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THE USE OF AGGREGATE DATA IN THE STUDY OF AGRICULTURAL CHANGE: A CASE STUDY OF UGANDA, 1955–67

INTRODUCTION

This article is a first step in the process of studying indigenous economics. Polly Hill advocates persistence with detailed studies in the field from which she believes a variety of standard forms of economic behavior can be perceived despite the diversity of conditions associated with small descriptive studies (5, p. 10). She maintains that an indigenous economics can only develop by observing economic behavior as it is found in the environment. Economic statistics, the lifeblood of economics as practiced in developed countries, must be derived from large-scale inquiries such as censuses and these are best undertaken by government or other official agencies. Polly Hill suggests that agricultural censuses are wished on the poorer countries by the United Nations and are a monstrous waste of their financial and manpower resources (5, p. 13). Given the thirst for development that exists in poor countries, statistics will continue to be gathered and used in economic planning even when they are sketchy and of poor quality. Decisions on development must be taken immediately. The detailed field studies of indigenous economies can only give direction slowly as general tendencies emerge from each specific study undertaken.

It is important, however, that the macro statistics available trace the underlying changes taking place in the indigenous economy. Constant attention is necessary to make the processes of estimation dynamic enough to give indications of emerging change which can then receive detailed examination in micro studies. If the emphasis is placed on the immediate problem of producing an aggregate measure of production or income rather than on the evolution of specialization and exchange, much of the planning which must be done using aggregate data will be misdirected.

In most of the emerging nations the aggregate measures of output for agri-

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culture, the largest sector of the economy, consist of sales data on export crops linked in various ways to a series of estimates of domestic crop production and disappearance which are of the sketchiest character. Most countries separate estimates of cash agriculture from those of subsistence agriculture, and attention is drawn to the difference in the quality of the estimates. In Africa, in particular, the leap forward from the production methods of the 16th century to those of the 20th century must be taken without the accumulated knowledge of change which the records of several centuries provided in the developed countries. Long before the evolution of national accounts there existed censuses of population, of agriculture, of industry, and of employment on which to build reliable estimates of sectoral accounts and national accounts when the need made itself felt. An implication of the Keynesian revolution in economics was that no country could aspire to sensible economic planning without first constructing national accounts. It was not surprising that in the emerging nations of the postwar period some of the earliest attempts at statistical description were aimed at the construction of national accounts rather than the gathering of detailed data on sectors of the economy.

The earliest attempts at building national accounts in the less developed countries drew attention to the need for detailed census and survey data. The pioneer was Phyllis Deane in 1948 followed by Prest and Stewart, 1953 (*3*; *16*). Miss Deane gave a full account of the problem in *Colonial Social Accounting* but, as pointed out by Jones, she largely ignored her own strictures (*2*; *9*). Peacock and Dosser worked on the National Accounts of Tanganyika and issued a plea for the reorganization of agricultural statistics in 1957 (*15*). These early attempts concentrated on aggregates for one period but they were followed by efforts to construct annual series in which the only firm estimates for agriculture were those for export crops. *African Studies in Income and Wealth*, 1963, the result of a conference on national accounting in Africa, contained little evidence of improvement (*17*). Indeed the reader could easily forget that the countries of Africa are overwhelmingly agricultural and that none of them could base estimates of peasant agricultural output on census material. The emphasis of the book is on national aggregates and on the evolution of a minimum system of national accounts for use by African countries.

A *cri de coeur* from Okigbo of Nigeria is worth quotation (*17*, p. 305):

> There is already a shift in many African countries from calculating national accounts for a single year to compiling a time series. This development has been accompanied by a similar shift of emphasis from measurement of welfare to a presentation of the dynamics of the economy. There is, therefore, very little justification for defining production so extensively that we are obliged to make very large imputations.
>
> We have not faced directly the question of measuring the so-called subsistence output. In agriculture, for instance, the real value of output may be rising over time because increasing proportions of the output are brought to the market although the total output may not have risen. It is then argued that without an estimate of subsistence output we would confuse increased monetization of activity with increased physical output. This argument is untenable, because we can get at total production directly

> through acreage and yield figures. Once we have reasonable figures of total output, the only virtue in measuring subsistence production is to determine what prices to use in valuing output—what weights to assign to ex-farm prices, rural and urban market prices.

His own attempt at improvement for Nigeria treats the problem with candor and fortitude (*14*). Helleiner provides a succinct comment on the agricultural data in Okigbo's study (*4*, p. 397).

Alongside this concentration on the evolution of national aggregates, however poorly constructed, there was the equivalent emphasis on large-scale capital investment as the key to development. This meant that industrialization was given priority, and in agriculture large-scale projects such as irrigation, land settlement, and mechanization were given attention. The key role of agriculture in the process of development did not become evident until the decade of the sixties. In some countries the emphasis within agriculture was shifted from large-scale projects to programs that would increase the technical efficiency and the specialization of the small producer. As the attention in development turned to agriculture and the farm unit, the realization that little or nothing is known about the structure of peasant farming, in Africa at any rate, produced a concentration on farm management surveys and some study of markets for staple food crops. These studies are important for the information they can provide on techniques and marketing channels, but they must be interpreted against some aggregate background. Moreover, they should add to the broad picture created by a census rather than substitute for it. In Kenya and Tanzania management studies are already contributing to better estimates for the national accounts, but the need for a broad brush that can sketch in a full view of the agricultural economy over time with a breadth that is not available from the single farm management study is still pressing upon the agricultural economies of Africa. Guy Hunter states the situation this way: "Sociologists and agricultural economists are now carrying out, year by year, detailed studies of farm management and village organization which reveal (on far too small a scale as yet) facts and relationships which have been smothered under broad generalizations, or interpreted wrongly by the use of theories thoughtlessly transferred from experience of the developed world" (*6*, p. 27).

Uganda presents conditions which are more favorable for the detection of economic change through the study of aggregate data than those of many other underdeveloped countries. The cash economy is dominated by two major export crops, coffee and cotton, and the greater part of the rest of agricultural activity is devoted to the production of food crops for domestic consumption.

Estimates of acreage in crop production exist in a series that is uniform in method for the last twenty-five years, and several earlier attempts were made to record systematically the acreages used in food production. The usefulness of these data are well illustrated by Masefield (*12*). There is reason to doubt the levels of some of the acreage information but it yields a detailed trend in crop production that is probably without parallel elsewhere in Africa. While other African countries have attempted detailed agricultural censuses of large-scale or plantation farming (e.g., Kenya and Tanzania) very little is known about food

crop acreages. Uganda cooperated with FAO in 1963/64 in a sample census of African agriculture producing additional detailed information on food crop acreages and some estimates of yields (*23*).

By combining the census data with the acreage series a trend in production of food crops emerges which shows the impact of cash export crops on food production. It also gives some indication of internal trade in food crops beyond the level assumed to take place in a subsistence economy. It suggests that the measurement of aggregate production in agriculture requires more detailed attention because of tendencies for exchange to arise within activities thought to be solely for subsistence. There is room to believe that a good sectoral account of agriculture, the dominant economic activity in the country, could be established on the foundation laid by the acreage data and the census. The present procedure of estimating the agricultural component of the national accounts assumes there is no substantial trade in food production and makes a firm distinction between the cash sector, for which good estimates exist, and the subsistence sector in which regional production is equated with population distribution. As long as such methods must be used in compiling aggregate data, economic change will be obscured and subsistence myths perpetuated. The work necessary for a production based estimate of agricultural output is considerable but the outcome throws enough light on indigenous markets to suggest a redirection of effort in the compilation of aggregate statistics. It is this redirection that should be emphasized rather than regarding all attempts at national aggregates as something wished on poorer countries by the United Nations and development agencies, or as prestige symbols akin to luxury hotels, or "as a monstrous waste of their financial and manpower resources" (*5*, p. 13).

THE AGRICULTURAL COMPONENT OF THE NATIONAL ACCOUNTS OF UGANDA, 1954–68

The beginnings of an agricultural account for Uganda were discussed in *The Geographical Income of Uganda 1950–1956* (*20*). The basis of the Gross Domestic Product of Agriculture in the form used at present was discussed in two subsequent publications, *The Gross Domestic Product of Uganda 1954–1959* (*21*), and *The Real Growth of the Economy of Uganda 1954–1962* (*27*). A summary of the method is given in Appendix A. It relies heavily on population growth rates and diet surveys. The greater part of production for internal use is estimated as consumption rather than as production. In all cases where consumption data were used, constant diet figures were maintained throughout the period 1954–62 and output estimates are, therefore, based on the *assumed* rate of growth in number of the various classes of population. Since 1962 new diet surveys have been taken among urban Africans and these undoubtedly have caused some modification in per capita amounts used in the calculations.

Only for export crops has output been used as a basis of measurement. Export crops have never accounted for more than 30 per cent of the estimated agricultural gross output. Of the remainder, the only part not tied to assumed population growth is meat production, which is estimated on the basis of hides and skins sold. At least 60 per cent of the total agricultural product has a built-in

growth rate determined by the growth rate of the population. The separation of the cash sector from the subsistence sector reduces the extent to which this practice is misleading.

Given the statistics available in the decade of the 1950s the estimates presented were as good as could be obtained. They are of little use for finding trends in agricultural production or for suggesting emerging growing regions, or declining regions. They cannot tell us anything of how the growth in production of export crops impinges upon food crops in one area and sets up a market stimulus for surplus from another area. In fact the very procedure denies this possibility. If the data on which this method depends are looked at by region over time they would suggest that food crops are produced by the consumers in the immediate area, and that export crops have been grafted on to the production of food crops without stimulating market exchange. It has been evident for a long time that this is not so. The production of coffee is concentrated strongly in Buganda and movements of plantains by road are evident over considerable distances. Thus, even if the assumption is correct that food crops expand at the rate of population growth in aggregate, the development of increased specialization through emerging markets cannot be detected from these methods of estimation. Nor can any information be obtained on yield levels, regional incomes, or rates of regional growth. All of these are of basic importance if internal growth in agriculture is to be generated and stimulated. A recent paper by Jones is an interesting attempt to generalize this situation (*8*).

