If $\alpha = \frac{1 - f'}{n' \bar{n}_0''}$ (10)

$$\text{and } \beta = f' \cdot \frac{1 - \bar{f}''}{n' \bar{n}''_0} \quad (11)$$

this formula becomes

$$V(\bar{y}) = \alpha A + \beta B, \quad (12)$$

which was the form used for the computation.

$$\text{Then, } S.E.(\bar{y}) = \sqrt{V(\bar{y})} \quad (13)$$

$$V(\underline{y}) = \underline{N}^2 \cdot V(\bar{y}) \quad (14)$$

$$S.E.(\underline{y}) = \underline{N} \cdot S.E.(\bar{y}) \quad (15)$$

(3) The estimated totals and their errors for zones and counties were obtained by summation from zone - size group totals and the corresponding variances.

(b) QUALITATIVE ANALYSIS.

(1) Estimation of population proportions and totals.

Estimated proportion of operators growing a given crop in a cluster-size group.

$$\underline{p} = \frac{u}{n''} \quad (16)$$

$$\text{and } \underline{q} = 1 - p \quad (17)$$

Estimated overall proportion of operators growing a given crop in a given zone-size group.

$$\underline{p}_0 = \frac{S'u}{S'n''} \quad (18)$$

$$\text{and } \underline{q}_0 = 1 - \underline{p}_0 \quad (19)$$

Estimated total number of operators growing a given crop in a zone-size group.

$$\underline{U} = \underline{N} \underline{p}_0 \quad (20)$$

where $\underline{N}$ is calculated as (2).

(2) Estimation of the standard errors of population proportions and totals.

For a given crop in a given zone - size group, the analysis of variance table takes the following form:-

Variance	d.f.	S.S.	M.S.
Between first stage units (i.e. clusters)	$n' - 1$	$\sum \{n''(\underline{p} - \underline{p}_0)^2\}$	$n''s'^2 = C$
Within first stage units and between second stage units (i.e. operators)	$S'(n'' - 1)$	$\sum \{n''(\underline{p} \cdot \underline{q} \cdot)\}$	$s''^2 = D$
Total	$S'(n'') - 1$	$(S'n'') \underline{p}_0 \cdot \underline{q}_0$	

By substituting n'' by $\bar{n}_0''$ as (8), and following the same arguments as in the quantitative analysis, one may derive the variance of the proportion as

$$V(\underline{p}) = \alpha C + \beta D \quad (21)$$

$$\text{Then } V(\underline{U}) = \underline{N}^2 \cdot V(\underline{p}) \quad (22)$$

$$S.E.(\underline{U}) = \underline{N} \cdot S.E.(\underline{p}) \quad (23)$$

(3) The estimated totals and their errors were derived as in the quantitative analysis.

"BREAKDOWN" OF THE ANALYSES.

The analyses as shown above failed in two circumstances;

- (i) when a size - group of a cluster had no operators;
- (ii) when a size - group of a cluster had all the operators within the rejected classes.

In both cases n'' was zero and $(n'' - 1)$ became meaningless. Due to the peculiar limitation imposed on the frame and the subsequent sampling techniques, it was decided that the only method of solving the problem was to ignore such a cluster in the analysis. This decision was based on the fact that the total number of clusters had been taken into account in deriving $\bar{n}_0''$.

If the rejected clusters had not been taken into account in computing $\bar{n}_0''$, $\bar{n}_0''$ would have been larger, and hence α and β would have been smaller. In consequence the variance would have been decreased, which was contrary to what would have been expected by the inclusion in the analysis of clusters with zero values. The fact that the variance was increased and hence part of the effect that the rejected clusters have on the variance was accounted for, the writer considered was a legitimate reason for their rejection in the analysis.

EXAMPLE COMPUTATIONS.

The following are examples of the computations carried out, together with notes on the methods used at each stage of the computations.

EXAMPLE COMPUTATION SHEET.

The details outlined on the sheet were entered for each cluster. The total number of cards and the total number of operators were entered, then the cards were divided by nationality. Under "A" the number of operators growing a given crop was entered and under "B" the total plant count for those operators was entered. In designing this sheet, the writer had intended that more computations would have been completed than the form actually allowed for, and hence a lot of the headings appear to be unnecessary.

"A" and "B" refer to the acreages estimated in the Agricultural Survey for those parcels included in the Food Crop Survey sample and those parcels in the Food Crop Survey Plot respectively. "C" refers to the actual acreage measured in the survey. Thus B/A gave a measure of the accuracy of the Agricultural Survey estimates while C/A gave a measure of the accuracy of the Food Crop Survey estimates. The heading "D" was included in the sample and is to be compared with the heading "E" which was based on operators.

SECTION D - COMPUTATIONS

ORGANISATION.

Each zone-size group in a county was analysed separately, hence there were eight sets of analyses to be computed. Each member of the team was allocated a zone-size group for the first part of the computations — recording of the data from the cards onto cluster calculation sheets. The zone-size groups were then re-allocated for the computation of the qualitative and quantitative analyses. This system allowed a check of the calculations to be made easily.

EXAMPLE COMPUTATIONS.

The following are examples of the computations carried out, together with notes on the methods used at each stage of the computations.

CLUSTER COMPUTATION SHEET.

The details outlined on the sheet were entered for each cluster. The total number of cards and the total number of operators were entered, then the cards were divided by nationality. Under "O" the number of operators growing a given crop was entered and under "N" the total plant count for those operators was entered.

In designing this sheet, the writer had intended that more computations would have been completed than the team actually had time for, and hence a lot of the headings appear to be unnecessary.

"A" and "C" refer to the acreages estimated in the Agricultural Survey for those parcels included in the Food Crop Survey sample and those parcels in the Food Crop Survey frame respectively. "B" refers to the actual acreage measured in the Survey. Thus B/A gave a measure of the accuracy of the Agricultural Survey estimates whilst C/A gave a measure of the proportion of the food area included in the sample and to be compared with the sampling fraction which was based on operators.

1

[illegible]

"A" included those plots that were entered under no response and rejected headings.

It may be argued that the tabulation of data in this form is completely contrary to the principles in favour of clip-cards, but it was found that, due to:-

- (i) the inexperience of the team in handling cards;
- (ii) the need to work on a cluster - size group basis and the consequent small number of cards handled; and
- (iii) the increased possibility of correcting mistakes early in the computations.

The time required to prepare these sheets was in fact, time well spent.

Checks were made as follows:-

- (i) that "A" was equal to the value in the summary sheet;
- (ii) that the sum of the number of operators under "M", "C. S." and "H. C." and the "no response" headings was equal to the total number of operators.

QUANTITATIVE COMPUTATION SHEET.

For this part of the analysis it was first necessary to have the plant counts for each operator readily available. These were transferred from the cards by means of a printer-adding machine to a strip of paper. This was done mainly to facilitate the checking of any obvious mistakes that appeared during the analysis. With more experience in handling the cards and figures, several members of the team were able to use the figures directly from the cards during this stage of the analysis.

In printing the data on to the strip, the cluster number was denoted by a figure with a black square opposite (obtained by pressing the "non-add" key), the values of y were printed in black (zero being denoted by ^{100,000}1,000,000, due to the machine's inability to print a nought preceeding a significant figure), and the total (S^y) was printed in red with a red square opposite.

7. H
9.
100,000.
660.

100,669. 0.0 H

19. H
17.
28.
100,000.
100,000.
20.

200,065. 0.0 H

20. H
1307.
562.
98.

1967. 0.0 H

28. H
34.
100,000.
100.

100,134. 0.0 H

669.
65.
1967.
134.

2,835. 0.0 H

Cluster Number

Values of y

$S''(y)$

Values of $S''(y)$

Total = $S'S''(y)$

QUANTITATIVE COMPUTATION SHEET

County ...1... Zone ...2... + 1 acre Crop ...00...

Cluster	$S''(\bar{y})$	n''	$n'' - 1$	$(S''(\bar{y}))^2/n''$	Difference	$S''(\bar{y})^2$
07	669	3	2	149,187	286,494	435,681
19	65	5	4	485	628	1,473
20	1967	3	2	1,289,696	744,000	2,033,696
28	134	3	2	5,985	5,170	11,155
Total	2835 $= S' S''(\bar{y})$	14	10	1,445,713	1,036,292	2,482,005 Check $= S' (S''(\bar{y}))^2$
C.F.				574,087		574,087
S.S.				871,626	1,036,292	1,907,919
d.f.				3	10	13 Check
M.S.				A = 290,542	B = 103,629	
d,				$\alpha = 0.0672$	$\beta = 0.0028$	
$V(\bar{y})$				19814.50		

$$\underline{N} = 345 \quad \bar{y} = 202.50 \quad S.E.(\bar{y}) = 140.77 \quad \%S.E. = 69.5\%$$

$$\underline{Y} = 69,862 \pm 48,565 \quad V(\underline{Y}) = 2,358 \times 10^6$$

The values $\underline{Y}$ and $\underline{Y}$ were entered for each zone-size group together with the appropriate standard errors and variances. The values $A/2$ ($\bar{y}$) and $\alpha/2$ ($V(\bar{y})$) were calculated in order to give an estimate of the percentage of the variance that was due to the first stage sampling i.e. between clusters.

Values of $\underline{Y}$ and $\underline{Y}$ were entered directly and the overall standard errors were derived from the sum of the corresponding variances. "Zones 3" were derived from the values for County 1, Zone 2 and County 2, Zone 2, whilst the "Zones 2" included the values for County 2 and County 1, Zone 2.

Whilst other tests and calculations, not apparent from the above, the quantitative and qualitative analyses were checked.

The grand total ($S'S''(y)$) was obtained by summing all values of $S''(y)$.

