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IX. AGRICULTURAL SURVEY

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## Objects of the Survey.

The primary objectives of the survey were as follows:

(1) To obtain, as accurately as possible, the acreage devoted to food gardens in the area surveyed.

(11) To determine the constituents of these food gardens, i.e. the actual crops grown, and to obtain some measure of their relative importance within the gardening system.

(111) The collection of as much secondary information about these crops as possible, i.e. the methods of husbandry, such as manurial and rotation practices, use of combinations, method of disposal, etc., and any other details which might prove of interest such as difference in gardening practices between racial groups of operators (gardeners).



### Scope of the Survey.

A food garden was defined as being a plot of land which was devoted to the growing of food crops and ground provisions.

For the purpose of the survey, food crops and ground provision included spices and fruits as well as vegetables, but excluded tree crops. (These were considered to be more typical of plantation agriculture) and cereals, which are usually grown in pure stands, with maize being the one exception. Bananas and plantains were not considered to be tree crops and came within the scope of the survey.

Where food crops were grown under a tree crop the latter was considered to be the primary crop, and therefore could not be considered within the scope of the survey. Preliminary investigation into this question in the field, showed that such crops were not likely to be of much significance; for it was found that the planting distances were extremely variable and the usual standard of husbandry low, making the estimation and tabulation of these crops not only difficult, but unreliable. As a practical example of this problem root crops such as tannia and dasheen are often found growing irregularly under cocoa but are not harvested annually, or indeed at any regular intervals, if at all.

As food gardens are predominantly characteristic of peasant agriculture, food crops grown on holdings of more than 100 acres were to be excluded from the survey. The grounds for this decision were that, where such crops did occur they were unlikely to be typical, and to avoid the possibility of unnecessarily increasing the standard error of the results.

(VII) Cocoa areas (South)



## Design of the Survey.

### Introduction.

Before starting a survey, such as this one on food gardens, it is first necessary to find out what information is already available about both the proposed area of the survey and the factors to be surveyed. By so doing it is possible to produce a workable frame that has the best chance of standing up to field conditions and minimising the possible error of the results.

### Available Information. (The Government Survey)

Although there was little published information of any value on our subject, it was known that an Agricultural survey of Trinidad had, at that time, recently been completed for the Government. The Government statistical office in Port of Spain was therefore approached for information. Although the compilation of their work was not complete they kindly gave us every assistance and made available all the known data for our use.

Our findings were as follows:

1. That the whole of Trinidad had been divided into seven zones depending on the predominant use of land for that area. Briefly, these seven consisted of: (I) Urban areas

(II) Forest areas

(III) Sugar cane areas

(IV) Rice areas

(V) Cocoa areas (North)

(VI) Cocoa areas (Central)

(VII) Cocoa areas (South)

2. That all the dwellings in Trinidad had conveniently been divided up into "Clusters" by the Malaria Division of the Government Department of Health. The basis of this Cluster system was the grouping together of those dwellings that contained approximately 150 adults i.e. those over 15 years of age, into geographical units.

Furthermore sketch maps of each Cluster were available showing the position of each dwelling, and code numbered to coincide with a list



of the occupiers.

3. The frame used for the Government survey was designed to make use of the Clusters already mentioned, and a random selection of one out of every ten of all Clusters had been made. Every dwelling within each Cluster had been examined: here the word dwelling is almost entirely synonymous with the word holding, certainly so for the rural areas as every house is accompanied by some land which is nearly always utilised for crops. A questionnaire was filled in for each dwelling and consisted of a very wide variety of facts of Agricultural interest, including whether or not food crops were grown.

Holdings within each Cluster were further stratified into three groups. These were: (1) Those under 1 acre  
(11) Those between 1 and 99 acres  
(111) Those greater than 100 acres.

4. The results of this questionnaire showed that a very high proportion of householders within the selected Clusters did, in fact, grow food crops of some sort. Although crops grown under trees were discounted, (the area subscribed to these being put down to the particular tree crop in question), there was no attempt to differentiate between the crops grown.

The acreage ascribed to food crops was thought to be liable to error, as, due mainly to pressure of time, many food gardens had been estimated by eye, and all the small gardens had been entered as being 1/10th of an acre; a common size for house "lots" in Trinidad, which of course, includes the area occupied by the house, paths, drains, etc.

#### Frame of the Survey.

In the determination of a frame for our own use we were faced with the problem, common to most surveys, of satisfactorily reconciling two separate groups of factors which tend to oppose one another, so that the general principles of sound statistical practice can be maintained. Namely, that of gathering as much information as possible, over as wide a field as possible, coupled with the greatest degree of accuracy. i.e. Minimising the error and at the same time



preventing the field covered from becoming so narrow that the results obtained become valueless.

In our particular case there were three main limiting factors.

- (1) The size of the team available for field work. i.e. eight students.
- (11) The time available for field work was limited to the Christmas vacation i.e. three weeks.
- (111) The amount of field work that could be carried out in a day.

Our frame therefore had to take these factors into consideration. As only the third left any scope for adjustment it was realised that some time could be gained by carefully planning the system of field techniques i.e. methods of recording and measurement.

For the frame itself, it was felt that the Statistical Department's selection of one Cluster in ten had much to recommend it, both from the statistical point of view, reconciling accuracy with coverage, and for saving of time. We therefore decided that the same Clusters as were used in the previous survey should form the basis for ours in the area to be chosen for survey.

Some modifications were still necessary, however, if sufficient coverage was to be obtained. If, for example, we were to measure and record crops on every holding in the Cluster, as had been done previously, we would only be able to complete work in a relatively small number of clusters. We, therefore, decided to make a further random selection within the holdings of each cluster. By so doing it was estimated that some forty or so clusters could be covered in the time (based on an estimate of 8 farms a day for each pair of enumerators).

The final result was that all the holdings recorded as growing food crops were taken, (the stratification based on size was maintained, except for those holdings over 100 acres which were discarded for reasons already mentioned) and a random selection of 1 in 3 was made for holdings under one acre and a selection of 1 in 2 made of those holdings between 1 and 99 acres.



In this way a total of 358 operators were selected from 41 Clusters. Of these 246 were in the under one acre group, and 112 operators with holdings of over one acre.

#### Area Selected.

The area chosen for the survey consisted of the counties of Caroni, St. Andrew and St. David, and represents 29% of the land area of Trinidad, 37% of the cultivated area and contains 16% of the population. The reasons for this choice were threefold.

- 1) It allowed for a comparison of Crop Zones
- 2) Proximity to I.C.T.A.
- 3) The number of holdings.

1) The area selected allows for a comparison between three Crop Zones, namely:

- (a) Zone one which corresponds to "Cocoa North" of the Government survey and is an area predominantly devoted to cocoa plantations in the valleys of the Northern Range.
- (b) Zone two or "Cocoa Central" which is again predominantly cocoa grown on the more undulating country of Central Trinidad. This Zone was further sub-divided into two portions as it fell in both the counties of Caroni and St. David.
- (c) Zone four consisted of the sugar cane growing area on the flat alluvial plain of Central Trinidad, in the County of Caroni.

2) Proximity to "headquarters" is always desirable in order to minimise the time and expense involved in travelling to and from the survey area. Although I.C.T.A. is situated within the county of St. George, its possible selection had to be discarded on the grounds that it contains the largest urban population in Trinidad and was, therefore, not typical. The three counties which were selected, therefore, represent the nearest rural areas that could be surveyed.



3) The number of holdings in the three counties, based on the method of selection already described, fell within the limits of the number that could be examined in the time available.

The distribution of size and numbers of holdings within the Clusters and Zones can be seen from the following table:

| COUNTY | ZONE | NO. OF CLUSTERS | NO. OF OPERATORS |             | TOTAL |
|--------|------|-----------------|------------------|-------------|-------|
|        |      |                 | LESS THAN 1 ACRE | OVER 1 ACRE |       |
| 1      | 2    | 4               | 8                | 14          | 22    |
| 1      | 4    | 24              | 174              | 56          | 230   |
| 2      | 2    | 9               | 56               | 30          | 86    |
| 2      | 1    | 4               | 8                | 12          | 20    |
| TOTAL  |      | 41              | 246              | 112         | 358   |

N.B. For the purpose of the survey COUNTY 1 refers to Caroni and COUNTY 2 to St. Andrew and St. David jointly.

Note: The numbers of operators referred to in the table above and in the text are not the original selection which gave a total of 412, but the number that were in fact finally interviewed.



## Recordings.

Having selected a frame and an area in which to carry out the survey, the next step was to decide exactly which measurements would have to be made and which facts recorded. Out of the multitude of factors that resulted from this consideration, it became clear that they would fall into two distinct groups; namely: those factors which could be obtained directly by observation and measurement, and secondly those which would require answers from the operator of the holding in question.

In order to facilitate working in the field, two forms were prepared:

- 1) A Field Sheet which dealt with the direct measurements.
- 2) A Questionnaire which was prepared for the indirect factors.

As these two forms contain all the varied information to be collected, I will deal with them in turn, and explain the individual measurements and questions, etc. as they arise. Specimen copies of these two sheets can be seen in Appendices I and II, along with the field instruction for their use Appendix III.

### 1) Field Sheet.

This contained firstly a certain amount of "known" information for the guidance of the enumerator; namely: the name and address of the operator, the code numbers of the building, Cluster, County and Zone, the number of plots believed to be cultivated and their estimated acreage. (This information was supplied by the Statistical Office).

The following list of measurements and data had to be made or ascertained by the enumerator:

- 1) The number of plots.
- 2) The acreage of these plots.
- 3) Any pure stand areas or definite areas where crops were grown in distinct combination.
- 4) Plant counts were to be taken.
- 5) Individual crops listed.
- 6) Combinations were to be defined.
- 7) Where possible the ethnic origin of the operator stated.



- 1) All plots of food crops cultivated by the operator were to be taken into account and separate field sheets filled in for each one.
- 2) The acreage of these plots was to be measured as accurately as possible by pacing, and the area recorded in square yards.
- 3) Similarly pure stand and combination areas were to be measured and treated separately as sub-plots. Where possible planting distances of row crops were to be recorded.
- 4) Plant Counts. The problem of crop measurement proved to be one of the most tricky questions involved in the whole survey and requires some further discussion.

The one vital factor involved in the consideration of any crop measurement is the yield that it will produce (physical or financial). Any form of measurement, or estimation of a crop, therefore, has to use this factor as a basis if it is to be of any value, irrespective of the reasons for making the estimation, whether they be economic, agronomic, pedologic and so on.

The measurement of any growing crop is always difficult because a very large number of variables, e.g. in size of plant, vigour, spacings, etc., make it hard to establish a common reliable standard. The task was made even more difficult in our case as we had to consider a very wide crop range, and more so by the fact that they are largely grown mixed in what appeared to be heterogeneous conglomerations. This impression later proved to be substantially correct.

After considerable thought and discussion on this subject it appeared that the only suitable practicable method of measuring the crops would have to be some form of Plant Count; thus giving a common denominator, albeit a shaky one, to the wide range of crops that we expected to encounter. In this way it was felt that it should be possible to make comparisons between crops (of production, intensity, etc.) if the need arose.

The next step was to consider which type of plant count was to be employed. The ideal would obviously be to count the entire plant population of every plot. This was, of course, quite impracticable, if more than one or two Clusters were to be considered. Some form of sampling



therefore, would obviously be required.