It is important in the estimation of agricultural aggregates that the estimates make sense *both* as production estimates and as estimates of assumed disappearance through consumption, manufacture, and export. Wide discrepancies between actual production and assumed disappearance can occur in food crops if trends are continued as they have been in Uganda without some guidance from production data of an aggregate nature. Fortunately, because of the Census of Agriculture some additional data on Ugandan agriculture do exist. They can be utilized to examine trends and to check implications of existing aggregates. No good estimates of production could be produced before this for two reasons. The acreage statistics, although available over a lengthy period, were known to be unreliable in certain areas and no information on yields was available until the report of the yield survey was published in 1967. The examination of the acreage and census data is the task of the next section.

THE ACREAGE DATA AND THE 1963/64 CENSUS OF AGRICULTURE

Up until 1959 two methods were used to estimate cultivated acreages. In the central region, Buganda, an estimate of the average acreage of each crop cultivated per taxpayer was made and these estimates were multiplied by the chief's figures of taxpayers. In the rest of Uganda estimates of average plot sizes were multiplied by estimates, provided by local chiefs, of the number of plots of each crop. In 1957 a three-phase plan for the overhaul of agricultural statistics was adopted. Phase I resulted in the publication of *Revised Crop Acreage Estimates, 1945–1956* (*22*). Phase II was concerned with testing the accuracy of the methods described above and devising new methods. The outcome was a report "Investi-

TABLE 1.—FOOD AVAILABILITY IN CALORIES PER HEAD PER DAY, 1964 BY CROP AND BY REGION*

Crop	Buganda	Eastern	Western	Northern	Uganda
Cereals					
Millet	37	486	117	579	284
Sorghum	37	181	183	91	124
Maize	165	229	171	139	182
Total	239	896	471	809	590
Roots and plantains					
Cassava	178	339	404	993	416
Sweet potatoes	158	110	325	130	177
Plantains	710	417	636	66	495
Total	1,046	866	1,365	1,189	1,088
Pulses and oil crops					
Groundnuts	96	284	30	150	148
Beans	148	100	179	244	156
Peas	—	14	—	124	25
Sesame	3	15	2	143	30
Total	247	413	211	661	359
Total food crops	1,532	2,175	2,047	2,659	2,037

* Computed from gross output in Appendix Table VIII, reduced to net food available as described for Appendix Table IX, using population figures shown in Appendix Table X. Figures for the Eastern region include Karamoja throughout.

gations into Acreage Statistics," 1959. Following upon that, a sample estimation of cultivated areas was launched in 1960 to coincide with the World Agricultural Census. This report, *Estimation of Cultivated Areas, 1960*, showed that acreage estimates had been generally too high, especially in the three regions other than Buganda (*24*). The total cultivated acreage produced by the 1960 survey was only 60 per cent of the current estimate published by the Department of Agriculture, although there was considerable variation around this figure both by crop and by district. This survey was followed in 1960 by a properly designed stratified multi-stage sample of the cotton acreage only. A further check was attempted in 1961 through a small-scale yield survey of cotton in one district (Busoga) where the greatest discrepancy existed between the survey and the Department's estimates. Both of these surveys suggested significant overestimation in the official estimates.

The IBRD report on Uganda, 1962, emphasized the need for a census of agriculture and the Uganda Government and the Food and Agriculture Organization agreed to cooperate on a four-year program which would include such a census (*7*). This ran from July 1962 to June 1966. The *Report on Uganda Census of Agriculture* states that the methods that had been used in the 1960 survey produced figures of doubtful reliability but that much was learned about the methodology of surveys of this type in the conditions existing in Uganda, and the range of error in estimates was becoming fairly well identified (*23*). The census itself was based on a 1 per cent sample. It included a yield survey which was based on a subsample of the original sample of parishes selected at random from

within each sample stratum. The yields were estimated from the daily recording of the crop harvested from the plots selected.

In Volume III of the census a comparison is made between the census results and the acreage figures published annually in the reports of the Department of Agriculture (*23*). The comparison is for one year only, and one is cautioned against assuming that the apparent errors in the departmental figures have been constant since the beginning of the revised series in 1945. The only other series giving trend data is that of the Gross Domestic Product (GDP) of Agriculture. It is widely assumed that no yield increases have occurred in the food crops grown in Uganda; the further implication of this is that acreages have expanded to meet population growth. Aggregate estimates of agricultural product reached through the use of constant diets and population estimates should be checked against output data obtained by the application of constant yields to acreages in crops. The only way this can be done is to assume that the acreage trends are those established by the Department of Agriculture's estimates and that estimates of level have had a consistent bias as shown by the census returns and the Department's estimates in 1963/64.

The next section will examine the validity of these assumptions. First the outputs obtained by assuming that the yield figures obtained in the census applied to the total adjusted acreages will be looked at in terms of food balance sheet implications. The outputs will then be valued by estimates of farm prices to see how closely they accord with the value determined for Gross National Product (GNP) on the basis of assumed domestic disappearance.

CROP PRODUCTION ESTIMATES

For the purposes of this analysis and for comparison with the GDP results, the calendar year 1964 has been taken as the base year for census results.[1] The daily availability of calories from food crops is shown in Table 1. These food crops provide about 82 per cent of the total calories in the average diet. The pattern for Uganda as a whole is close to that shown by Cleave who used slightly different estimates of crop yields (*1*). It is consistent with dietary expectations. The food crops produced by this pattern of output would more than suffice to maintain the population of Uganda at an adequate calorie level (if unbalanced, in the dietary sense). The regional variation in total calorie availability, however, suggests the strong possibility that regional product figures would not balance with regional consumption figures because of interregional trade of a type which cannot be examined from a regional breakdown of the Agricultural Gross Product as presently calculated. The comparison of the value of the food crop output with the product value calculated from estimates of domestic disappearance is shown in Table 2. The two estimates were priced quite independently and both calculations fall back on some rather thin markets in which to value crop output at farm prices. The estimate of food crop output is 5 per cent higher than the estimate for disappearance through assumed diets.

[1] Several adjustments to the published data had to be made. The yield data used and the product outcome are shown in Appendix Tables I, II, and VIII. The outputs of Table 8 reduced to net food values following the procedures used by Cleave are shown in Appendix Table IX (*1*).

TABLE 2.—GROSS AGRICULTURAL OUTPUT FROM FOOD CROPS, 1964 AND GROSS AGRICULTURAL PRODUCT FROM ESTIMATED DISAPPEARANCE, FOOD CROPS ONLY, UGANDA 1964*

(Million Uganda shillings, current prices)

Gross output		Domestic disappearance and exports	
Millet	171.3	Exports of miscellaneous products minus tobacco	13
Sorghum	62.1	Sales to rural employees	46
Maize	65.0	Sales to urban Africans	16
Cereals	298.4	Ruandi porters' rations	3
Cassava	190.2	Beer[a]	145
Sweet potatoes	101.1	Total cash sales	223
Plantains	291.8	Staple crops	769
Roots and plantains	583.1	Beer materials	81
Groundnuts	85.5	Subsistence crops	850
Beans	71.1	Less adjustment for beer[b]	−58
Peas	11.3		
Sim-sim (sesame)	17.3		
Pulses and oils	185.2		
Total food crops	1,066.7	Total food crops	1,015

* Gross agricultural output from food crops is calculated from the output data in Appendix Table VIII, and prices in Appendix Table XI. Gross agricultural product at farm prices is based on gross product at factor cost, African enterprises, as supplied to the author from the Statistics Division, Ministry of Planning and Economic Development, Uganda (January 1970).

[a] Retail value of beer sold.

[b] Adjustment to farm prices of beer materials.

These tests suggest that the census estimates of acreage and yield provide a reasonable picture of the pattern of food crop production in 1964. Some unpublished estimates of acreages and yields are available for the crop year 1966/67 so that sufficient information is available to repeat the output estimate for 1967. Assuming no change has occurred in the yields of food crops over the period since World War II and that the acreage levels reported by the Department of Agriculture have had roughly the same biases over time as they were thought to have in the year of the census, an output trend can be developed. Two periods were selected to test the reasonableness of these assumptions: a three-year period centered on 1960 and a three-year period centered on 1955.[2] The resulting figures for per capita calories available, shown in Table 3, are at levels within the bounds of reason. In addition, the figures for total food crops for Uganda as a whole may be considered consistent with constant availability from 1960 to 1967 since the apparent fluctuations are well within the range of accuracy to be expected from the methods of approximation. The composition of the diet also appears reasonably constant. The data for 1955 suggest that either the overall availability of food then was slightly higher than in the sixties or that the error of estimate in the Department of Agriculture's acreage figures was larger at that time. The

[2] Gross output of each crop was calculated using the regional adjusted acreage figures basic to Appendix Table IV and the regional yields shown in Appendix Table V. The data of Appendix Tables VI and VII were used to obtain gross output for 1967. The gross outputs are shown in Appendix Table VIII. These were converted to calorie availability per capita following the procedure outlined in footnote 1.