The $S''(y)$ values were checked against the total plant count on the appropriate cluster computation sheet.

The additions for the crude sum of squares for the between and within cluster variances were self-checking with the total crude sum of squares.

The correction factor (C.F.) and mean square (M.S.) were determined in the conventional manner i.e. Y^2/n'' and corrected S.S./d.f. respectively.

The values of α , β and N were given for all zone-size groups. (Appendix V).

QUALITATIVE COMPUTATION SHEET.

The values of u/n'' were obtained from the cluster computation sheet. The actual method of the computation closely followed the pattern of the theory to the analysis. The most noteworthy feature of this analysis is that all the sums of square values were computed independently and hence a unique check was formed.

CROP COMPUTATION SHEET.

The values $\underline{Y}$ and $\underline{U}$ were entered for each zone-size group together with the appropriate standard errors and variances. The values $\alpha A/V(\bar{y})$ and $\alpha C/V(\underline{p})$ were calculated in order to give an estimate of the percentage of the variance that was due to the first stage sampling i.e. between clusters.

Values of $\underline{Y}$ and $\underline{U}$ were summed directly and the overall standard errors were derived from the sum of the corresponding variances. "Zones 2" were derived from the values for County 1, Zone 2 and County 2, Zone 2, whilst the "Cocoa Zones" included the values for County 2 and County 1, Zone 2.

Whilst doing these last computations, any apparent gross errors in the quantitative and qualitative analyses were checked.

QUALITATIVE COMPUTATION SHEET.

County .1..

Zone ..2..

+ 1 acre

Crop .00..

Cluster	07	19	20	28	Overall		
$\bar{u}/n''$	2/3	3/5	3/3	2/3	10/14		
$\underline{p}$	0.6667	0.6000	1.0000	0.6667	$\underline{p}_o$	0.7143	
$\underline{q}$	0.3333	0.4000	0	0.3333	$\underline{q}_o$	0.2857	
					<u>Total</u>	<u>d.f.</u>	<u>M.S.</u>
$(\underline{p}-\underline{p}_o)^2 n''$	0.0068	0.0653	0.2449	0.0068	0.3238	3	0.1079 = C
$n'' \underline{p} \underline{q}$	0.6666	1.2000	0	0.6666	2.5332	10	0.2533 = D
$(S' n'') \underline{p}_o \underline{q}_o$	14 x 0.7143 x 0.2857				2.8570	13	
					↓		
					Check		

$$V(\underline{U}) = 345^2 (0.0672 \times 0.1079 + 0.0028 \times 0.2533)$$

$$S. E. (\underline{U}) = 947$$

$$S. E. (\underline{U}) = \pm 97$$

$$\underline{U} = 345 \times 0.7143$$

$$= 246$$

$$\% S. E. = 39.6\%$$

					Crop Count					Number of Operators				
County	Zone	Group	n'	S'(n'')	<u>Y</u>	S.E. (<u>Y</u>)	%S.E.	$V(\underline{Y}) \times 10^6$	$\frac{aA}{V(\underline{y})}$	<u>U</u>	S.E. (<u>U</u>)	%S.E.	$V(\underline{U}) \times$	$\frac{aG}{V(\underline{p})}$
1	2	+	4	14	69,862	48,565	69.5	2,358	99%	246	97	39.6	947	91%
		-	4	8	3,816	339	8.8	1	36%	318	69	22.4	4,764	92%
Zone 2			4	22	73,678	48,559	65.9	2,358		564	76	13.5	5,711	
1	4	+	24	56	13,385	7,190	53.7	52	98%	645	68	10.6	4,650	98%
		-	24	174	62,357	12,343	19.8	152	93%	3,667	141	3.9	20,001	89%
Zone 4			24	230	75,742	14,283	18.9	204		4,312	157	3.6	24,651	
County 1			28	252	149,420	50,616	33.9	2,562		4,876	174	3.6	30,362	
2	1	+	4	12	6,543	1,028	15.7	1	74%	94	10	10.7	101	81%
		-	4	8	3,352	1,608	48.0	3	31%	82	15	18.7	234	76%
Zone 1			4	20	9,895	2,000	20.2	4		176	21	11.9	435	
2	2	+	9	30	69,606	40,757	58.6	1,661	99%	550	9	1.7	90	80%
		-	9	54	26,765	3,507	13.1	12	90%	1,560	54	3.6	2,955	90%
Zone 2			9	84	96,371	40,902	42.4	1,673		2,110	55	2.6	3,045	
County 2			13	104	106,266	40,951	38.5	1,677		2,286	59	2.6	3,480	
Zones 2			13	106	170,049	63,491	37.3	4,031		2,764	94	3.4	8,756	
Cocoa Zones			17	126	179,944	63,522	35.3	4,035		2,850	96	3.4	9,191	
Survey			41	356	255,786	65,108	25.5	4,239		7,162	184	2.6	33,842	

Although, it was appreciated that, failing a complete check of the analyses, a sample of the computations made by each member of the team should have been checked, the time was not available to do this work.

MINOR COMPUTATIONS.

The following computations were also carried out:-

(a) Analysis of the crops grown in pure stands and simple combinations.

(b) Analysis of the crops related to fertilizer and sale practices.

(c) Analysis of the crops grown related to the nationality of the operator.

The first two analyses, though calculated on a size-strata basis, were computed in terms of the number of operators pursuing a given policy with a crop as a percentage of the total number of operators.

The latter analysis was computed in a similar manner, i.e. the number of operators growing a given crop as a percentage of the total number of operators of that nationality. No attempt was made at detailed analyses unless it was considered that significant differences were indicated in certain crops or attributes.

	Est. Plant Count (000)		Est. No. of Operators	
	253 ± 65	33.2	7,162 ± 1,54	2.6
	1,382 ± 433	33.2	4,996 ± 258	5.1
	1,303 ± 239	33.1	5,641 ± 292	3.2
	1,052 ± 502	27.7	2,755 ± 292	7.7
	532 ± 169	33.0	1,553 ± 233	15.5
	75 ± 25	33.7	1,202 ± 152	14.1
	29 ± 15	32.1	526 ± 173	27.2
	27 ± 22	34.5	1,932 ± 283	11.5

SECTION E - RESULTS.

The results given below have been derived from analyses based on a sample of 356 of the estimated 8,983 operators having food gardens in the three counties of Trinidad.

ESTIMATED PLANT COUNTS AND NUMBER OF OPERATORS GROWING EACH CROP.

SUMMARY OF FOOD CROP SURVEY

Crop	Est. Plant Count (000]	% S.E.	Est. No. of Operators	% S.E.
Banana	256 ± 65	25.5	7,162 ± 184	2.6
Cassava	1,962 ± 435	22.2	4,995 ± 256	5.1
Dasheen	1,308 ± 239	23.1	5,641 ± 292	5.2
Tannia	1,052 ± 502	47.7	3,755 ± 292	7.7
Eddoe	354 ± 88	24.9	1,707 ± 205	12.0
Pigeon Pea	950 ± 349	36.7	4,943 ± 269	5.4
Okra	68 ± 17	25.3	2,881 ± 263	9.1
Egg Plant	69 ± 15	22.0	2,389 ± 269	11.3
Beans	2,931 ± 5,510	188.0	1,050 ± 210	20.0
Yams	31 ± 15	50.2	1,616 ± 263	16.3
Tomatoes	285 ± 232	81.4	594 ± 125	21.0
Sugar Cane	68 ± 36	53.4	1,519 ± 192	12.6
Maize	1,452 ± 650	44.7	723 ± 173	23.9
Cucumber			591 ± 156	26.4
Pumpkin			1,381 ± 198	14.3
Sweet Potato	512 ± 169	33.0	1,353 ± 223	16.5
Topee Tambo	76 ± 26	33.7	1,109 ± 156	14.1
Pineapple	29 ± 15	52.1	658 ± 178	27.1
Peppers	87 ± 82	94.8	1,932 ± 223	11.5

SUMMARY OF FOOD CROP SURVEY (cont'd)

Operations, etc	Est. Plant Count (000)	% S.E.	Est. No. of Operators	% S.E.
Cutlass			6,922 $\pm$ 355	5.1
Forking			6,079 $\pm$ 336	5.5
Ploughing			954 $\pm$ 200	21.0
Home Consumed			7,710 $\pm$ 161	2.1
Casual Sales			609 $\pm$ 129	21.2
Marketing of Crops			634 $\pm$ 110	17.4
Organic Manure			3,349 $\pm$ 314	9.4
Artificial Manure			1,252 $\pm$ 186	14.9
Area	2,161 $\pm$ 258 acres	12.0		

In the main, there did not appear to be any distinct preference for growing a particular crop in a particular county. Between zones and size groups certain differences were apparent. Okra was predominantly grown in the large stratum. Egg plants were virtually not grown in the Northern Cocoa zone, whilst the majority of yams were found in the Central Cocoa zone on the small stratum holdings. Approximately 86% of the total pepper plants occurred on a few holdings in the large stratum of the Central Cocoa zone.

Ploughing was practised by only 10% of the operators and most of these were found in the sugar cane zone.

The standard errors for the quantitative values were higher than for the corresponding qualitative values. The excessively high standard error for the plant count on beans^{was} due almost entirely to one operator having approximately 3 acres of beans, producing in consequence an extreme plant count.

The values of $\alpha A/V(y)$ and $\alpha C/V(p)$ (as computed on the Crop Computation Sheet) were in most cases of the order of 95%. The significance of this will be shown later.

CROP AND SALE PRACTICES.

A further examination of the cultivation, fertilizer and sale practices of the operators gave the following results.