A number of different techniques of sampling were suggested and put to the test in the field i.e. random traverse lines, quadrats, etc. Most had to be rejected on the grounds of impracticability, as a number of gardens were found to be veritable jungles, where the existence of a very formidable third dimension precluded the use of these methods. From these tests it appeared that the most suitable form of sample was a quadrat, where some form of rigid framework could be employed to demarcate the sample area. Finally, a square of 100 square feet at ground level, was adopted for the following reasons:

- 1) Ease of use. Ten foot poles could be used to limit the sample area, being fairly easy to handle and sufficiently rigid to push through dense foliage.
- 2) Speed of operation. Being fairly small it was a simple matter demarcating the sample area, and counting the plants within these limits took only minutes. A square of this size was, however, found to be sufficiently large to include a representative sample of crop plants under field conditions.
- 3) The reason for siting the quadrat at ground level was to avoid the problem of deciding whether or not a particular plant came within the sample area, as only those plants which actually emerged from the soil within the square were to be counted.
- 4) Ease of calculation. A small point but worth mentioning; that the area being 100 square feet made the calculation of total plant numbers relatively simple.

The next question to be decided was the number of samples to be taken in each garden. As it had been found, from preliminary trials, that the standard error of sample counts taken in typical gardens remained relatively high until most of the garden had been covered (due to extreme variation within the crop mixture), it was decided that much was to be gained in speed of operation, by limiting the number of counts per garden, while little was lost in the accuracy of the results obtained. Two sample counts were to be made in gardens of less than



6. What combinations are grown?

7. If crops are grown in combination, what are the reasons for the combination?

C. Crop Yields.

8. What were the yields of the crops grown?

D. Crop Disposal.

9. What percentage of the various crops was home consumed?

10. What percentage of the various crops was marketed?

11. What percentage of the various crops was sold casually?

E. Manurial practice.

12. Was organic manure applied, and to which crops?

13. Was artificial fertiliser applied, and to which crops?

F. Miscellaneous.

Space was also available for general remarks or specific points of interest.

It was realised at the time of formulation that this list of questions represented the ideal, and that we would be indeed fortunate if we were able to obtain a complete list of answers from any one operator. It was known, for example, that many operators would be completely ignorant of the yields of their crops and that in many instances it would be impossible to state just how much of a particular crop was disposed of in a particular way. Although we were aware of the existence of this ignorance we knew nothing of its extent. We felt, however, that although the answers might well be too few in numbers to stand up to statistical analysis, where the information could be obtained its value was sufficient to warrant asking the questions.

In general the object of the questionnaire was to obtain an overall picture of Agricultural practices among food garden cultivators. Specifically we were interested in the following points:

A. Cultivations.

1. The standards of husbandry as indicated by the relative numbers of operators who cutlassed, forked or ploughed their plots.



2. The extent of mechanisation could be ascertained from the number of operators who used ploughs.

3. The extent to which crop rotations and shifting agriculture are practised. The latter was known to take place as part of the Government Forestry Department's programme of reafforestation in forest areas.

#### B. Crops Grown.

4. Most of the information on this point was to be obtained directly from the plant counts. What the questionnaire was designed to do was to reveal what reasons (if any) lay behind the growing of particular crops in particular combinations.

#### C. Crop Yields.

5. As there is no information on the levels of production of peasant garden crops in Trinidad it was felt that any information on yields that could be obtained would be valuable.

#### D. Crop Disposal.

6. The framing of the three questions on crop disposal was designed to reveal the extent to which garden crops are grown for commercial purposes, as opposed to those that are grown purely for domestic use. The amount of Casual sales would tend to show how much surplus garden produce is available after domestic consumption has been met.

#### E. Manurial Practices.

7. We were interested to know how many operators were concerned with maintaining the fertility of their land and raising the yields of their crops by the use of Organic manures (pen manure, compost, etc.) and artificial fertilisers.

#### 3. Log Sheets.

A cyclostyled log sheet was prepared for each Cluster, and provision was made on each for the recording of:

- (1) The miles travelled to and from headquarters, or between Clusters.
- (11) The time spent in travelling, and in interviewing each individual operator.

The object of these recordings was to provide a breakdown of the time spent on the survey, so that, in conjunction with a more general



recording of the time spent on the other phases of the survey, kept by Mr. Meredith at headquarters, a check could be kept on the time and money expended at each stage. This would not only test the accuracy of our own estimates, but also provide a useful guide for anyone who might consider carrying out similar work in the future.

(A sample log sheet is to be seen in Appendix IV, along with the instructions for its use Appendix V.)

## 2. Preparation.

The supervisor for each area was responsible for carrying out a preliminary survey of his area, in order to check the accuracy of the sketch maps of his District. (These maps were copies of the original malaria division District sketch maps). He would also be able to see what areas there might be in his area and to make an impression of the best means of working his area when the time came for it to be surveyed.

Each holding would require a copy of the field sheet and a questionnaire. The name and address of the operator and all the other available information (already mentioned) was to be entered on each sheet. In the case of the field sheet, certain numbers were to be added for the purpose of giving the sample area within the plot. A log sheet was also required for each District. These problems were to be the responsibility of the supervisor.

## 3. Method of working survey area.

It was decided that enumerators should work in pairs, with one operator for each pair. The areas were to be worked in rotation, starting with County 2 (St. Andrew and St. David) and then County 1 (Carmarthen and St. David). The areas were to be worked from South to North. All the necessary pairs of enumerators were to be employed in each area in turn, moving on to the next area when their services were no longer required for the completion of that area i.e. if the other enumerators working in the area could handle the remainder of the area.



## Implementation of the Survey.

### 1. Division of Area.

The survey area was divided into seven geographical units each containing approximately 6 Clusters. There was some slight variation in number due to the fact that the Clusters were not of uniform size and the ease of working them would therefore vary considerably. One member of the team was made responsible for each area, the eighth man being responsible for overall co-ordination of survey work.

### 2. Preparation.

The supervisor for each area was responsible for carrying out a preliminary survey of his area, in order to check the accuracy of the sketch maps of his Clusters. (These maps were copies of the original malaria division Cluster sketch maps). He would also be able to see what snags there might be in his area and to make an impression of the best means of working his area when the time came for it to be surveyed.

Each holding would require a copy of the field sheet and a questionnaire. The name and address of the operator and all the other available information (already mentioned) was to be entered on each sheet. In the case of the field sheet, random numbers were to be added for the purpose of siting the sample area within the plot. A log sheet was also required for each Cluster. These problems were to be the responsibility of the supervisor.

### 3. Method of working survey area.

It was decided that enumerators should work in pairs, with one car for each pair. The areas were to be worked in rotation, starting with County 2 (St. Andrew and St. David) and then County 1 (Caroni) which was to be worked from South to North. All the necessary pairs of enumerators were to be employed in each area in turn, moving on to the next when their services were no longer required for the completion of that area i.e. if the other enumerators working in the area could handle the remainder themselves.



#### 4. Practical applications.

(a) Organization. The team members met each night and the supervisor of the area to be worked on the following day, stated what his requirements would be. Arrangements were then made with available pairs of enumerators to work specific Clusters. These pairs would then be given the required Cluster maps, field sheets, questionnaires, log sheets, and any advice needed on Cluster location and best means of working the area, etc.

(b) The day's work. Each pair left the College after breakfast for their working area. The first job was to locate the Cluster and then the first dwelling to be examined, having already decided on the method of working the Clusters from reference to the maps and the supervisor of the area. This usually proved a fairly simple matter. Once the occupier, or a suitable spokesman for the occupier, had been found and one's mission sufficiently explained to gain leave of entry, the pair of enumerators split up, one man remaining with the operator, in order to fill in the questionnaire, while the second measured the garden, i.e. that area of it devoted to food crops, and made plant counts.

Once the two forms (i.e. field sheet and questionnaire) had been satisfactorily completed for that holding the enumerators would move on to the next, and so on, until lunch time (pack lunches were carried). Similarly the afternoon's work was carried out in the same way, and at the end of the day the log sheets, questionnaires, etc. were checked for completeness and the acreage and total plant numbers calculated. The forms were then handed back to the supervisor, with notes of any snags, such as no response, through an operator not being at home, having moved, or not having a garden, etc., which might have arisen.

(c) The operators were generally very helpful, although the majority found it difficult to understand the precise nature of the visit. The first impression was usually one of suspicion, as it was imagined that we had called on some official business, such as rents, eviction notices, or income tax. They were usually quite easy to convince that we were harmless and although we carried official letters from Dr. A.L. Jolly stating our business, these were never used. The



appearance of the measuring poles moreover, often produced the impression that we were connected with the various oil companies operating in Trinidad, and after a day or so, we realised that it was often to our advantage not to dispel this idea too readily as the operator was only too happy to cooperate in answering any questions that we might ask. Often any attempt at further explanation only served to confuse the issue.

Generally the operators were at home and were not difficult to find. This was more noticeable in the sugar zone of Caroni, where the cane cutting season had not opened and many were out of work, than in the other areas where there was a greater proportion of self employed, and where the food gardens were often at some distance from the houses.

We did run into occasional trouble over names, as the list of names that we obtained from the Statistical Office did not always resemble the "nickname" that the operator was commonly known by.

(d) The gardens were generally small and situated at the house, making our job much simpler. In some of the more remote areas, however, (where land was more readily available and the risk of theft less), we found operators with food gardens up to 15 miles away from the residence. These were often unapproachable by car, and in some cases paths even had to be cutlassed through the bush in order to reach them. Fortunately, these gardens were relatively few in number, as the time involved in the inspection of such gardens was considerable.

(e) The system devised for plant counts proved to be fairly satisfactory, and could easily be employed by one man. The siting method based on random numbers was simple, and four ten-foot wooden poles were used to limit the area in which the plants were to be counted. It was found in practice that in some instances rigid counts of plant numbers were impossible and estimates had to be made of the numbers present. In these cases plants were found to be growing in dense clumps where it was impossible to tell the exact number of rootstocks without actually digging up the plants.

One modification in practice which was not entirely expected at the outset, was that in many instances where the gardens were small it was far simpler to count all the plants in the garden. By so doing, time



was saved in laying out sample areas, and calculation of total plant numbers, and the accuracy of the results was increased.

(f) The measurement of the plots by pacing was largely replaced in practice by using the ten foot poles. This had the effect of standardising the measurements made by the various enumerators and made the estimation more accurate.

These measurements were fairly accurate, although not always easy to make, due to irregular shapes of plot, dense weeds, intervention of ditches, etc. Sketch maps were, however, often made on the back of the field sheet and these aided the ease of calculation. At other times, these sketches sometimes proved invaluable in the checking of results.

(g) The questionnaire was found to be quite satisfactory in practice. Once local differences of expression and nomenclature had been mastered (e.g. "salt" for artificial fertiliser), the answers to the questions (where they were possible to obtain) were readily obtained. The range of the questions was found to be satisfactory, and if the questionnaire did err it was by attempting to include too much detail - however, this had already been anticipated.

(h) The major problems encountered were those where:

1) the operator or holding couldn't be located

11) where the operator had moved

111) deciding the question: when is a garden not a garden?