TABLE 3.—ESTIMATED CALORIES PER CAPITA PER DAY FROM NET SUPPLY OF FOOD CROPS, UGANDA AND REGIONS, SPECIFIED YEARS, 1954–1967*

Crop groups and regions	1954–56 average	1959–61 average	1964	1967
All food crops				
Uganda	2,258	2,143	2,037	2,076
Buganda	2,326	1,833	1,532	1,397
Eastern	2,137	2,139	2,175	2,390
Western	2,277	2,341	2,047	1,901
Northern	2,364	2,374	2,659	2,975
Cereals				
Uganda	672	616	590	563
Buganda	608	394	239	215
Eastern	710	715	896	858
Western	531	513	471	408
Northern	907	916	809	854
Roots and plantains				
Uganda	1,149	1,126	1,088	1,130
Buganda	1,340	1,191	1,046	978
Eastern	957	939	866	1,072
Western	1,433	1,519	1,365	1,238
Northern	808	824	1,189	1,362
Pulses and oil crops				
Uganda	437	401	359	383
Buganda	378	248	247	204
Eastern	470	485	413	460
Western	313	309	211	255
Northern	649	634	661	759

* Methods of calculation and basic sources, as for Table 1.

apparent variation in food supply is sufficiently slight to conclude that the assumptions made regarding yield and acreage provide useful estimates. The regional distribution of food production implies that the central region of Buganda is becoming increasingly less self-sufficient and that the Western region might also be drawing upon food supplies from outside the region. The Eastern and Northern regions on the other hand may be food surplus regions. The suggestion of substantial interregional trade in food crops in the census year, mentioned earlier, is strengthened by the indications of an increasing tendency in that direction over the 1955–67 period.

If the gross outputs of regions indicated in Appendix Table VIII are valued at farm prices they can be compared to the domestic disappearance estimates of the GDP calculations (Tables 4 and 5). The correspondence between these aggregates in 1960 and 1967 is very close indeed.[3] While the 19 per cent divergence in the 1954–56 period could mean an overstatement of acreage, it must be remembered that the constant diet figures on which the disappearance estimates are based are also a rough estimate and that the diet composition and the output

[3] If the population figures reported by the 1969 census prove to be correct, the correspondence would be less good, but still well within limits suggested by the general reliability of the data.

TABLE 4.—GROSS AGRICULTURAL OUTPUT FROM FOOD CROPS, UGANDA 1954–56, 1959–61, AND 1967*

(Million Uganda shillings, current prices)

Crop	1954–56	1959–61	1967
Cereals			
Millet	121.5	117.7	203.8
Sorghum	40.1	62.4	66.4
Maize	73.7	71.0	57.3
Total	235.3	251.1	327.5
Roots and plantains			
Cassava	161.0	149.0	194.6
Sweet potatoes	91.8	99.6	93.2
Plantains	244.9	225.9	461.4
Total	497.7	474.5	749.2
Pulses and oil crops			
Groundnuts	43.1	65.6	92.6
Beans	123.9	89.8	94.3
Peas	8.4	6.3	14.0
Sim-sim (sesame)	14.7	18.1	23.2
Total	190.1	179.8	224.1
Total food crops	923.1	905.4	1,300.8

* Computed from output data in Appendix Table VIII and prices in Appendix Table XI. See Table 2 for 1964.

TABLE 5.—GROSS AGRICULTURAL PRODUCT FROM ESTIMATED DISAPPEARANCE, FOOD CROPS ONLY, UGANDA, 1954–56, 1959–61, AND 1967*

(Million Uganda shillings, current prices)

Category	1954–56	1959–61	1967
Exports of miscellaneous products minus tobacco	16	14	18
Sales to rural employees	45	46	61
Sales to urban Africans	15	13	20
Ruandi porters' rations	4	3	4
Beer[a]	127	123	153
Total cash sales	207	199	256
Staple crops	554	608	1,000
Beer materials	67	62	93
Total subsistence crops	621	670	1,093
Less adjustment for beer[b]	−51	−49	−61
Total	777	820	1,288
Gross agricultural output (from Table 4)	923	879[c]	1,301
Output value as per cent of disappearance estimate	119.0	107.2	101.0

* Data, except 1967, based on Uganda, Ministry of Planning and Community Development, Statistics Division, *The Real Growth of the Economy of Uganda, 1954–1962* (1964), pp. 31–34; for 1967 based on Gross Product at Factor Cost, African Enterprises as supplied by the Statistics Division, Ministry of Planning and Economic Development, Uganda (January 1970). See Table 2 for 1964.

[a] Retail value of beer sold.

[b] Adustment to farm price of beer materials.

[c] Reduced from the figure of 905 in Table 4 for comparability with the gross agricultural product figure. Subsistence crops, normally calculated on a constant per capita basis in the GDP accounts, were reduced for 1961 by 10 per cent to allow for the drought. The Department of Agriculture acreage figures used in calculating Table 4 showed no reduction because they are on a sown acreage basis.

composition are not identical. It is also likely that some divergences occur in pricing the crops. It will be noted that the estimates converge over time as follows:

Year	Output as per cent disappearance
1954–56	119
1959–61	107 (adjusted)
1964	105
1967	101

This convergence could mean that the constant diet figures used along with population growth rates might produce results in the future which would overstate the production of food crops in total value, just as they may have understated it in previous periods.

Although there is no GDP estimate available for the 1947–49 period, it is interesting to find out what results come from pressing the assumptions on acreage trends and constant yields back to this period which coincides with the 1948 population census (see Table 6). The output of 1948 would have yielded 2,100 calories in food crops and so also would that of 1967. The distribution of approximately 600 calories in grains, 1,100 in roots and plantains, and 400 in pulses and oils remains consistent with acreage trends and constant yields throughout the period 1948–67, when averaged for Uganda as a whole. In Buganda food availability from local production appears to have been falling throughout the period.

The next three sections will examine the ways in which the aggregate product series can be used to throw light on the development process.

THE PATTERN OF EXCHANGE IN FOOD CROPS

The sale of food crops outside of Uganda is thought to be small. Groundnuts and sesame have small export markets outside Africa. Export sales of food crops are valued at about 1.5 per cent of the total value of food crops produced (1964 and 1967). The amounts of food crops sold across the borders into the Congo, the Sudan, and Kenya are unrecorded and any net disappearance in this manner is not allowed for in the disposition of total product. D. N. McMaster suggests that within Uganda trade in bananas probably occupies first place among all food crops sold for consumption (*10*). He believed that by 1960 the major source of bananas for the Kampala market was Bugerere with supplies coming from Singo, Masaka, and Ankole districts (*10*, pp. 98–99). Some trade in food crops between cultivators and fishermen extends over the areas around Lake Victoria and Lake Kyoga, but individual markets are not prominent. McMaster believes that border markets have importance to the local economies, if not in terms of gross trade. Several reasons are given. Food crops become important as sources of income beyond the coffee-cotton zones. Profitable opportunities exist across the Congo and Kenya borders and the physiographic and climatic conditions of the borderlands result in the juxtaposition of areas of agricultural deficiency with areas able to furnish a surplus of food crops. Food purchases can be financed by the sale of fish and salt along the Western Rift valley and by the sale of stock in Karamoja and in central Ankole. McMaster gives an example of rural trade in food crops in northwestern Ankole where bananas are important as a cash

TABLE 6.—ESTIMATED CALORIES PER CAPITA PER DAY FROM NET SUPPLY OF FOOD CROPS, UGANDA AND REGIONS, 1948*

Crop	Buganda	Eastern	Western	Northern	Uganda
Cereals					
Millet	30	348	157	654	270
Sorghum	13	54	159	117	79
Maize	494	156	186	132	249
Total	537	558	502	903	598
Roots and plantains					
Cassava	323	338	464	583	405
Sweet potatoes	248	145	572	121	269
Plantains	1,072	287	320	4	455
Total	1,643	770	1,356	708	1,129
Pulses and oil crops					
Groundnuts	67	249	24	88	121
Beans	157	266	297	164	228
Peas	—	—	17	73	16
Sesame	5	17	6	213	44
Total	229	532	344	538	409
Total food crops	2,409	1,860	2,202	2,149	2,136

* Methods of calculation and basic sources, as for Table 1.

crop both as food and as beer, with the copper mines at Kilembe in the Ruwenzori flanks, the salt center at Katwe on Lake Edward, and the fishing villages of the Rift valley as ready markets (*10*, p. 99).

Anne Martin recorded trade in Buganda in maize and sesame. In the Eastern region the most important food crop for cash sale was groundnuts, with some trade in maize and sesame. She recorded trade from Bugisu to Karamoja in groundnuts and maize and some exchange of millet from Busoga to Bukedi, but otherwise she believed the region to be self-sufficient. In the Northern region the sale of groundnuts and sesame from Lango, and groundnuts, beans, sesame, and finger millet from West Nile are mentioned. In the Western region she reported sales of maize, mixed beans, groundnuts, sorghum, finger millet, and field peas (*11*, pp. 26–27).

The extent to which these descriptions of food markets are corroborated by the pattern of production estimated from the census can be found by converting production by districts into calories available per person per day (Table 7, Map 1). There is support for the suggestion that the widest trade is in bananas. The production data on plantains suggest that Buganda lost its self-sufficiency between 1955 and 1960 when the acreage ceased to expand. Since then supplies must have moved in to meet the growth of population, gradually drawing on districts further and further from Kampala. The movement from the periphery of the banana region in towards Kampala is reflected in the recorded rise in the price of matoke in the Kampala market from 8 cents per pound in 1964 to 12 cents in 1967 (*28*, p. 87).[4] McMaster suggested that the districts of Masaka and Ankole supplied Kampala. The consumption of matoke in Kampala by an unskilled

[4] Cooking bananas or plantains.