Attribute	Large Stratum		Small Stratum	
	No. of operators as a % of total in stratum and predominant crop code.		No. of operators as a % of total in stratum and predominant crop code.	
Pure stand	22.3%	16 59.1	9.4%	02
Combination	20.5%	01 x 05	8.2%	01 x 05
Art. Manure	33.0%	05; 00	10.2%	00
Org. Manure	38.4%	00	41.8%	00
Casual Sales	10.7%	01	6.1%	00
Marketing	32.1%	00; 05	0.8%	—

In the above table, the percentage of the total operators refers to all operators having or practising the particular attribute irrespective of the crop concerned.

It is thus seen that whatever the crop grown, one is more likely to find a pure stand or a definite combination of crops planted on a holding of over one acre than on a smaller holding. Also an operator on a larger holding is far more likely to use artificial manures (in most cases ammonium sulphate appeared to be used) than an operator on a holding of less than one acre.

There appeared to be little difference between strata regarding the use of organic manures. The regular sale of crops appears to be a large stratum practice.

With regard to the crops most commonly related to the above practices, dasheen was the main pure stand crop in the cocoa zones and sweet potatoes in the sugar cane zone. Pigeon peas was by far the most common crop in a simple combination, generally with cassava or eddoes.

Artificial manures were applied predominantly to pigeon peas in the cane zone; bananas and cassava throughout the whole area, whilst the fourth in the list was egg plants, though this

practice was exclusively in the cane zone.

The banana crop was the most common crop to receive organic manures over the whole area. Egg plants (mainly in the cane zone), cassava and pigeon peas were the other crops most commonly enumerated.

The crop most commonly marketed in the cocoa zone was bananas whilst pigeon peas was the main commodity marketed in the cane zone.

The above results are not exclusive to the crops mentioned, but they are an indication of the more commonly enumerated practices.

NATIONALITY.

There appeared to be no significant differences between the East Indian and Creole populations regarding the crops grown or the crop practices.

TIME AND COST STUDY.

The estimated time spent on the survey was 1313 man hours and an operating cost of \$392. This was divided as follows:-

<u>Preliminary Work</u>	<u>Time (Man-hrs.)</u>	<u>Travelling Cost \$</u>
Obtaining and selection of the sample	45	8
Preliminary surveying of the area	71	70
Preliminary statistical analysis	45	
Preparation of Maps	26	9
Preparation of Field Papers	34	
Total	<u>221</u>	<u>87</u>
<u>Field Work</u>		
Supervisory work	40	
Travelling to and from a task	116	235
Travelling within clusters	132	
Interviewing time	185	
Total	<u>453</u>	<u>235</u>

<u>Follow - up</u>	<u>Time (man-hrs.)</u>	<u>Travelling Cost \$</u>
Total travelling	25	42
Interviewing time	13	
Total	<u>38</u>	<u>42</u>
 <u>Analysis</u>		
Preparation for the analysis	134	
Computations	<u>232</u>	
Total	<u>366</u>	
General discussion	235	
Cost of Boards and Pads		10
Cost of paper		18

The total time represented 3.05 man-hours per operator interviewed. Of this the field work (including follow-up) accounted for 1.14 man-hours and the analysis for 0.85 man-hours. Thus at least one man-hour per operator was spent on the preliminary work and general discussions.

Considering the field work in more detail, the actual interviewing time was 0.43 man-hours per operator or an average of $12\frac{1}{2}$ minutes spent with each operator by a field unit. The travelling time, both between and within clusters, represented 0.58 man-hours per operator or an average of 17 minutes travelling time by a field unit.

No attempt has been made to value the time spent on this project. The writer is of the opinion that the time study is sufficiently detailed for the reader to cost this item for any given set of circumstances.

Thus, considering only the travelling expenses, approximately 1,800 miles were covered in the field work, including the follow-up, at a cost equivalent to 64 cents per operator interviewed. The overall expenses were equivalent to 92 cents per operator.

SECTION F - DISCUSSION AND CONCLUSIONS.

Though the Agricultural Survey data provided a suitable frame for the Food Crop Survey, the writer is of the opinion that the stratification imposed on the frame - namely the stratification according to the size of an operator's holding - does not appear to have been justified. From observations made in the field, it would appear that there was a correlation between neither the size of the food parcel nor the crop pattern within a parcel and the size of the holding.

The only differences that have been referred to, with respect to the size strata, are those concerning the crop and sale practices. Since those were only minor considerations in the survey it is doubtful if the increased accuracy gained due to stratification before selection was worth the extra work involved in the computations.

It may also be shown that if there had been no stratification according to the size of the holding prior to the selection of the sample, the analysis would not have "failed" due to certain cluster - size groups having no operators. Though the failure was corrected to some degree, it was not entirely satisfactory.

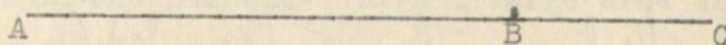
On the other hand, it may be argued that since there were three times as many operators in the frame having holdings under one acre than those having holdings over one acre in size, there should have been a variable sampling fraction. Such an argument, however, is irrelevant where it is considered that there is little difference in the variability in respect of the major factors of the enquiry. A pilot survey would have been very useful in indicating these deficiencies earlier in the survey.

The validity of the survey may be challenged on a second fault of the frame. The fault was the inclusion of operators who either had food parcels which did not strictly comply with the definition of the Food Crop Survey, i.e. food crops growing beneath tree crops, or who had no garden. The possible reasons for the

former fault have been described, and though the latter fault was partly due to the frame being out of date, some of the operators did not appear to have had gardens at all.

If in a random sample of 1 in 3, one operator is shown to have been wrongly included in the frame, then, assuming the population to be homogenous, two others in the frame may be placed in the same class. If this hypothesis is accepted, then it follows that however large the proportion rejected from the sample, a proportion equal to the product of the number rejected and the inverse of the sampling fraction can be rejected from the frame, and therefore any rejection does not alter the overall sampling fraction.

Does any such rejection invalidate the results? This question may be considered in the following manner. Suppose a well defined population to be represented by a line AB and the frame covering that population AB extends to a point C. One is



justified in rejecting the portion BC on the grounds that the whole of the population AB is covered in the remaining proportion of the frame.

Conversely if the population required is AC and BC is rejected, then the survey would not be valid since the whole of the population is not covered by the remaining portion of the frame.

The latter may be true where the frame is out of date. If a large number of operators no longer cultivate their gardens, is it likely that a large number of new operators have started cultivating gardens? If the investigator considers the answer is in the affirmative, then the survey is strictly invalid. In the present survey it was found that the number of people who had increased the number of parcels they cultivated since the Agricultural Survey was small. Thus it was considered probable that the number of new gardens cultivated would likewise be only a small proportion of the total population and would not significantly

invalidate the results.

It is thus seen that the frame, though out of date in certain features, was reasonably satisfactory for the purposes of the Food Crop Survey.

The main criticism of the methods used in the field work appears to be in respect of the estimation of plant counts. The method of selecting the areas for sample plant counts was not entirely satisfactory. There were 16 possible portions for the ten foot square to be placed in any parcel. Providing the garden was 40 feet square, the area was completely covered. If, however, the garden was larger, there was not a complete coverage and thus selection was biased. A consequent deficiency was that for a combination of two digits randomly selected from 0 to 3, there was a seven to nine chance of 0 being one of the digits. It is thus seen that with two sides of a plot marked in quarters, there were seven chances to nine of an edge effect being introduced, whatever the area of the parcel. With a large area there tended to be a bias due to edge effects. The use of line sample method or a more complex method of randomizing a square were considered to present too many difficulties in the field.

When the results of the quantitative analyses are examined it is seen that, although a relatively high degree of accuracy was aimed at by the use of detailed sample counts within a parcel, the standard errors derived are relatively high. If it could be shown that under similar circumstances eye estimates, as made by the enumerators in the Agricultural Survey, lost little in the reliability of the results, then a method utilizing sample counts may not be worth while in a large survey. Unfortunately at the time of writing, the Agricultural Survey Report has not been published.

Since a large variability was found between the first stage sampling units, the writer is of the opinion that a third stage in the sampling hierarchy would contribute but little to the total variance and there is little to be gained from attempting

to estimate plant counts to a high degree of accuracy.

This does not necessarily apply to such quantitative data as the area of the parcels. From the Agricultural Survey data the area of land in food crops included in the frame of the Food Crop Survey was 416 acres. Assuming a working sampling fraction of $1/10$, this represents an area of 4,160 acres for the whole area. However, the Food Crop Survey estimate was 2,161 $\pm$ 258 acres. There is then a considerable difference in the estimates. This may be due to poor estimation on the part of the enumerators - most gardens were found to be considerably smaller than the estimate given - or it may have been due to the fact that the acreage was only recorded to one decimal place. If the former applies, then an eye estimate does not appear very satisfactory, whilst if the latter is true then there is a need for a greater accuracy in recording.

Although certain improvements to the clip-card system used have been suggested, the writer considers that in this particular analysis the system could not have been used to its full advantage. The analyses were framed in such a manner that the computations had to be made cluster by cluster and hence the advantage of large scale sorting was lost. The time spent in the transference of the data was approximately half of that taken to do the computations. How long the computations would have taken if clip-cards had not been used is an unknown quantity! It is suspected that there was only a slight gain in efficiency. If the sampling scheme and hence the subsequent analyses had been much simpler, or if a larger number analyses using the same figures had been made, a clip-card system would have been more appropriate in the survey. This however was not appreciated at the time the decision was made to use clip-cards.

Certain advantages of the system were however apparent. In order to transfer the data to the clip-cards, the questionnaires

required to be coded and the data placed in an orderly and repetitive manner. Consequently a large amount of data was filed in a readily accessible form and in a relatively small space. Also the team considered that it was easier to refer to a card rather than to examine at least two questionnaires for each operator.

