R.O.R.I (831)

PRELIMINARY DESIGN FOR THE FARM MANAGEMENT SURVEY IN THE COFFEE - BANANA ZONE OF BUGANDA AND BUSOGA.

I. Aim of the Study

The proposed study is designed to obtain a range of information on the farming system of the Robusta Coffee/Banana Zone of Buganda and Busoga. A general background to the farming of the area has been written by Parsons[1] who described the ecological environment, the social background and the pattern of farming, but this study did not attempt a detailed farm management approach and therefore gave very little quantitativeinformation. Such information is almost non-existent and pleas for the initiation of research to rectify this situation are constantly made both by agriculturalists and economic planners. The report of the Mission from The International Bank for Reconstruction and Development on the economic development of Uganda stresses the need for a more detailed economic analysis of agriculture in Uganda in order to identify the major factors limiting production; thereby ensuring the effective evolution of the agricultural programme.[2]

The following quotation taken from a paper presented to a Conference of East African Agricultural Economists[3] indicates the importance attached to farm-level research by many of the workers concerned with raising the efficiency of the existing agriculture. "The essence of the problem is to identify those factors that are currently limiting increased production and to define a combination of inputs that will yield large returns in increased farm output and productivity. Although general presumptions may be of some value as a guide to research and analysis, there is no substitute for farm-level studies carried out in areas representative of the different types of farming situations that exist within a country or region. Such studies are needed to determine the nature of present input combinations and returns, and ways in which efficient decisions and practices at the farm are hindered by lack of essential inputs".

Of more immediate significance are the comments on the need for improved agricultural data contained in a report on the economic development of Buganda issued by the Ministry of Economic Development and Planning of the Kabaka's Government.[4] Proposals on agricultural research requirements for

1. Memoirs of the Research Division, Series 3, No.2 Dept. of Agric., Uganda, The Plantain-Robusta Coffee System, D.J.Parsons.
2. The Economic Development of Uganda, I.B.R.D., 1961.
3. Some Priorities for Agricultural Economics Research in East Africa, D.G.R.Belshaw. A paper presented to the Agricultural Economics Symposium held at Makerere Dec., 1962.
4. The Economic Development of the Kingdom of Buganda, Part 1, A Report to the Kabaka's Council of Ministers by the Buganda Planning Commission.

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for planning purposes include a recommendation that the Uganda Government should extend the present 'Peasant Farm Surveys' in the Nothern and Western Regions of Uganda to include a survey in Buganda. The report shows an awareness of the dangers involved in planning without adequate background data in stating, "We need to have more detailed farm studies of yields, costs and profitability of various crops. In the absence of such results it is difficult to know about the reasons for low production."[1]

The proposed survey, which is to be jointly financed by Makerere College and the Uganda Government, should go a long way towards remedying the current state of ignorance with regard to the economics of peasant farming in the area. The aim of the survey will be to study a number of randomly selected farms for periods of up to two years in order to gather information on both farm and non-farm income and expenditure, husbandry techniques, and physical input-output information. The data will be useful to both Economic Planners and the Agricultural Department which will be provided with a more accurate picture of farming organisation in the area. The physical input-output information will be used to formulate a series of farm plans which will then be tested by applying them in the field by means of a controlled extension exercise similar to the work at Borgo a Mozzano in Italy carried out by extension specialists of the Shell Company. It is anticipated that this Company will provide at least part of the finance needed for the project.

It is hoped to integrate into the survey a study of the emergence of successful commercial farms and the land tenure systems in Buganda which is to be carried out in the coming year by a Cambridge University team under the guidance of Dr. A. Richards former Director of the Institute of Social Research, Makerere and Professor Sir Joseph Hutchinson, former Director of Namulonge. Mr. J. Moris of the Department of Agriculture, Makerere has expressed an interest in carrying out a study, within the same sample of farms, of the sociological influences on agricultural production, and Mr. Ronald Watts, Lecturer in Agricultural Extension Methods, will also be available to investigate various aspects of agricultural development in the survey areas.

1: The Economic Developmentof the Kingdom of Buganda

op. cit p.6.

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II. The Sampling Procedure:-

(1) Sampling Universe

It is necessary to examine all the variables operating within the area of study to ensure that the results from the sampled areas are capable of the widest possible application. The major variables requiring consideration in selecting the sampling universe are as follows:

a) Climate
   (a) Temperature range and variation.
   (b) Rainfall amount and distribution.
b) Soils.
c) Altitude and Topography.
d) Vegetation.
e) Population.
   (a) Tribal Admixture.
   (b) Density.
f) Ease of Access to major consuming centres.
g) Land tenure status.
h) Farm size and degree of fragmentation.
i) Farming type.

Some of the above factors are responsible for delineating the boundaries of the Coffee/Banana Zone, and all give rise to inter-area and inter-farm variation within it.

a) Climate

Temperatures

Although the 'Coffee/Banana Zone' lies astride the Equator, the climate is very much modified by the relatively high altitude of the area. If the Zone is pictured as an arc running along the northern and north-western shores of Lake Victoria with the towns of Masaka, Kampala and Jinja lying along a chord, the variation in temperature within its area can be shown with reference to climatic data collected at stations near to each town.[1] Masaka at the western end of the zone experiences a mean annual maximum temperature of approximately 25°C and mean annual minimum temperature of around 16°C; approximate comparative figures for Kampala are 27.5°C and 17°C and for Jinja, a slightly higher mean annual maximum temperature of 28°C and a lower mean annual minimum temperature of 15°C. Namasagali lying at the apex of the triangle to the north of Jinja and Kampala exhibits both higher mean annual maximum and minimum temperatures than the other three stations. This interpretation of temperature range and levels is confirmed by an examination of the maps[2] showing the various zones of mean annual maximum and minimum