1) These problems were often solved by asking neighbours the right questions. For example, where an operator was thought to be unknown in the district, questions revealed that he was better known by another name.

11) Where an operator had moved, either his new holding was examined, or if its location was unknown or out of the survey area, the old one was taken under the name of the new occupier.

Where the problem was purely one of the operator being away, the examination was left over for the follow up.

111) Questions of this type were left to the discretion of the enumerators. It was usually fairly easy to judge whether plants had been deliberately planted and were being cared for, or whether they happened merely to be growing there as a weed.



### Tabulation of Data.

All completed forms were handed in by the enumerators to the area supervisors, and each supervisor was responsible for checking these forms for completeness and accuracy. Once the data was considered complete the information on the field sheets and questionnaires was transferred to Cope Chat clip cards. This was made possible by a system of coding, so that much of the information could be entered in a series of clipped holes round the edge of the card. Further information was entered in writing on the card itself. Each area supervisor was responsible for clipping a complete set of cards for his particular area. A complete set consisting of one type (blue) for holdings of over one acre and another type (pink) for holdings of less than one acre. One card was to be clipped for every plot and sub plot examined during the survey.

In this way the information collected in the field was readily available for extraction (under any desired heading) as required for the various stages of analysis.

For a full explanation of this system, an annotated diagram of a clip card with explanatory instructions is set out in Appendices VI, VII & VIII.

Here the numbers of operators growing the crop were used (Quantitative analysis) and a raised total was calculated. This figure applied to the Cluster as a whole, and was based on the relative total and sample numbers.

In the final stage master sheets (Appendix II) were employed for both the Quantitative (number of operators) and the Qualitative (number of plants) analysis of individual crops, on the basis of stratification within each of the four crops.

On these sheets the raised figures were used, in order to apply to the entire area (i.e. counties, zones and total survey area), and the standard error, percentage standard error, variance and percentage variance of these raised values calculated.

A full explanation of the statistical methods employed with raised samples of the analysis is given in Appendices III and IV (Qualitative Analysis) and V (Quantitative Analysis).



### Analysis of results.

The first step taken in the analysis of the results was the extraction of information from the clip cards on a Cluster basis. Cluster sheets (Appendix IX ) were completed with the relevant data for holdings in excess of one acre on one side, and for those of less than one acre on the other. The information given for each Cluster included crop numbers and the numbers of operators growing each crop, subdivided into the three racial groups. Similarly the numbers of operators practising the various methods of cultivation, manurial treatment and crop disposal were divided on a racial basis.

The estimated area of food garden (both for the sample and the total for the Cluster) was given along with the measured area for the sample found during the survey. All plots where no food crops were found, grown under trees or where there was no response were recorded.

Computation sheets (Appendix X ) were then completed for each crop grown on holdings of the two size groups within each zone. i.e. Eight sheets were used for each crop, four for those on holdings of over one acre and four for those under one acre, so that two sheets applied to each zone. Here the numbers of operators growing the crop were used (Quantitative analysis) and a raised total was calculated. This figure applied to the Cluster as a whole, and was based on the relative total and sample numbers.

In the final stage master sheets (Appendix XI) were employed for both the Quantitative (number of operators) and the Qualitative (numbers of plants) analysis of individual crops, on the basis of stratification within each of the four zones.

On these sheets the raised figures were used, in order to apply to the entire areas (i.e. counties, zones and total survey area), and the standard error, percentage standard error, variance and percentage variance of these raised values calculated.

A full explanation of the statistical methods employed with worked examples of the analysis is given in Appendices XII and XIII (Qualitative Analysis) and XIV (Quantitative Analysis)



## Results and Conclusions.

As many of the factors under consideration in this survey are interrelated, any attempt to study them as a whole is apt to lead to confusion, while subdivision into different topics is likely to result in some repetition. However, as the latter case is considered to be the least harmful, the results will be dealt with under definite headings (at the risk of repetition) in order to achieve greater clarity.

(A general summary of the results is included in Appendix XV)

### Acreage devoted to food gardens.

The total measured acreage of the sample area was found to be 99.7 acres. This compares with the original estimated acreage (Agricultural survey) for the same area of 182 acres. The main reason why the measured acreage should have been found to be only half the estimated acreage is thought to be due to the methods of estimation not being very accurate, and a difference in definition. i.e. In the case of the estimated acreage, garden boundaries were considered as the limits and not the edge of the area devoted to food crops, as was the case when the gardens were measured. (All small gardens were classed as being 1/10th of an acre in the estimate) The distribution of acreage throughout the survey area can be seen from the following table.

|                                                           | County 1 |      |        |      | County 2 |      |        |      |        |       |       |
|-----------------------------------------------------------|----------|------|--------|------|----------|------|--------|------|--------|-------|-------|
|                                                           | Zone 2   |      | Zone 4 |      | Zone 1   |      | Zone 2 |      | Totals |       |       |
| Acreage                                                   | - 1      | 1    | - 1    | 1    | - 1      | 1    | - 1    | 1    | - 1    | 1     |       |
|                                                           | Acre     | Acre | Acre   | Acre | Acre     | Acre | Acre   | Acre | Acre   | Acre  |       |
| Measured                                                  | 1.6      | 11.9 | 19.4   | 20.4 | .9       | 16.1 | 4.4    | 24.8 | 26.3   | 73.3  | 99.7  |
| Estimated                                                 | 3.3      | 14.4 | 37.1   | 29.6 | 3.7      | 27.0 | 10.6   | 56.3 | 54.7   | 127.3 | 182.0 |
| <div>+= over 1 Acre</div> <div>- = less than 1 Acre</div> |          |      |        |      |          |      |        |      |        |       |       |



County 2 many of the larger gardens are leased areas, often situated in the forest, where only a portion of the total area available was being used for crops.

Further analysis of the measured acreage based on a raised acreage value of 2161 acres for the survey area with a standard error of  $\pm 12\%$  shows the following means and distribution:

|             | Mean Acreage/Operator |           | % Distribution of Acres/Operator |           |
|-------------|-----------------------|-----------|----------------------------------|-----------|
|             | Cocoa Zones           | Cane Zone | Cocoa Zones                      | Cane Zone |
| All Gardens | .36                   | .17       | 54%                              | 46%       |
| + 1 Acre    | . 9                   | .45       | 68%                              | 32%       |
| - 1 Acre    | .11                   | .12       | 31%                              | 69%       |

+ = over 1 Acre  
- = less than 1 Acre

In general the larger gardens were found in the cocoa zones where a larger proportion of the acreage of food gardens was found to be held in the larger units. The reasons for this are undoubtedly those associated with population pressure, as in the relatively dense population area of the cane zone nearly all the land is held by the sugar estates and the majority of the population is housed on lots of 50 x 100 feet. Furthermore any land not utilised by sugar cane or house lots is jealously guarded by the Companies, probably to allow for further development of cane fields and to avoid the necessity of removing squatters etc. in so doing. The result is that the cultivation of food crops is largely restricted to the small house lots. There was considerable complaint among the operators in these areas about the shortage of land for cultivation.

In the cocoa zones, however, the opposite tends to be the case, as a gardener can usually lease as much land as he can cultivate. The result is that in many gardens only a small portion of the total area was found to be cultivated.



## Crops.

### (a) Quantitative Results.

The popularity and distribution of crop plants can best be seen from the following tables which are based on the numbers of operators growing the crops.

|              |                     |    |        | Over 1 Acre      |      | Under 1 Acre     |      |
|--------------|---------------------|----|--------|------------------|------|------------------|------|
|              | Estimated Operators | %  | % S.E. | Operator Numbers | %    | Operator Numbers | %    |
| Banana       | 7162                | 80 | 3      | 1535             | 77   | 5627             | 81   |
| Cassava      | 4995                | 56 | 5      | 1296             | 65   | 3699             | 53   |
| Dasheen      | 5641                | 63 | 5      | 1233             | 62   | 4418             | 63   |
| Tannia       | 3755                | 42 | 8      | 738              | 37   | 3017             | 43   |
| Eddo         | 1707                | 19 | 12     | 535              | 27   | 1172             | 17   |
| Pigeon pea   | 4943                | 55 | 5      | 1251             | 62   | 3692             | 53   |
| Okra         | 2881                | 33 | 9      | 504              | 25   | 1877             | 27   |
| Egg Plant    | 2389                | 27 | 11     | (317)            | (16) | (2072)           | 30   |
| Beans        | 1050                | 12 | 20     | (146)            | (7)  | (904)            | (13) |
| Yam          | 1616                | 18 | 16     | (354)            | (18) | (1262)           | (18) |
| Tomato       | 594                 | 7  | 21     | (141)            | (7)  | (453)            | (7)  |
| Sugar Cane   | 1519                | 17 | 13     | 314              | 16   | 1205             | 17   |
| Maize        | 723                 | 8  | 24     | (341)            | (17) | (382)            | (5)  |
| Sweet Potato | 1353                | 15 | 17     | (345)            | (17) | (1008)           | (15) |
| Topee tamboo | 1109                | 12 | 14     | (226)            | (11) | (883)            | 13   |
| Pineapple    | (658)               | 7  | 27     | (186)            | (9)  | (472)            | (7)  |
| Pepper       | 1932                | 22 | 12     | (351)            | (18) | (1581)           | 23   |
| Cucumber     | (591)               | 7  | 26     | (156)            | (8)  | (435)            | (6)  |
| Pumpkin      | 1390                | 16 | 14     | (297)            | (15) | (1093)           | (16) |

1. Those grown universally.

2. Those grown universally but less commonly found.

3. Those grown either by specialists or in specific localities.

1. The crops grown universally include - Banana, Cassava,

Dasheen, Tannia and Pigeon peas. These crops were found generally

throughout the entire area in both large and small food gardens. Although

many crops for home consumption were, particularly bananas and pigeon



|              | Zone 4 (Sugar)      |      | Zones 1 & 2 (Cocoa) |      |
|--------------|---------------------|------|---------------------|------|
|              | Operator<br>Numbers | %    | Operator<br>Numbers | %    |
| Banana       | 4312                | 76   | 2850                | 87   |
| Cassava      | 2922                | 51   | 2073                | 63   |
| Dasheen      | 3249                | 57   | 2392                | 73   |
| Tannia       | 2278                | 40   | 1477                | 45   |
| Eddo         | 1384                | 24   | 323                 | 10   |
| Pigeon pea   | 3459                | 61   | 1484                | 45   |
| Okra         | 2329                | 41   | 552                 | 17   |
| Egg Plant    | 2146                | 38   | (243)               | (7)  |
| Beans        | 613                 | 11   | (437)               | (13) |
| Yam          | 1046                | 18   | (570)               | (17) |
| Tomato       | 477                 | 8    | 117                 | (4)  |
| Sugar Cane   | 540                 | 9    | 979                 | 30   |
| Maize        | 435                 | 8    | 288                 | (9)  |
| Sweet Potato | 923                 | 16   | (430)               | (13) |
| Topee tamboo | 873                 | 15   | (236)               | (7)  |
| Pineapple    | (405)               | (7)  | (253)               | (8)  |
| Pepper       | 1586                | 28   | 346                 | 11   |
| Cucumber     | (557)               | (10) | (34)                | (1)  |
| Pumpkin      | 1031                | 18   | (359)               | (11) |

(Note - Figures in brackets are known to have a standard error greater than 25%.) Generally these crops fall into three basic categories:

1. Those grown universally.
2. Those grown universally but less commonly found.
3. Those grown either by specialists or in specific localities.