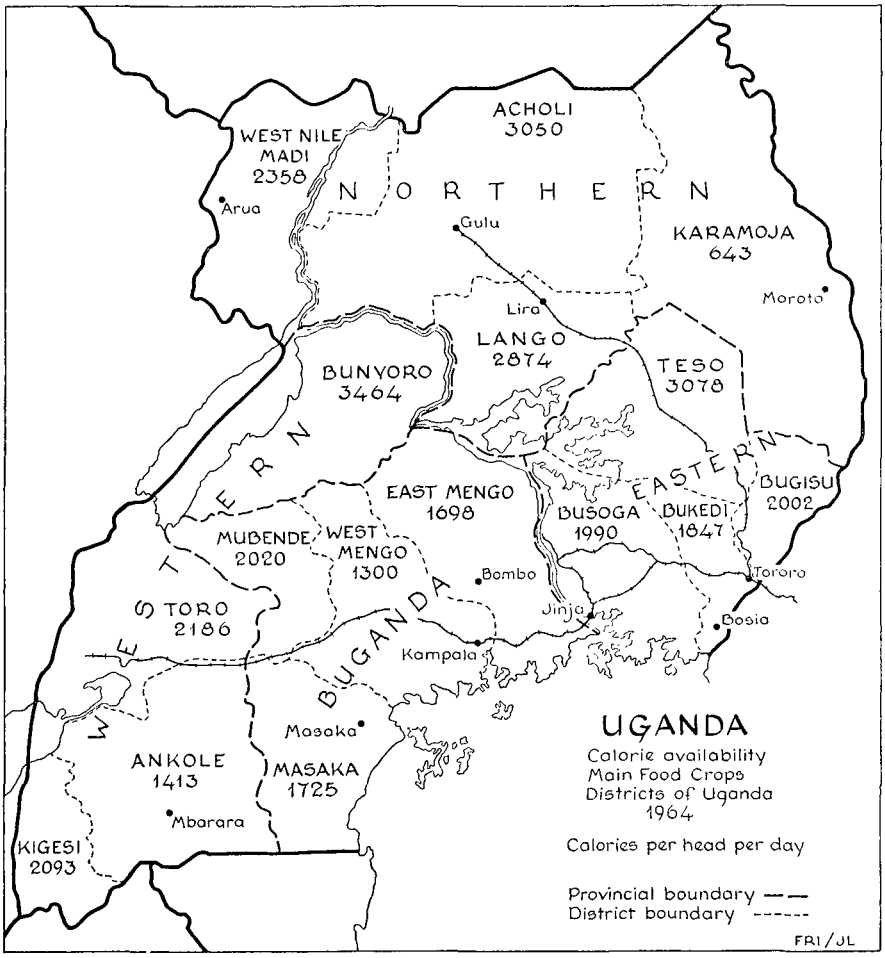
TABLE 7.—CALORIE AVAILABILITY FROM FOOD CROPS, DISTRICTS OF UGANDA, 1964*
(*Calories per head per day*)

Region and district	Total	Cereals	Roots and plantains	Pulses and oil crops
Buganda	1,532	239	1,046	247
West Mengo	1,300	194	896	210
East Mengo	1,698	294	1,114	290
Mubende	2,020	226	1,422	372
Masaka	1,725	315	1,089	321
Eastern	2,175	896	866	413
Busoga	1,990	498	1,053	439
Bukedi	1,847	632	989	226
Bugisu-Sebei	2,002	927	755	320
Teso	3,078	1,585	760	733
Karamoja	643	—	—	—
Western	2,047	471	1,365	211
Bunyoro	3,464	525	2,471	468
Toro	2,186	469	1,566	151
Kigezi	2,093	824	959	310
Ankole	1,413	133	1,190	90
Northern	2,659	809	1,189	661
Lango	2,874	963	971	940
Acholi	3,050	1,300	1,040	710
West Nile-Madi	2,358	401	1,462	495

* Methods of calculation and basic sources, as for Table 1.

African worker in 1964 was thought to provide approximately 900 calories per day (*26*). The production data suggest an availability of 710 calories per capita for all of Buganda and only in Masaka district is the availability greater than 900 calories per capita. The pattern of production indicates a possibility of movement from Toro and Ankole in the west and Bugisu and Busoga in the east into Mengo district. The extent of the markets in this crop is undoubtedly larger now than in 1958 when McMaster examined the situation.

Border trade with the Congo is suggested by the calorie availability of food in Bunyoro and West Nile Madi. In West Nile Madi, however, the production data suggest that only cassava is in supply in excess of needs. The unreliability of output data for this crop makes it hazardous to suggest that border trade in it takes place, but it is a possibility. In Bunyoro there seem to be excess supplies of both plantains and cassava for trading purposes. Border trade with Kenya is less evident from the production levels indicated for Bukedi and Bugisu. There is every indication that trade takes place for livestock in central Ankole and between Acholi and Karamoja. The extensive trade in groundnuts identified by Anne Martin is evident also, the districts with large outputs in relation to population being Busogo and Teso in the Eastern region, Bunyoro in the Western region, and Acholi and West Nile Madi in the Northern region. The general crop movements suggested by her can be substantiated from the crop production data. The one item which is produced in amounts well beyond requirements



in the Eastern and Northern regions and which is not strongly identified by McMaster and Martin as a traded commodity is millet. The production data point to an availability of millet in Teso that is more than twice the Eastern region average and about four times the level of average domestic disappearance in Uganda. The same is true of Acholi which undoubtedly sells to Karamoja and possibly across the Sudanese border. Trade between Teso and Karamoja is not recorded and Anne Martin suggests that the profitability of cotton and the pressures of population on land limit any surplus production food crops in this district (*11*, p. 25). The channels of disposition of the total crops of plantains and millet might profitably be traced in detail. Such studies could throw some light on the extent to which the food economy has become a cash economy.

THE TRENDS IN PRODUCTIVITY IN THE REGIONS OF UGANDA

In the twenty-year period from 1947–49 to 1966–68 the output of coffee in Uganda has risen from 27,000 tons to 156,000 tons, an increase of 5.8 times. The acreage under coffee rose approximately 5.4 times from about 150,000 to 816,000.

Cotton production increased by about 50 per cent and the acreage devoted to it by about 38 per cent. Allowing for year to year fluctuations in output these figures do not suggest any striking increases in yield per acre. There have been marked regional shifts in the location of production. The acreage in coffee in Buganda has risen by about 536,000 acres and the acreage in cotton has contracted by about 260,000 acres. From the point of view of the producer the growth in coffee production has been rational, as the gross receipts per acre from coffee have never been less than twice those of cotton, and at times over the twenty-year period they have been between three and four times as high.[5]

If the period of 1947–49 to 1954–56 is eliminated on the grounds that coffee trees were becoming established during this time some trend in yield is suggested for coffee but the extent of the yield increase is difficult to measure because of the rate at which new acres were being planted to coffee trees (Table 8). There is no increase in cotton yields and some suggestion that extension into new areas has produced a fall in output per acre. The trend in output of food crops assumes constant yields and therefore increased output in food crops could come only from acreage expansion and shifts between crops.

TABLE 8.—COFFEE AND COTTON OUTPUT, AREA, AND YIELD, UGANDA, ANNUAL AVERAGES 1954–56, 1959–61, AND 1963–67*

Years	Output (*thousand long tons*)	Area (*thousand acres*)	Output per acre (*tons*)
		ROBUSTA COFFEE	
1954–56	44.3	282	.157
1959–61	94.3	500	.189
1963–67	165.0	677	.244
		ARABICA COFFEE	
1954–56	4.3	25	.172
1959–61	5.3	37	.143
1963–67	8.8	46	.191
		COTTON	
1954–56	208	1,206	.172
1959–61	221	1,270	.175
1963–67	237	1,586	.150

* Output measured as sales of clean coffee and seed cotton by African growers, from Uganda, Ministry of Planning and Economic Development, Statistics Division, *1968 Statistical Abstract*, p. 41, and earlier issues. Area based on data in *Annual Report of the Department of Agriculture*, various issues, adjusted for census discrepancy as described for food crops in Appendix Table III.

Between 1954–56 and 1967 the increase in gross physical output of African agriculture was about 45 per cent (Table 9). This breaks down into three components with quite different rates of growth. The food crops expanded by 26 per cent, cash export crops rose by 92 per cent, and livestock output including milk increased by 49 per cent. Livestock production and food crops together increased approximately 31 per cent compared to an estimated population increase of 34.5 per cent. As the volume of food crops exports has not changed between the

[5] When valued at farm level in the raw state. The higher tax on cotton than on coffee increased the differential to the farmer.

TABLE 9.—RATES OF GROWTH IN GROSS AGRICULTURAL OUTPUT (1964 PRICES), UGANDA AND REGIONS, SPECIFIED PERIODS 1954–67*

(Per cent per year)

Category and years	Buganda	Eastern	Western	Northern	Uganda
Food crops					
1955–67	−0.7	3.1	1.0	4.4	2.0
1955–60	−1.3	0.8	2.5	2.8	1.0
1960–67	0.0	4.8	−0.2	5.6	2.6
Export cash crops					
1955–67	6.0	2.7	13.2	7.5	5.5
1955–60	7.3	4.1	15.7	10.7	7.0
1960–67	5.1	1.7	11.5	5.3	4.6
Livestock and milk					
1955–67	5.1	2.4	4.2	4.0	3.4
1955–60	8.1	0.7	1.4	3.4	2.5
1960–67	3.1	3.6	4.9	4.4	4.0
Total output					
1955–67	2.8	2.9	2.5	4.9	3.1
1955–60	2.9	1.6	2.3	4.3	2.7
1960–67	2.7	3.8	2.7	5.4	3.4
African population					
1948–59	3.2	2.0	2.3	2.6	2.5

* Averages for 1954–56 and 1959–61 are indicated above by their central years. Growth rates computed from volume indexes in Table 11 for food crops and Table 10 for export cash crops. Rates for livestock are computed by deflating livestock and milk estimates from *Annual Report*, Department of Veterinary Services and Livestock Industry for 1954–56 and 1959–61 and from the Statistics Division, Ministry of Planning and Economic Development, Uganda, for 1964 and 1967, by a weighted index of retail meat and milk prices compiled from *Statistical Abstract*, various issues. Gross agricultural output computed from the total constant value output of export crops, food crops, and livestock and milk. Intercensal growth rates for the African population are from Uganda, Ministry of Planning and Economic Development, Statistical Division, *1968 Statistical Abstract*, p. 9.

periods these results suggest a constant output per head of population. In the export sector, which in this analysis consists of cotton, coffee, and tobacco, production increased more rapidly than total population. The volume, at constant prices, increased by 92 per cent, but average prices returned to farmers fell to 57.8 per cent of the 1954–56 level. Cash increase from export crop sales rose by only 11 per cent over 12 years, an increase of 0.9 per cent per annum against an increase in volume of 5.5 per cent per annum.