It has been suggested that clip-cards could have been used in the field. If this system had been adopted a large card would have been required in order that calculations need not have been made in the field and hence a mass of data irrelevant to the analysis would have remained on the card. Furthermore a rigid system of coding would have to have been devised prior to the field work. That would not have been possible as the team had only a vague idea of what they would encounter. It is conceivable that the direct use of cards in the field would have advantages on a purely qualitative type of survey.

The techniques adopted for coding the data appeared entirely satisfactory. The arrangement of the data in an orderly manner was a considerable advantage throughout the subsequent work.

It would have been advantageous in organizing the previous work if a skeleton analysis had been derived earlier on in the proceedings. The somewhat artificial limitations imposed on the formation of the frame and the subsequent stratification had a considerable influence on the complexity of the analysis. The variability between the number of operators in each cluster-size group was perhaps one of the greatest influences. Fortunately the final equation for deriving the variance of a particular factor was reduced to a simple one involving two series of constants and two mean squares. Thus the computations became tedious rather than laborious.

The qualitative computation sheets may have been more efficiently organized with the main part of the analysis computed in terms of u , rather than u/n . This, however, is a rather minor modification.

Both series of computations could have been greatly simplified. It has been shown that the term αA generally accounted for 90% or more of the total variance. It does not follow that the variance due to the first stage sampling was 90% of the total variance.

For example, in a two stage sampling scheme, a variate y can be regarded as made up of the sum of two parts, one, u , which varies from group to group, but has a fixed value for all units of a particular group, and the other, v , which varies from unit to unit independently of the groups. The variances of u and v are denoted by U and V respectively. In the analysis under discussion, the mean squares A and B provide estimates of U and V such that

$$A = V + \bar{n}_0 U$$

$$B = V \quad (Y. 8. 10) \dots\dots (24).$$

It is thus seen that although the term αA included the variance due to the first stage sampling, it also included a factor equal to the variance due to sampling at the second stage.

It may, however, be inferred that providing αA was a high proportion of the total variance (e.g. 90% or more), it would have been possible to ignore the computation of the term βB without losing a great deal of the accuracy. This would have considerably reduced the work involved in the computations. Whether such methods would have been suitable in this project is debatable.

The correction of the computations was somewhat lax it is admitted, but the writer believes that any gross errors became apparent and were corrected in the last stage of the computations.

The results produced from the survey show that this type of sample appears to be satisfactory to derive an estimate of a qualitative variate with ^agood degree of accuracy. A quantitative variate will be estimated with considerably less accuracy. This

tends to the conclusion that for many types of sample surveys, especially those concerned with providing such services as marketing facilities, a first estimate should be based purely on a qualitative analysis since this will produce the greatest degree of accuracy for the minimum input of labour and money. To have increased the accuracy of the quantitative estimates, it would have been necessary to greatly increase the sampling intensity at the first stage level.

Although it has been stated that the excessively high standard error for the plant count on beans is almost entirely due to the fact that one operator had a count that was well outside the distribution for the rest of the population, it would not have been justified to reject the parcel from the analyses. Since the sample is a random sample with a sampling fraction of $\frac{1}{2}$, it must be assumed that it is equally likely that at least one other operator in the cluster has a large area of beans. For this reason alone the analysis must be included as it stands.

The proportion of the land in food crops is small. The three counties have a total area of 368,436 acres and a population of 117,350. Of this less than 1/12th of the population cultivate food gardens on a very small part of the area. Regarding the productivity of this small area, the survey was unable to gain much information. Very few of the operators knew how much they sold, let alone the yield of a crop.

The results are thus most unsatisfactory in that the plant counts are only vaguely related to an acreage and do not give any indication of the productivity of the land.

A relationship to a definite area may have been gained by examining the pure stand plots and classifying the crops by the distance of the plant spacings in the field, large, medium or small. By weighting the plant counts, an estimate of the area occupied by each crop could have been made. To have taken this process a step further, i.e. to estimate the productivity either in terms of

various crop yields or in terms of starch equivalent produced per acre, would have given rather doubtful results.

Very few estimates of yields were available from the survey. Estimates of yields could, no doubt, have been obtained from the records of the College, the Eastern Caribbean Farm Institute and the District Agricultural Stations. The team considered, however, that such estimates would not represent a true estimate of the yields in the field, since they would have been made under conditions of cultivation far in advance of those used by the majority of the operators. Even to take a proportion of the values would not have significantly increased the confidence in the validity of the results.

For these reasons the results have been reported purely as plant counts in the hope that someone in the future may be stimulated to solve this very difficult problem in this type of survey.

Two points from the qualitative analyses are worth discussion. The survey had shown that only approximately 7% of the operators market any crops regularly, although one county lies between San Fernando and Port of Spain, both having relatively large markets. However, the large market garden area that serves Port of Spain is north of the Caroni river in the County of St. George and did not enter into this survey. The result does infer that beyond the County of St. George there is only a small trade with the peasant producers in food commodities.

The use of the plough was confined almost exclusively to the cane zone. It was noticeable that if you found one person in a cluster with his garden ploughed, then nearly every other operator would have his garden ploughed. The reason was that one man owned a tractor and probably did contract work on the sugar estate, then out of the cane season he hired himself and his tractor to his neighbours. Thus although 10% of the operators had part of their land ploughed, only a very few operators owned ploughing equipment.

It is difficult to see how the time spent in the field

could have been decreased. - The fact that the computations extended over a long period, due to the time available for project work being limited, may have increased the working time required. Beyond the fact that a reasonable estimate could have been obtained using only the first factor (αA) of the variance, probably only a simpler sampling scheme would have reduced the time taken to complete the computations.

If on top of the costs already considered, a charge is made for labour, one must inevitably become aware of the high cost of survey work. It would appear that the advantages to be gained must be seriously considered against the estimated costs before a survey is conducted.

The survey has produced some information on the composition of and the cultivation practices used in peasant food gardens. It has shown that the small operator, i.e. on a holding of less than 100 acres, has only a very minute area of the land and that in a free economy the contribution of such an operator in the area to commerce is very small, i.e. so far as the food crops included in the survey are concerned.

Whether a Government would be justified, even for political reasons, in promoting and subsidising a peasant farming industry is doubtful. However, the writer considers that the discussion of such broader topics are beyond the scope of this particular report, since whatever advice is given, politicians will always tend to take only that which helps their own political ends.

SECTION G - RECOMMENDATIONS.

Though the writer considers that general recommendations based on the results are out of place in this report, certain recommendations on the general methods of the Survey can be made.

Primarily any survey, especially one with a complex frame, requires careful planning throughout. If possible the opinion of a statistician should be sought early in the proceedings and a skeleton analysis devised. Whenever possible a pilot survey should be carried out to test both the field and the analytical methods. Certain refinements may then be introduced without any great loss of accuracy.

The use of clip-cards in survey work appears to have great value, providing the analysis is not complex and each computation involves a large number of units.

For accurate work there is a definite need for an unbiased method to be devised for the estimation of crop plants in a parcel. For a general large scale survey carried out by junior staff however, an eye estimate is probably the easiest method and the consequent decrease in accuracy is likely to be slight.

To obtain an estimate of the productivity of the land in terms of most food crops seems an insurmountable problem. Probably the method suggested in the discussion is a good approach provided a set of reliable standards are available.

For a purely exploratory survey of conditions in an area, a design involving a series of positive and negative answers appears to give the most reliable results and is the easiest type of survey to carry out.

SUMMARY

A sample Survey of the food crops grown in the counties of Trinidad has been made. Details of the frame, the sampling technique and the methods involved both in the field and the office have been described.

References have been made to certain general principles of sample surveys and to the advantages of a clip-card system of tabulating data.

The detailed theory of the analyses for this survey have been given, together with a set of worked examples.

The results of the survey have been tabulated and some remarks made on them.

A discussion has been made on the methods and the results of the survey and certain recommendations have been drawn.

Finally, the writer wishes to acknowledge the co-operation of the rest of the survey team, without whose labour, criticism and advice the survey would not have been satisfactorily completed.

ACKNOWLEDGEMENTS.

The writer wishes to place on record his thanks to Dr. A.L. Jolly both for the facilities granted by him as supervisor of this project and for his advice and criticism throughout the survey and the preparation of this report.

Thanks are also due to Mr. G.E. Hodnett of the Regional Research Scheme for his invaluable advice on all the statistical problems of the survey; to Mr. M. de Souza of the Central Statistical Office, Trinidad, for granting the team access to the Agricultural Survey records and without whose co-operation the Survey could not have been made; to Miss Alleyne of the Economics Department, I.C.T.A., for her assistance with some of the computations; and to the rest of the staff of the Economics Department for "services rendered".

Finally, the writer wishes to acknowledge the co-operation of the rest of the survey team, without whose labour, criticism and advice the survey would not have been satisfactorily completed.

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AGRICULTURAL SURVEY QUESTIONNAIRE

1. Name of person	2. Address	3. City	4. State	5. Zip	6. Date	7. Signature	8. Title

1. If you are a farmer, give number here:

2. If you are a farmer, check the appropriate box, ☒ Yes, ☐ No.

3. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

4. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

5. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

6. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

7. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

8. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

9. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

APPENDIX I.

AGRICULTURAL SURVEY QUESTIONNAIRES.

10. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

11. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

12. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

13. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

14. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

15. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

16. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

17. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

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19. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

20. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

21. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

22. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

23. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

24. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

25. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

26. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

27. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

28. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

29. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

30. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

31. If you are a farmer, check the appropriate box, ☐ Yes, ☐ No.

SAMPLE SURVEY OF AGRICULTURE - 1956.