1. Figures deduced from charts of mean maximum and minimum T. p 21 Atlas of Uganda.
2. Ibid., p.21.

temperatures. Whereas all four towns lie within the same minimum temperatures zone of 15°C to 17.5°C they lie within three different maximum temperature zones. Masaka falls within the 25°C to 27.5°C mean annual maximum temperature zone which extends southwards into Tanzania, westwards into Ankole and Toro and swings north-east almost to Kampala then north-west through W. Mengo and Mubende. Kampala and Jinja lie within the 27.5°C to 30°C zone running along the northern shores of Lake Victoria and northwards to Bunyoro. Namasagali is situated within the 30°-32.5° zone which encompasses North-Eastern Buganda and whole of Northern Busoga. These differences in mean maximum temperatures will later be shown to play an important part in the delineation of the possible areas for growing robusta coffee.

Rainfall

A glance at the 'Probability Maps of Rain[1] [2] will suffice to show that the northern and north-western shores of Lake Victoria enjoy a relative abundance of rainfall. Most of Buganda and Busoga can be sure of at least 30-40" of rainfall in 9 years of 10 and E. Mengo and Busoga can rely on 40-50" of rainfall in four years out of five. The distribution of rainfall is similar throughout the Coffee/Banana Zone and this is confirmed by an examination of charts showing the monthly variation in rainfall experienced by various towns.[3] It is essentially bi-modal with two peaks, in April-May and September-November and two dry seasons in June-July and December-February. Both the first peak and the first dry season are the more pronounced.

The mean annual rainfall map shows a number of sub-zones within the main probability zones. Generally speaking the annual precipitation drops rapidly from 80" over part of the Ssese Islands to 50-60" on the Lake shore fringe, this gives way a short distance inland to a 40-50" belt about forty miles wide running approximately 100 miles from Lake Wamala in the west to Iganga in the east and with a panhandle, 15 miles wide running south-west from Buwama to Rakai. Rainfall drops rapidly west of a line from Masaka to Lake Wamala and the northern parts of both E and West Mengo average under 40 inches of rainfall.

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1. Atlas of Uganda p. 19
2. The Statistical Assessment of Rainfall Probability and its application to Uganda Agriculture H.K. Manning. Research Memoirs No. 23, Empire Cotton Growing Corporation, 195.
3. Atlas of Uganda, p. 17.

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b) Soils

The soils of Buganda have been mapped and described by S.A. Radwanski[1] and those of Busoga by C.D. Ollier and J.F. Harrop[2]. Most of the soils in the area are classified as sandy-clay loams but this soil type is surrounded on all sides by sandy-loams. In a semi-circle to the north of Jinja lies a belt of crystalline basic rocks forming ferrisols[3]. The Zone as a whole is one of mainly undulating relief comprising a series of flat topped hills with wide swamp filled valley bottoms typically 400-500' below the hill summits. A definite and remarkably uniform series of soils can be recognized almost throughout the area. The hill tops usually consist of a thin layer of soils lying on top of impermeable laterite and are therefore useless for cultivation purposes and are utilized as grazing land. On the middle slopes of the hills, areas of fertile red loams are encountered and these give way to black swamp soils in the valley bottoms. The red loams provide the main arable area, although annual crops may be grown towards the foot of the hill slopes[4].

After describing the main soil series in Buganda, Radwanski went on to classify them into productivity classes with regard to perennial crops and annual crops[5]. Most of the southern parts of Buganda possess a soil which is rated as highly productive both for perennial and annual crops. This belt, stretching approximately 25 miles inland from the Lake shore, gives way to an area of mixed productivity ratings. Here the middle slopes or pediment members of the catenas[6] are highly productive but tend to be dominated by the summit and upper slopes soils, as well as the alluvial or plain soils of a lower productivity. The main characteristics of Busoga Soil series have been described[7] but no productivity map has been produced.

c) Interaction of Soils, Rainfall and Temperature.

The variations in the different interrelated factors described above interact and give rise to a complex pattern of crop environments, which have been delineated by means of superimposing on transparent sheets, the various maps showing

1. The Soils and Land Use of Buganda. S.A. Radwanski. Memoirs of the Research Division Department of Agriculture, Uganda Series 1, No. 4.
2. The Soils of the Eastern Province of Uganda. C.D. Ollier & J.F. Harrop. Memoirs of the Research Division, Dept. of Agric., Uganda, Series 1, No. 2.
3. Atlas of Uganda p. 23.
4. See McMaster, D.N., A Subsistence Crop Geography of Uganda; World Land-use Survey Paper No. 2.
6. Radwanski, op. cit., Map 10.
7. Ibid., Map 7. 7. Ollier, op.cit.

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rainfall, soils and temperature.[1] The first stage of the process was to compare the map of mean annual rainfall with the various mean maximum temperature zones. As maximum temperature is intimately connected with water stress in plants, it was decided to regard precipitation as being more effective in the cooler zones than in the hotter ones e.g. 40-45" mean annual rainfall in the hottest zone was only given equivalence to 35-40" in the medium temperature zone and to 30-35" in the coolest zone. (humidity is fairly uniform throughout the region) When these zones were superimposed upon the soil productivity map a series of areas emerged, differering in their degree of suitability for the growing of crops. The next step was to define the parameters for a suitable environment for robusta coffee[2] [3] and for bananas.[4]

Robusta coffee requires a more evenly distributed rainfall than arabica; 42-70" of rainfall being sufficient with the proviso that there should be over 3" of precipitation in at least 10 months of the year to ensure optimum conditions. Robusta prefers a narrow temperature range 58-85°F and grows between the altitude of 3,500-5,000 feet in East Africa. The soil should be permeable but retentive of water and should be neutral or slightly acid. Optimum conditions for banana growing are a temperature of around 78°F and a very high rainfall. The absolute ecological parameters for the Coffee/banana Zone were therefore decided as follows.