1. The crops grown universally include - Banana, Cassava, Dasheen, Tannia and Pigeon peas. These crops were found generally throughout the survey area in both large and small food gardens. Although mostly grown for home consumption some, particularly bananas and pigeon



peas, were found to be grown for commercial purposes, and often surplus production of these was sold casually.

2. Eddoes, Okra, Egg plant, Yam, Sugar cane, Maize, Sweet potatoes, Topee tamboo and Peppers, were found over the whole area but were encountered less frequently.

While okra, yam, sugar cane and sweet potatoes, appeared to be grown on holdings irrespective of size, there was a tendency for eddoes and maize to be found on the larger class of holdings, and egg plant, topee tamboo and peppers on the smaller holdings. The fact that maize was grown more commonly for commercial purposes than the other crops mentioned, would explain its more common occurrence on the larger holdings.

Some crop preference was also noted between the Zones. Eddoes, okra, egg plant, topee tamboo and peppers were all found to be more commonly grown in the sugar cane Zones, while sugar cane itself was much more frequently met with in gardens in the cocoa Zones. It should be pointed out that sugar cane, where it was found in gardens, only amounted to one or two stools for chewing purposes and lack of available cane fields would account for its more numerous occurrence in the cocoa Zones.

3. Of the specialist crops, (Beans, Tomatoes, Pineapples, Cucumber, Pumpkin and some of the lesser crops, such as Lettuce, which are not included in the tables as they were not found significantly often), beans, cucumber and pumpkins enjoyed a more even distribution than the others. They have, however, been included in this group as they were frequently found to be grown by specialist gardeners. The other crops, tomatoes, pineapples, lettuce, etc. were definitely found to be grown by specialists, often in definite areas. e.g. Tomatoes at the higher elevations, and pineapples on the more sandy poorer soils.

In general the results of the quantitative analysis are quite good with the standard error falling within reasonable limits. There is a tendency, however, for the standard error of some crops, particularly those of a specialised nature, to be high. The main reason for this is the infrequency with which the crops were met.



(b) Qualitative analysis.

The results of the Qualitative analysis are set out in the following tables. The total figures given for plant numbers represent those per 000 plants, and have been raised in order to refer to the whole survey area.

|              | Total esti-<br>mated plant<br>number | % S.E. | Over 1 Acre     |               | Under 1 Acre    |               |
|--------------|--------------------------------------|--------|-----------------|---------------|-----------------|---------------|
|              |                                      |        | Plant<br>Number | % of<br>Total | Plant<br>Number | % of<br>Total |
| Banana       | 256                                  | 25.5   | 159             | 62            | 96              | 38            |
| Cassava      | 1962                                 | 45.0   | 1432            | 73            | 530             | 27            |
| Dasheen      | 1308                                 | 23.1   | 628             | 48            | 681             | 52            |
| Tannia       | 1052                                 | 47.7   | 680             | 65            | 372             | 35            |
| Eddo         | 354                                  | 24.9   | 230             | 67            | 114             | 33            |
| Pigeon Pea   | 950                                  | 36.7   | 710             | 75            | 239             | 25            |
| Okra         | 68                                   | 25.3   | 27              | 40            | 40              | 60            |
| Egg Plant    | 69                                   | 22.0   | 23              | 33            | 47              | 67            |
| Beans        | 2931                                 | 188.0  | 2926            | 100           | 5               | 0             |
| Yam          | 31                                   | 50.2   | 7               | 22            | 24              | 78            |
| Tomato       | 285                                  | 81.4   | 250             | 88            | 34              | 12            |
| Sugar Cane   | 68                                   | 53.4   | 10              | 15            | 57              | 85            |
| Maize        | 1452                                 | 44.7   | 1387            | 96            | 65              | 4             |
| Sweet Potato | 512                                  | 33.0   | 160             | 31            | 352             | 69            |
| Topee bamboo | 76                                   | 33.7   | 7               | 9             | 69              | 91            |
| Pineapple    | 29                                   | 52.1   | 13              | 45            | 16              | 55            |
| Pepper       | 87                                   | 94.8   | 78              | 90            | 8               | 10            |



|               | County 1        |        |               | County 2        |        |               |
|---------------|-----------------|--------|---------------|-----------------|--------|---------------|
|               | Plant<br>Number | % S.E. | % of<br>Total | Plant<br>Number | % S.E. | % of<br>Total |
| Banana        | 149             | 34     | 59            | 107             | 39     | 41            |
| Cassava       | 810             | 26     | 41            | 1153            | 30     | 59            |
| Dasheen       | 593             | 31     | 45            | 716             | 22     | 55            |
| Tannia        | 836             | 59     | 79            | 217             | 51     | 21            |
| Eddo          | 317             | 28     | 92            | 27              | 35     | 8             |
| Pigeon Pea    | 721             | 47     | 76            | 229             | 32     | 24            |
| Okra          | 56              | 20     | 84            | 11              | 35     | 16            |
| Egg Plant     | 62              | 21     | 88            | 8               | 101    | 12            |
| Beans         | 2927            | 188    | 100           | 4               | 14     | -             |
| Yam           | 13              | 31     | 42            | 18              | 85     | 58            |
| Tomato        | 40              | 48     | 14            | 245             | 94     | 86            |
| Sugar Cane    | 53              | 68     | 81            | 13              | 44     | 19            |
| Maize         | 963             | 57     | 66            | 490             | 73     | 34            |
| Sweet Potato. | 422             | 40     | 82            | 91              | 26     | 18            |
| Topee bamboo  | 70              | 37     | 92            | 6               | 46     | 8             |
| Pineapple     | 16              | 54     | 55            | 13              | 98     | 45            |
| Pepper        | 10              | 20     | 13            | 76              | 108    | 87            |

Cucumber and pumpkin have been omitted from these tables as no practicable method was found suitable for counting their numbers in the field; (due to the tortuous nature of growth and the production of numerous adventitious rooting systems). As only their presence or absence was recorded for each holding, only a quantitative consideration of these crops has therefore been possible.

Generally, the results of the qualitative analysis have proved disappointing, due to the large standard error percentage found for most crops. (Range from 22 - 188). The reason for this may be found in the extreme variability in plant numbers found on the different holdings examined. An extreme example of this may be seen in the case of the results for crops of beans. Here 40 operators were found to be growing



beans, but 39 of them had less than 2,000 plants between them, while the fortieth grew some 166,000 plants. The percentage standard error in this case worked out at 188.

The reliability of the figures, as a whole, is further impaired by variation within the variability of the plant numbers found for the different crops. i.e. The variation for each crop varies. Any interpretation of the results is therefore made extremely difficult. In general, however, those crops grouped in the first section of the quantitative analysis (i.e. those found universally) have the lowest percentage standard error and are therefore the most reliable. While those in the third, or specialist class, have the highest standard error, and are the least reliable (due to both fewer growers and a high variation in numbers of plants between holdings).

Although it would be a mistake to place too great an emphasis on the results, certain trends do emerge from these figures. Briefly they are that:

1. A greater number of Bananas, Cassava, Tannia, Eddoes, Pigeon peas, Tomatoes, Maize and Peppers are grown on the larger class of holding.
2. A greater number of Dasheen, Okra, Egg plant, Yam, Sugar cane, Sweet potato, Topee tamboo and Pineapples are grown on the smaller holdings.
3. A greater number of Eddoes, Banana, Tannia, Pigeon peas, Okra, Egg plant, Sugar cane, Maize, Sweet potato and Topee tamboo are grown in County 1 (mainly Sugar Zone).
4. A greater number of Cassava, Dasheen, Yam, Tomatoes and Peppers are grown in County 2 (Cocoa Zones).

It must, of course, be remembered that when plant numbers are being considered, the presence of one or two large commercial growers in any one area or zone can very appreciably alter the picture of results. This picture may, however, very well be more accurate, as far as any consideration of crop importance is concerned, than would seem justified from a statistical point of view; for it was found in practice that the standard of husbandry on very many of the small holdings (assuming it to be correlated with smaller plant numbers) was deplorably low and that the contribution from these gardens must be small compared with those of the



larger more commercially run gardens where superior methods are employed.

Racial origin of operator.

In a consideration of the crops as grown by the different racial groups, those grown by the "others" class (Europeans, Chinese, etc.) proved to be negligible and are not worth considering. The Quantitative results found for the other two, i.e. East Indian (E.I.) and West Indian (W.I.), are as follows:

| Crop         | WEST INDIANS    |    |        |    |        |    |
|--------------|-----------------|----|--------|----|--------|----|
|              | Total<br>Number | %  | Number | %  | Number | %  |
| Banana       | 127             | 84 | 88     | 83 | 39     | 84 |
| Cassava      | 93              | 61 | 59     | 55 | 34     | 73 |
| Dasheen      | 107             | 70 | 77     | 72 | 30     | 65 |
| Tannia       | 62              | 41 | 46     | 43 | 16     | 34 |
| Eddo         | 21              | 14 | 17     | 16 | 4      | 8  |
| Pigeon pea   | 79              | 52 | 55     | 52 | 24     | 52 |
| Okra         | 33              | 22 | 27     | 25 | 6      | 13 |
| Egg plant    | 19              | 13 | 15     | 14 | 4      | 8  |
| Beans        | 17              | 11 | 12     | 11 | 5      | 11 |
| Yam          | 30              | 20 | 20     | 9  | 19     | 30 |
| Tomato       | 6               | 4  | 3      | 2  | 3      | 6  |
| Sugar cane   | 36              | 24 | 24     | 22 | 12     | 26 |
| Maize        | 14              | 9  | 6      | 5  | 8      | 17 |
| Cucumber     | 11              | 15 | 7      | 6  | 4      | 8  |
| Pumpkin      | 16              | 5  | 11     | 10 | 5      | 10 |
| Sweet potato | 22              | 10 | 15     | 14 | 7      | 15 |
| Topee tamboo | 8               | 16 | 7      | 6  | 1      | 2  |
| Pineapple    | 15              | 7  | 10     | 9  | 5      | 10 |
| Pepper       | 24              | 11 | 19     | 18 | 5      | 10 |



# EAST INDIANS

| Crop         | Total<br>Number | %  | Number | %  | Number | %  |
|--------------|-----------------|----|--------|----|--------|----|
| Banana       | 151             | 76 | 105    | 78 | 46     | 70 |
| Cassava      | 101             | 50 | 64     | 47 | 37     | 57 |
| Dasheen      | 114             | 57 | 77     | 57 | 37     | 57 |
| Tannia       | 79              | 39 | 55     | 41 | 24     | 37 |
| Eddo         | 50              | 25 | 23     | 17 | 27     | 41 |
| Pigeon pea   | 119             | 59 | 73     | 54 | 46     | 70 |
| Okra         | 78              | 39 | 55     | 41 | 23     | 35 |
| Egg plant    | 71              | 35 | 57     | 42 | 14     | 21 |
| Beans        | 21              | 10 | 17     | 12 | 4      | 6  |
| Yam          | 29              | 14 | 21     | 15 | 8      | 12 |
| Tomato       | 20              | 10 | 14     | 10 | 6      | 9  |
| Sugar cane   | 22              | 11 | 16     | 11 | 6      | 9  |
| Maize        | 18              | 9  | 6      | 4  | 12     | 18 |
| Cucumber     | 15              | 7  | 9      | 6  | 6      | 9  |
| Pumpkin      | 40              | 20 | 26     | 19 | 14     | 21 |
| Sweet Potato | 29              | 14 | 17     | 12 | 12     | 18 |
| Topee tamboo | 34              | 17 | 23     | 17 | 11     | 16 |
| Pineapple    | 13              | 6  | 7      | 5  | 6      | 9  |
| Pepper       | 53              | 26 | 39     | 29 | 14     | 21 |

(the percentage figures refer to the number in the racial and size of holding group).