CONTROL SHEET - TO BE COMPLETED FOR EVERY HOUSEHOLD IN THE CLUSTER

Interviewer No.	County No.	Cluster No.	Zone No.	Building No.	Household No.	Address of Building	No. of Households in this Building.

1. If NO INTERVIEW, give reason here: _____

2. TYPE OF BUILDING: (Tick in appropriate Block, thus ☐ ☒)

Dwelling House: ☐ 1 ☐ Dwelling and Business Combined: ☐ 2 ☐

Business Place: ☐ 3 ☐ Otherwise: ☐ 4 ☐ Specify: _____

3. How many Persons are there in this Household(i.e. those who normally sleep here)?

INCLUDE all Children and Nurses away from home but EXCLUDE Persons in Institutions

THE REST OF THIS FORM IS TO BE COMPLETED FOR PERSONS 15 YEARS OLD AND OVER IN THIS HOUSEHOLD

4. Name of Head of Household: _____

5. Name of Informant: (Write "do" if same as 4): _____

ASK Q. 6-11 SEPARATELY IN RESPECT OF EACH PERSON. Insert Answers For Each Person In A Single Column.

6. PERSON NUMBER:	1	2	3	4	5	6	7	8	9	10
7. AGE LAST BIRTHDAY:										
8. SEX ("M" or "F")										
9.1 How many Parcels of Land does this Person Control?										
9.2 What is the total acreage? (Excluding Land let out)										

IF LESS THAN ONE ACRE, Write Person No. and Name at 11.1 and GO ON TO FORM 2 ON REVERSE SIDE OF THIS SHEET

IF MORE THAN 100 ACRES, ASK NO FURTHER QUESTIONS.

With respect to 1-99 Acres Ask with respect to Land or Livestock	1	2	3	4	5	6	7	8	9	10
10.1 Does this Person make ALL the decisions? (Tick if "YES")										
If NO to 10.1 ask										
10.2 Does this Person make SOME of the decisions? (Tick if "YES")										

If "YES" to 10.1 or 10.2, Write this person's number and name below. If "YES" to 10.2, then Ask 11.2 and 11.3 also.

11.1 Person No. (as at 6)	NAMES OF ALL FARM OPERATORS IN THIS HOUSEHOLD	11.2 Which decisions does this person make?	11.3 Who makes the other decisions?

FOR EACH PERSON WHOSE NAME IS ENTERED IN 11.1, COMPLETE FORM 2 FOR LESS THAN 1 ACRE OR IF 1-99 ACRES COMPLETE A QUESTIONNAIRE (FORMS 3, 4 & 5)

DATE: _____

SIGNATURE OF INTERVIEWER: _____

FOR OFFICE

☐ H

USE ONLY

☐ F

11	12	23	24	35	46	57
15 - 18	19	20	21 - 24	25 - 44	45 - 59	60 +

SAMPLE SURVEY OF AGRICULTURE

"SMALL HOLDINGS"

Inter-viewer No.	County No.	Cluster No.	Zone No.	Building No.	Household No.	PERSON NO. on Control Sheet

To Be completed only for persons with less than ONE acre.

LIVESTOCK INCLUDING POULTRY

Q. 1 HOW MANY OF THE FOLLOWING TYPES OF LIVESTOCK HAVE YOU IN THE FARM/ESTATE/GARDEN?			
1. Cattle Total:		5. Sheep:	
1.1 Female Calves under 1 year:		6. Horses:	
1.2 Cows 1 - 3 years Old:		7. Donkeys:	
1.3 Cows over 5 years:		8. Mules:	
1.4 Bulls, Work Oxen & Steers:		9. Ducks:	
2. Buffaloes:		10. Turkeys:	
3. Pigs:		11. Geese:	
4. Goats:		12. Fowls(hens, chickens etc.)	

Tick relevant block - kept mainly for household use

1	
2	

- kept mainly for commercial purposes

Q. 2 DO YOU GROW FOOD CROPS? (Tick relevant block) YES

1	
2	

NO

If "YES" are they - Mainly for household use?

1	
2	

- Mainly for commercial purposes?

IF FOOD CROPS ARE GROWN MAINLY FOR COMMERCIAL PURPOSES, GIVE DETAILS HERE:

CROPS	No. of Lots	No. of Plants	REMARKS

Q. 3. Are you a member of an Agricultural Credit Society

YES	1	
NO	2	

If YES, which one?

LIVESTOCK PRODUCTION AND EMPLOYMENT.

TO BE COMPLETED FOR ALL OPERATORS OF 1 - 99 ACRES INCLUSIVE

Interviewer No.	County No.	Cluster No.	Zone No.	Building No.	Household No.	Person No. on Control Sheet

LIVESTOCK INCLUDING POULTRY

Q. 1. HOW MANY OF THE FOLLOWING TYPES OF LIVESTOCK HAVE YOU ON THE FARM/ESTATE/GARDEN ?

1. Cattle Total:		5. Sheep:	
1.1 Female Calves under 1 year		6. Horses:	
1.2 Cows 1 - 3 years old:		7. Donkeys:	
1.3 Cows over 3 years:		8. Mules	
1.4 Bulls, Work Oxen & Steers:		9. Ducks:	
2. Buffaloes:		10. Turkeys:	
3. Pigs:		11. Geese:	
4. Goats:		12. Fowls (hens, chickens etc.):	

MILK PRODUCTION

Q. 2. How many Cows were milked yesterday?	
Q. 3. How many bottles of Milk did they give yesterday ?	
Q. 4. How many bottles of Milk were sold yesterday ?	
Q. 5. How many bottles of Milk were used by members of the household yesterday?	
Q. 6. How many bottles of this Milk were fed back to calves yesterday ?	
Q. 7. What kind of BOTTLE do you use? RUM BOTTLE? (Tick "YES") If "NO" Specify other type(s) of Bottle(s) used	

EGG PRODUCTION

Q. 8. How many eggs did the hens lay last week?	
Q. 9. How many eggs were sold last week ?	
Q. 10. How many eggs were eaten by members of this household last week ?	
Q. 11. How many of the eggs collected last week were kept for hatching?	

EMPLOYMENT

Q. 12. Did this person work on the farm for at least 16 hrs. last week? (Yes/No)	
Q. 13. What other kinds of work does this person do besides operating this Estate/ Farm/Garden?	
Q. 14. How many persons of the household worked on the farm last week for at least 16 hours without pay?	
Q. 15. How many persons, (household or otherwise) were paid to work the farm last week ?	
Q. 16. How many of these persons were paid by the Job ?	
Q. 17. How many persons were paid to do clerical or managerial work ?	

Q. 18. Are you a member of an Agricultural Credit Society? Tick YES

1

NO

2

If "YES" which one ?

SAMPLE SURVEY OF AGRICULTURE - 1956

LAND AND LAND TENURE

TO BE COMPLETED FOR ALL THE LAND UNDER THE CONTROL OF THE OPERATOR.

INTERVIEWER NO.	COUNTY NO.	CLUSTER NO.	ZONE NO.	BUILDING NO.	HOUSEHOLD NO.	PERSON NO. ON CONTROL SHEET

P A R C E L N O.	1	2	3	4	5	6
1. What is the acreage of this parcel?						
2. How much is rented out, leased out, or given out to others?						
3. Actual acreage operated (1 less 2)						

TENURE OF LAND

Put a tick in the appropriate square if "Yes". If not 4 or 5 or 6 for any parcel, give the parcel No. and details in 7 e.g. of any contracts.

4. Is this parcel <u>owned</u> by the operator?						
5. Is this parcel <u>rented</u> or leased by the operator?						
6. Is this parcel <u>only managed</u> by the operator?						
7. Otherwise: Give parcel No. and details of the tenure:						

LAND UTILISATION

A C R E A G E S

8. Built on areas, including farm yards, railways, main irrigation and drainage trenches:						
9. Swamp and Inland Water, if included in 1:						
10. Waste, unuseable land (too steep, rocky, and barren, and not used for rough grazing):						
11. All forest, bush, lastro, etc. including abandoned Tree Crops:						
12. Cultivated Land (tree and other crops including fodder grass):						
13. All grazing land (cultivated or rough):						
14. Land under preparation for agricultural use: (formally abandoned or not used for agricultural purposes)						
15. Other uses e.g. quarries, sand pits etc: Specify:						
16. TOTAL 8 - 15. (Check against 3).						

NOTES:

SAMPLE SURVEY OF AGRICULTURE - 1956

CROPS GROWN

INTERVIEWER NO.	COUNTY NO.	CLUSTER NO.	ZONE NO.	BUILDING NO.	HOUSEHOLD NO.	PERSON NO. ON CONTROL SHEET

		A		A		A		A		A		A		A	
		B		B		B		B		B		B		B	
		ACRES	NUMBERS	ACRES	NUMBERS	ACRES	NUMBERS	ACRES	NUMBERS	ACRES	NUMBERS	ACRES	NUMBERS	ACRES	NUMBERS
Write "p" if pure stand:															
1.	Sugar Cane: (Plants:														
2.	(Ratoons)														
3.	Rice: (Plants:														
4.	(Ratoons:														
5.	Cocoa: New Clonal														
	(Bearing)														
6.	New Clonal														
	(Non-Bearing)														
7.	Rehabilitated:														
8.	Old:														
9.	Coffee: Bearing:														
10.	Non Bearing														
11.	Coconuts: Bearing														
12.	Non Bearing														
13.	Bananas:														
14.	Plantains														
15.	Oranges: Bearing														
16.	Non Bearing														
17.	Grapefruits: Bearing:														
18.	Non Bearing:														
19.	Other Citrus: Bearing														
20.	Non Bearing														
21.	Tonca Beans:														
22.	Other Trees:														
23.	Cassava:														
24.	Yams:														
25.	Sweet Potatoes:														
26.	Dasheen/Eddoes/ Tannia:														
27.	Corn (Maize)														
28.	Pigeon Peas:														
29.	Other Peas & Beans:														
30.	Cabbage:														
31.	Pumpkin/Cucumber Water Melon:														
32.	Other Vegetables:														
33.	Fodder Grass:														
34.	Pineapples:														
OTHERS: (SPECIFY)															

WHAT CROPS, WHICH YOU HAVE ALREADY REMOVED, WERE PLANTED ON THIS PARCEL IN THE PAST 12 MONTHS?