	Maximum high temperature zone	Medium mean maximum temperature zone	Cool mean maximum temperature zone
Mean annual rainfall	45-50"	40-45"	35-40"
Soil productivity numbers (Map 10 Radwanski)	a. 1+2 b. 3 c. 3+2 d. 2+4 e. 10+2	a. 1+2 b. 3 c. 3+2 d. 2+4 e 10+2	a. 1+2 b. 3 c. 3+2 d. 2+4 e.10+2

Within the absolute parameters, three main classes were defined by their suitability for growing perennial crops. The best category of land was defined as that containing soils with a class 1, 2 or 3+2 productivity rating. The next

1. G. Jackson, Senior Lecturer in Agricultural Botany gave me very valuable assistance with this exercise.
2. Haarer, A.E., Modern Coffee Production, Ch. 4.
3. A.H. Savile and B. Hanger., Robusta Coffee. East African
4. Agricultural Journal, Jan. 1959., p. 155. Robusta Climate.
5. Champion, J., Le Bananier, Ch. 3.

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category was taken as that land with a soil productivity rating of 3 and the third category consisted of land within the rainfall parameters but with mixed soil productivity ratings of 2/4 and 10/2. The remaining soil classes are useless for perennial crops. Category One forms an almost continuous area separated from Lake Victoria by a strip of poor, highly leached soils. To the north of this in East and West Mengo is a narrower belt of Category 3 land and to the south east edge of the Masaka District Category 1 land lies a narrow strip of Category 2 land. A large area of Category 1 land is situated in the north of Mubende District, but after consultation it was decided to exclude Mubende District from the study as it tends to be remote and underpopulated, and in any case most of the potential coffee area lies in the former 'Lost Counties' and is therefore not very amenable to study at the present time.

The universe is therefore provided by Categories 1, 2 and 3 land within Masaka District, East Mengo District and West Mengo District of Buganda, but Category 2 land i.e Soil Productivity Rating 3 will not be considered further as it covers a very small area. The ecologically suitable land within Busoga District is also included, this area corresponds very closely with the distribution of the soils of the Nakabango Series which are deep red clays and the Buyago Catena which is a deep red clay loam.[1] Although rainfall would seem adequate both in total amount and distribution the other soil series are of too light a material to conserve enough water to ensure that coffee will survive during a prolonged dry period.[2] The final sample universe based on the criteria of ecological potential is seen to correspond closely with the Coffee Area, derived by McMaster and O'Connor from the Gombolola planting returns, except for parts of Mubende which are not yet closely settled. There is also close correlation between the Vegetative Zone shown on the Vegetation Map of Uganda as semi deciduous forest; this zone corresponds to the secondary fire climax zone of elephant grass. This is probably because elephant grass thrives in the same climatic conditions as robusta coffee and bananas. The Western part of Busoga does not however conform to the above pattern as the soils there are too light to sustain robusta through a dry period but the deep rooting elephant grass manages to survive these droughts. The

1. see Ollier, op. cit., Soil Map.
2. This is described in detail by J. Kaibale, Coffee Production in Busoga District. Special Project for the Degree of B.Sc. (Agriculture), Makerere University College.

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sample universe can be further subdivided into zones using several criteria such as rainfall, soil class, topography and percentage of land cultivated; and the most important areas within it can be deduced.

CHARACTERISTICS OF LAND OF CATEGORY 1 AND 2. QUALITY WITHIN THE SAMPLING UNIVERSE.

	Productivity Rating		Rainfall (Mean Annual)		Farming Density	
	Class	%	Effectiveness(1-4)	%	Degree of Cultivation	%
Category 1 Land in Buganda	1+2	15%	2	10%	80-100%	90%
	2	80%	3	40%	50-80%	5%
	3+2	5%	4	50%	20-50	5%
Category 2 Land in Buganda	2+4	60%	2	5%	80-100%	50%
	10+2	40%	3	30%	50-80%	5%
			4	65%	20-30%	25%
					0-20%	25%

The predominant characteristics of Category 1 Land are therefore, a high soil productivity rating; class 4 mean annual rainfall i.e. 45-50" in the hottest zone, 40-45" in the intermediate zone and 35-40" in the coolest zone, although almost as much land enjoys a higher rainfall i.e class 3; and a farming density with 80-100% of the land cultivated. Category 2 Land is mainly of mixed productivity lying in the class 4 rainfall belt and about half of it is farmed at high density. Any sampling carried out within the two main categories of potential coffee/banana land will have to take cognizance of the fact that the areas with the above characteristics dominate. Similar considerations also apply to the coffee/banana belt in Busoga although this area is much more homogeneous and should pose no sampling problems.

d) Other Factors to be Considered.

(1) Land Tenure

The Land Tenure System in Buganda is extremely complex[1] as the four traditional forms of tenancy-Butaka (Clan Lands), Butongole (land held by Chiefs and officials), Bwesengeze (individuals based on long occupation) and Ekibanja (small peasants) were further complicated by the Administration.

