INSTITUTE FOR DEVELOPMENT STUDIES
UNIVERSITY OF NAIROBI

Working Paper No. 62

LABOUR IN SMALL SCALE AGRICULTURE: AN ANALYSIS OF THE 1970/71 FARM ENTERPRISE COST SURVEY LABOUR AND WAGE DATA

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G. D. Gwyer

September 1972

I.D.S. Working
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ABSTRACT

The purpose of the paper is to present labour/land coefficients for small farms by enterprise computed from the Ministry of Finance and Planning Farm Enterprise Cost Survey for 1970/71 and to demonstrate the usefulness of these coefficients in national, district, and farm planning. Three computer programmes developed specifically for analysis of the FECS labour and wage data are described, the implications of the findings in relation to the operation of agricultural labour markets are discussed, aggregate crop labour profiles for sixteen districts are presented, and suggestions for further work are made.

LIST OF TABLES

Labour in Small Scale Agriculture: An Analysis of the 1970/71 Farm Enterprise Cost Survey Labour and Wage Data[1]

Introduction

The purpose of this paper is to present labour/land coefficients for small farms by enterprise computed from the Ministry of Finance and Planning Farm Enterprise Cost Survey (FECS) for 1970/71, and to demonstrate the usefulness of these coefficients in national, district and farm planning. An additional objective is to place on record three computer programmes for calculating labour inputs and wages from the FECS.

In the first section we consider the uses and limitations of labour/land ratios and their derivatives with particular reference to the FECS and the Kenya situation. Secondly, the FECS and the computer programmes are described. Thirdly, the findings are discussed. Lastly, suggestions are made for future work.

Uses and Limitations of Labour/Land Coefficients

Knowledge of the seasonal distribution of labour inputs by farm enterprise in small scale agriculture is useful at three levels. First, at the locational level, farm planning aimed at increasing the income and employment generating capacities of modal farm situations needs to take heed of seasonal labour requirements of farm enterprises. Second, at the divisional or district level, aggregate labour profiles based upon average labour/land coefficients are useful in identifying slack periods in the agricultural calendar when labour intensive projects like road construction, bush clearing, and digging trenches for the provision of water supplies, can best be undertaken. Third, at the national level, aggregate labour profiles for districts can give understanding of the magnitude and location of the unemployment problem. Apart from their role in directing Government's attention to areas in most need of employment creating projects, district labour profiles can be compared with a view to determining either formally, using a linear programming transportation model, or informally, the needed direction of short term labour movements from a trough in one district to a peak in another.

Recent efforts on the development front in Kenya suggest that labour data of the kind presented in this paper will be increasingly used at all three levels. With the renewed interest in farm planning (and especially linear programming) being shown by the Farm Management Division of the Ministry of Agriculture, and by a number of individual researchers, there is a growing demand for farm level crop labour profiles for different parts of the country and different ecological zones. At the same time a new emphasis on area based planning both at the divisional level under the Special Rural Development

Programme and now at the district level, has created a need for information about the present and within year allocation of labour between farm employment and non-farm activities. Most recently, the ILO Employment Mission to Kenya has drawn attention to apparent regional disparities in agricultural income and employment and the need to monitor the progress of policies aimed at overcoming these inequalities.

An additional use of labour/land coefficients as presented here is the light they shed on the operation of the labour markets in small scale agriculture. Not only do we find out which crops attract hired labour, at what times and in what quantities, but we also learn something about the characteristics of farms which do and do not hire labour, and differences between districts in their use of family and hired labour.

There are two sorts of difficulties or limitations of labour/land coefficients: the first is conceptual, the second is practical.[2] The conceptual limitation arises because actual work input is the product of two factors: work intensity and the time spent in a given activity. Thus observed labour time spent in a given activity is an imperfect measure of actual work input. Work intensity is likely to increase at seasonal peaks and drop off when there is less to do.

The practical limitations of labour input measurement arise from the common conflict in survey work between coverage or sample size and accuracy. It is apparent that direct observation of labour time is itself a very labour intensive activity, which severely restricts the scope of an investigation. The usual solution is to place reliance upon the memories of those involved in work input. In the FECS enumerators record labour inputs on the basis of monthly visits to farmers, which is probably stretching accuracy in the interests of coverage, although Collinson from his experience in Tanzania argues in favour of monthly visits.[3] More frequent visits could be made with the same resources if the amount of information collected on other aspects of farm operations (much of which is not being used in analysis) was reduced.

The Farm Enterprise Cost Survey[4]

The Farm Enterprise Cost Survey is now in its fifth year (1972/3). Each year some 2000 farms are surveyed from 1st April to 31st March by about 70 permanent enumerators covering about 30 farms each. The first year of operation (1968/9) only covered the long rains crop and although the results were processed they were not released. The 1969/70 survey data is still undergoing validation. The monthly labour inputs recorded on the survey forms are presently not being coded for analysis. Hence one contribution of this study is that it brings to light data which are presently being collected but not analysed : another is that it has speeded up the presentation of some of the findings of the 1970/71 survey.

The information on labour use on small farms in the FECS is given in standard mandays of eight hours. Thus if a man and a child work four days in a month for four hours each day on maize then their combined labour input will be recorded as three mandays. The information on labour inputs is recorded on monthly visits to the farmer by enumerators and is then checked for internal consistency by the district planning office before being sent to Nairobi. The labour input on the farm is allocated among fifteen enterprises including three residual categories: all other crops, all other livestock and farm general. For some districts, particularly Kilifi and Kwale, the range of enterprises encountered differs markedly from the categories recorded, so that much information goes into the residual 'all other crops'. An improvement in the Survey would be to include additional enterprises explicitly; for example, beans, peas, sugar cane, cassava, potatoes, bananas, cashews, millet are important crops . the labour inputs for which are not presently recorded. Additionally blank columns could be left for other specific crops.

The Computer Programmes

Three computer programmes have been developed for the analysis of the labour and wage data of the FECS. These are S40C which carries out an analysis of labour inputs for crop enterprises; S40L which carries out analysis of labour inputs for livestock enterprises; and S40W, which analyses the wage data. All three programmes are written in FORTRAN IV and are available from the IDS data processing room. A common feature of the crop and livestock labour programmes is that they separate out farms which use family labour only for a particular enterprise (F farms) from those which use hired labour only (H farms) and those that use both family and hired labour (F+H farms). Thus as may be seen from the specimen computer print outs shown on pages 6 and 7 labour inputs are shown for each of these three categories as well as for all farms taken together.

S40C Labour Land Coefficients Programme (Crops)

This programme carries out the following operations:

(i) performs a check on the data, rejecting cards where mandays per acre per year are less than 15 or greater than 450, or where a monthly labour input per acre exceeds 75 mandays. The programme also rejects cards which have fewer than three monthly observations per year. Each of these limits may be adjusted if required by alteration of one of the programme cards.

(ii) sorts farms into three categories on the basis of the type of labour input, and records the numbers falling into each category (OBSR);

(iii) for each farm expresses labour inputs for a particular enterprise in terms of mandays per acre per month (these can be printed out if required);

(iv) for each enterprise and for the three farm categories (FAMILY LABOUR ONLY, HIRED LABOUR ONLY, and PANDI FARMS) calculates and prints out the average labour input per acre for the farms with that particular enterprise for each

month of the year, and for the year total. For farms using both hired and family labour these inputs are recorded separately (FANDH FARMS FAMILY and FANDH FARMS HIRED);
(v) for each enterprise and for the three farm categories calculates and prints out the average enterprise size (ENTS) and farm size (FRMS) in acres;
(vi) for each row of monthly labour inputs calculates the coefficient of variation (COV) thus giving a measure of seasonal variation in labour inputs.