The same position can be stated another way. The aggregate volume of food crops, livestock, and livestock products increased at a rate of 2.3 per cent per annum between 1954–56 and 1967. The population growth of Uganda has been estimated at 2.5 per cent per annum. Whatever the rate of growth in labor input in agriculture has been, it can be concluded that no productivity gain has resulted from the production of food crops and livestock per unit of labor. The rate of increase of 5.5 per cent per annum for export crops resulted in an overall growth rate of agricultural output of 3.1 per cent per annum. The current value of gross output at farm prices rose by 2.7 per cent per annum, which suggests a very slight rise in the purchasing power of the population engaged in agriculture.

The regional rates of growth by class of output are shown in Table 9. Any

overall increase in productivity would seem to be due to growth in the Northern region, which had an overall growth rate of 4.9 per cent. In the 1955–60 period this was sustained by expansion into cotton and tobacco. In the later period the expansion was concentrated in cotton, cassava, and groundnuts, all of which might be traded. In the Eastern region the rate of growth between 1960 and 1967 came from expansion in food crops and considerable slackening in the rate of expansion of export crops. The food crops which contributed most to this growth were millet, plantains, and cassava. The growth rate in Buganda of 2.8 per cent was maintained entirely through expansion in coffee and increased livestock and milk production. The output of food crops remained constant in volume between 1960 and 1967, expansion in the production of groundnuts and cassava counteracting declines in maize and sweet potato. Within the constraints of population growth and falling prices for cash export crops agricultural producers have been expanding the volume of export crops to maintain the level of cash inflow. This appears to have necessitated some decrease in regional self-sufficiency in Buganda and the Western region. It may have provided the market stimulus for the expansion of food crop production in the Eastern and Northern regions since 1960. Other means of sustaining the cash flow within Buganda and the Western region have probably arisen from urban demand for fruits, vegetables, and poultry, items which are too inadequately measured in the recording of production to trace their impact. In the sixties a further source of cash income came from the expansion of outgrower production of tea in the Western region, but so far this is of significance to relatively few producers and is not separated sufficiently from estate production to indicate its growing importance to peasant producers. Since 1960 food crop production seems to have been maintained at about the level of growth of the African population only through rates of expansion in the Eastern and Northern regions that approach twice the rate of growth of population in those regions. The rate of increase in export cash crops has been slightly reduced and the volume of livestock output has risen. Overall acreage expansion does not seem to be taking place in Buganda and the Western region. Expansion in cash export crops in these regions is at the expense of growth in the acreage under food crops. In Buganda in particular, it is possible that the overall acreage cultivated in the 1955–67 period remained constant and output increases were possible only by substituting coffee for cotton, and extending the coffee acreage into areas previously growing maize and beans. Even within the food crop acreage, the expansion has been into readily saleable crops such as groundnuts.

THE PRICE AND INCOME IMPLICATIONS

The period under review (1955–67) has been one of falling prices for the cash export crops of Uganda. Farmers did not feel the full effect because they had not received the benefits from the price rise over the immediate postwar years through the buildup of the Price Assistance Fund and also because the full effect of the decline in prices was not passed on to them until the Price Assistance Fund was exhausted in 1964. Nevertheless, the effect on the cash income of farmers has been considerable. The volume of output has doubled but cash income has risen little in aggregate because the price level of export

TABLE 10.—VOLUME AND PRICE INDEXES FOR EXPORT CASH CROPS, COMPARED WITH CASH INCOME, UGANDA AND REGIONS, SPECIFIED PERIODS, 1954–67*

Period and indicator	Buganda	Eastern	Western	Northern	Uganda
1954–56 average					
Volume index (1964 prices)	100.0	100.0	100.0	100.0	100.0
Implicit price index	100.0	100.0	100.0	100.0	100.0
Cash income (*million shillings*)	271.0	144.0	17.1	41.3	473.5
1959–61 average					
Volume index (1964 prices)	142.2	122.3	207.2	166.4	140.3
Implicit price index	69.3	78.0	71.1	75.5	72.5
Cash income (*million shillings*)	267.5	137.4	25.2	51.9	481.9
1964					
Volume index (1964 prices)	241.3	124.5	215.2	204.8	194.3
Implicit price index	62.6	86.3	80.7	91.5	73.0
Cash income (*million shillings*)	409.8	154.9	29.7	77.4	672.0
1967					
Volume index (1964 prices)	201.9	137.0	442.7	239.2	192.3
Implicit price index	49.8	68.3	68.7	67.5	57.8
Cash income (*million shillings*)	272.5	134.8	52.0	66.7	526.0

* Indexes, 1954–56 = 100. Computed by the author from cash receipts received by farmers in current shillings, and output valued at 1964 prices. Export crops are limited to African enterprises and consist of cotton, coffee, and tobacco. Regional distribution of production drawn from *Annual Report of the Department of Agriculture*, various issues.

crops by 1967 was half the level of 1954–56 in Buganda, and about two-thirds the level in the other regions. On a per capita basis, particularly in Buganda, cash receipts have been falling, with the exception of 1964 when yields were high and price assistance was operative (Table 10).

Farm prices for food crops are difficult to determine because markets from which prices could be reported before 1960 were very thin. Even since then the volumes moving in food markets have been small in relation to aggregate supplies.[6] The aggregate price indexes and volumes are shown in Table 11. A general fall in food crop prices occurred between 1954–56 and 1959–61 but by 1964 the price level of food crops was about the same as in 1955. The rise in the price level from 1964 to 1967 was almost entirely attributable to a 50 per cent increase in the price of plantains.

The absence of a unit by which to divide the aggregate gross revenue makes income comparison by regions difficult. Estimates of African population make a poor index because of the increasing urban effect in Buganda. Because some comparison of this kind illustrates the income effects of the falling terms of trade, an imperfect measure of labor input was devised.[7] Regional revenue estimates per unit of labor were obtained by expressing the gross revenues (Tables 10 and 11) per unit of the labor input. The outcome is shown in Table 12.

[6] The prices used for individual crops are given in Appendix Table XI.

[7] See Appendix Table XII for derivation of these approximations from the 1964 Census of Agriculture.

TABLE 11.—VOLUME AND PRICE INDEXES FOR FOOD CROPS, COMPARED WITH CASH VALUE, UGANDA AND REGIONS, SPECIFIED PERIODS 1954–67*

Period and indicator	Buganda	Eastern	Western	Northern	Uganda
1954–56 average					
Volume index (1964 prices)	100.0	100.0	100.0	100.0	100.0
Implicit price index	100.0	100.0	100.0	100.0	100.0
Cash value (*million shillings*)	254.9	287.4	217.0	163.8	923.1
1959–61 average					
Volume index (1964 prices)	93.5	104.0	113.1	114.6	105.1
Implicit price index	91.1	96.6	91.8	92.9	93.3
Cash value (*million shillings*)	217.0	288.7	225.3	174.5	905.4
1964					
Volume index (1964 prices)	92.3	122.5	111.0	139.6	114.3
Implicit price index	101.9	100.1	102.1	100.0	101.1
Cash value (*million shillings*)	239.8	352.1	245.9	228.8	1,066.7
1967					
Volume index (1964 prices)	92.1	144.0	111.8	168.1	126.1
Implicit price index	124.6	112.3	112.6	98.0	111.7
Cash value (*million shillings*)	292.7	465.0	273.3	269.8	1,300.8

* Indexes 1954–56 = 100. For Uganda cash values in current shillings are from Tables 2 and 4. Data for Uganda in 1964 prices and all regional data similarly computed.

TABLE 12.—GROSS VALUE OF AGRICULTURAL OUTPUT PER UNIT OF LABOR, UGANDA AND REGIONS, 1959–61, 1964, AND 1967*

Category and years	Buganda	Eastern	Western	Northern	Uganda
Food crops					
1959–61 average	458	376	394	436	409
1964	444	422	392	514	436
1967	494	525	407	561	494
Export crops					
1959–61 average	564	179	44	130	218
1964	759	186	47	174	275
1967	460	152	77	139	200
Livestock and milk					
1959–61 average	95	153	46	102	104
1964	92	161	59	111	110
1967	114	206	75	143	140
Total output					
1959–61 average	1,116	707	484	668	730
1964	1,295	768	499	798	821
1967	1,068	883	560	842	834

* Calculated from values in current shillings for food crops in Table 11, export cash crops in Table 10, and livestock and milk for 1959–61 from GDP estimates in Uganda, East African Statistical Department, *The Gross Domestic Product of Uganda, 1954–1959* (April 1961) and Statistics Division, Ministry of Planning and Community Development, *The Real Growth of the Economy of Uganda, 1954–1962* (April 1964); for 1964 and 1967 from the Statistics Division, Ministry of Planning and Economic Development, Uganda.

The dominance of Buganda in the export sector is evident. In 1959–61 export crops provided less than 10 per cent of the aggregate gross value of output in the Western region, 20 per cent in the Northern region, 25 per cent in the Eastern region, and slightly over 50 per cent in Buganda. By 1967 the relative importance of export crops had fallen everywhere except in the Western region. The efforts to maintain receipts from export crops have almost certainly pushed the Buganda population further into the purchase of food crops from other regions. The rise in the value of food crops produced per unit of labor input in Buganda is a pure price effect. The output per unit of labor in volume terms appears to have fallen 20 per cent in the period since 1960.