1. See Land Tenure in Buganda: Present Day Tendencies A.B. Mukwaya. East African Studies No. 1, 1953.

The Buganda Agreement of 1900 destroyed the first three forms of tenure and substituted Crown Land and Mailo Land which was distributed among chiefs and notables. As a result there are now five main forms of tenure[1], those farming on Crown Land either freehold or leasehold, Mailo landowners and their kibanja tenants and those farmers leasing land annually from Mailo owners; this forms a unique amalgam of traditional tribal tenure welded to the British concept of land holding. The Busoga system[2] is less complex, but it is felt that a study of the effects of tenure systems is best dealt with by a team of specialists working solely on this problem; therefore no attempt will be made to stratify the sample to include an adequate proportion of each class of holding.

(ii) Holding Size and Fragmentation.

It is desirable to include a range of holdings sizes in the sample in order to examine its effect on the farming system. By using a system of stratified sampling it should be possible to obtain a sample representative of different groups of holding by size. Holdings with more than a certain acreage of cultivated land will not be included in the survey as they involve too many recording difficulties. Fragmentation will be studied only incidentally and fragmented holdings will not purposely be included in the sample as it is hoped that this problem will be studied in more detail by the Cambridge team.

(iii) Tribal Admixture

The coffee/banana Zone is exceptional in Uganda as it has an extremely high proportion of immigrants[3] forming almost 50% of the population and outnumbering the indigenous Baganda in some sazas; a total of 21 alien tribes are represented within Buganda.

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1. H.West, at present working on Land Tenure problems in Buganda recognizes seven main tenure types.
2. Land Tenure in Busoga, L.Fallers.
3. See Uganda Census 1959 - African Population. Published by the Statistics Branch of the Ministry of Planning and Community Development.

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In West Mengo for example 75% of the farmers are Baganda and most of the immigrants are Banyarwanda[1] or from other Bantu tribes whereas in East Mengo only 60% of the farmers are Baganda and the immigrants come from a much wider selection of tribes and include people of Nilotic stock. In Busoga the proportion of immigrants is lower but still significant.

When the survey areas are chosen it will be necessary to select those which are representative of the district from the point of view of tribal admixture and in drawing the final sample it must be ensured that an adequate ratio of Baganda to non-Baganda is chosen.

(iv) Topography

As previously stated the various catenas encountered in the zone display a remarkably uniform series of soils from the tops of the hills running down to the swamp valleys. Soil features will affect the types of crops which can be grown and must therefore be considered in the sampling design. If the sample units tend to lie across the contours all types of soil will be included although individual farms may be situated predominantly on a single soil type. If subsequent investigation show this to be the case, within-area stratification by altitude will be necessary. In the case of units lying along contours, areas of differing altitudes will have to be chosen. Preliminary investigations indicate that sample areas will lie across the contours and individual farms will encompass the whole catena. Confirmation of this observation will mean that no stratication by altitude or soil type will be necessary.

(v) Distance From Main Consuming Centres.

The two main consuming centres in the zone are Jinja and Kampala but Masaka is also a sizeable town. Farmers close to the towns will enjoy better marketing opportunities for such products as milk and vegetables and the enterprise combination on such farms will therefore be different from the mass of holdings situated further from towns. Sampling units will be more typical of the universe if they are at a distance from the towns sufficient to remove them from the danger of a typicality due to specialization for the urban market.

1. See Richards, A., (ed.) Economic Development and Social Change, p. 77.

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2. Selection of the Main Strata

It has been decided to subdivide the universe, defined as the land with ecological potential for banana and robusta coffee growing, into four main strata and to select parishes as the sample units within these strata with individual holdings as the recording units.

The universe can easily be divided into two main strata on ethnographic grounds i.e. Buganda and Busoga. Of the three districts of Buganda forming part of the universe, Masaka District stands out as an area with some exclusive characteristics. It was the original nucleus for robusta coffee growing in East Africa, it is a district containing some large african owned mailo estates and it is not subjected so greatly to the influence of the many job opportunities open to the population of West Mengo, East Mengo and South-West Busoga. In addition to the above characteristics, Masaka District is at the extreme western end of the Coffee/Banana Zone and so forms useful stratum from the point of view of studying the effect on the farming system brought about by the influence on climate of changing longitude from Busoga in the east to Masaka in the west. East and West Mengo are administratively separate, homogeneous in many other respects, but could in fact be subdivided into many different strata using various criteria such as rainfall, heat zone, soil zone etc. As it is impractical within the constraints of funds, personnel and adequacy of supervision to choose more than four strata, East and West Mengo have to be split into two strata and the best method would be to choose Category 1 soil productivity land to the south of the two districts and the Category 2 land to the north of this.

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Characteristics of the Four Main Strata.

	% Category 1 Land	% Category 2 Land	Approximate land % in each rainfall class 2 3 4	Land Class density of cultivation (1-4) % Area
Busoga (that part of the district lying within the sampling universe)	100%	-	- 30% 70%	1 90% 2 10% 3 - 4 -
Masaka (that part of the district lying within the sampling universe)	60%	40%	20% 20% 60%	1 45% 2 35% 3 - 4 20%
E & W. Mengo Category 1 (that part of the district lying within the sampling universe)	100%	-	15% 45% 40%	1 95% 2 5% 3 - 4 -
E & W. Mengo Category 2 (that part of the district lying within the sampling universe)	-	100%	- 30% 70%	1 45% 2 10% 3 25% 4 20%

3. Selection of Sample Units.

It is desirable to have more than two sample units within each stratum so as to gain some measure of inter-parish variability. The problem is, however, that with limited resources, an increase in the number of sample units will decrease the sample fraction within each unit with a consequent increase in sampling error. Another consideration is that supervision becomes progressively more difficult as the number of sample units rises. It has therefore been decided to include two parishes only within each stratum and site them fairly closely together for ease of supervision. This is really a compromise between what is statistically desirable and the limitations imposed by the available level of resources. Nevertheless, some measure of inter-parish variations will be obtained and this will be strengthened by the inter-parish variations revealed by the study of the FAO Census Data.