S40L Labour Animal Coefficients Programme (Livestock)

This programme carries out the following operations:
(i) performs a check on the data, rejecting cards where mandays per cow per year are less than 12 or greater than 150, or where a monthly labour input per cow exceeds 20 mandays. The programme also rejects cards which have zero labour inputs for any month of the year. Each of these limits may be adjusted if required by alteration of one programme card;
(ii) sorts farms into three categories on the basis of the type of labour input and records the numbers falling into each category (OBSR);
(iii) for each farm expresses labour inputs in terms of mandays per animal per month (these can be printed out if required);
(iv) for the three farm categories calculates and prints out the average labour input per animal for each month of the year and for the year total;
(v) for the three farm categories calculates and prints out the average herd size (STOCK) the average farm size (FRMS) and the stocking rate (RATE) which is number of animals divided by area of farm in acres allocated to the production of feed or pasture.
(vi) for each row of monthly labour inputs calculates the coefficient of variation (COV) thus giving a measure of seasonal variation in labour inputs.

S40W Daily Wage Calculation Programme

This programme carries out the following operations :
(i) performs a check on the data, rejecting data cards where in any month the daily wage exceeds shs. 7.00;
(ii) sorts farms into three categories: farms which hire casual labour only (CASUAL) farms which hire regular labour only (REGULAR) and farms which hire both casual and regular labour (REGULAR AND CASUAL): Regular labour is paid on a monthly basis; casual labour is paid by the day;
(iii) computes for each farm the average daily wage paid for each month, and calculates the average wage for the three categories;
(iv) accumulates for each district the monthly totals of wages paid and days worked, and computes the weighted average daily wage paid to all labour for each month;
(v) calculates the average farm size (FARMSZ) and number of farms falling into each category (OBS).

The format for input for each of these programmes is described in Appendix A. On the University of Nairobi ICL 1902A computer the run time for the labour and wage analysis of the whole FECS is about two hours.

Print out of Programme # S40W

DISTRICT APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR FARMSZ OBS

REGULAR AND CASUAL (average daily wages paid by this category of farms for each month)

NO OF FARMS HIRING R/C LABOUR (for each month)

NO OF DAYS WORKED (total days worked each month by hired labour for farms in this category)

AVERAGE REG/CAS WAGE (average daily wage for the year)

CASUAL (average daily wages paid by this category of farms for each month)

NO OF FARMS HIRING CAS LABOUR (for each month)

NO OF DAYS WORKED (total days worked each month by hired labour for farms in this category)

AVERAGE CASUAL WAGE (average daily wage for the year)

REGULAR (average daily wages paid by this category of farms for each month)

NO OF FARMS HIRING REGULAR LABOUR (for each month)

NO OF DAYS WORKED (total days worked each month by hired labour for farms in this category)

AVERAGE REGULAR WAGE (average daily wage for the year)

TOTAL WAGE PAYMENTS (total wages paid by all farms for each month)

AVERAGE WAGE ALL LABOUR (average daily wage paid for the year by all farms)

NO OF DAYS WORKED (total days worked each month by hired labour for all farms)

AVERAGE WAGES (average daily wages paid for all farms each month)

Labour Coefficients

The labour data for crops from the 1970/71 FECS have been analysed by district, and by ecological zone within districts. The district analysis aimed at obtaining average labour coefficients which could be combined with information on crop areas from the Statistical Abstract to derive aggregate crop labour profiles. The ecological zone analysis aimed at obtaining coefficients of labour inputs for certain enterprises which would be of use for farm planning. Tables 1 to 5 present information on labour inputs for crops by district, Tables 6 and 7 give information on labour inputs for improved and unimproved dairy cattle by district, and Tables 9 through 20 labour inputs for crops by ecological zones within districts. One of the objectives of the exercise is to gain understanding of the operation of labour markets in different parts of the country, and to this end each Table shows the number of farms hiring labour for a particular enterprise, the proportion of hired labour used on those farms hiring labour (F+H farms), and a combination of these indices labelled Hired Labour Intensity.

The Hired Labour Intensity index is an attempt to measure the importance of hired labour in the production of a crop in a particular district. It is obtained as the product of

$$\left(\frac{\text{F+H farms} + \text{H farms}}{\text{All farms}} \times 100 \right)$$

and

$$\left(\frac{\text{Hired Labour Input on F+H farms}}{\text{Total Labour Input on F+H farms}} \times 100 \right)$$

It is not possible to present monthly labour inputs in the Tables, but the reader who requires these for farm planning purposes may consult the original computer print outs which are now with the Statistics Division of the Ministry of Finance and Planning.

(a) Maize

Labour inputs for maize show wide variability between districts, the range being from 24 mandays per acre in Kericho to 145 mandays for Kisii. The range is narrower for hybrid maize: from 27 mandays in Kericho to 98 mandays in Kisii. There are three explanations for this variability among districts:

(i) climatic difference between districts determine whether one or two maize crops can be grown per year. In most of Bungoma for example the distribution of rainfall is such that only one crop can be produced per year, In most of Kisii two crops are the norm. Within districts altitude, temperature and soil characteristics affect cropping frequency.

(ii) districts vary in the extent to which maize crops are interplanted with other, usually food, crops. Table 22 indicates that interplanted maize tends to have a higher labour input per acre than maize grown in pure stand.

(iii) the use of tractors or oxen for cultivation is more common in some districts than others. Mechanised cultivation tends to occur where farm sizes are larger and the land is flat. It is worthy of note therefore that districts with the highest labour inputs for maize are Meru, Taita, Embu, and Kisii where farm sizes are small and the topography is hilly.

The three reasons given above for the wide disparity of labour inputs for maize among districts are also important in understanding why annual labour inputs for hybrid maize are for many districts less than those for all other maize. Husbandry recommendations for hybrid maize call for more careful seed-bed preparation, weeding three times instead of once, and application of insecticides and fertilizer: all of which should tend to increase the labour requirement. The extra labour input for hybrid maize is unlikely to show up in comparison of annual labour inputs if as is usually the case, hybrid maize is grown but once a year and other maize is grown twice. Looking at labour inputs in the peak month (usually April) however we find that for Kirinyaga, Kakamega, Nyeri, Nyandarua, Muranga, Nandi and Kericho the labour input for hybrid maize exceeds that of all other maize. We must also take into account the likelihood that farms growing hybrid maize are those using some form of mechanized cultivation, and that hybrid maize is less likely to be interplanted with other crops than all other maize. For hybrid maize it is interesting to note that for all districts save one F+H farms have higher labour inputs than do F farms. Two possible explanations come to mind. The first is that F+H farms having the cash to hire labour also have the cash to purchase and apply material inputs which increase the demand for labour. An alternative explanation is that F farms have no money to hire labour, and their own labour is insufficient to meet peak labour demands.