SAMPLE SURVEY OF AGRICULTURE - 1956

INTERVIEWER NO.	COUNTY NO.	CLUSTER NO.	ZONE NO.	BUILDING NO.	HOUSEHOLD NO.	PERSON NO. ON CONTROL SHEET

[illegible]

WHAT CROPS, WHICH YOU HAVE ALREADY REMOVED, WERE PLANTED ON THIS PARCEL IN THE PAST 12 MONTHS?

Appendix II. Summary of Sample

Sample No.		Depth	Over 1 acre			Under 1 acre		Total	
Core	Depth		Operations	Parcels	Acres	Operations	Acres	Operations	Acres
01	01	1	0	0	0.5	7	1.8	9	2.3
02	02	4	-	-	-	4	0.4	4	0.4
03	03	4	-	-	-	9	1.1	9	1.1
04	04	4	-	-	-	3	0.3	3	0.3
05	05	2	1	1	0.5	6	1.7	9	2.2
06	10	4	2	3	1.3	13	2.4	18	3.7
07	13	8	3	4	2.0	3	0.3	6	2.3
08	15	4	3	4	3.0	6	2.1	9	5.1
09	16	4	15	16	6.7	10	2.4	25	9.1
10	17	4	1	1	1.0	3	0.3	4	1.3
11	18	4	5	5	2.2	9	1.3	14	3.5
12	19	4	6	7	4.1	4	1.3	10	5.4
13	20	4	6	6	3.0	6	1.0	12	4.0
14	21	4	-	-	-	6	0.8	6	0.8
15	22	4	1	1	1.1	11	1.2	12	2.3
16	23	4	3	3	4.4	6	1.7	9	6.1
17	24	4	-	-	-	9	0.9	9	0.9
18	25	1	1	1	0.3	12	1.2	10	1.5
19	26	3	0	0	0.0	2	0.2	2	0.2
20	27	2	2	2	4.3	1	0.1	4	4.4
21	28	4	2	2	1.0	11	1.2	12	2.2
22	29	4	0	0	2.1	5	2.2	11	4.3
23	30	1	2	2	1.0	8	1.3	10	2.3
24	31	4	-	-	-	10	1.7	16	1.7
25	32	4	-	-	-	11	1.7	11	1.7
26	33	4	2	2	1.0	17	1.7	19	2.7
27	34	1	1	1	0.1	9	1.4	10	1.5
28	35	2	3	3	2.0	7	2.0	10	4.0
Total			53	58	36.4	217	35.5	290	71.9

County 1 - County of Caroni.

Cluster No.		ZONE	Over 1 acre			Under 1 acre		Total	
I.C.T.A	Agric.		Operators	Parcels	Acres	Operators	Acres	Operators	Acres
01	01	4	2	2	0.5	7	1.8	9	2.3
02	03	4	-	-	-	4	0.4	4	0.4
03	05	4	-	-	-	8	1.1	8	1.1
04	07	4	-	-	-	3	0.3	3	0.3
05	09	4	1	1	0.5	8	1.7	9	2.2
06	11	4	3	3	1.3	13	2.4	16	3.7
07	13	2	3	4	2.9	3	0.3	6	3.2
08	15	4	3	4	3.0	6	2.1	9	5.1
09	16	4	13	19	6.7	10	2.4	23	9.1
10	17	4	1	1	1.0	3	0.3	4	1.3
11	18	4	5	6	2.9	9	1.8	14	4.7
12	19	4	6	7	4.1	4	1.8	10	5.9
13	20	4	6	6	6.7	6	1.6	12	8.3
14	21	4	-	-	-	8	0.8	8	0.8
15	22	4	1	1	1.1	11	1.2	12	2.3
16	23	4	3	5	4.4	6	1.7	9	6.1
17	24	4	-	-	-	9	0.9	9	0.9
18	25	4	1	1	0.5	12	1.2	13	1.7
19	26	2	6	6	6.6	2	0.9	8	7.5
20	27	2	3	3	4.5	1	0.1	4	4.6
21	28	4	2	2	1.8	11	1.9	13	3.7
22	29	4	6	8	2.1	5	2.2	11	4.3
23	30	4	2	2	1.2	8	1.1	10	2.3
24	31	4	-	-	-	16	1.7	16	1.7
25	32	4	-	-	-	11	1.7	11	1.7
26	33	4	2	3	1.6	17	1.7	19	3.3
27	34	4	1	1	0.1	9	1.4	10	1.5
28	35	2	3	3	2.9	7	2.0	10	4.9
Total			73	88	56.4	217	38.5	290	94.9

County 2 - County of St. David and St. Andrew

Cluster No.		ZONE	Over 1 acre			Under 1 acre		Total	
I.C.T.A.	Agric		Operators	Parcels	Acres	Operators	Acres	Operators	Acres
01	01	1	1	1	1.0	6	1.1	7	2.1
02	03	2	1	1	2.0	5	0.5	6	2.5
03	05	2	9	10	6.2	1	0.2	10	6.4
04	07	1	2	2	3.0	2	0.2	4	3.2
05	08	2	12	17	9.5	11	2.2	23	11.7
06	09	2	1	2	1.5	9	0.9	10	2.4
07	10	1	4	6	9.5	2	0.2	6	9.7
08	11	2	5	6	7.1	13	2.1	18	9.2
09	12	2	8	10	9.6	4	0.4	12	10.0
10	13	1	7	10	13.5	-	-	7	13.5
11	14	2	1	1	1.0	14	1.4	15	2.4
12	15	2	5	6	2.5	5	1.2	10	3.7
13	16	2	8	9	17.8	4	0.4	12	18.2
Total			64	81	84.2	76	10.8	140	95.0

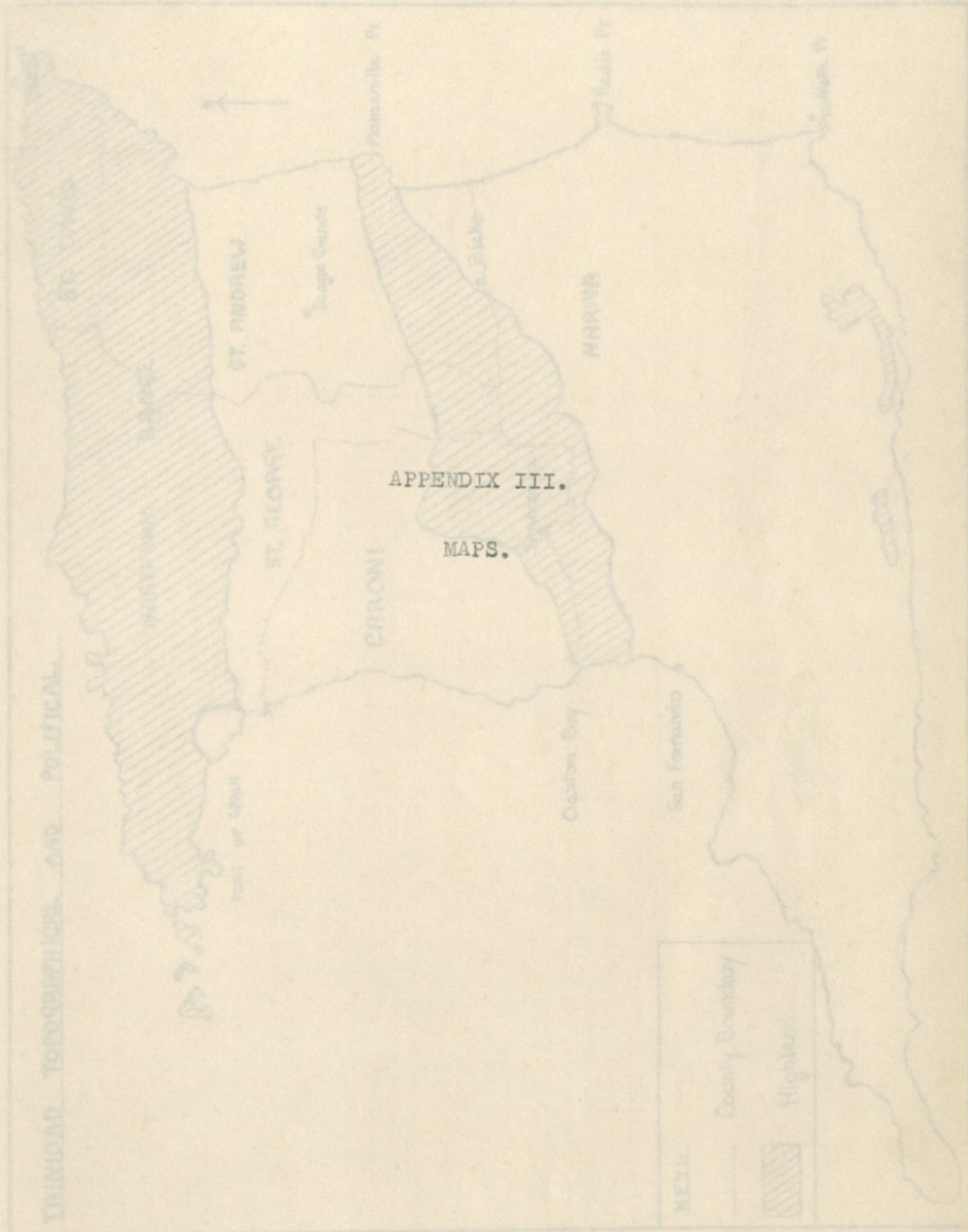
ZONAL DISTRIBUTION

Zone No.	County No.	Clusters	Over 1 acre			Under 1 acre		Total	
			Operators	Parcels	Acres	Operators	Acres	Operators	Acres
1	2	4	14	19	27.0	10	1.5	24	28.5
2	1	4	15	16	16.9	13	3.3	28	20.2
	2	9	50	62	57.2	66	9.3	116	66.5
Total		13	65	78	74.1	79	12.6	144	86.7
4	1	24	58	72	39.5	204	35.2	262	74.7
<u>COUNTY DISTRIBUTION</u>									
	1	28	73	88	56.4	217	38.5	290	94.9
	2	13	64	81	84.2	76	10.8	140	95.0
Grand Total		41	137	169	140.6	293	49.3	430	189.9