The FAO-sponsored Agricultural Census of Uganda is divided into two phases. The first phase ran from June 1963 to July 1964 and was preceded by pre-enumeration surveys in all the sample parishes. The information gathered during the first phase consisted of acreage estimation of crops and an estimation of the areas of agricultural holdings, together with the collection of data on the holder (age, tribe, status, occupation, location); the farm population (number of people on the holdings); labour employed (classified by the number of workers, period of employment, reason for employment of labour and the form and basis of payment of labour); and a count of livestock by age and sex. The second phase of the census is concerned with the estimation of the yields for ten of the major food crops in Uganda on the basis of three crops per district. The crops being measured in East and west Mengo are sweet potatoes, maize and bananas; in Masaka District, beans, groundnuts and sorghum and in Busoga District, groundnuts, sweet potatoes and maize.

On final selection of the survey parishes they will be compared with their respective strata to ensure that they are representative in the frequency distribution of cropping patterns, holding sizes, ethnic composition, and labour employed. Parish figures cannot be abstracted from the F.A.O. Census as they are currently regarded as too confidential, but for each parish, information will be available in the form of gross figures representing the results for that particular stratum rated up using the sampling fraction, to represent the surrounding ten or so parishes. Statistics for the strata to be used in the Farm Management Survey will be derived by summing the F.A.O. results for all the counties lying within each stratum. Parishes in the upper range of population density, i.e. 250-500 people per square mile will be chosen, as the zone is one of high population and the rate of population growth is extremely high.

Some Characteristics which Dominate the Sample Strata and to which the Sample Units Must Conform.

Stratum	Land Category by productivity/rainfall effectiveness	Rainfall Class (1-5)	% of Land cultivated
Busoga	1	4	80-100
Masaka	1	4	80-100
Mengo: Category 1	1	3 or 4	80-100
Mengo: Category 2	2	4	80-100

4. Sampling Frame:-

During 1963, the FAO Census of Agriculture in Uganda carried out a pre-enumeration exercise in each sample parish. The resulting lists can be brought up to date by adding the new entries taken from the gombolola tax list which otherwise, has several drawbacks and innaccuracies as many immigrants are not included. yet names of people long deceased still remain. The method of completing the pre-enumeration list was by checking each plot holder and working from one end of the parish to the other. A systematic sample will be drawn as this will give a more certain geographical spread than random sampling and so ensure that possible variation in soils will be adequately covered. The distribution of sample holdings will then be checked using paired aerial photographs and a bioscope to check on any bias in the areal distribution of the sample.

III. DEFINITIONS USED.

The main definitions will conform to FAO[1] usage.

(1) The Holder:- is defined as the person who is responsible for the operation of the holding whether run by himself or his wife or employing a hired manager. If the operation of the holding is shared by two or more persons they should be considered as a single holder; e.g. father and son farming the same land. If the holding is being run by a relative, other than the wife of the actual owner, then the relation can be regarded as the holder. If, however, a paid manager is running the holding for the owner who lives elsewhere, the owner is the holder but information may be recorded from the manager.

(2) The Holding (Recording Unit):- For the purpose of the survey, a holding is all the land which is used by the holder completely or partly for the purpose of agriculture (including grazing land other than communal grazing). The holding may consist of more than one block of land provided that the blocks are in one gombolola.

If a family is living together and sharing their meals, then all the plots cultivated by the family may be regarded as one holding, and the holder is the head of the household. If, however, an area of land is cultivated by relatives who live separately, even though they share the work on the land, each of them will normally know which plot belongs to him. In such a case the area of land is not one holding but several holdings according to the number of persons who

1: See Uganda Census of Agriculture 1963 Instructions to Enumerators.

have claims to parts of it.

A block of land is that land which is entirely surrounded by land of other holdings or land belonging to no holding. A block may consist of several plots. The number of separate blocks which make up the holding is the number of blocks the holder farms which are in the same gombolola. If the holder has a block or blocks of land outside the gombolola, these should be considered as another holding, (although approximate acreage will be noted).

Land which the holder owns but which he has either loaned or rented to other people should not be included in his holding. The holding is the land that he and his household are operating for crops or grazing (other than communal grazing).

If an owner claims that he farms a large area of land but on a shifting cultivation basis the total area of the holding should be considered as (a) the area under crops; (b) the area prepared for cultivation but not planted, (c) the area that has been resting (i.e. without crops) for less than 3 years; and (d) the area used for his own grazing (not communal grazing). It is not anticipated that this particular problem is likely to be encountered.

(3) Tenure Status:- Vernacular descriptions will be used as FAO definitions are inadequate for use in Buganda/ Busoga.

IV: ORGANISATION OF THE SURVEY.

(1) Methodology:-

Survey methodology has been almost completely neglected in most Farm Management Surveys and it is hoped to carry out some research on this aspect of the study. Previous surveys have differed in sampling techniques, the type of information gathered, frequency of visiting and consequently the number of holdings covered by each enumerator, and uses made of the data.