(b) cash crops

For the cash crops tea, coffee, pyrethrum and cotton a greater proportion of total labour input is taken up with harvesting the crop than with food crops like maize, although this tendency is much more apparent with a perennial crop like tea than an annual cash crop like cotton. Continuously harvested crops like pyrethrum and tea tend to have a more even requirement for labour through the year which shows up in lower coefficients of variation in monthly labour inputs. Mature tea appears as the most labour intensive crop with annual inputs in excess of 200 mandays followed by coffee, with cotton and pyrethrum having labour inputs generally in excess of 100 mandays. Inter-district variability in labour inputs for these crops likely reflects yield differences, which may also vary from year to year with weather conditions. Coffee for example tends to exhibit a biannual bearing cycle, and cotton yields are very susceptible to the timing of the rains.

of present levels of labour inputs with those recorded in earlier surveys (Table 22). The tendency is particularly marked in areas where there is a fair degree of cash crop diversificationce.g. Kiambu, Kisii.

Interesting contrasts between the employment generating effects of tea and cotton may be observed. Tea is a very labour intensive crop in all districts where it is grown, but cotton's labour intensiveness is about half that of tea and varies from district to district. Tea is a high income crop yielding the average farmers some shs 1500 a year per acre. Cotton growers are lucky if they get a gross return of shs 500 per acre. The income from tea comes at regular intervals through the year as the crop is harvested. Cotton payments are made once a year. The labour requirement from tea is fairly constant through the year: cotton's requirements peak markedly at weeding and harvesting times. With these considerations in mind it is not surprising that the hired labour intensity of tea is generally much higher than that of cotton. In Nandi, for example, we find three farms with an average of 1.7 acres of tea in a sample of 13 tea shambas relying exclusively on hired labour. Labour inputs of 294 mandays per acre per year means that two fulltime workers can be employed on each farm just to look after the tea. In Siaya, by contrast, only 10 out of 27 cotton farms employ any hired labour, and hired labour input is only six per cent of an annual labour input of 141 mandays on these farms.

(c) dairy livestock

The labour data for livestock can be analysed in two ways : either using the labour land programme which gives labour inputs per unit of land allocated to pasture and the production of feed for livestock, or by using the labour livestock programme which gives labour coefficinets in terms of mandays per animal. Because feed produced on the farm may be less or greater than that fed to a farmer's animals it is much more satisfactory to analyse labour coefficients in terms of mandays per animal.

There appear to be two major determinants of how much labour time is spent in looking after dairy animals: the amount of milk they produce which in small scale agriculture is more likely to be obtained by hand rather than machine, and whether the animals are fenced, herded or stall fed. Generally one would expect improved livestock to be fenced rather than herded, and to produce more milk than unimproved stock. Thus one cannot reason a priori that unimproved livestock will have lower labour requirements than improved livestock. In fact the labour coefficients are in some districts higher for unimproved livestock. Generally labour inputs for both improved and unimproved fall within a narrow range, between 40 and 60 mandays per year, suggesting that a herd of 5 or 6 animals would provide full time employment for one man. Another common feature of the labour data for livestock is the low variation in labour requirements through the year. The coefficient of variation in monthly labour inputs is for most districts less than ten.

While labour inputs for cattle show a fair degree of uniformity among districts, herd size and stock rates do not. Variation in measured stocking rates probably reflects, in addition to differences in grassland productivity, variation in the use of purchased feedstuffs and access to common grazing land. Herd sizes for improved livestock are typically less than those for unimproved livestock. Relatively few farms hire labour to look after unimproved livestock, this being in many districts the traditional task of children, but where labour is hired it often accounts for a high proportion of total labour, indicating a high degree of job specificity. Hired labour intensity tends to be greater for improved livestock.

Labour Market Indicators and Farm Wages

We have noted in previous sections wide variability among districts and crops in use of hired labour, and also that certain crops, like tea, and certain districts, like Kiambu, have higher propensities to hire labour than others. The contribution of hired labour to total labour input on F+H farms is typically in the range 20 to 45%. In nearly all cases farms which hire labour are on average larger than farms which do not. The variation in hired labour input for given crops through the year generally exceeds the variation of family labour inputs, which indicates that small scale farms seldom provide around the year employment for hired workers. Most jobs in small scale agriculture are for casual workers paid on a daily basis.

Interesting contrasts between labour market situations are provided by Kisii and Kiambu, which have similar demographic and agricultural characteristics. Both are densely and evenly populated, and both grow a range of high value cash crops like tea, coffee, pyrethrum, pineapples and passion fruit, as well as hybrid maize. However both the use of hired labour and the level of labour inputs for given crops differ markedly. Thus

	Kisii	Kiambu
Hired Labour Intensity		
All Other Maize	2	13
Hybrid Maize	3	9
Coffee	6	21
Pyrethrum	4	12*
Mature Tea	15	29
Labour Inputs/Acre (All farms)		
All Other Maize	145	98
Hybrid Maize	98	35
Coffee	256*	105*
Pyrethrum	177	55
Mature Tea	217	198

(i) the size distribution of land holdings according to the Statistical Abstract for 1970 is more unequal in Kiambu than in Kisii. Hence there are more farmers who are farming larger holdings than their family labour can manage in Kiambu, and at the same time there are farmers whose holding is too small to give them full time employment. In Kisii by contrast there are many small holdings, but relatively few so large that the labour requirements cannot be met from family labour.

(ii) incomes of farm owners tend to be higher in Kiambu than in Kisii, because of the proximity to Nairobi and the opportunities for earning non-farm income. Because of a (postulated) high income elasticity of demand for hired labour, increased incomes tend to lead to the substitution of hired labour for family labour in farm activities.

There are two considerations which help to explain why labour inputs for given crops are lower in Kiambu than in Kisii.

(i) Although both areas are densely populated the effective supply of labour to small scale agriculture is less in Kiambu than in Kisii because of the higher opportunity costs of labour in Kiambu which in turn is a consequence of employment opportunities on estates and in non-farm urban activities. The higher supply price of labour in Kiambu does not show up in the wage data for 1970/71, possibly because of too small a sample size (see Table 25).

(ii) because of the higher supply price of labour, and possibly because of proximity to service facilities in Nairobi and a flatter topography, the extent of mechanization is greater in Kiambu than in Kisii.

Other district labour market situations are less easy to typify, but broadly one can differentiate districts where demand for agricultural labour is low because of low farm productivity and little crop diversification (e.g. Siaya), and yet where observed labour inputs are moderately high because labour has low opportunity costs, from districts which approximate the Kisii pattern just described. Nandi and Kericho tend to fall outside this grouping because of large farm sizes and the greater importance of livestock husbandry in their farming systems, as do areas where low and erratic rainfall affects labour demand within the area and labour supply to adjacent higher rainfall areas.

The level of wages paid in small scale agriculture (Table 25) seems to vary with the extent of cash crop development. Thus districts which Table 23 shows to have a high degree of crop diversity (Kiambu, Nyeri, Kisii) pay higher average wages than districts with a low degree of crop diversity (Nandi, Kisumu, Siaya, Busia). In most districts the casual wage exceeds the regular daily wage, indicating the different opportunity costs for landless regular workers and part time family casual workers (on the supply side) as well as the difficulties of keeping a man fully employed through the month on a small shamba.

In seeking to establish the importance of demand vs. supply shifts in the determination of agricultural wages, correlation coefficients between average monthly wages and days worked per month were calculated for each district. For Nandi, Siaya, Meru, Kiambu and Nyeri the correlation coefficients showed the expected positive signs, indicating that demand shifts associated with the seasonal requirements of agriculture were having a dominant effect on the market. However in no case were wages in the peak month very much higher than those in other months, which would have indicated situations of acute labour shortages at these times.