These tables are based on the following total numbers:

|      | Over 1 Acre | Under 1 Acre | Total |
|------|-------------|--------------|-------|
| W.I. | 46          | 106          | 152   |
| E.I. | 65          | 134          | 199   |
|      | 111         | 240          | 351   |

These figures do not reveal any "startling" facts, but if the total numbers growing various crops is considered the following differences



emerge:

1. That a greater number of East Indians grow Eddoes, Pigeon peas, Okra, Egg plant, Tomato, Pumpkin, Topee tamboo and peppers.
2. That a greater number of West Indians grow Sugar cane and Pineapples.

These two statements do not in fact have very much value as

(a) The distribution of the racial groups was not evenly spread throughout the survey area, i.e. There being a far greater proportion of East Indians in the sugar areas, compared with the number of West Indians; while the cocoa zones showed the numbers to be more evenly matched.

(b) The total number of operators involved in growing most of the crops mentioned is so small that the percentage standard error must be very high.

It is therefore hard to ascribe any difference in choice of crop to the racial origin of the operator as the soil type of the locality of the holding probably holds far greater sway. I would add, however, that, purely from observation during field work, the figures for Eddoes and Peppers do have a racial significance, i.e. That East Indians do favour the choice of these crops.

Any consideration of the proportion of crop choice within racial groups (as measured by the percentage figures), merely tends to support the differences found between the zones.

Similarly, examination of holding size supports the reasons already mentioned in the section on holding size, rather than anything that can be attributed to race.

Note. The distribution of racial groups within the survey area is as follows:

|            | W. I.  |       | E. I.  |       |
|------------|--------|-------|--------|-------|
|            | Number | %     | Number | %     |
| Cocoa Zone | 80     | 52.6  | 44     | 22.1  |
| Sugar Zone | 72     | 47.4  | 155    | 77.9  |
|            | 152    | 100.0 | 199    | 100.0 |



## Cultivation Operations.

### 1. Annual Cutlassing of Gardens.

Out of a total of 356 operators 288 or 77%, cleared their gardens annually by cutlassing. This operation, which was by far the most common, represents the minimum of cultivation that can be carried out in a garden if any yield is to be expected. What is significant is not so much the figure of 77% itself, (as many operators hand fork or plough their land in addition) but the remaining 23% who do not appear to carry out any cultivation methods at all.

The distribution of cutlassing was found as follows:

| <u>Total (Survey)</u> | <u>County 1</u> | <u>County 2</u> | <u>Over 1 Acre</u> | <u>Under 1 Acre</u> |
|-----------------------|-----------------|-----------------|--------------------|---------------------|
| 77%                   | 81%             | 66%             | 89%                | 74%                 |

(The figures are a percentage of the total operators for each county or size group).

This indicates the fact already mentioned, that the larger gardeners took greater care in the growing of their crops, and also a higher standard in the cane zone where land is more limited than the cocoa zones.

### 2. Annual forking of gardens.

Here a total of 231 operators or 68% were found to practise annual forking of their plots, these were distributed in the following way:

| <u>Total (Survey)</u> | <u>County 1</u> | <u>County 2</u> | <u>Over 1 Acre</u> | <u>Under 1 Acre</u> |
|-----------------------|-----------------|-----------------|--------------------|---------------------|
| 68%                   | 76%             | 45%             | 57%                | 71%                 |

It would appear from these figures that hand forking is the most common form of tillage in the small gardens; being more commonly practised in the cane zone.

### 3. Annual ploughing of gardens.

Only 44 operators or 11% were found to plough their land and the distribution is as follows:



| <u>Total (Survey)</u> | <u>County 1</u> | <u>County 2</u> | <u>Over 1 Acre</u> | <u>Under 1 Acre</u> |
|-----------------------|-----------------|-----------------|--------------------|---------------------|
| 11%                   | 13%             | 5%              | 25%                | 6%                  |

Here as one would expect the highest proportion of ploughed gardens is found among the larger class in County 1, where they are generally much more accessible to mechanization.

Discussion. In general the main system found was to cutlass the garden and clear or burn off the cut weeds. The garden was then either forked by hand or ploughed, and the crops planted.

In the case of the 23% (approximate) who did not appear to cultivate at all (where gardens were cutlassed, they were usually subsequently tilled) holes were merely made between the weeds and the crop plants placed in them - the standard of yield from these crops can only be imagined, as the casualty rate must be extremely high.

Ploughing where it did occur was invariably by tractor. In such cases it was usually found that a larger gardener, or a small cane farmer, possessed a tractor and cultivated the larger gardens (and sometimes a few small ones, where practicable) of his friends and neighbours. Ploughing was thus found to be very localised, i.e. very common in some small areas e.g. a Cluster, and entirely absent from others.

#### Use of Fertilisers and Manures.

1. Use of Organic Manures (e.g. Pen manure, compost, cane trash).

Of the 356 total number of operators 145 or 40.7% were found to be making use of Organic manures. These were split up in the following way:

|      | County | Zone | Total Operators | Number using Organic Manure | %    | Main Crop |
|------|--------|------|-----------------|-----------------------------|------|-----------|
|      | 1      | 2    | 14              | 4                           | 28.6 |           |
| Over | 1      | 4    | 56              | 29                          | 51.8 | Banana    |
| 1    | 2      | 1    | 12              | 2                           | 16.6 |           |
| Acre | 2      | 2    | 30              | 8                           | 26.6 | Banana    |
|      | Total  |      | 112             | 43                          | 38.4 |           |



|        | County | Zone | Total Operators | Number using Organic Manure | %    | Main Crop |
|--------|--------|------|-----------------|-----------------------------|------|-----------|
|        | 1      | 2    | 8               | 8                           | 100  | Banana    |
|        | 1      | 4    | 174             | 83                          | 47.7 | Banana    |
| Under  | 2      | 1    | 8               | -                           | -    |           |
| 1 Acre | 2      | 2    | 54              | 11                          | 20.4 | Banana    |
|        | Total  |      | 244             | 102                         | 41.8 |           |

Organic manures were found equally popular among large and small farmers alike. The biggest difference was found between zones, where greater use was made of organic manures in the cane areas than in the cocoa zones, possibly due to availability of cane trash. This statement is not, however, entirely true as a greater use of organic manure was found in the cocoa areas of County 1 than for those in County 2. The reason for this discrepancy is not known and may be either -

- (1) Racial preference
- (11) Difference in number and management of livestock, or
- (111) Error in sampling; in this case 24% S.E. for cocoa and 10% S.E. for cane zones.

Organic manure was most commonly applied to crops of bananas, especially so in County 2 where bananas accounted for 75% of the organic manure applied. In County 1, the use was more widespread with the recipient crops in order of preference (i.e. for the use of a limited resource) being: banana, pigeon pea, eddo, egg plant, okra, tannia and cassava. Tomatoes, cucumber and pumpkins also benefited by application of organic manure, but crops of these were far fewer in number.

## 2. Use of Artificial Manures.

Artificial fertiliser, or "salt" was used by 61 operators out of the total of 356. This is 14% and was distributed among the operators, zones, etc. as follows:



| County       | Zone  | Total Operators | Number using<br>Artificials | %  | Main Crop |            |
|--------------|-------|-----------------|-----------------------------|----|-----------|------------|
| Over 1 Acre  | 1     | 2               | 14                          | 3  | 21.4      | Banana     |
|              | 1     | 4               | 56                          | 26 | 46.5      | Pigeon pea |
|              | 2     | 1               | 12                          | 3  | 25.0      | Banana     |
|              | 2     | 2               | 30                          | 5  | 16.6      | Banana     |
|              | Total |                 | 112                         | 37 | 33.0      |            |
| Under 1 Acre | 1     | 2               | 8                           | 1  | 12.5      |            |
|              | 1     | 4               | 174                         | 22 | 12.6      | Banana     |
|              | 2     | 1               | 8                           | -  | -         |            |
|              | 2     | 2               | 54                          | 2  | 3.7       |            |
|              | Total |                 | 244                         | 25 | 10.2%     |            |

Artificial fertiliser was more commonly used by the larger gardeners. Its application was more widespread in County 1 than in County 2, especially so for Zone 4 (the cane area). The reason in this case is quite obvious as the majority of the operators are part time employees on the sugar estates where considerable quantities of Artificial fertiliser are used. These men therefore gather some knowledge as to the use of Artificials, which are readily available in these districts.

The choice of crops for fertiliser application is interesting, in that bananas gained top priority in County 2 with cassava and pigeon peas taking second place, while in County 1 the order of priority was found to be pigeon peas, okra, eddoes, egg plant and lastly bananas. Whether this was due to variance in response discovered by trial and error in the two areas, or through difference in relative importance of the crops grown in the different zones we were unable to discover.

#### Methods of Cropping.

##### a) Pure stands.

During the survey note was made of any crops found growing in pure stands. The following table gives a summary of our findings.



|       | County | Zone | Total Operators | Holdings with Pure stands | %    | Crop         |
|-------|--------|------|-----------------|---------------------------|------|--------------|
|       | 1      | 2    | 14              | 3                         | 21.4 | Maize        |
| Over  | 1      | 4    | 56              | 14                        | 25.0 | Sweet potato |
| 1     | 2      | 1    | 12              | 6                         | 50.0 | Dasheen      |
| Acre  | 2      | 2    | 30              | 2                         | 6.7  |              |
|       | Total  |      | 112             | 25                        | 22.3 |              |
|       | 1      | 2    | 8               | -                         | -    |              |
| Under | 1      | 4    | 174             | 15                        | 8.6  | Sweet potato |
| 1     | 2      | 1    | 8               | 4                         | 50.0 | Dasheen      |
| Acre  | 2      | 2    | 54              | 4                         | 7.4  | Dasheen      |
|       | Total  |      | 244             | 23                        | 9.4  |              |

These figures show an equal number of holdings with pure stands being grown on them for both large and small gardens. The proportion is however, higher for the larger class. The difference is probably greater than is apparent as a large number of pure stands on the small holdings were patches of dasheen, which are hardly comparable with deliberately spaced areas of maize or sweet potatoes.

On a zonal basis, there is the difference that dasheen is the predominant crop grown in pure stands in the cocoa zones, where-as sweet potatoes and maize are more commonly met with in the sugar zone.