The Buganda producer, already well drawn into the cash economy by his advantage in coffee production, is likely to search out sources of cash alternatives in the face of adverse price conditions for coffee. Given present technology and yield conditions, the cash alternatives do not exist in cotton production. Some farmers will turn to vegetables and poultry, others may try increased specialization in coffee, counteracting falling terms of trade with rising productivity. The markets for milk and meat are other alternatives. Buganda is likely to remain the cash nexus of the agricultural economy of Uganda and the impact on the rest of the agricultural economy to be found in increased opportunities for sale of food crops, as much as it is in the expansion of export crops.

CONCLUSIONS

Official estimates of agricultural GDP in Uganda are built on the basis of an agricultural economy rather sharply divided between cash and subsistence activities. Reasonably good production records of the main cash sources, coffee and cotton, exist. By the time the present system of accounting for subsistence production and cash exchange of food crops and livestock was adopted, the impact of the coffee economy, a very much improved transportation system, and an expanding urban area were already having their effect on the pattern of agricultural production. Certainly by the time the agricultural census was completed the evidence of internal markets was accumulating. The regional pattern of production indicated rather strongly that it is no longer valid to assume that most food crops are consumed close to production.

An effort to record output by regions more systematically so that some form of regional balance sheet of production and consumption by crops might be constructed would be invaluable in assessing the needs of one area and the surplus of another. Enough information is now available to make a beginning in that direction. Better knowledge of regional production and trade would provide a broad canvas against which more intensive micro studies of management and marketing could be interpreted. If the calculation of agricultural product required the use of acreage and output data, the surveys necessary for this purpose could act as a major source of intelligence on where to survey in depth using farm management and marketing studies.

No claim is made for accuracy in the level of estimates presented. Some implications raised by the trends do seem worth pursuing. The most prominent of these is the contention that regions are no longer self-sufficing in food crops,

although the country is. It is suggested that the impact of the coffee crop on the Buganda economy produced this result. Better production data could either dispel or substantiate this conclusion. The market in plantains has wider effects on the rest of the food economy than can be deduced from the study of the markets in Kampala and Jinja as described by Mukwaya and Schubert (*13*; *18*). Todd describes the changes between 1937 and 1962 in a *mutalla* (district) in the south of Bulemezi county (*19*). In that 25 years the acreage of coffee trebled and the area in cotton was reduced to one quarter of what it was in 1937. The acreage in plantains remained constant *although the resident population doubled.* Although smaller acreages of annual food crops were being grown, a larger sized family was being supported, a change made possible by the expansion of the area under coffee and by a greater participation in the monetary economy. The analysis of gross output suggests that this picture applies to all of the Buganda region. Further, the dependence of Buganda on cash crops may well have penetrated beyond the Buganda region leading to more exchange of food crops than is generally recognized. If this is so, some assistance in planning patterns of exchange and improving marketing channels in food crops may be as necessary as the diversification of the cash export crops in the agricultural growth of Uganda.

In the development of agriculture in Uganda so far effort has been centered on the raising of productivity in both cotton and coffee, improvements in quality, and better use of pesticides and insecticides. The rapid expansion of cotton and coffee production in the postwar period was greatly assisted by the construction of a good network of roads. The role of transportation, processing, and marketing in stimulating efficient output is recognized in the IBRD report which refers to the controlled location of ginneries based on the pattern of cotton production of pre-1955 as being one of the obstacles in further developing that crop (*7*, p. 173). The same report refers also to the need to identify the quality of the coffee bean at the time of sale and that this must be achieved by relying on market forces (*7*, p. 165). Plans to extend the production of outgrower tea and sugar are being implemented and efforts to improve livestock production are being made. The hope for achievement of these ends is being placed on agricultural extension and the introduction of better varieties (*25*). Little attention is given to the development of production, or to the marketing, of food crops. The IBRD report has only one paragraph on food crops, other than groundnuts for which there is a recognized cash market. That paragraph is confined to a discussion of the need to improve production techniques as population grows. The Second Five Year Plan indicates that most food crops are produced mainly for the farmer's own consumption though some hope is expressed that better communication and the establishment of the Agricultural Produce Marketing Board might lead to increased cash income from some food crops. It is suggested that rice and wheat may be developed as cash exchange crops (*25*, p. 70).

There is no recognition in either the IBRD report or the Second Five Year Plan that the development of the cash crop sector may not be independent of the market exchange of food crops. The conflict that can occur between the need for food crops and the growing of cash export crops has been studied at the farm

level. Some attention is being given to the distribution of labor supply throughout the year to see if conflicts between time on food crops and time on cash export crops can be resolved. This work assumes that these activities must be complementary enterprises within one production unit. The role of specialization and exchange in raising productivity in farming is recognized elsewhere. The extent to which it has occurred within Uganda is unknown. Better regional production data would indicate what exchange patterns are developing. It may well be that some regional specialization and exchange is occurring within the agricultural economy. The role played by interregional dependence in food supplies in growth and development is well recognized in mature economies. Markets in food crops may have a more vital role to play in the development process than is given to them in East Africa at the moment. Uganda may be a particularly useful country in which to examine this contention because cash export crops have been grown by African farmers since they were introduced, and the expansion of acreage in export crops must sooner or later compete directly with the food needs of the farm family. It would not be surprising if specialization of production and market exchange of food crops have gradually occurred in this environment.

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APPENDIX A

Gross Domestic Product of Agriculture in Uganda: Summary of Method[8]

For the purposes of the National Accounts, the agriculture of Uganda was looked at in two main divisions, the cash exchange division and the subsistence division. Within the cash exchange division there was the further distinction between African enterprise and corporate or non-African enterprise. The estimates of each division have been constructed on the same basis for the data from 1954 to the present.

A. Cash Exchange Division

I. African Agriculture

(i) *Cotton payment to growers from Lint Marketing Board*
± Lint Marketing Board surplus or deficit
+ Cotton bonuses to African local government
+ Export tax

(ii) *Coffee payment to growers from Coffee Marketing Board*
+ Association of Growers net output from processing
+ African Estates
+ Bugisu Arabica
± Bugisu Price Assistance Fund
+ Coffee Industry Board surplus or deficit
+ Export tax

(iii) *Other exports*
The quantities of exports are obtained from trade returns. These quantities are valued at producer prices in the areas producing the bulk of the exports. The total production of tobacco for sale, whether it was exported or not, is included in this section.

(iv) *Sales to rural employees*
These are defined as employees outside of the urban areas of greater Kampala, Masaka, Jinja, and Mbale. It was *assumed* that these employees bought half of their diet and that they had a diet identical with that used in the Subsistence Division (see B below). The quantities obtained by a constant diet multiplied by a population estimate were valued at producer prices.

(v) *Sales to urban Africans*
These are estimated for the African population of greater Kampala, Masaka, Jinja, and Mbale. Quantities consumed were derived from budget survey diets for unskilled workers. These have been revised from time to time and the amounts valued at producer prices.

(vi) *Sales to non-Africans*
A crude estimate of consumption of local produce by non-African households was made from the information used for weighting the Kampala Cost of Living Index. Consumption per head is estimated separately for Europeans and other non-Africans. The amounts are valued at retail prices on the assumption of direct sale by growers to households.

[8] Summarized from *21* and *27*.

(vii) *Payment in kind to employees of small African agricultural enterprises and peasants*
The number of these employees is assumed to be constant and it is assumed that they receive a subsistence diet for six months of the year.

(viii) *Livestock*
The total production of slaughter animals is based on statistics of hides sold. This amount is divided *arbitrarily* into cash and subsistence sections. The number of animals slaughtered is valued on the hoof at average prices at auction sales in the district of production.
Milk
An estimated per capita consumption determined by examining diet figures and production data is multiplied by population and divided between cash and subsistence. The per capita figure is estimated separately for peasants, urban Africans, Asians, and non-Africans. Retail price is the basis of valuation, assuming direct sales from producer to household.

(ix) *Beer sales*
Estimates of quantities consumed per African adult male have been made from data obtained in small-scale surveys. This consumption was divided *arbitrarily* between cash and subsistence. Cash consumption was valued at retail prices.

(x) *Farm costs*
An estimate of purchases of hand tools, etc., is obtained from import statistics and valued at retail. Some consumption of insecticides is allowed for and no other deductions are made for purchases from other sectors of the economy.

II. Non-African Enterprises
This consists of estate production, dominantly of tea and sugar, less 43 per cent for sugar and 16 per cent for tea, assumed to be the contribution of manufacturing less inputs of imported raw materials and other inputs.

B. Subsistence Division
Consists of staple crops, livestock, milk, and beer materials. Methods of estimation for all but staple crops have been stated above. Staple crops are estimated on the basis of rural, non-employed African population multiplied by commodity quantities estimated from seven tribal diets compiled during World Health Organization nutrition surveys taken in 1956.