For Muranga, Embu, Kirinyaga, Machakos and Kisumu the correlation coefficients between days worked per month and the average wage paid were either close to zero or negative. A possible explanation for this finding is as follows. An important shifter of labour supply through the year is the stock of food in a small farmer's store. If the stock of food dwindles to zero before harvest time, people come into the labour force looking for work. In carrying out investigations into the labour market in Mbere in 1971 we were struck by the number of people from lower Machakos looking for work at weeding time, because they had experienced a poor crop year and were short of food.[5] On the other side of Mbere in Mwea the saying is that the number of people who come to work at the rice scheme depends very much on the size of the maize harvest in neighbouring Kirinyaga. Given that food supplies are an important determinant of labour supply, it is interesting to note that four of the districts which have low or negative correlation coefficients border on the drier areas of Eastern Province where seasonal migration of labour on account of food shortages is most likely to take place.

Aggregate Labour Profiles for Districts

Table 24 gives the aggregate crop labour profiles for 16 districts. The figures for monthly labour inputs were calculated by applying to the crop areas for each district (from the Statistical Abstract 1971) the labour/land coefficients for the district computed from the FECS for 1970/71. Labour allocated to livestock enterprises is not included, but since labour use is fairly constant through the year the omission does not have such affect on the overall shape of the labour profile. The exclusion of these enterprises may influence the magnitude of the coefficients of variation but probably does not affect their ordering.

It is interesting to note by comparing Tables 23 and 24 that it is districts having a high degree of crop diversity which also have a fairly flat labour profile through the year, while Siaya, for example, with a low degree of diversity has a labour profile which shows marked variation in labour input through the year. This finding is readily explainable by what we know of the labour profiles of individual crops. Maize, and hybrid maize particularly, are crops with marked labour peaks at land preparation and weeding time. Most cash crops, especially tea, pyrethrum, and livestock enterprises,

acre basis. Districts which have a low degree of crop diversity have labour profiles dominated by maize, and hence have marked seasonality in labour requirements through the year. Districts with a high degree of crop diversity have more crops with flatter labour profiles, and hence an even requirement for labour through the year.

Suggestions for Further Work

We have indicated earlier in this paper the need for ways of monitoring progress in increasing employment opportunities in small scale agriculture. The application of the programmes developed and described in this paper to the labour data from successive FECS would meet this need and over a period of years provide an interesting picture of progress in increasing the labour absorptive capacity of farming.

Proposals are currently being discussed between Ministries for changing the sample frame of the FECS to improve the usefulness of the data for farming planning. Whether the ecological zones or farming systems approach is used the programmes meet the requirement of farm planners for calculating monthly labour enterprise requirements.

If the FECS is to be restructured, consideration needs to be given to ways in which the quality of the labour data can be improved. The point has been made earlier that improved accuracy would likely result if farms were visited more frequently than monthly, and that this accuracy could be obtained at no additional costs if some of the information now being collected, without apparent analytical value were scrapped. Other needs are :

(i) to increase the number of enterprise categories for which labour data is recorded. As it is too much information is lost in the residual categories 'all other crops', 'all other livestock', and 'farm general'. This is especially true for the Coast districts and the drier areas where few of the presently specified enterprises apply.

(ii) to distinguish labour inputs as between long and short rains crops which occasionally overlap when, for example, the long rains crop is being threshed and land for the short rains crop is being prepared.

(iii) to adopt a consistent procedure for the treatment of crop mixtures, so that for example labour inputs for maize and beans may be distinguished from those for maize in pure stand.

(iv) in the analysis and coding of data to be careful to apply the correct acreage figures to labour data in situations where the crop year does not coincide with the April-March year of the survey e.g. cotton. This may require a similar procedure to that described for long and short rains maize.

(v) To record labour inputs by enterprise by sex, and to record children's inputs explicitly. One of the information gaps revealed by the ILO Employment Mission to Kenya was lack of knowledge of how much time women spend in farm as well as household activities. It has often been asserted on the basis of casual observation that (a) women are overemployed and men underemployed on

the family shamba and (b) that men look after cash crops while women's concern is with food crops. Statistical evidence from different parts of the country on these two points would help improve understanding of the nature of the unemployment problem, as well as providing information important to farm planning.

(vi) to concentrate increased on the ground supervision initially in districts where labour inputs seem to be out of line with those recorded elsewhere for no apparent reason (e.g. South Nyanza), and for all districts to request enumerators to be more careful in their collection of wage information. There are many farms where hired labour inputs are recorded but no information is given about wages.

Further development of the analysis of the labour data from the FECS requires more explicit consideration of the factors which determine the level of labour use within small scale agriculture. Put another way, the present study has shown that there is large variation in the levels of labour use for particular crops among districts. Some of the within district variation is eliminated when farms are stratified by ecological zone, but between farm variation in labour inputs is still high. A partial reduction of this variation is probably achieved by separating out farms which hire labour from those that do not, but we do not know whether this is because farms which hire labour are bigger farms or farms which apply greater amounts of inputs which are complementary to labour.

Two approaches are considered worthy of exploration:

(i) to add to the present S400 programme a sub-routine for computing the variance of labour inputs, and then to stratify the district ecological zone sample by enterprise size and farm size ranges to test for significant differences between sample means i.e. to look for reductions in variance which may be attributed to the stratification. The same procedure could be applied to the present stratification by F and F+H farms.

(ii) to add to the present coded information data from the FECS on levels of use of material inputs like fertilizer and insecticides, and the use of farm machinery. The concern would then be to estimate a labour demand function of the following implicit form :

$$N_D = f (M, T, FS, ES, H, OC)$$

where N_D is annual labour demand per acre for a particular crop,

M is value of material inputs applied with an expected positive sign,

T is a zero one variable, 0 for hand labour, 1 for use of tractor, with an expected negative sign,

FS and ES are farm size and enterprise size in acres to test for scale effects with expected negative signs,

H is another zero-one variable: 0 for F farms, 1 for F+H farms, with an expected positive sign, assuming that F+H farms are less faced with credit constraints than F farms and hence are not subject to labour input rationing at peak times,

OC is an index of the importance of other crops on the farm derived from their labour intensiveness and area. This variable would

have an expected negative sign as a proxy for the implicit price or opportunity cost of labour.

The explicit functional form for estimational purposes would depend upon assumptions about the production function appropriate to small scale agriculture.

FOOTNOTES

1. I am grateful to officials of the Ministry of Finance and Planning for access to the 1970/71 Farm Enterprise Cost Survey labour and wage data, and to the ILO/UNDP Employment Mission to Kenya for funds for coding the data. My thanks are also due to Ridley Nelson for help in sorting out the ecological zones. An earlier version of this paper was presented at the East African Agricultural Economics Society Conference held at Makerere University in June 1972.

2. Some of the limitations mentioned here are discussed more fully by J.H. Cleave in Chapter V of "Labour in the Development of African Agriculture: The Evidence of Farm Surveys," unpublished Ph.D. thesis, Stanford University, 1970.

3. Collinson M.P., "Farm Economics in African Peasant Agriculture: An Approach to Investigation and Planning with Reference to Experience in Tanzania," unpublished Ph. D. thesis, Reading University, 1971.

4. For a fuller account of the objectives and methods of the Farm Enterprise Cost Survey, see "Agricultural Surveys in Kenya: Some Methodological Problems," by I.K. Mutuku, East African Agricultural Economics Society Conference, Dar es Salaam, 1970, and "Farm Management Surveys Carried Out by the Central Bureau of Statistics," by J. Exeter, paper presented at the Seminar on Problems of Farm Management Surveys and their Possible Solutions, Department of Agricultural Economics, University of Nairobi, 1972.