ESTIMATED SAMPLING FRACTIONS (SECOND STAGE SAMPLING) BASED ON AGRICULTURAL SURVEY DATA

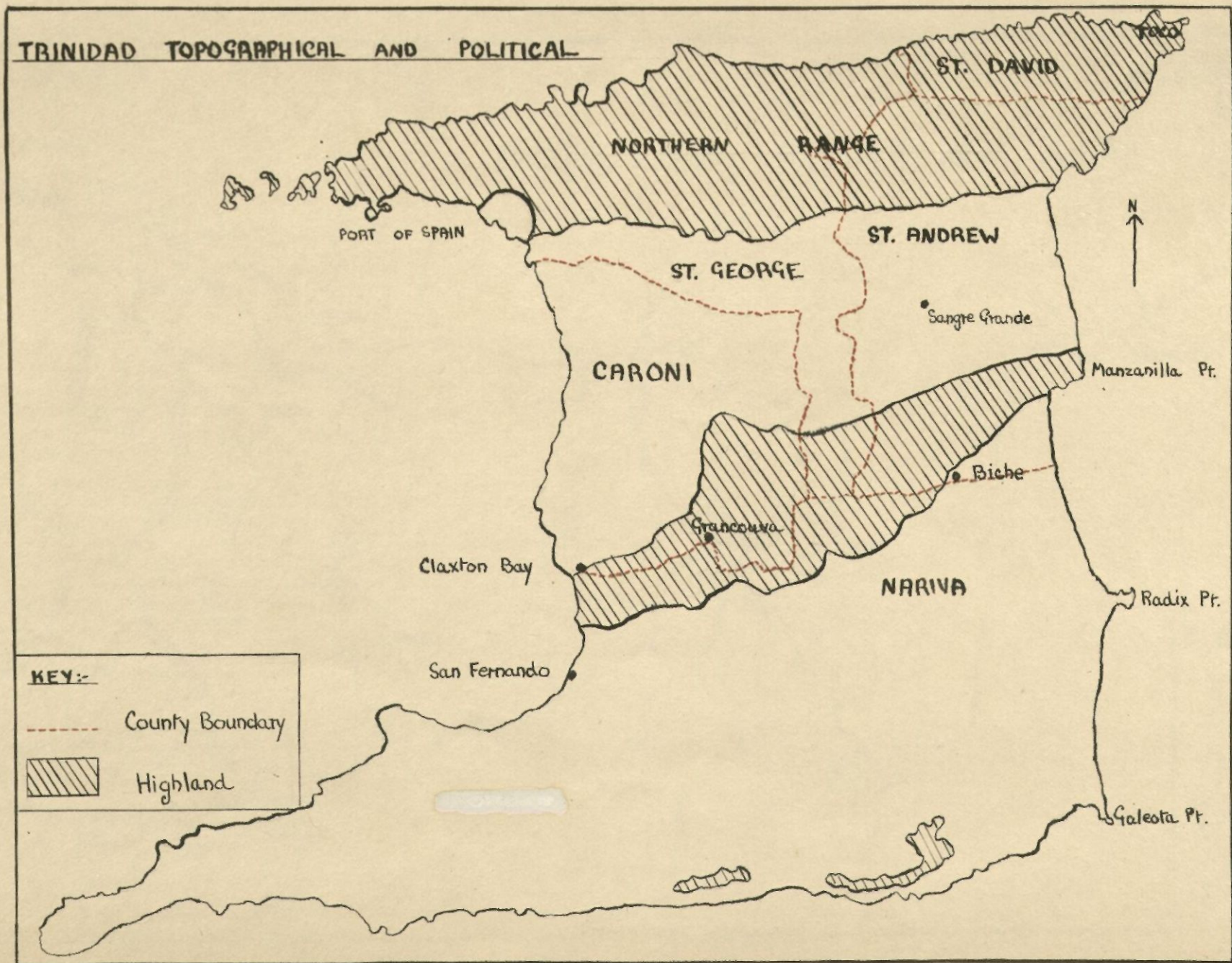
County	Zone	Group	Within Frame		Within Sample		Sampling Fraction Based on	
			Operators	Acreage	Operators	Acreage	Operators	Acreage
1	2	+	29	36.4	15	16.9	0.517	0.464
		-	36	8.2	13	3.3	0.361	0.402
	4	+	107	80.1	58	39.5	0.542	0.493
		-	586	112.5	204	35.2	0.348	0.313
County 1		+	136	116.5	73	56.4	0.537	0.484
		-	622	120.7	217	38.5	0.349	0.319
2	1	+	25	36.3	14	27.0	0.560	0.743
		-	26	4.5	10	1.5	0.384	0.333
	2	+	88	112.1	50	57.2	0.568	0.510
		-	188	25.9	66	9.3	0.351	0.359
County 2		+	113	148.4	64	84.2	0.566	0.567
		-	214	30.4	76	10.8	0.355	0.355
Survey		+	249	264.9	137	140.6	0.550	0.530
		-	836	151.1	293	49.3	0.350	0.326

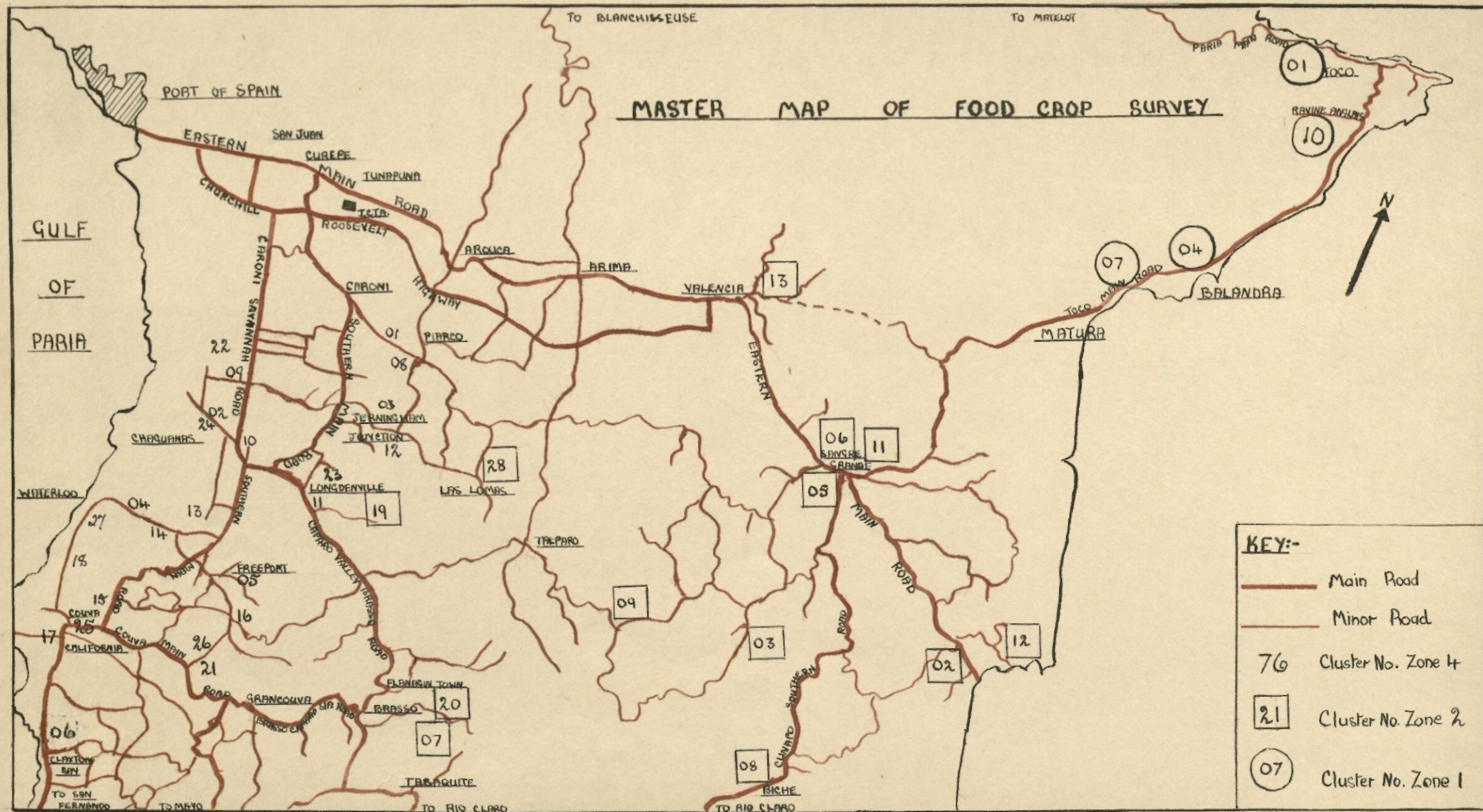
TRINIDAD TOPOGRAPHICAL AND POLITICAL



APPENDIX III.
MAPS.