APPENDIX TABLE I.—CROP YIELD DATA, UGANDA AND REGIONS, 1963/64*
(*Pounds per acre*)

Crop and nature of stand	Buganda	Eastern	Western	Northern	Uganda
Millet (dry heads)					
Pure	1,000	800		800	
Predominant	800	625	1,300	650	758
Not predominant	800	625		650	
Sorghum (dry heads)					
Pure	900	600	1,000	500	
Predominant	450	500	700	300	536
Not predominant	400	300	400	200	
Maize (dry on cob)					
Pure	970	950	1,050	1,000	
Predominant	675	550	800	950	553
Not predominant	500	350	600	350	
Sweet potatoes (fresh)					
Pure	6,900	4,700	6,800	4,600	
Predominant	5,800	5,800	5,800	5,800	5,991
Not predominant	5,800	5,800	5,800	5,800	
Cassava (wet)					
Average	5,000	7,000	7,500	8,000	7,103
Plantains					
Pure	7,200	4,600	9,900	9,000	
Predominant	4,800	4,400	9,200	9,200	6,165
Not predominant	4,800	4,400	—	9,200	
Groundnuts (dry unshelled)					
Pure	700	1,000	550	550	
Predominant	700	900	550	550	740
Not predominant	600	850	350	350	
Beans (dry threshed)					
Pure	600	600	500	550	
Predominant	400	400	500	350	379
Not predominant	300	300	400	350	
Pigeon peas (dry threshed)					
Pure	—	150	—	150	
Predominant	—	—	—	150	150
Not predominant	—	150	—	150	
Cowpeas (dry threshed)					
Pure	—	150	—	150	
Predominant	—	150	—	150	150
Not predominant	—	150	—	150	
Sesame					
Pure	140	140	140	140	
Predominant	130	130	130	130	134
Not predominant	—	130	130	130	

* Data for districts within the regions from or approximated from Uganda, Ministry of Agriculture, Forestry and Co-operatives, *Report on Uganda Census of Agriculture*, Vol. IV. Yields for cassava are the author's estimates based on follow-up surveys on the census, and various farm management studies. Uganda yields include output of Karamoja and Toro at yields indicated in Appendix Table II.

APPENDIX TABLE II.—ACREAGES IN FOOD CROPS, UGANDA AND REGIONS, 1963/64*
(Thousand acres, except as noted)

Crop and nature of stand	Buganda	Eastern	Western	Northern	Total[a]	Karamoja	Toro
Millet							
Pure	12	401	41	106	560		
Predominant	14	165	9	254	442	2.0	7.5
Not predominant	8	13	2	44	67	(744)[b]	(1,300)[b]
Sorghum							
Pure	29	143	123	40	335		
Predominant	6	12	4	24	46	106	4.0
Not predominant	14	112	7	107	240	(500)[b]	(700)[b]
Maize							
Pure	30	51	20	10	111		
Predominant	33	50	6	11	100	9.8	59.2
Not predominant	120	232	28	93	473	(500)[b]	(800)[b]
Plantains							
Pure	237	289	128	10	664		
Predominant	121	82	34	3	240	—	36.0
Not predominant	164	47	26	6	243		(9,200)[b]
Cassava							
Pure	13	67	17	113	210		
Predominant	7	6	3	27	43	—	77
Not predominant	69	53	8	36	166		(7,500)[b]
Sweet potatoes							
Pure	39	43	75	25	182		
Predominant	4	2	2	2	10	—	—
Not predominant	7	5	2	5	19		
Groundnuts							
Pure	25	96	10	35	166		
Predominant	28	57	7	36	128	0.7	4.4
Not predominant	28	24	4	30	86	(944)[b]	(512)[b]
Sesame							
Pure	4	9	1	112	126		
Predominant	5	3	1	40	49	—	—
Not predominant	—	28	1	53	82		
Beans							
Pure	15	32	71	25	143		
Predominant	32	6	24	18	80	—	20.6
Not predominant	202	124	50	163	539		(500)[b]
All peas							
Pure	—	46	—	52	98		
Predominant	—	4	—	14	18	—	—
Not predominant	—	4	—	182	186		

* Acreages from Uganda, Ministry of Agriculture and Co-operatives, *Report on Uganda Census of Agriculture*, Vol. III (1966). Acreages in peas are those reported by region only. Estimates for Karamoja and Toro are adjusted acres based on Annual Report of the Department of Agriculture, 1963–65, adjusted by factors shown in Appendix Table III. Figures in parentheses indicate yields applied to Karamoja and Toro acreages.

[a] Excluding Karamoja and Toro.

[b] Yield in pounds per acre.

APPENDIX TABLE III.—ACREAGE ADJUSTMENT FACTORS APPLIED TO DEPARTMENT OF AGRICULTURE ANNUAL ACREAGE ESTIMATES, 1947–49, 1954–56, AND 1959–61*

(Per cent of Department of Agriculture annual figures)

Crop	Buganda	Eastern	Western	Northern
Millet	100	50	45	100
Sorghum	66	100	75	100
Maize	200	200	200	180
Cassava	100	50	87.5	50
Sweet potatoes	39	30	66	24
Plantains	100	80	33	33
Groundnuts	61	56	65	73
Beans, cowpeas	160	180	182	130
Pigeon peas	—	—	75	70
Sim-sim (sesame)	155	120	120	107

* Based on comparison of 1963/64 census acreages with 1963 Department of Agriculture annual estimates as reported in Uganda, Ministry of Agriculture and Co-operatives, *Report on Uganda Census of Agriculture*, Vol. III. A direct comparison of Department of Agriculture acreage estimates and those produced by the census is not easy, due to the different breakdown of the acreages. As a rule of thumb, the most significant figure may be taken as the combined census figures for pure stands plus the area in which the crop is predominant in a mixture. Regional interpretation was sometimes difficult due to the size of the sample. The fact that some crops, e.g., maize, were recorded as not predominant, created further difficulties. In these instances, the adjustment factor is a rounded approximation based on the comparisons given in the census and the associated textual comment.

APPENDIX TABLE IV.—TOTAL ADJUSTED ACRES IN FOOD CROPS, UGANDA, 1947–49, 1954–56, 1959–61 AVERAGES*

(Thousand acres)

Crop	1947–49	1954–56	1959–61
Millet	683	770	802
Sorghum	344	524	565
Maize	566	875	755
Cassava	344	350	424
Sweet potatoes	211.5	241	474
Plantains	764	1,066	1,073
Groundnuts	212	251	287
Beans	690	1,026	1,017
Peas	147	186.7	170.7
Sesame	269	272	272

* Computed from Appendix Table III, applied to Department of Agriculture acreage data, as given in *Annual Reports*. See Appendix Table II for 1964, and VI for 1967.

APPENDIX TABLE V.—ESTIMATED WEIGHTED YIELDS OF FOOD CROPS, REGIONS OF UGANDA, 1947–49, 1954–56, AND 1959–61*

(Pounds per acre, and percentage weights)

Crop	Buganda	Eastern	Western	Northern
Millet				
Yield	1,000	744	1,300	688
Weight	—	60P 40M	—	25P 75M
Sorghum				
Yield	738	500	820	310
Weight	66P 34M	50P 50M	60P 40M	24P 76M
Maize				
Yield	701	530	756	676
Weight	16P 84M	16P 84M	16P 84M	7.5P 92.5M
Cassava				
Yield	5,000	7,000	7,500	8,000
Weight	—	—	—	—
Sweet potatoes				
Yield	6,900	4,700	6,800	4,600
Weight	—	—	—	—
Plantains				
Yield	5,715	4,540	9,662	9,070
Weight	45P 55M	70P 30M	66P 34M	66P 34M
Groundnuts				
Yield	668	913	494	486
Weight	33P 67M	30P 70M	44P 56M	35P 65M
Beans				
Yield	365	380	475	380
Weight	6P 94M	12P 88M	50P 50M	15P 85M
Peas				
Yield	—	150	150	150
Weight	—	—	—	—
Sesame				
Yield	134.4	134.4	134.4	136.0
Weight	44P 56M	44P 56M	44P 56M	55P 45M

* Adapted from Appendix Table I for use with area figures that do not distinguish between pure and mixed stands. Percentage weights were derived with regard to the number of yield samples and comment on their representativeness appearing in the text of the Census. Weights are shown above for Pure (P) and Mixed (M) combining predominant and not predominant.

APPENDIX TABLE VI.—ACREAGES IN FOOD CROPS IN UGANDA AND REGIONS, 1967*
(*Thousand acres*)

Crop and nature of stand	Buganda	Eastern	Western	Northern	Total[a]	Karamoja	Toro
Millet							
Pure	16.8	421.0	28.5	45.8	512.1	—	18.8
Mixed	6.8	240.1	19.3	359.1	625.3		
Sorghum							
Pure	32.7	105.4	78.9	100.4	317.4	106	4.0
Mixed	7.2	64.6	31.0	114.3	217.1		
Maize							
Pure	51.0	51.1	21.6	20.0	143.7	—	59.2
Mixed	111.4	249.3	29.5	100.0	490.2		
Cassava							
Pure	48.4	124.0	18.8	125.0	316.2	—	79
Mixed	62.9	44.7	20.1	92.6	220.3		
Sweet potatoes							
Pure	43.2	73.4	56.2	19.9	192.7	—	—
Mixed	4.3	3.9	10.8	2.5	21.5		
Plantains							
Pure	209.0	521.0	130.0	40.0	1,287.0	—	—
Mixed	311.0		76.0				
Groundnuts							
Pure	29.0	90.0	21.4	31.0	171.4	—	—
Mixed	52.0	79.0	11.6	114.0	256.6		
Beans							
Pure	20.1	21.9	71.0	10.3	123.3	—	—
Mixed	170.0	267.1	150.0	334.7	921.8		
All peas	6.2	94.1	8.8	280.1	389.2	—	—
Sesame							
Pure	2.2	20.7	—	99.5	122.4	—	—
Mixed	10.7	44.9	7.9	83.5	147.0		

* Data from Uganda, Department of Agriculture, *Census Survey, 1966–67* (mimeo., 1969) and Department of Agriculture estimates 1967 (unpublished).

[a] Excluding Karamoja and Toro.