5. Mbithi and Wisner write "Migration is another significant dimension of the drought problem. It was found that short term migration to the nearest upland area in search of wage employment was very common in the marginal zones of Meru, Embu and Kitui..... These wage migrants are usually paid in kind and carry food back to their families at intervals." "Drought and Famine in Kenya, Magnitude and Attempted Solutions," by P.M. Mbithi and B. Wisner, IDS Discussion Paper No. 144, p.25, July 1972.

APPENDIX B

Ecological Zones

The data for labour inputs presented in Tables 9 to 20 is based upon ecological zone groupings within each district. Because the original selection of farms in the district sample was not based upon an ecological zone stratification, a common situation was that a large number of farms fell within one ecological zone, but there were too few farms from other ecological zones to meet the minimum requirement for inclusion within a Table of a sample size of ten. Clearly if the main purpose of the Farm Enterprise Cost Survey is to provide data for representative farm planning, then the system of farm selection must take explicit heed of zones, be they based on ecology or farming systems.

The ecological zones used to stratify the farms for each district in the present investigation are those worked out by Ridley Nelson of the Farm Management Division of the Ministry of Agriculture based upon the Leslie Brown ecological zone classification using dominant grass species for districts east of the rift and the more recent vegetation map for districts west of the rift. Nelson has distinguished the following zones:

Zone	Description	Districts with Farms falling in this zone from the 1970/71 Survey.*
1	Intermediate semi-ever evergreen thicket	Kisumu, Siaya, South Nyanza, Busia
3	Kano type impeded drainage and open grassland on clay pans	Kisumu, South Nyanza
4	Combretum and allied wood leafed savannah	Kisumu, South Nyanza, Kakamega, Busia Bungoma
5	Moist montane and intermediate forests	Kisii, Kericho, Nandi
6	Montane Accacia	Kisii, Nandi
7	Impeded drainage clum grassland on vlei soils	South Nyanza
9	Lower most montane and intermediate forests	Siaya, Kakamega, Busia
21	High Bracken	Nyeri, Muranga, Embu, Meru
22	Kikuyu Grass	Nyeri, Muranga, Kirinyaga, Kiambu, Embu, Meru
23	Star Grass	Muranga, Kirinyaga, Kiambu, Embu, Meru
24	Grass woodland and savannah	Nyeri, Muranga, Kirinyaga, Embu, Meru

*Although a district has farms in the sample coming from a particular ecological zone there may have been too few observations to warrant that ecological zone's appearance in the district Table.

Coding for Card II Wage Card

1-12		The same as for Card 1
13		Blank
14,15,1		Total wage bill for the month of April (from Form 6 column 20)
17,18,19		Total wage bill for the month of May (from Form 6 col. 20)
20,21,22		Total wage bill for the month of June (from Form 6 col. 20)
23,24,25		Total wage bill for the month of July (from Form 6 col. 20)
26,27,28		Total wage bill for the month of August (from Form 6 col. 20)
29,30,31		Total wage bill for the month of September (from Form 6 col. 20)
32,33,34		Total wage bill for the month of October (from Form 6 col. 20)
35,36,37		Total wage bill for the month of November (from Form 6 col. 20)
38,39,40		Total wage bill for the month of December (from Form 6 col. 20)
41,42,43		Total wage bill for the month of January (from Form 6 col. 20)
44,45,46		Total wage bill for the month of February (from Form 6 col. 20)
47,48,49		Total wage bill for the month of March (from Form 6 col. 20)
		Round all wage data into whole shillings
50,51		Total hired labour days in the month of April (from Form 8, col. 16)
52,53		Total hired labour days in the month of May (from Form 8, col. 16)
54,55		Total hired labour days in the month of June (from Form 8, col. 16)
56,57		Total hired labour days in the month of July (from Form 8, col. 16)
58,59		Total hired labour days in the month of August (from Form 8, col. 16)
60,61		Total hired labour days in the month of September (from Form 8, col. 16)
62,63		Total hired labour days in the month of October (from Form 8, col. 16)
64,65		Total hired labour days in the month of November (from Form 8, col. 16)
66,67		Total hired labour days in the month of December (from Form 8, col. 16)
68,69		Total hired labour days in the month of January (from Form 8, col. 16)
70,71		Total hired labour days in the month of February (from Form 8, col. 16)
72,73		Total hired labour days in the month of March (from Form 8, col. 16)
74		Blank
75	1	If regular labour only employed (see sheet 6)
	2	If casual labour only employed (see sheet 6)
	3	If casual and regular labour employed (see sheet 6)
76-79		Blank
80	2	For Card II

Dummy cards for the Labour Inputs programme, to be put at the end of each enterprise set of cards are:

33	in	columns	73,74	for hybrid maize
44	..	..	.. ..	all other maize
55	..	..	..	wheat
66	..		..	pyrethrum
77	..		..	coffee
88	..		..	mature tea
99	..		..	immature tea
20	..		..	mature pineapples
21	..		..	immature pineapples
34	..		..	all other crops
35	..		..	farm general
45	..		..	improved dairy cattle
46	..		..	unimproved dairy cattle
47	..		..	all other livestock
90	..		..	last card in data set.

to introduce all title cards except the first of a run.

Dummy cards for the Wages Programme to be put at the end of each district set of cards are:

9700	in	columns	9,10,11,12	for Kwale
9710	..	..	..	.. S. Nyanza
9720	..	..	..	.. Kericho
9730	..	..	..	.. Bungoma
9740	..	..	..	.. Busia
9750	..	..	..	.. Kilifi
9800	..	..	..	.. Kisii
9810	..	..	..	.. Embu
9820				.. Taita

APPENDIX A

Coding Instructions for Monthly Labour Inputs and Wages.*

(a) The first step is to check that there are labour inputs on forms 7 and 8 for the enterprises shown on form 5 and numbers of livestock shown on Closing Valuation Form 1A and B. If there are no labour inputs for a crop which is shown on form 5, or conversely if there are labour inputs for a crop not shown on form 5, this can be ignored. The same applies to livestock.

(b) There will be as many card I's as there are enterprises for which labour inputs are shown, given the point made in paragraph one. Thus if a farm has labour inputs for improved dairy cattle, tea, maize and coffee, there will be four card I's to complete. In all cases however there will be only one card 2 to complete per farm.

(c) All numbers to be right justified

Coding for Card I Labour Inputs

Column	
1,2	Blank
3	Code the following letter depending on the District.

N	Nyeri	K	Kakamega
G	Kisii	S	Kisumu
C	Kilifi	B	Kirinyaga
E	Embu	A	Kiambu
T	Taita	P	Busia
D	Nandi	R	Kericho
M	Meru	U	Nyandarua
H	Machakos	Z	Nyanza
Y	Siaya	W	Kwale
F	Muranga	J	Bungoma

4,5	The sub-location number
6	/
7,8	Farm number
9	Blank
10,11,12	The Farm size from Form 5 in tenths of an acre e.g. 10.1 acres coded as 101 8.7 " " " 87
13	Blank
14,15,16	For each card classified as card 1, code the acreage of the enterprise in question in tenths of an acre from form 5.

If there are long and short rains crops, use separate cards and put a 1 in column 77 of the second card which will correct the farm totals for the extra observation.

*I am grateful to Julian Exeter for setting out the coding instructions in this form.