Sampling techniques have included selection mainly based on ease of visiting;[1] purposeful selection for case studies,[2]

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1. M.P. Collinson, Farm Management Survey No.1, Western Research Centre, Tanzania.
2. Mrs. Judith Heyer, Seasonal Labour Inputs in Peasant Agriculture: Paper presented to the 2nd Conference of East African Agricultural Economists, Nairobi 1965.

selection of those farmers willing to co-operate and therefore likely to be the better farmers,[1] selection from gombolola tax lists[2] which was the method used in selecting the sample of farmers for the previous Farm Management Surveys in Uganda, sampling from pre-enumerated lists as in the FAO Census of Uganda Agriculture and even the recording of data from 100% of holdings in a village as in the Mutala Survey carried out in Uganda.[3] A 100% sample is wasteful of resources and in this case would require more resources than will be available. All the other methods used except for the pre-enumerated sample are open to large sampling errors. The Coffee-Banana Zone survey will use accepted sampling procedure in order to obtain a representative sample, although, unfortunately, limited resources will not permit a high sampling fraction. As one enumerator is used to record several farmers, the indivisibility of enumerators may mean that the sample fraction will vary slightly between parishes. This is not a great drawback although a different rating up coefficient will have to be applied to each parish.

Data collected has ranged from single aspects of farm life, such as household expenditure, to the recording of household expenditure and income, farm income and expenditure, physical input-output data, family food consumption and leisure activities. No attempt has been made to evaluate these different levels of recordings using the technique of cost-benefit analysis. It is hoped that the proposed survey will be able to investigate the costs and benefits of the different approaches to data collection with the result that concrete proposals can be made on the future survey procedures.

(b) Visiting Frequency:-

Previous surveys have used a variety of visiting frequencies including the single visits of Beck and Collinson in Tanzania to obtain data on the previous years activities, varying intervals of one visit per week to a visit every three weeks used by the Kenya Farm Economics Survey Unit, three visits per week as in the Uganda Farm Management Surveys, and daily recording used by Mrs. Heyer in Massii, Kenya.

1: See Reports on African Farming, Farm Survey Unit, Nairobi.

2: Unpublished Reports on Farm Management on Northern Region, Uganda.

3: J.D. Tothill. Uganda Department of Agriculture. A Report on 19 Surveys done in Small Agricultural Areas of Uganda. Govt. Printer 1938.

The relative efficiencies of the different visiting frequencies have only been evaluated subjectively and even then not very exhaustively, as most workers have only used one visiting interval. The only reliable information on this problem resulted from a series of household expenditure surveys carried out by the Uganda Statistical Department. Here it was found that a visiting frequency of less than once every two days produced a drop in the accuracy of results.[1] This observation was simply a by-product of the survey and it was not possible therefore to obtain quantitative correlations between visiting frequency and accuracy of results. Collinson, working on the collection of Farm Management data in Mwanza District of Tanzania, maintains, on the other hand, that input-output data of sufficient accuracy to formulate extension plans in that district can be obtained from a once per year visit.

Obviously, it is preferable to make infrequent visits provided that the data gathered is of sufficient accuracy for its proposed uses, for in this way the survey will be either much cheaper or else can cover a wider and more representative sample of the relevant population or could continue over a longer period with the same resources. By recording data obtained from visits of different frequencies it is hoped to recommend the cheapest survey method which will give adequate results for similar agricultural areas. The results will be mainly evaluated from the point of view of their usefulness in agricultural extension programmes although they will have other uses which will be described later.

To understand the reasons behind the schedule of visiting frequencies it should first of all be realised that a maximum of around 20 enumerators, two of whom will act in a supervisory capacity, can be employed. The reasons for this limitation are twofold, and of equal importance, although the second one stems from the first. Lack of resources limit the amount of money available for enumerators' salaries and confines the number of economists working on the survey to one, working in a part-time capacity. This means that no more enumerators can be afforded, and if more could be hired by the expedient of lowering salaries and accepting a lower quality applicant the standard of supervision would suffer. This is an unavoidable result of any increase above in a certain ration of enumerators to economist as it is

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1: D. Casley (formerly of the Uganda Statistical Department): Verbal communication.

necessary for the latter to become socially acquainted with the farmers, and to obtain an intimate knowledge of the day to day activities on at least a significant percentage of the sample holdings, as well as maintaining a continuous check on the accuracy of the recorded data.

The proposal is to visit at five different frequencies i.e. daily, weekly, monthly, three times per year and once per year in the following pattern:-

Frequency of visits	Total No. of holdings visited	No. of parishes included	No. of Enumerators used	No. of Holders visited per Day (6 days per week	No. of Holdings per Enumerator
Daily	40	2	10 Es	4	4
Weekly	60	4	4 Es	3 approx.	15
Monthly	192	8	4 Es (1 to 2 parishes)	2	48
3 times per year	192(+100?)	8	(secondary school students on vacation)	2	24 per recording period (2 weeks only)
Once per year	192(+100?) (+192)	8	" " " " " " "	2	24 per recording period (2 weeks only
Total:	767	8	-	-	-

..... 19/

It is proposed to carry out the three-monthly and annual visits on the same holdings as the daily and weekly visits, although Collinson[1] found when carrying out a similar exercise that the farmers regarded this as an insult for they felt it indicated a lack of trust in their ability to give accurate information. The proposal, however, has the advantage that the same enumerators could be used for the long and the short recording intervals and a more direct comparison of recording accuracy from different visiting frequencies would be gained. Farmers giving weekly and daily data will be approached and asked whether they would be willing to give 3-monthly and yearly information but in any case a separate sample of holders will also be recorded at these intervals.