#### b) Combinations of crops.

Where crops were deliberately grown together in combination, they were recorded and attempt was made to learn of the reasons for the combination. The following table shows the number of distribution of holdings growing crops in combination, together with any crops grown this way in significant numbers.

|      | County | Zone | Number of Holdings | Holdings with Combination | %    | Crops                |
|------|--------|------|--------------------|---------------------------|------|----------------------|
|      | 1      | 2    | 14                 | 1                         | 7.1  |                      |
| Over | 1      | 4    | 56                 | 14                        | 25.0 |                      |
| 1    | 2      | 1    | 12                 | 1                         | 12.0 |                      |
| Acre | 2      | 2    | 30                 | 7                         | 23.0 |                      |
|      | Total  |      | 112                | 23                        | 21.0 | Cassava & Pigeon pea |



|       | County | Zone | Total Operators | Number Selling | %    | Produce            |
|-------|--------|------|-----------------|----------------|------|--------------------|
|       | 1      | 2    | 8               | 2              | 25.0 |                    |
| Under | 1      | 4    | 174             | 6              | 3.4  | Banana, Pigeon pea |
| 1     | 2      | 1    | 8               | 3              | 37.5 | Banana             |
| Acre  | 2      | 2    | 54              | 4              | 7.4  | Banana             |
|       | Total  |      | 244             | 15             | 6.1  |                    |

The number of operators who admitted to casual sales was small (some reluctance to disclose this was encountered during the survey) so that definite interpretation of the results is difficult. Generally the most common crops disposed of in this way for the whole area, were bananas and cassava. A number of other crops were also sold particularly in Zone 4 (Sugar cane) where pigeon peas and eddoes were sold more frequently than bananas. The size of holding appears to have little effect on sales, though size of family probably is important.

b) Marketed.

|       | County | Zone | Total Operators | Number Selling | %    | Produce     |
|-------|--------|------|-----------------|----------------|------|-------------|
|       | 1      | 2    | 14              | 2              | 14.3 |             |
| Over  | 1      | 4    | 56              | 16             | 28.6 | Pigeon peas |
| 1     | 2      | 1    | 12              | 7              | 58.3 | Bananas     |
| Acre  | 2      | 2    | 30              | 11             | 36.6 | Bananas     |
|       | Total  |      | 112             | 36             | 32.1 |             |
|       | 1      | 2    | 8               | -              | -    |             |
| Under | 1      | 4    | 174             | 1              | 0.6  |             |
|       | 2      | 1    | 8               | -              | -    |             |
|       | 2      | 2    | 54              | 1              | 1.8  |             |
|       | Total  |      | 244             | 2              | .8   |             |

In the question of marketed crops, size of holding is obviously important as only 2 operators in the smaller holding group were found to be marketing produce. Of the larger holdings, however, 32% marketed their crops and there is some distinction between Zones. Zone 1 (Cocoa North) has nearly double the proportion of producers found in any other Zone. It



is predominantly a banana producing area, due, probably, to ideal banana conditions coupled with available land along a main road (Main Toco to Sangre Grande Road). Some cassava and pigeon peas were also found to be grown for sale.

Although there was a lower proportion of growers found in the other Zones, bananas were grown in them all. The predominant crops sold in County 1, however, were found to be eddoes and pigeon peas, with lesser sales of okra, sweet potato, cucumber and pumpkins.

In all cases of sales of produce (both casual and organised) we were unable to obtain any definite information on exact amounts sold; as was the case for yields of the various crops grown.

#### Log Sheets.

A full account of the time and expense involved in the various phases of the survey is given in Appendix XVI. Briefly, however, the facts are that 221 man hours were spent in the preliminary work (drawing up of maps, field sheets, etc.), 491 hours in field work (approximately half in interviewing time and half in travelling), 235 hours in analysing the results, with 369 hours for general discussion and supervision, making a total of 1,313 man hours.

The cost of the survey amounted to \$392.00, most of which was taken up in travelling expenses.

#### General discussion of Results.

In practice our frame did not prove to be quite as foolproof as was originally thought; for it was found that the final number of farmers interviewed fell short of our original total, i.e. 356 farmers were interviewed out of an original total of 412. This fact led, of course, to some increase of the error of the results obtained. The reasons for this were due to holdings without food crops, no response where an operator could not be found, or where crops were grown under trees, and should not have been included in the frame. They were, however, included because our selection was based on the Agricultural Survey frame and as it had been produced the previous June, it was out of date by the time it was used for ours. Some false information was therefore used in the basis of the



plan. Unfortunately, there was no means of checking the verity of the information available before making field investigations.

Despite this basic disadvantage the frame acted sufficiently well for the quantitative results. The standard error of these was sufficiently low so that some meaning could be attached to the figures obtained. The qualitative results, on the other hand (based on plant numbers), were disappointing with a universally high standard error percentage. The reasons for this lay primarily within the sampling methods used, i.e. the plant counts themselves and in error between clusters. In this respect, the frame was not well designed. If the standard error of the qualitative analysis were to be reduced, the sampling coverage within each garden would have to have been greatly increased, as would the number of Clusters selected.

Although there was considerable variation between individual Clusters, no major differences were apparent, as was the case between Zones and Counties.

The results of cultivation methods and practices revealed a generally low standard of husbandry with a considerable number not practising any real cultivation methods at all. So that one could assume that the yields, (on which the operators were unable to give any information) must usually be fairly low.

One of the main factors emerging from the survey is that the comparatively small amount of produce grown in the rural districts we examined cannot make much of a contribution towards the volume of garden crops known to be sold in the markets of the larger towns in Trinidad. The conclusion one might make from this is that the bulk of these crops are grown in a few specialised areas (e.g. Aranguez, outside Port of Spain), and not throughout the countryside as a whole.



## Summary.

1. A survey of food gardens was carried out in three Counties of Trinidad in December 1956.
2. The objects of the survey were:
  - I. To determine the acreage devoted to food gardens.
  - II. To determine the constituent crops of these gardens.
  - III. Attempt to get a measure of the relative importance of each.
  - IV. Collection of any further information available about these crops, i.e. yields, cultivation, methods, racial preferences, etc.
3. The area chosen consisted of Caroni (County 1) and St. Andrew and St. David (County 2), and contrasted cocoa and sugar cane areas.
4. The frame used was based on a random selection of 1 in 10 of the Clusters, with a further selection of 1 : 2 for holdings over 1 acre and 1 : 3 for holdings under 1 acre.
5. The final selection gave a total of 412 operators in 41 Clusters. 28 Clusters in County 1 and 13 in County 2.
6. Recordings were made of the acreage, number of plots, any pure stands or deliberate combinations of crops, individual crops grown and the ethnic origin of the operator.
7. Plant counts were taken by counting crops in 100 ft. squares i.e. 2 sample squares in plots under 1/10 of an acre and 4 in plots larger than this. Counts were taken similarly in pure stands and areas of crop combinations.
8. Facts were recorded on:
  - (a) Methods of cultivation
  - (b) Manurial practice
  - (c) Method of crop disposal
  - (d) Crop yields
  - (e) Reasons for crop practices, e.g. combinations.
  - (f) Time and cost of the survey.



9. The information was tabulated on cope chat clip cards and analysed quantitatively (operator number) and qualitatively (plant numbers).

10. The results showed that:

1. Operators - The final number of operators interviewed was 356 (of 412) as some did not fall within the scope of the survey and others could not be located. All results are therefore based on 356 operators.

2. Acreage - 99.7 acres were found to be devoted to food gardens (estimated 182 acres). Of this area 54% was found in the cane zone and 46% in the cocoa zone.

3. Average size of holding was found to be .36 acre in the cocoa zones and .17 in the cane zone.

4. The principal crops grown quantitatively were:

1. Banana, Cassava, Dasheen, Tannia and Pigeon Peas.

2. Less commonly found were - Eddoes, Okra, Egg Plant, Yam, Sugar Cane, Maize, Sweet Potato, Topee Tamboo and Peppers.

3. Specialised crops of Beans, Tomatoes, Pineapples, Cucumber and Pumpkins were also grown.

5. Eddoes and Maize were grown on larger holdings, while Egg Plant, Topee Tamboo were more common on small holdings.

6. Some zonal difference was noted i.e. Eddoes, Egg Plant, Okra, Topee Tamboo and Peppers in the Cane zone. Sugar cane and Pineapples were more common in the Cocoa zones.

7. The Qualitative results are unreliable because of a high percentage standard error, Certain trends are, however, indicated.

8. Racial origin of the operators did not reveal much information. There was a tendency for East Indians to grow more Eddoes, Peppers, Pigeon Peas, Okra, Egg Plant, Tomatoes, Pumpkin and Topee Tamboo, and West Indians to grow Sugar Cane and Pineapples more frequently.

9. 288 or 77% of gardeners cutlassed (cleared) their land annually.

10. 231 or 68% forked their gardens annually.

11. 44 or 11% ploughed their land - This being the extent of mechanisation in the area. Most common in the Cane zone.

12. 145 or 40% utilised organic manures, the majority in the Cane zone. Bananas were the main crop to benefit.



13. Artificial fertilisers were used by 61 or 14% operators. The majority in the Cane zones and applied to Pigeon Peas, Okra, Eddoes, Egg Plant and Bananas. (The latter receiving chief priority in the Cocoa zones however.)
14. Pure stands were found on 22% of holdings. The majority on the larger gardens. The main crops were Sweet Potato, Dasheen and Maize.
15. Crops grown in combination were found on 12% of holdings. The main crops were Pigeon Peas, Cassava and Eddoes.
16. Very few operators were able to give reasons for the combination of crops.
17. None of the operators was able to give accurate details of crop yields.
18. 280 or 86% of gardeners consumed their own produce.
19. 27 sold surplus crop produce casually. Mainly Cassava and Banana, Pigeon Pea and Eddoes.
20. 38 operators marketed their produce (only 2 of the small garden class) mainly bananas in the North and Cassava and Pigeon Peas in other areas.
21. None of the operators was able to give accurate details of quantities of crops sold.
22. The survey took 1,313 man hours to complete and cost \$392.00



Acknowledgements.

I should like to thank in particular Dr. Jolly for his continuous guidance throughout the survey; Mr. Hodnett for his advice on statistical matters; Mr. De Sousa and his staff of the Government Statistical Office for their information, which they made so readily available, and Messrs. Watson Gunn, Hill, Law, Mawly, Meredith and Waterworth, the other members of the team, without whose help and hard work this survey would not have been possible.



# APPENDIX I

|        |      |         |           |           |      |
|--------|------|---------|-----------|-----------|------|
| COUNTY | ZONE | CLUSTER | BUILDINGS | No: PLOTS | NAME |
|        |      |         |           |           |      |

|      |             |                       |         |      |         |
|------|-------------|-----------------------|---------|------|---------|
| DATE | INTERVIEWER | ACREAGE<br>(measured) | ACREAGE | PLOT | ADDRESS |
|      |             |                       |         |      |         |

| RANDOM NUMBERS |  | A     |       |       |       |  | PURESTAND<br>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:



## APPENDIX II

|        |             |         |           |           |      |
|--------|-------------|---------|-----------|-----------|------|
| 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:



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. PACE 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)



# APPENDIX IV

## 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 SURVEY UNITInstructions to supervisors re the Log Sheet.

- A. Before distribution to enumerators, fill in:-
  1. Area number.
  2. Cluster number.
  3. Names of enumerators.
  4. Vehicle number enumerators are to use.
- B. On return of the log sheets fill in the time in the following categories.
  - VIII. Number of hours travelling to and from the task, i.e. the journey time in plus the journey time out multiplied by the number of enumerators.
  - IX. Interviewing time i.e. the sum of the column headed "Time (man-hours)" less that entered for the lunch-break.
  - X. Travelling within the clusters i.e. the total time from departure to return multiplied by 2, less VIII, less IX less the time entered for the lunch break.
  - 8/10. Cost of transport i.e. the total mileage covered by the vehicle (if any entered) multiplied by the rate per mile applicable to the vehicle.