In the case of Livestock Enterprise

(c) Forms will have up to two livestock enterprises,

(i) improved/unimproved livestock and

(ii) other livestock. In each case code the total of fodder crops, planted crops and permanent grass. If there is a difference in area between the long and short rains, take the mean.

17 Blank

From Form 7

18,19 The April family labour input for the particular crop
20,21 The May family labour input for the particular crop
22,23 The June family labour input for the particular crop
24,25 The July family labour input for the particular crop
26,27 The August family labour input for the particular crop
28,29 The September family labour input for the particular crop
30,31 The October family labour input for the particular crop
32,33 The November family labour input for the particular crop
34,35 The December family labour input for the particular crop
36,37 The January family labour input for the particular crop
38,39 The February family labour input for the particular crop
40,41 The March family labour input for the particular crop

If there are no data in any or all of the months, leave blank

42,43,44 Blank

From Form 8

45,46 The April hired labour input for the particular crop
47,48 The May hired labour input for the particular crop
49,50 The June hired labour input for the particular crop
51,52 The July hired labour input for the particular crop
53,54 The August hired labour input for the particular crop
55,56 The September hired labour input for the particular crop
57,58 The October hired labour input for the particular crop
59,60 The November hired labour input for the particular crop
61,62 The December hired labour input for the particular crop
63,64 The January hired labour input for the particular crop
65,66 The February hired labour input for the particular crop
67,68 The March hired labour input for the particular crop

If there are no data in any or all of the months, leave blank.

69,70,71,72 Blank

For all Enterprises:

73,74 The Crop code from Form 7 or 8 e.g.
improved dairy cattle 1,
wheat 4, cotton 12

If the Enterprise is either improved or unimproved livestock then either:

75,76 From the Closing Valuation form 1A (Improved Livestock), the combined total number of beef and dairy cattle
77 Blank
78,79 From the Closing Valuation form 1B (unimproved Livestock), the total number of cattle from section 1.

80 Code 1 for card 1

Repeat this procedure for the next and all subsequent enterprises.

9830	in	columns	9,10,11,12	for	Nandi
9840	..	..	..	..	Meru
9850	..	..	..	..	Machakos
9860	..	..	..	..	Siaya
9870	..	..	..	..	Muranga
9880	..	..	..	..	Kakamega
9890	..	..	..	..	Kisumu
9900	..	..	..	..	Kirinyaga
9910	..	..	..	..	Kiambu
9920	..	..	..	..	Nyeri
9990	..	..	..	..	last card in data set

The order in which the data cards for the crop and livestock programmes are presented to the computer should be as follows:

- Title Card e.g. Nyeri
- card with 91 punched in columns 73,74
- second Title card e.g. High Bracken Zone
- labour data cards for particular enterprise i.e. those having common entries in columns 73,74
- dummy card for the particular enterprise e.g. 33 in columns 73,74 for hybrid maize
- labour data cards for next enterprise
- dummy card for the particular enterprise et. seq. until all enterprises for ecological zone completed
- card with 91 punched in columns 73,74 (to introduce next Title Card) Title Card e.g. Kikuyu Grass Zone
- labour data cards for particular enterprise
- dummy card for particular enterprise et. seq. until all ecological zones for district completed
- card with 91 punched in columns 73,74
- Title Card e.g. Kisumu
- card with 91 in columns 73,74
- Title card e.g. Intermediate Semi Evergreen Thicket
- labour data cards for first enterprise et. seq. until cards for all districts read
- card with 90 in columns 73,74 to stop the programme.

The order in which the data cards for the wages programme are presented to the computer should be as follows:

- Title Card e.g. Wage analysis
- data cards for particular district
- dummy card to bring in next district e.g. 9800 in columns 9,10,11,12 for Kisii
- data cards for Kisii
- dummy card for next district et. seq. until all districts included.
- 9990 in columns 9,10,11,12 to stop the programme.

Table 23. Measures of Crop Diversity by District, 1969/70

District	Improved maize as percent of all maize	Cereals area as percent of cultivated area +	Cash crop as percent of cultivated area A	Cash crop as percent of cultivated area B
Kericho	31	88	41	16
Nandi	61	91	69	8
Nyeri	9	58	57	37
Muranga	2	83	40	18
Nyandarua	11	40	108*	86
Kiambu	2	60	56	41
Kirinyaga	6	76	42	23
Kisumu	2	98	54	21
Kisii	45	78	68	31
S. Nyanza	2	98	26	20
Siaya	12	128*	26	9
Kakamega	54	88	61	13
Bungoma	64	86	64	13
Busia	10	96	27	20
Kilifi	0	84	73	66
Kwale	40	87	71	42
Taita	**	67	75	66
Embu	11	87	35	7
Meru	5	67	55	35
Machakos	2	77	57	24

Source: Table 82 of Statistical Abstract, 1971, Statistics Division, Ministry of Finance and Planning.

Footnotes:

A. includes as cash crops: improved maize, wheat, all pulses other than beans, all temporary industrial crops, English potatoes, cabbages, other vegetables, other temporary crops, all permanent crops.

B. includes as cash crops: wheat, all temporary industrial crops, English potatoes, cabbages, other vegetables, coffee, tea, coconuts, cashew nuts.

* cereals area or cash crop area can exceed cultivated area because of double cropping or because crops grown in mixtures are double counted.

** less than 0.5% but not zero

\+ excluding wheat

Table 20. Labour Inputs by Ecological Zone : Siaya (1970/71)

Zone/Crop	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Inputs			Enterprise Size (acres)			Farm Size (acres)			Hired Labo of Total I F+H fa
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Zone 1																
All other Maize	29	8	37	52	69	56	92	97	90	1.7	1.6	1.6	9.6	8.2	9.3	17
Cotton	10	5	15	75	59	70	71	64	64	1.0	1.3	1.1	11.0	11.2	11.1	5
Zone 9																
All other Maize	8	2	10	164	95	150	103	149	105	0.6	1.0	0.7	4.2	11.7	5.7	16
Cotton	6	5	11	175	222	196	82	62	67	0.6	0.5	0.5	7.6	6.1	6.9	6

Table 21. Labour Inputs by Crop Zone : Kisii (1970/71)

Tea/Pyrethrum Zone																
Hybrid Maize	23	5	28	89	101	92	48	80	50	1.4	2.7	1.7	4.4	8.6	5.2	13
All other Maize	18	3	21	103	45	95	57	169	62	1.4	1.7	1.4	5.1	5.5	5.1	47
Pyrethrum	29	11	40	124	170	136	27	41	26	0.8	1.1	0.9	5.4	5.7	5.5	15
Immature Tea	9	4	13	72	94	79	45	65	44	0.8	2.0	1.2	7.0	11.0	8.2	52
Coffee Zone																
Hybrid Maize	4	12	16	93	91	91	62	27	22	1.6	3.2	2.8	5.5	8.4	7.7	7
All other Maize	23	17	40	198	148	177	23	22	17	1.2	1.8	1.5	3.8	6.2	4.8	9
Coffee	36	14	50	109	102	107	16	29	19	1.4	1.8	1.5	5.4	6.0	5.6	13

Table 18. Labour Inputs by Ecological Zone : Kiambu (1970/71)