In general, the number of farmers each enumerator can record will depend on the distance between farms and the length of the recording period. In Northern Region of Uganda it was found that each enumerator could visit three farmers per day in order to record the events of the previous two days. If the visiting frequency is increased, the distance travelled by the enumerators will also be increased, but against this is the fact that visiting time should be less. To elucidate accurate information on the previous two days events requires the enumerator to stimulate the farmer's memory and to guard against double counting, therefore daily recording time should take less than 50% of the time required on thrice weekly visits. Offsetting this however, is the time required for traditional courtesies and casual conversation which will be fairly independent of visiting frequency. The total result should be that the total time spent with each farmer will be about 70% of that spent with a thrice weekly visiting regime. This would indicate that five farmers per day could be visited, but the increased daily travel between farms, which depends on the degree of scatter of the sample (hence one reason for the choice of the parish as a sampling unit) will, it is estimated, cut the number of farmers to four per day, visited 6 days per week. As many farmers do not work on Sundays, the enumerators will be required to take their day off on a Sunday. Each Monday they should record the activities of the previous Saturday and Sunday with little loss of accuracy.

Enumerators visiting on a weekly basis will be required to complete the recording of 15 farms during their six working days. These daily requirements are lower because one is much more likely to find a farmer absent without notice when visiting

1 Collinson, ibid.

weekly, whereas the daily visitor will probably receive warning and can make other arrangements. In addition, the recording of a week's activities is much more complicated, as events tend to become confused and double counting must be guarded against by very careful questioning. There is no doubt that this sort of mistake is made when visiting at lower frequencies than daily visiting, certainly, the writer experienced similar drawbacks in the system of visiting three times per week in the Farm Management Survey of The Northern Region of Uganda. Paradoxically, a longer visiting interval such as a month or more does not seem to suffer from this particular defect, but the incidence of omissions of data is bound to be greatly increased. Enumerators making monthly visits will be working in two parishes but they can work systematically through them so as to minimize distances and in any case they are only required to visit two farmers per day.

The number of holders visited per enumerator actually falls between monthly interval visits and of four monthly interval visits. This is because recording for the longer period must be condensed into a short span of, say, two weeks every three months so that the enumerators can use a standard series of questions relating to the agricultural activities in the previous four months. Similar considerations apply to the annual visit and therefore, what at first seems to be an advantage of long interval visiting becomes less attractive as the system only needs seasonal employees whereas regular enumerators can be better trained and become more experienced and reliable. Two alternatives do offer themselves, however; the first is to utlize agricultural assistants to make the long interval visits. This system is better than employing enumerators who are only busy for short periods in the year but it is open to the objection that these men cannot be spared from general extension work. The second alternative, which will be adopted in this survey, is to use secondary school boys during their vacations. This has the advantage that a ready source of high quality, easily trained enumerators is always available and the cost per holder interviewed will be low because the enumerators will only be employed for a maximum of three weeks.

Type of Data to be Collected

1. All Holdings:-

A schedule giving background information on farm resources (land, labour, capital and management) will be completed for each holding. The acreage of each plot will be measured and a complete inventory taken. Income from farm and non-farm sources and estimates of yields will also be recorded.

2. Daily Visits:-

On these holdings, input-output information will be collected for each plot because, strictly speaking, every plot represents a separate activity from the point of view oflinear programming. As all time consuming events, which occur during daylight hours, compete for labour with the farm-work, it is proposed to record all the actions of the holder and his wife (wives) during daylight hours. This should give invaluable information on the type and degree of labour constraints operating in the Coffee-Banana Zone.

Each enumerator could be further required to record the household expenditure and diet of one of his farmers. However, this information is not directly useful to farm planning and expenditure and diet surveys have already been carried out in Buganda by the Statistics Department of the Ministry of Planning and Community Development and the Nutritional Research Unit attached to Mulago Hospital.
It is doubtful, therefore, if the possible annoyance caused to the farmers and the extra burden imposed on the enumerators can be justified.

3. Weekly Visits:-

The same type of information will be recorded, but it is felt that only the activities of the farmer should be noted, as to ask this information about more than one member of the household would involve too much strain on the person supplying the information.

4. Monthly, Four-Monthly and Annual Visits:-

Input-output information will be gathered for each plot but the other questions regarding the activities of the family will require description in a generalized form only.

Uses of the Data.

1. Farm Plans and Extension Work:-

Surveys are frequently criticized on the grounds of being diagnostic and not prescriptive, but the Coffee-Banana Zone Survey will attempt to cover both of these aspects. The input-output data will be used to compute resource coefficients and with the help of data on non-farm activities, it will also indicate the level of labour constraints at different times of the year. These levels can be varied by 'borrowing' time from various non-farm activities in order to show the cost of these activities in terms of farm revenue foregone. Gross Margins will be calculated using lists of prices gathered weekly in local markets and they can be varied to conform with various yields representing different levels of technical efficiency.

Because a computer will be available to formulate farm plans using the Simplex Method of Linear Programming, it will be relatively easy to formulate a series of optimum plans by introducing different resource coefficients and different levels of constraints into the initial matrix. Resource coefficients can be altered by improved techniques such as more efficient and better-timed use of labour, and the introduction of mechanisation. New seed, fertilizer, or sprays, and better techniques could alter the level of Gross Margins. Therefore, by postulating various efficiency levels and techniques, a series of plans will be arrived at to show the relative profitabilities of such improvements. Different constraints can be introduced, such as the provision for family self-sufficiency in food or the strict application of official extension advice, different rotations and resting periods, etc. and the effect on the optimum solution can be noted. New activities such as growing cocoa and keeping exotic dairy cattle can also be introduced into the programme in order to examine their effect on profits.