Instructions to enumerators re. the Log Sheet.

Enter the following details:-

1. Date.
2. If you are driving a car enter the milometer reading at the start of the day.
3. Enter time of departure.
4. The time taken to get to the first cluster in hours under "Journey out". Also enter here the time taken to travel between clusters.



APPENDIX VII Cont'd

codes, using line 3 for those to which organics are applied and line 4 for those to which artificials are applied.

8. Cultivation. Clip appropriate holes.
9. Nationality. Clip appropriate hole. If "other" write nationality along left hand side of card.
10. Zone. Clip appropriate hole.
11. If this card refers to a pure stand area clip out "pure stand".  
If the card refers to an area with a definite combination clip out "00".  
If the card refers to an area that is only a part of a parcel clip out "M".
12. If there are no sales at all, clip out the dollar sign on the left hand margin of the card.  
If any crops are sold enter appropriate crop code in the body of the card. Line 1 for casual sales and line 2 for those crops that are regularly marketed.

Section C. Crops.

Clip out appropriate holes when crops occur in a garden.

Code of crops.

|    |            |     |                               |
|----|------------|-----|-------------------------------|
| 00 | Fig        | 16  | Sweet Potatoes                |
| 01 | Cassava    | 17  | Topee tamboo                  |
| 02 | Dasheen    | 18  | Pineapple                     |
| 03 | Tannia     | 19  |                               |
| 04 | Eddo       | 10  |                               |
| 05 | Pigeon Pea | 300 |                               |
| 06 | Okra       | 311 | Pepper                        |
| 07 | Egg Plant  | 310 | Green Vegetable crops         |
| 08 | Beans      | 21  | Others                        |
| 09 | Yam        | 22  |                               |
| 11 | Tomatoes   | 310 | will be sub-coded as follows: |
| 12 | Cane       | 312 | Cabbage                       |
| 13 | Corn       | 313 | Lettuce                       |
| 14 | Cucumber   | 314 | Mustard                       |
| 15 | Pumpkin    | 315 | Patchoi                       |



plants against the appropriate punched hole.

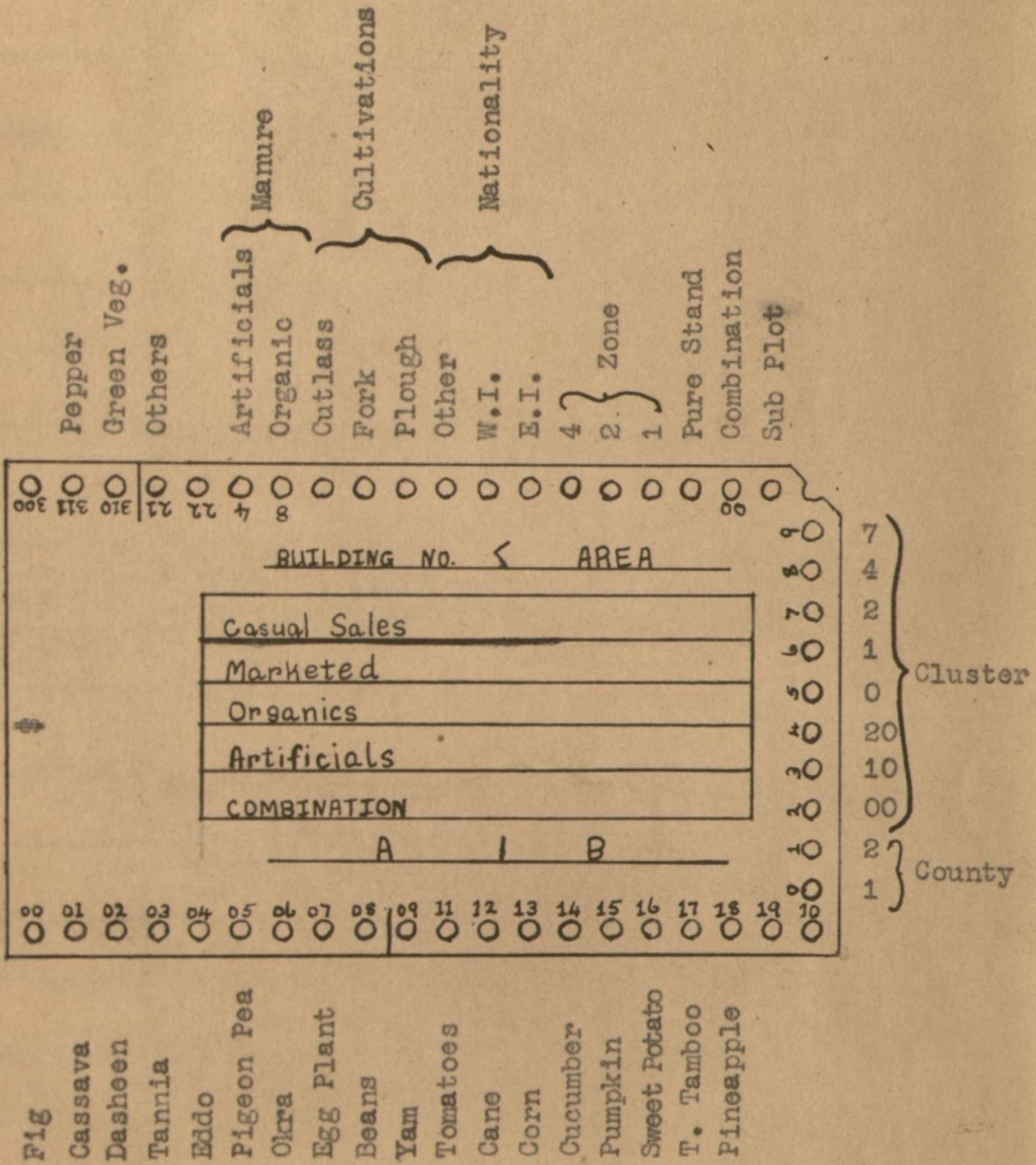
in the centre of the card e.g. (312) 200 (212) 850

(313) 415

clipped corner to the bottom left-hand corner of the card.



No Sale





[illegible]



No. Operators..... No. cards..... S.F..... M.R.F..... Zone..... County..... Cluster..... +1 acre..

| C           | W.I. |   | E.I. |   | Others |   | Total |   | Raised |       | W.I. |   | E.I. |   | Others |   | Total |   | Raised |       |
|-------------|------|---|------|---|--------|---|-------|---|--------|-------|------|---|------|---|--------|---|-------|---|--------|-------|
|             | O    | N | O    | N | O      | N | O     | N | Total  | Total | O    | N | O    | N | O      | N | O     | N | Total  | Total |
|             |      |   |      |   |        |   |       |   |        |       |      |   |      |   |        |   |       |   |        |       |
| 00          |      |   |      |   |        |   |       |   |        | 2101  |      |   |      |   |        |   |       |   |        |       |
| 01          |      |   |      |   |        |   |       |   |        | 2102  |      |   |      |   |        |   |       |   |        |       |
| 02          |      |   |      |   |        |   |       |   |        | 2103  |      |   |      |   |        |   |       |   |        |       |
| 03          |      |   |      |   |        |   |       |   |        | 2104  |      |   |      |   |        |   |       |   |        |       |
| 04          |      |   |      |   |        |   |       |   |        | 2105  |      |   |      |   |        |   |       |   |        |       |
| 05          |      |   |      |   |        |   |       |   |        | 2106  |      |   |      |   |        |   |       |   |        |       |
| 06          |      |   |      |   |        |   |       |   |        | 2107  |      |   |      |   |        |   |       |   |        |       |
| 07          |      |   |      |   |        |   |       |   |        | 2108  |      |   |      |   |        |   |       |   |        |       |
| 08          |      |   |      |   |        |   |       |   |        | 2109  |      |   |      |   |        |   |       |   |        |       |
| 09          |      |   |      |   |        |   |       |   |        | 2110  |      |   |      |   |        |   |       |   |        |       |
| 11          |      |   |      |   |        |   |       |   |        | 2111  |      |   |      |   |        |   |       |   |        |       |
| 12          |      |   |      |   |        |   |       |   |        | 2112  |      |   |      |   |        |   |       |   |        |       |
| 13          |      |   |      |   |        |   |       |   |        | 2113  |      |   |      |   |        |   |       |   |        |       |
| 14          |      |   |      |   |        |   |       |   |        | 2114  |      |   |      |   |        |   |       |   |        |       |
| 15          |      |   |      |   |        |   |       |   |        | 312   |      |   |      |   |        |   |       |   |        |       |
| 16          |      |   |      |   |        |   |       |   |        | 313   |      |   |      |   |        |   |       |   |        |       |
| 17          |      |   |      |   |        |   |       |   |        | 314   |      |   |      |   |        |   |       |   |        |       |
| 18          |      |   |      |   |        |   |       |   |        | 315   |      |   |      |   |        |   |       |   |        |       |
| 19          |      |   |      |   |        |   |       |   |        | 316   |      |   |      |   |        |   |       |   |        |       |
|             |      |   |      |   |        |   |       |   |        | 317   |      |   |      |   |        |   |       |   |        |       |
|             |      |   |      |   |        |   |       |   |        | 318   |      |   |      |   |        |   |       |   |        |       |
|             |      |   |      |   |        |   |       |   |        | 319   |      |   |      |   |        |   |       |   |        |       |
|             |      |   |      |   |        |   |       |   |        | 320   |      |   |      |   |        |   |       |   |        |       |
| 311         |      |   |      |   |        |   |       |   |        |       |      |   |      |   |        |   |       |   |        |       |
| Check Total |      |   |      |   |        |   |       |   |        |       |      |   |      |   |        |   |       |   |        |       |

Sq. yds. acres

A  
B  
C  
B/A

Number of Operators

Cutlass  
Fork  
Plough  
None  
Art.  
Org.  
C.S.  
M.  
H.C.

Plots A

No response  
No garden  
Under trees







[illegible]



Sample Survey UnitMethod of analysis and determination of Standard Error of crop counts.

$n'$  = no. of clusters in the sample.

$n''$  = no. of operators per cluster in the sample.

$y$  = the crop count for each operator.

$Y$  = the total crop count for the zone =  $S' S''(y)$

Estimation of population mean and total.

Mean per operator

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

Estimated number of operators in zone

$$N = \bar{g} S' (n'')$$

where  $\bar{g}$  = average raising factor =  $\frac{1}{\bar{f}' \bar{f}''}$   
(For  $\bar{f}''$ , see below)

Then  $\underline{Y} = N \bar{y}$

Estimation of sampling error.