Zone/Crop	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired labour a of Total Labou F+H farms
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Zone 22																
Hybrid Maize	8	3	11	31	52	36	124	113	105	1.0	0.8	0.9	6.2	10.8	7.4	44
All other Maize	42	22	64	81	127	97	33	64	44	1.0	1.0	1.0	5.8	7.5	6.4	45
Coffee	17	37	54	160	135	143	21	20	17	1.0	1.5	1.4	6.3	7.6	7.2	27
Mature Pineapples	11	2	13	76	48	72	24	55	21	0.9	1.2	0.9	8.0	13.5	8.9	33
Zone 23																
All other Maize	30	9	39	89	79	87	42	49	42	1.8	2.8	2.0	6.9	18.8	9.6	4[illegible]
Coffee	9	8	17	177	124	152	21	16	18	1.2	6.7	3.8	9.6	19.7	14.4	39

Table 19. Labour Inputs by Ecological Zone : Kakamega (1970/71)

Zone 4																
Hybrid Maize	14	2	16	31	28	30	86	103	87	3.9	5.0	4.0	11.6	10.9	11.5	21
All other Maize	24	2	26	40	29	39	92	104	93	2.6	5.2	2.8	9.6	12.2	9.8	30
Zone 9																
Hybrid Maize	12	6	18	39	62	46	182	135	160	1.4	1.7	1.5	2.9	6.2	4.0	29
All other Maize	24	8	32	57	67	60	75	79	76	1.3	2.2	1.6	3.3	4.8	3.6	30

Table 16 : Labour Inputs by Ecological Zone : Kirinyaga (1970/71)

Zone/Crop	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired Labou of Total La F+H fam
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Zone 22																
Hybrid Maize	9	15	24	62	78	72	54	63	57	1.1	1.7	1.5	7.6	7.9	7.8	42
All other Maize	19	14	33	63	83	71	46	39	38	1.5	1.6	1.6	5.4	8.1	6.6	40
Coffee	24	38	62	134	176	160	38	33	33	1.0	1.4	1.2	5.6	7.5	6.8	38
Zone 23																
All other Maize	17	13	30	43	59	50	54	45	47	3.1	2.5	2.8	6.1	6.6	6.3	12
Coffee	10	11	21	120	174	148	39	23	24	0.5	1.0	0.7	6.7	6.6	6.7	17
Zone 24																
All other Maize	7	3	10	40	69	49	60	62	53	2.5	1.8	2.3	16.3	16.7	16.4	22
Cotton	15	5	20	37	53	41	46	97	52	1.1	1.2	1.2	12.8	13.9	13.1	20

Table 17 : Labour Inputs by Ecological Zone : Meru (1970/71)

Zone 22																
All other Maize	11	3	15	64	99	73	62	95	56	1.0	0.8	0.9	11.1	11.7	10.8	40
Coffee	15	3	18	138	159	143	27	31	25	1.2	1.7	1.2	8.2	6.3	7.9	35
Zone 23																
All other Maize	16	11	27	137	125	132	39	38	37	0.7	1.2	0.9	7.2	10.8	8.7	31
Coffee	20	23	44	142	166	157	26	36	29	0.9	1.5	1.2	5.9	9.1	7.6	33
Zone 24																
All other Maize	14	2	16	158	102	151	47	87	46	0.7	1.2	0.8	6.8	11.5	7.4	9

Table 14: Labour Inputs by Ecological Zone : Murangh (1970/71)

Zone/Crop	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired Labour of Total Lab F+H farms
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Zone 21																
All other Maize	5	8	13	45	78	66	77	47	50	1.3	1.2	1.2	8.0	9.3	8.8	29
Coffee	0	9	9	-	157	157	-	29	29	-	3.6	3.6	-	9.9	9.9	50
Zone 23																
Hybrid Maize	4	7	11	72	36	49	142	80	100	0.8	1.5	1.2	2.4	6.7	5.1	31
All other Maize	49	22	71	84	71	80	45	69	48	1.5	1.4	1.4	4.3	5.8	4.8	26
Coffee	16	24	40	141	198	175	20	25	22	1.0	1.5	1.3	4.5	8.3	6.8	22

Table 15: Labour Inputs by Ecological Zone : Kisumu (1970/71)

Zone 1																
All other Maize	6	7	13	112	177	147	56	66	61	1.0	0.7	0.9	2.8	4.1	3.5	18
Zone 3																
All other Maize	45	7	52	85	51	80	122	163	124	1.3	2.1	1.4	5.4	6.5	5.5	12
Zone 4																
All other Maize	13	-	13	161	-	161	98	-	98	0.9	-	0.9	5.5	-	5.5	-

Table 12. Labour Inputs by Ecological Zone : Nandi (1970/71)

Zone/Crop	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired Labour of Total Labo F+H farm
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Zone 5																
Hybrid Maize	8	9	17	33	77	56	94	88	87	1.3	2.0	1.7	20.6	15.6	17.9	45
All other Maize	21	17	38	38	43	40	78	108	91	1.3	1.8	1.5	13.9	15.8	14.8	32
Zone 6																
Hybrid Maize	21	10	31	45	39	43	108	137	113	2.0	3.2	2.4	18.5	22.4	19.7	28
All other Maize	9	4	13	56	46	53	126	161	132	1.1	3.0	1.7	16.7	46.7	25.9	22

Table 13. Labour Inputs by Ecological Zone : Busia (1970/71)

Zone 1																
All other Maize	13	3	16	26	28	26	73	101	74	1.5	1.7	1.5	10.2	17.5	11.6	17
Cotton	17	6	23	41	50	44	58	55	55	1.4	2.0	1.6	16.4	21.2	17.6	32
Zone 4																
All other Maize	7	5	12	22	34	27	100	112	106	1.6	1.3	1.5	17.6	11.8	15.2	28
Cotton	18	10	28	50	63	55	77	70	73	1.8	1.9	1.8	14.2	13.5	13.9	19
Zone 9																
All other Maize	13	4	17	46	37	44	55	93	58	1.2	1.7	1.4	11.2	26.0	14.7	22
Cotton	15	16	31	77	108	93	88	53	66	1.1	1.6	1.4	14.7	14.7	14.7	18

Table 10. Labour Inputs by Ecological Zone : South Nyanza (1970/71)

Zone Crop	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired Labour as % of Total Labour on F+H farms
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Zone 4																
All other Maize	38	16	54	132	148	137	61	41	53	1.1	1.5	1.2	13.4	12.8	13.2	6
Zone 1																
All other Maize	3	9	12	61	119	104	84	83	83	1.5	1.4	1.5	33.3	25.0	27.1	9
Cotton	3	11	14	271	133	163	74	69	70	0.7	1.6	1.4	25.0	27.3	26.8	23

Table 11. Labour Inputs by Ecological Zone : Nyeri (1970/71)

Zone 22																
Hybrid Maize	7	4	11	46	80	58	100	100	96	0.8	0.7	0.8	3.3	4.8	3.9	24
All other Maize	71	10	81	72	54	69	30	27	29	1.5	1.9	1.5	4.0	6.1	4.2	24
Coffee	36	15	51	158	132	150	23	32	22	0.5	1.4	0.8	3.5	8.5	5.0	41
Mature Tea	6	6	12	110	110	110	26	19	20	0.6	1.0	0.8	5.0	6.9	5.9	22

Table 8. Labour Inputs on Farms of less than 3 Acres (1970/71)