Plans for individual farms will be programmed but it is also hoped to formulate a series of plans for different classes of holding delineated by land area and family size. In addition, plans will be programmed from data obtained from each visiting frequency and the effect of visiting interval on the suitability of programming data will be assessed using the criteria of applicability in an extension programme and the feasibility of the solutions presented. Comments on the plans by experienced extension workers will be sought and the phasing of an extension exercise discussed. It is further hoped to compile a handbook of planning data which will enable field officers to do their own budgeting exercises for individual farms.

2. Research Uses:-

The problem of reducing labour constraints lies mainly within the province of the sociologist and it is hoped that Mr. Jon Moris will analyse those social factors which limit the labour available for farm work. Labour coefficients, however, can be improved by applying Work Study and other techniques to the labour operations on the farm and the survey will indicate those operations causing labour bottlenecks which could then be reduced by more efficient labour use, mechanisation or a change in the rotation. All of the above alternatives imply research in their respective fields in order to raise technical and economic efficiency. More indications for profitable research should emerge from

correlations which will be attempted between the levels of various inputs and the resulting yields and Gross Margins.

The applicability of research station results will also be tested by using a series of programmes utilizing input coefficients derived from research station experiments and records.

3. Credit Implications:-

Lack of credit facilities is known to hamper the growth of agricultural production and yet provision of credit has often led to farmers being financially damaged because of injudicious allocation of loans. The survey will be able to pinpoint restrictions which arise through lack of capital at various times of the year. Liquidity shortages will be indicated by the cash profile derived from farm and non-farm income and expenditure. The need for working capital will be indicated quantitatively by the fact that the programme will derive the marginal return to labour at various times of the year. Fixed capital for livestock, buildings, and equipment may also limit improvement plans and the desirability of obtaining loans for various capital purchases can be tested by noting the improvement or otherwise in profit when a programme is run through the computer with various capital improvements included in the farming system.

4. Marketing and Price Policies:-

If the prices of the major crops such as coffee and cotton are fed into the matrix at different levels, the final plans computed would indicate what changes in the farming system are likely to result from changes in product prices.[1] This type of sensitivity analysis could be of great help to government planners concerned with price and marketing policies.

Phasing of the Survey:

If an accurate measure of between-year variation were required, it would be necessary to continue the survey for at least five years. This is not possible both because finance is limited and because it is highly unlikely that a farmer would voluntarily co-operate for such a long period. It has therefore been decided to carry on the survey for two years so that daily visits will be carried out in only two

1. Described in greater detail by Clayton, E.S., Agricultural Development in Peasant Economies, 1964.

parishes in each year. As a result of experience in Farm Management Surveys in Kenya, MacArthur has found that between - year variation of output is greater that between-year variation of inputs (50% as opposed to 10%). The results of the survey will have to be interpreted with this fact in mind. If enough finance can be found it would be desirable to continue in at least one of the parishes for a number of years to record improvements brought about by the application of survey results.

Recruitment of enumerators is now under way, but unfortunately trained enumerators working on the F.A.O. Census will finish their work in December, too late to be available for the Farm Management Survey. The type of enumerator required will be a person of at least Primary Eight and preferably Senior Two standard of education. The two senior enumerators should be of Cambridge Certificate standard or else be persons of considerable experience in survey work. It is proposed to pay the Enumerators two hundred shillings per month and the Senior Enumerators five hundred shillings per month.

The enumerators will undergo a week's training course at Mukono District Farm Institute during early September. They will be trained to complete the schedules which they will be using and be taught methods of plot measurement using Trumeter wheels and chain and compass. The training in plot measurements will be particularly intensive as it will be of little use obtaining accurate data if it is applied to the wrong acreage. Introduction to the sample farmers will be preceded by barazas organised by the local Agricultural Officer. The last two weeks in September will be treated as a pilot project to test the suitability of the schedules and to allow the enumerators to familiarize themselves with the work. This period will also be necessary so that refusals can be substituted by further selection from a reserve list of sample holders. It will also be valuable to allow farmers to adjust to memorizing their own actions, those of the family and the work done by hired labourers.

The survey proper will begin on October 1st to coincide with the beginning of the Coffee Marketing Board year. This will be useful as the Board's annual figures will indicate the general yield levels in any one year. Apart from this, October is a convenient month to start farm recording in Buganda and it was in fact chosen as the date on which Phase 2 of the F.A.O. Census was started. Recording schedules will be handed in to the Senior Enumerators when completed and collected by the economist for transfer to punch cards and analysis on the

Makerere I.C.T. Counter-Sorter and in preparation for linear programming which will be carried out on the I.C.T. computer at Nairobi or possibly on the proposed Uganda computer. It is hoped to have an initial set of farm plans ready for use by December 1966.

Costs and Equipment

Each enumerator will be expected to find his own accomodation and to own a bicycle. He will be provided with two spring balances, a clipboard, a red, green and blue ballpen, a notebook in which to record unusual events and carry out calculations, as well as report sheets in which to enter daily visiting times and time spent recording. This latter record will be checked by the Senior Enumerator and will both aid supervision and provide much of the material for the monthly report in which the Senior Enumerator will be required to comment on his enumerators and account for mistakes in the data.

Trumeter wheels will be borrowed from the Department of Agriculture and Farbrother gauges will be set up in each sample parish. It is hoped to take soil samples on each farm, but the costs of the exercise have not been included, as it is hoped to use student classes to do some of the work and also to enlist the aid of the Agricultural Department's Soil Chemists.

Other main costs are wages, and travelling and subsistence allowances to the economist, giving the total breakdown of costs shown in the following table. Overhead costs such as the economist's salary, provision of calculating machines etc. will be met by Makerere University College.

Malcolm Hall,
LECTURER IN AGRICULTURAL ECONOMICS.

Makerere University College,
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August, 1965.