APPENDIX TABLE VII.—CROP YIELD DATA, UGANDA AND REGIONS, 1967*

(*Pounds per acre*)

Crop and nature of stand	Buganda	Eastern	Western	Northern	Karamoja	Toro
Millet						
Pure	1,000	800	1,300	800	—	1,300
Mixed	800	625		650		
Sorghum						
Pure	900	600	1,000	500	500	700
Mixed	425	400	550	250		
Maize						
Pure	970	950	1,050	1,000	—	900
Mixed	650	450	700	650		
Cassava	5,000	7,000	7,500	8,000	—	7,500
Sweet potatoes						
Pure	6,900	4,700	6,800	4,600	—	5,800
Mixed	5,800	5,800	5,800	5,800		
Plantains						
Pure	7,200	4,500	9,600	9,200	—	—
Mixed	4,800					
Groundnuts						
Pure	700	1,000	550	550	—	—
Mixed	650	875	450	450		
Beans						
Pure	600	600	500	550	—	—
Mixed	350	350	450	350		
Peas	150	150	150	150	—	—
Sesame						
Pure	140	140	140	140	—	—
Mixed	130	130	130	130		

* Adapted from data in Appendix Table I for use with area figures that do not subdivide mixed stands into predominant and not predominant.

APPENDIX TABLE VIII.—ESTIMATED OUTPUT OF FOOD CROPS, UGANDA AND REGIONS, INDICATED YEARS 1947–67*

(*Thousand metric tons*)

Period	Region	Millet	Sorghum	Maize	Cassava	Sweet potatoes	Plantains	Groundnuts	Beans	Peas	Sesame
1947–49	Buganda	6.8	3.7	89.6	222.3	142.8	1,252.0	10.7	23.0	0.0	0.5
	Eastern	105.2	18.9	35.6	293.0	105.2	420.0	50.1	49.0	0.0	2.2
	Western	32.1	39.3	30.2	285.8	294.8	333.8	3.5	38.8	2.4	0.5
	Northern	94.3	20.2	14.9	252.2	43.5	2.7	8.9	15.1	7.5	13.3
	Uganda	238.4	82.1	170.3	1,053.3	586.4	2,008.5	73.2	125.9	10.0	16.5
1954–56	Buganda	12.0	12.9	119.2	125.0	146.0	1,436.8	16.8	55.2	0.0	0.5
	Eastern	121.6	39.0	68.9	330.2	127.9	803.8	50.6	53.5	0.4	1.8
	Western	37.5	50.3	39.6	320.2	337.1	533.4	3.1	44.5	2.7	0.4
	Northern	99.8	25.1	29.9	352.0	50.7	1.8	13.2	30.4	9.6	14.0
	Uganda	270.8	127.3	257.6	1,127.5	662.5	2,775.9	83.6	183.6	12.7	16.7
1959–61	Buganda	11.2	11.7	77.2	183.7	161.8	1,407.9	17.1	38.1	0.0	0.6
	Eastern	128.6	39.4	69.8	419.1	165.7	723.9	60.1	60.1	0.0	1.4
	Western	30.0	55.7	41.0	323.0	382.7	777.5	4.4	48.4	2.7	0.3
	Northern	108.0	29.0	30.8	420.9	46.1	5.4	14.5	36.9	8.9	14.4
	Uganda	277.8	135.8	219.4	1,346.7	756.2	2,914.7	96.1	183.5	11.6	16.7
1964	Buganda	13.4	15.6	50.5	201.9	151.0	1,394.5	24.5	37.4	0.0	0.5
	Eastern	196.0	80.7	73.5	400.1	110.0	860.5	76.4	26.9	3.7	2.4
	Western	35.3	59.6	40.8	357.4	241.9	975.0	5.9	35.3	0.0	0.2
	Northern	126.1	21.8	24.0	638.7	70.6	78.0	22.5	34.9	16.9	12.5
	Uganda	370.8	177.7	188.9	1,598.0	573.4	3,308.0	129.3	134.4	20.6	15.6
1967	Buganda	10.1	14.8	55.2	251.7	146.5	1,360.6	24.8	32.5	0.4	0.8
	Eastern	220.8	64.4	72.9	537.1	166.7	1,063.2	72.1	48.3	6.4	4.0
	Western	39.3	44.8	43.7	401.1	201.9	897.2	7.7	46.7	0.7	0.5
	Northern	122.5	35.4	38.6	791.1	48.1	166.9	31.0	55.8	17.8	11.2
	Uganda	392.6	159.4	210.5	1,980.9	563.3	3,487.9	135.6	183.3	25.2	16.5

* Computed from yield figures in Appendix Tables I, V, and VII, all based on the 1964 census and areas from Appendix Tables II and VI and the regional data underlying Appendix Table IV.

APPENDIX TABLE IX.—NET FOOD AVAILABLE FROM SPECIFIED CROPS, UGANDA AND REGIONS 1964, WITH CALORIE FACTORS*

Crop	Net food available (*thousand metric tons*)					Calories per 100 grams
	Buganda	Eastern	Western	Northern	Uganda	
Millet	8.7	120.6	21.5	77.6	228.5	332
Sorghum	8.5	43.5	32.6	11.8	96.5	343
Maize	36.0	52.3	29.0	17.1	134.5	360
Cassava	128.2	256.3	227.0	405.5	1,017.0	109
Sweet potatoes	127.9	93.4	205.0	59.8	486.3	97
Plantains	976.0	602.4	683.1	51.4	2,312.9	57
Groundnuts	13.8	42.8	3.4	12.2	72.2	546
Beans	34.1	24.1	32.2	31.8	122.3	341
Peas	0.0	3.4	0.0	16.1	19.6	342
Sesame	0.5	2.1	0.2	11.1	13.8	574

* Gross output data of Appendix Table VIII less estimated seed, manufacture, and waste; plus or minus net trade; and where appropriate, further reduced from gross to net food by standard extraction rates. Calorie factors are from FAO, *Food Composition Tables, Minerals and Vitamins for International Use* (1954).

APPENDIX TABLE X.—ESTIMATES OF AFRICAN POPULATION, UGANDA AND REGIONS, INDICATED YEARS 1948–67*

(*Thousand persons*)

Year	Buganda	Eastern	Western	Northern	Uganda
1948	1,302	1,634	1,164	817	4,917
1955	1,617	1,889	1,367	968	5,842
1960	1,893	2,086	1,532	1,101	6,611
1964	2,147	2,258	1,678	1,220	7,303
1967	2,360	2,396	1,796	1,318	7,870

* Estimated on the basis of growth rates of African population from 1948 to 1959 in Uganda, Ministry of Planning and Economic Development, Statistics Division, *1968 Statistical Abstract*, p. 9. Eastern region includes Karamoja.

APPENDIX TABLE XI.—PRODUCER PRICES FOR FOOD CROPS, UGANDA AND REGIONS, SELECTED YEARS 1954–67*

(*Cents per pound*)

Crop	1954	1955	1956	1959	1960	1961	1964	1967[a]			
								B	E	W	N
Millet	20.0	20.0	20.0	15.0	18.0	24.0	22.0[b]	20.0	23.0	23.0	25.0
Sorghum	13.0	15.0	15.0	16.0	18.0	24.5	15.8	20.0	20.0	20.0	15.0
Maize	13.5	15.5	10.5	16.0	18.0	11.0	15.6	12.5	13.5	12.5	10.0
Cassava	6.5[c]	6.5[c]	6.5[c]	5.0	5.0	5.0	5.4	5.0	4.1	4.5	4.5
Sweet potatoes	5.0[d]	6.5	7.0[e]	5.0	7.0	6.0	8.0	7.5	7.5	7.5	7.5
Plantains	4.0	4.0	4.0	3.0	4.5	3.0	4.0	6.0	6.0	6.0	6.0
Groundnuts	20.0	25.0	25.0	32.0	33.0	29.0	30.0	31.0	31.0	31.0	31.0
Beans	34.0	30.0	28.0	20.0	19.0	26.5	24.0	23.0	26.5	23.0	21.0
Peas	30.0	30.0	30.0	23.0	23.0	31.0	25.0	21.0	21.0	21.0	25.0
Sesame	40.0	40.0	40.0	48.0	48.0	50.5	51.0	64.0	64.0	64.0	64.0

* Data, except 1967, from or based on Uganda, *Annual Report of the Department of Agriculture, 1964*, appendix on food prices; Ministry of Planning and Economic Development, *Statistical Abstract*, various issues; and for 1954–56 varied sources. Producer prices were estimated at 50 per cent of retail prices when no producer prices could be found. Cassava prices approximated at 45 per cent of dry cassava prices. For 1967 unpublished data from a continuation of E. B. Riordan and D. M. S. Coles, *The Food Crop Market in Uganda, 1961–67* (Department of Rural Economy, Makerere University, R.E. 12).

[a] Buganda (B), Eastern (E), Western (W), and Northern (N).

[b] Eastern, 20.0.

[c] Buganda, 5.0.

[d] Buganda, 6.0.

[e] Buganda, 7.0.

APPENDIX TABLE XII.—ESTIMATES OF REGIONAL DISTRIBUTION OF LABOR FORCE IN AFRICAN AGRICULTURE, UGANDA AND REGIONS, 1960, 1964, AND 1967*

(*Thousand full-time units*)

Year	Buganda	Eastern	Western	Northern	Uganda
1960	474	768	571	400	2,213
1964	540	835	627	445	2,447
1967	593	886	671	481	2,631

* Estimates for 1964 are based on Uganda, Ministry of Agriculture and Co-operatives, *Report on Uganda Census of Agriculture*, Vol. I, p. 45, which reports work on holdings by members of the holder's household. Approximations for Karamoja have been added to the Eastern Region and for Toro to the Western Region. Full-time workers under 16 and over 45 have been counted at half-time, and those recorded as part-time have been assumed to work half the time of full-time workers in the same age group. Estimates for 1960 and 1967 are calculated from the 1964 figures at the annual percentage growth rates for the African population shown by regions in Table 9.