For a given crop in a given zone and a given 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<br>(i.e. clusters)                                   | $n' - 1$      | $(S''(y))^2/n'' - Y^2/S'(n'')$ | $A = n'' s'^2$ |
| Within first stage unit<br>and between second stage<br>units (i.e. operators). | difference    | difference                     | $B = s''^2$    |
| Total                                                                          | $S'(n'') - 1$ | $S' S''(y^2) - Y^2/S'(n'')$    |                |

The Variance of the mean  $\bar{y}$  may be calculated thus

$$V(\bar{y}) = \frac{1 - f'}{n'} s'^2 + f' \frac{1 - f''}{n' n''} s''^2 \quad \text{---(Y.7.17)---(a)}$$

However, all the above presupposes that  $n''$  is constant, which is not true in this analysis. Hence one must replace  $n''$  by  $\bar{n}''_0$  where

$$\bar{n}''_0 = (S'(n'') - S'(n''^2)/S'(n''))/(n' - 1) \quad \text{---(Y.8.11d)---}$$



Further  $f''$  is not constant and  $\bar{f}''$  must be determined. For example in county 1, Zone 2 (+1 acre) there were 29 operators growing food crops out of which 15 were interviewed, hence

$$\bar{f}'' = \frac{S'(n'')}{S'(N'')} = \frac{15}{29}$$

This approximates to  $1/2$ , which was the working sampling fraction.

With these modifications and substituting for  $s'^2$  and  $s''^2$  from the analysis of variance, we may rewrite (a) as:

$$V(\bar{y}) = \frac{1 - f'}{n'} \cdot \frac{A}{n_0''} + f' \cdot \frac{1 - \bar{f}''}{n' \bar{n}_0''} \cdot B \quad \text{-----}(c)$$

$$\text{If } a = \frac{1 - f'}{n' n_0''}$$

$$\text{and } B = f' \cdot \frac{1 - \bar{f}''}{n' n_0''}$$

this formula becomes

$$V(\bar{y}) = aA + \frac{1}{2}B. \quad \text{-----}(d)$$

which is the form used for computation.

For example in County 1 Zone 2 (+1 acre), there were 4 clusters in the sample out of a total of 51 so that

$$f' = \frac{n'}{N'} = \frac{4}{51}$$

(Due to stratification by zones after selection, this differs from  $1/10$ )

$$\text{Also, } \bar{f}'' = \frac{14}{4/51 \cdot 15/29} = 3451$$

(It should be noted that in determining  $\bar{n}_0''$  and  $\bar{g}$ , allowance has been made for those operators whose food crops were under tree crops or who had no garden at all.

No allowance for the above operators has been made in determining  $\bar{f}''$  since if it is assumed that the sampling is uniform over the whole cluster, there would be no alteration of  $f''$  when these were rejected.)

Thus the estimated standard error of the total plant population of a crop will be

$$N. S. E. (\bar{y}).$$

$$S. E. (\bar{y}) = \sqrt{V(\bar{y})}$$



Computation Sheet.

| County ...1... | Zone ...2...    | $\frac{+1 \text{ acre}}{-1 \text{ acre}}$ |           | Crop .....50      |                  |              |        |
|----------------|-----------------|-------------------------------------------|-----------|-------------------|------------------|--------------|--------|
| Cluster        | $S''(y)$        | $n''$                                     | $n'' - 1$ | $(S''(y))^2/n''$  | Difference       | $S'S''(y)^2$ |        |
| 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          | 2,033,697    |        |
| 28             | 134             | 3                                         | 2         | 5,985             | 5,170            | 11,156       |        |
| <hr/>          |                 |                                           |           |                   |                  |              |        |
| Total.         | $\sum Y = 2835$ | 14                                        | 10        | 1,445,713         | 1,036,292        | 2,482,007    | Check. |
| C. F.          |                 |                                           |           | 574,087           |                  | 574,087      |        |
| S. S.          |                 |                                           |           | 871,626           | 1,036,292        | 1,907,919    |        |
| d. f.          |                 |                                           |           | 3                 | 10               | 13           |        |
| M. S.          |                 |                                           |           | A = 290,542       | B = 103,629      |              |        |
|                |                 |                                           |           | $\alpha = 0.0672$ | $\beta = 0.0028$ |              |        |
| 19809.70       |                 |                                           |           |                   |                  |              |        |

Between  $\underline{N} = 3451$   $\bar{y} = 202.50$   $S. E.(\bar{y}) = 140.75$   $\%S.E. = 69.5\%$   
 i.e.  $V(\underline{Y}) = 235,922 \times 10^6$   $\underline{Y} = 698827 \pm 485728$

With first stage within

and between stages

units.

Total

By substituting  $\bar{y}$  for  $\bar{Y}$  in the quantitative methods, the following are obtained as

$$V(\bar{P}) = \dots \dots \dots (4)$$

$$V(\bar{Q}) = \dots \dots \dots (5)$$

$$S.E.(\bar{Q}) = \dots \dots \dots (6)$$

(c) Estimated totals and their errors for stages are obtained by substitution from non-misc group totals and the corresponding variances.



Sample Survey TeamMethod of analysis and determination of Standard Error  
of number of operators growing a given crop.(a) Estimation population proportions and totals (in a given size group).Estimated proportion of operators growing a given crop in a given cluster.

$$\underline{P} = \frac{u}{n''} \quad q = 1 - p \quad \dots\dots\dots (1)$$

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

$$\underline{P}_0 = \frac{S'u}{S'n''} \quad q_0 = 1 - p_0 \quad \dots\dots\dots (2)$$

Estimated number of operators growing a given crop in a given zone

$$\underline{U} = \underline{N} \underline{p}_0 \quad \dots\dots\dots (3)$$

(b) Estimation of Standard Errors.For a given crop in a given zone and a given size group,  
the analysis of variance table takes the following form.

| Variance                                                     | d.f.          | S.S.                                             | M.S.           |
|--------------------------------------------------------------|---------------|--------------------------------------------------|----------------|
| Between first stage units<br>i.e. clusters                   | $n' - 1$      | $\sum (n'' (\underline{P} - \underline{P}_0)^2)$ | $n'' s'^2 = C$ |
| With first stage units<br>and between second stage<br>units. | $S'(n'' - 1)$ | $\sum (n'' \underline{p} \underline{q})$         | $S''^2 = D$    |
| Total                                                        | $S'(n'') - 1$ | $(S'n'') \underline{P}_0 q_0$                    |                |

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

$$V(\underline{P}) = a C + \beta B D. \quad \dots\dots\dots (4)$$

$$V(\underline{U}) = \underline{N}^2 V(\underline{P}) \quad \dots\dots\dots (5)$$

$$S.E.(\underline{U}) = N S.E.(\underline{P}) \quad \dots\dots\dots (6)$$

(c) Estimated totals and their errors for zones and counties are obtained  
by summation from zone-size group totals and the corresponding variances.



Computation Sheet (2)

| County..1.. | Zone...2.. |        |        | + 1 acre | Crop .03..              |
|-------------|------------|--------|--------|----------|-------------------------|
| Cluster     | 07         | 19     | 20     | 28       | Overall                 |
| u/n"        | 1/3        | 2/5    | 2/3    | 2/3      | 7/14                    |
| p           | 0.3333     | 0.4000 | 0.6667 | 0.6667   | p <sub>o</sub> = 0.5000 |
| q           | 0.6667     | 0.6000 | 0.3333 | 0.3333   | q <sub>o</sub> = 0.5000 |

|                                       |                      |        |        |        | Total  | D.F. | M.S.       |
|---------------------------------------|----------------------|--------|--------|--------|--------|------|------------|
| $(p - p_o)^2 n''$                     | 0.0834               | 0.0500 | 0.0834 | 0.0834 | 0.3002 | 3    | 0.1001 = C |
| n'' p q                               | 0.6666               | 1.2000 | 0.6666 | 0.6666 | 3.1998 | 10   | 0.3200 = D |
| (S'n'') p <sub>o</sub> q <sub>o</sub> | 14 x 0.5000 x 0.5000 |        |        | →      | 3.5000 | 13   |            |

$$V(\underline{U}) = 345^2 (0.0672 \times 0.1001 + 0.0028 \times 0.3200)$$

$$= 907.2942$$

$$S.E.(\underline{U}) = 30.12$$

$$\underline{U} = 345 \times 0.5$$

$$= 172.5$$

$$\% S.E. = 17.5\%$$



## SUMMARY OF FOOD CROP SURVEY

| Crop                    | Est. Plant Count<br>(000) |              | % S.E. | Est. No. of<br>Operators |     | % S.E. |
|-------------------------|---------------------------|--------------|--------|--------------------------|-----|--------|
|                         |                           |              |        |                          |     |        |
| Banana                  | 256 ±                     | 65           | 25.5   | 7,162 ±                  | 184 | 2.6    |
| Cassava                 | 1,962 ±                   | 435          | 45.0   | 7,358 ±                  | 256 | 3.5    |
| 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 Tamboo            | 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   |
| <u>Operations, etc.</u> |                           |              |        |                          |     |        |
| Cutlass                 |                           |              |        | 6,922 ±                  | 355 | 5.1    |
| Forking                 |                           |              |        | 6,079 ±                  | 336 | 5.5    |
| Ploughing               |                           |              |        | 954 ±                    | 200 | 21.0   |
| Home Consumed           |                           |              |        | 7,710 ±                  | 161 | 2.1    |
| Casual Sales            |                           |              |        | 609 ±                    | 129 | 21.2   |
| Marketing of Crops      |                           |              |        | 634 ±                    | 110 | 17.4   |
| Organic Mamure          |                           |              |        | 3,349 ±                  | 314 | 9.4    |
| Artificial Mamure       |                           |              |        | 1,252 ±                  | 186 | 14.9   |
| Survey Total            |                           |              |        |                          |     |        |
| Area                    | 2,161 ±                   | 258<br>acres | 12.0   |                          |     |        |



TIME AND COST STUDY

The following is an account of the time and expense involved in carrying out the Survey.

Preliminary Work

|                                       | Time<br>(man hours) | Cost \$<br>(travelling only) |
|---------------------------------------|---------------------|------------------------------|
| Obtaining and selection of the sample | 45                  | 8:00                         |
| Preliminary surveying of the area     | 71                  | 70:00                        |
| Preliminary statistical analysis      | 45                  |                              |
| Preparation of Maps                   | 26                  | 9:00                         |
| Preparation of Field Papers           | 34                  |                              |
| Total                                 | 221                 | \$87:00                      |

Field Work

|                              |     |          |
|------------------------------|-----|----------|
| Supervisory work             | 40  |          |
| Travelling to and from tasks | 116 | 235:00   |
| Travelling within clusters   | 132 |          |
| Interviewing time            | 185 |          |
| Total                        | 453 | \$235:00 |

Follow-up

|                       |    |         |
|-----------------------|----|---------|
| Total travelling time | 25 | 42:00   |
| Interviewing time     | 13 |         |
| Total                 | 38 | \$42:00 |

Analysis

|                                 |     |  |
|---------------------------------|-----|--|
| Preparation for and supervising | 134 |  |
| Computation and supervising     | 232 |  |
| Total                           | 366 |  |

|                         |                    |          |
|-------------------------|--------------------|----------|
| General discussion      | 235                |          |
| Cost of Boards and Rods |                    | \$10:00  |
| Cost of Paper           |                    | \$18:00  |
| Survey Total            | 1,313<br>man hours | \$392:00 |



Map of

TRINIDAD

Showing food crops  
survey area.

\* Location of clusters