TRINIDAD TOPOGRAPHICAL AND POLITICAL





FIELD PAPERS OF THE FOOD CROP SURVEY.

Section I. FIELD PAPERS OF THE FOOD CROP SURVEY.

1. On a given locality the survey was made in 1934.

2. The field observations were made in 1934. The survey was made in 1934.

(1) In the field the survey was made in 1934. The survey was made in 1934.

(2) In the field the survey was made in 1934. The survey was made in 1934.

(3) In the field the survey was made in 1934. The survey was made in 1934.

(4) In the field the survey was made in 1934. The survey was made in 1934.

Section II. FIELD PAPERS OF THE FOOD CROP SURVEY.

1. On a given locality the survey was made in 1934.

2. The field observations were made in 1934. The survey was made in 1934.

(1) In the field the survey was made in 1934. The survey was made in 1934.

(2) In the field the survey was made in 1934. The survey was made in 1934.

APPENDIX IV.

FIELD PAPERS OF THE FOOD CROP SURVEY.

1. On a given locality the survey was made in 1934. The survey was made in 1934.

2. The field observations were made in 1934. The survey was made in 1934.

(1) In the field the survey was made in 1934. The survey was made in 1934.

(2) In the field the survey was made in 1934. The survey was made in 1934.

Section III. FIELD PAPERS OF THE FOOD CROP SURVEY.

1. On a given locality the survey was made in 1934. The survey was made in 1934.

2. The field observations were made in 1934. The survey was made in 1934.

(1) In the field the survey was made in 1934. The survey was made in 1934.

(2) In the field the survey was made in 1934. The survey was made in 1934.

(3) In the field the survey was made in 1934. The survey was made in 1934.

(4) In the field the survey was made in 1934. The survey was made in 1934.

Section IV. FIELD PAPERS OF THE FOOD CROP SURVEY.

1. On a given locality the survey was made in 1934. The survey was made in 1934.

2. The field observations were made in 1934. The survey was made in 1934.

(1) In the field the survey was made in 1934. The survey was made in 1934.

(2) In the field the survey was made in 1934. The survey was made in 1934.

(3) In the field the survey was made in 1934. The survey was made in 1934.

(4) In the field the survey was made in 1934. The survey was made in 1934.

Section V. FIELD PAPERS OF THE FOOD CROP SURVEY.

1. On a given locality the survey was made in 1934. The survey was made in 1934.

2. The field observations were made in 1934. The survey was made in 1934.

(1) In the field the survey was made in 1934. The survey was made in 1934.

FIELD INSTRUCTIONS (MEASUREMENTS)

1. Record LENGTH OF PACE under field conditions (e.g. 20 = 16 yds.)
N.B. On a given holding one person must do all pacing.
2. PAGE out field dimensions, the BOUNDARY being the extent of the operators FOOD CROPS (excluding bananas).
(ii) If the house etc. comes WITHIN the food garden, pace out extent of house + courtyard + flower garden (to be excluded from calculation of plot area).
N.B. Record figures on a rough sketch plan.
3. (i) Pace out PURE STANDS.
(ii) SAMPLE THESE (One sample per pure stand). Place the 10ft square on a REPRESENTATIVE part and count food plants.
4. Record number of BANANA STOOLS and number of SEPARATE PATCHES OF PUMPKIN OR WATER-MELON.
5. SELECTION OF SAMPLE AREAS IN PLOT:-
N.B. Take 2 samples if GIVEN ACREAGE is 0.1 and 4 samples if over 0.1
(i) Number of NEAREST CORNER of field is 1, and other corners 2,3,4 in a CLOCKWISE direction.
STARTING CORNER for the 2 (or 4) samples is given by RANDOM No. (A).
(ii) LOCATE SAMPLING POINT according to random Nos. (B)
N.B. (a) EXCLUDE pure stands, flower garden, etc.
(b) CALCULATE No. OF PACES required by the fraction given by the sampling No. ($0 = 0, 1 = \frac{1}{4}, 2 = \frac{1}{2}, 3 = \frac{3}{4}$ of a plot side)
(iii) Lay down SAMPLE SQUARE parallel to sides of field and to FRONT and LEFT of LOCATED POINT.
N.B. WHEN sample would fall OUTSIDE field, place to FRONT and RIGHT.
6. COUNTING OF PLANTS IN SAMPLE AREAS:-
Count Nos. of each food plant present in the 10ft x 10ft square ACCORDING TO THE FOLLOWING DEFINITIONS:-
GROUND PROVISIONS:-
(i) CASSAVA. Count EACH STEM emerging from soil.
(ii) DASHEEN, EDDOES, TANNIA. Count EACH CROWN; IGNORE small offsets.
(iii) SWEET POTATOES. Count or Cal- } (1) Record (a) STEMS (OR SETS) in 10ft
 } or 10 square ft.
(iv) YAMS. Count or calculate } and (b) TOTAL ROW, LENGTH OR AREA
 } COVERED WITHIN SAMPLE
 } (write e.g. 16X 56ft or 18 X 33 sq.ft)
 } OR(2) COUNT ALL STEMS (OR SETS) IN SAMPLE.
 } (WRITE E.G. 25)
- OTHERS:-
(i) CORN. Count EACH MAIN STEM. (ii) OKRA. Count EACH CLUMP OF stems.
(iii) PIGEON PEAS. Count EACH STEM emerging.
(iv) OF FOLLOWING COUNT STEMS EMERGING (or "Calculate by" Method used with Sweet Potatoes)
BEANS - POLE TYPE.
BODI BEANS.
SPINACH - CLIMBING TYPE.
(v) OF FOLLOWING COUNT EACH BUSH OR PLANT:-
BEANS (BUSH OR DWARF), BEET, CABBAGE, CHRISTOPHINE, CAULIFLOWER, EGG-PLANT,
LETTUCE, PEPPER, PINEAPPLE, SPINACH (BUSH TYPE), TOMATO.
(vi) MISCELLANEOUS:-
CARROTS. Count No. of FEET OF ROW. 4" = 1 PLANT. WRITE E.G. 20(ft) x 3
CUCUMBER. Count No. of "HILLS"
LEEK. Count No. of "HILLS"
MUSTARD. Count No. of SQUARE FEET.
ARROWROOT, ONION, SHALLOTS, TOPEE TAMBOO. Count No. of SETS
(BANANA and PUMPKIN - See Section (4) above)

COUNTY	ZONE	CLUSTER	BUILDINGS	No: PLOTS	NAME

DATE	INTERVIEWER	ACREAGE (measured)	ACREAGE	PLOT	ADDRESS

RANDOM NUMBERS		A					FOREST AND AREA	TOTAL
		B						
CROP			SPL 1	SPL 2	SPL 3	SPL 4		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								

COMBINATIONS:

COUNTY	ZONE	CLUSTER	BUILDINGS	No: PLOTS	NAME
DATE	INTERVIEWER	ACREAGE	PLOT	ADDRESS	

CROP	DISPOSAL %			MANURES		YIELD	REMARKS
	HC	CS	M	ART	ORG		
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

CULTIVATION (i) Land cleared annually _____ (a) Forked _____
 (b) Ploughed _____
 (ii) Non food crops grown in last 2 years _____

COMBINATIONS (e.g. 1 & 2)

REASONS FOR COMBINATIONS:

GENERAL:

SAMPLE SURVEY UNIT

LOG SHEET

Area _____ Clusters _____ Date _____

Enumerators _____ Vehicle No: _____

Departure: Time _____ Mileometer reading _____

Return: _____

Journey Time: Out _____ In _____

Interview	Bldg.No.	Time (Man-hours)
-----------	----------	------------------

1

2

3

4

5

Lunch

6

7

8

9

10

VIII-

IX-

X-

8/10-

Enumerators Report.

Sample	Depth (m)	Size (mm)	Time (h)	Temp (°C)	Pressure (atm)	Volume (ml)	Weight (g)	Concentration (%)	Notes
1	10	10	10	10	10	10	10	10	
2	20	20	20	20	20	20	20	20	
3	30	30	30	30	30	30	30	30	
4	40	40	40	40	40	40	40	40	
5	50	50	50	50	50	50	50	50	
6	60	60	60	60	60	60	60	60	
7	70	70	70	70	70	70	70	70	
8	80	80	80	80	80	80	80	80	
9	90	90	90	90	90	90	90	90	
10	100	100	100	100	100	100	100	100	

APPENDIX V.

SAMPLING FRACTIONS AND RAISING FACTORS.

County	Zone	Group	n'	S' (n'')	f'	$\bar{f}''$	α	β	<u>N</u>
1	2	+	4	14	4/51	15/29	0.0672	0.0028	345
		-	4	8	4/51	13/36	0.1626	0.0088	424
	4	+	24	56	24/227	58/107	0.0175	0.0009	977
		-	24	174	24/227	204/586	0.0052	0.0004	4,727
2	1	+	4	12	4/21	14/25	0.0888	0.0092	113
		-	4	8	4/21	10/26	0.1428	0.0207	109
	2	+	9	30	9/97	50/88	0.0335	0.0015	569
		-	9	54	9/97	66/188	0.0173	0.0011	1,719