District/Crop.	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired Labour as % total labour on F+H farms	Hired Lab Intensity
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL		
Nyeri																	
All other Maize	32	0	32	77	-	77	46	-	46	0.8	-	0.8	1.5	-	1.5	-	-
Coffee	17	2	19	180	219	184	29	48	28	0.4	0.5	0.4	1.7	2.4	1.8	31	3
Kisii																	
All other Maize	9	1	10	255	243	254	28	63	28	0.7	1.0	0.8	1.6	2.8	1.7	10	1
Coffee	11	2	13	173	189	175	18	37	20	0.4	0.4	0.4	1.8	1.7	1.8	2	0
Kiambu																	
All other maize	25	7	32	103	94	101	48	86	51	0.9	0.8	0.9	1.7	1.8	1.7	23	5
Kakamega																	
Hybrid Maize	8	3	11	45	61	50	196	161	183	1.1	1.0	1.1	2.0	2.3	2.1	13	4
All other Maize	12	1	13	52	50	51	100	219	107	1.1	1.0	1.1	1.9	1.5	1.9	4	0
Kiambu																	
All other Maize	19	3	22	109	156	115	37	60	40	0.9	0.5	0.9	1.7	1.7	1.7	42	6
Coffee	6	5	11	202	131	169	23	17	15	0.6	0.8	0.7	1.6	1.9	1.7	12	5

Table 6. Labour Inputs for Improved Dairy Cattle by District 1970/71

District	Number of Observations			Annual Labour (mandays/animals)			C.V. of Monthly Labour Input			Herd Size			Stock Rate			Farm Size			Hir as % on F
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Meru	9	11	21	37	49	43	10	11	8	4	4	4	1.5	1.2	1.4	11.6	9.5	10.2	
Kirinyaga	11	8	20	44	67	54	16	27	16	3	3	3	1.5	1.2	1.3	6.2	7.2	6.6	
Embu	11	2	13	44	32	42	9	16	9	2	7	3	1.3	2.8	1.6	5.5	10.2	6.2	
Nyeri	27	4	31	57	44	55	8	18	8	4	4	4	1.7	2.5	1.8	5.1	4.5	5.0	
Kiambu	36	19	55	57	63	59	12	16	13	3	5	4	0.8	1.0	0.9	11.2	8.6	10.3	
Kericho	17	5	22	18	20	19	11	31	13	6	7	6	0.5	0.6	0.5	15.2	23.2	17.0	
Murang'a	17	12	29	50	85	65	6	13	8	4	4	4	1.5	1.0	1.2	6.3	9.6	7.6	

Table 4. Labour Inputs for Pyrethrum and Cotton by District 1970/71

District	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired Labour % total labou on F+H farms
PYRETHRUM	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Nyandarua	33	82	118	92	111	104	16	23	21	1.8	2.4	2.2	20.3	34.7	30.7	28
Kisii	36	13	49	181	166	177	16	39	17	0.7	1.1	0.8	5.1	6.2	5.4	14
COTTON																
Taita	12	2	14	63	130	73	103	108	103	0.9	1.0	0.9	3.5	6.5	3.9	43
S. Nyanza	4	11	15	214	133	154	77	69	71	0.6	1.6	1.3	25.0	27.3	26.7	23
Kirinyaga	15	5	20	37	53	41	46	97	52	1.1	1.2	1.2	12.8	13.9	13.1	20
Siaya	17	10	27	126	141	132	58	53	52	0.8	0.9	0.8	9.4	8.7	9.1	6
Bungoma	22	-	22	219	-	219	62	-	62	1.2	-	1.2	14.0	-	14.0	-
Busia	51	32	83	55	83	65	67	54	60	1.4	1.8	1.6	15.1	15.6	15.3	20
Embu	21		21	109	-	109	78	-	78	1.2	-	1.2	4.6	-	4.6	-

Footnote: The farm category (H) is omitted from the Table which accounts for discrepancies under Number of Observations.

Table 2. Labour Inputs for Hybrid Maize by District 1970/71

District	Number of Observations			Annual Labour (mandays/acre)			C.V. of monthly labour input			Enterprise size (acres)			Farm size (acres)			Hired labour as % of total on F+H farm	Hired Labo Intensity
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL		
Kiambu	11	3	14	30	52	35	113	113	101	1.0	0.8	1.0	7.6	10.8	8.3	44	9
Kirinyaga	10	21	31	58	74	68	55	59	56	1.1	3.0	2.4	7.3	9.4	8.7	44	30
Kisii	25	8	33	90	124	98	46	45	41	1.4	2.1	1.6	4.3	7.1	5.0	13	3
Nandi	38	23	62	34	56	42	104	96	98	2.0	3.5	2.7	20.8	19.0	20.6	44	16
Kericho	22	8	30	22	38	27	79	62	59	2.2	1.8	2.1	15.6	19.7	16.7	45	12
Murang'a	6	13	19	52	43	46	139	74	95	1.1	1.7	1.5	4.2	7.5	6.5	37	25
Kakamega	35	10	45	29	54	35	120	150	128	3.0	2.2	2.9	7.7	6.5	7.4	31	7
Bungoma	67	20	87	72	84	74	75	75	73	2.8	4.7	3.3	13.7	18.1	14.7	33	8
Nyeri	9	4	13	51	80	60	97	100	94	0.7	0.7	0.7	3.5	4.8	3.9	25	8

Footnotes: The farm category (H) is omitted from the Table which accounts for discrepancies under Number of Observations.

Table 1. Labour Inputs for All Other Maize by District (1970/71)

District	Number of Observations			Annual Labour (mandays/acre)			C.V. of monthly Labour input			Enterprise size (acres)			Farm size (acres)			Hired labour as % total labour on F+ farms
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Nandi	42	22	65	36	43	38	95	118	102	1.3	2.0	1.6	14.9	21.0	17.0	31
Kakamega	56	11	67	44	57	46	79	83	79	2.1	2.6	2.1	6.3	5.8	6.2	30
Siaya	42	11	53	114	68	105	66	98	69	1.3	1.5	1.4	8.2	8.3	8.2	17
Kisii	38	6	44	146	138	145	24	38	23	1.4	1.2	1.4	4.8	5.0	4.8	12
Muranga	61	36	97	80	74	78	46	60	48	2.0	1.5	1.8	5.3	6.8	5.8	26
Embu	62	12	75	101	138	107	30	29	27	1.4	1.0	1.3	9.4	6.0	8.8	24
Kirinyaga	43	30	73	51	71	60	44	38	40	2.3	2.0	2.2	7.4	8.8	7.8	28
Machakos	48	29	77	51	56	53	53	45	49	2.0	3.4	2.5	14.9	27.7	19.7	29
Kisumu	69	16	85	112	116	112	92	59	82	1.2	1.4	1.2	5.1	5.0	5.1	23
Meru	50	23	74	128	124	126	36	47	33	0.8	1.0	0.9	7.6	9.8	8.2	27
Kiambu	76	31	107	92	113	98	29	55	35	1.4	1.5	1.4	6.4	10.8	7.6	45
Nyeri	77	10	87	68	46	65	43	33	42	1.2	1.9	1.3	3.8	5.4	3.9	20
Bungoma	56	1	57	84	34	83	87	86	87	1.8	5.0	1.8	12.3	20.0	12.5	16
Busia	46	12	58	27	33	33	57	87	61	1.4	1.5	1.4	12.2	18.0	13.4	24
Kericho	82	3	85	26	17	24	68	64	67	1.7	3.2	1.8	11.7	18.4	11.9	28
S. Nyanza	25	18	44	118	150	128	68	58	56	1.1	1.3	1.2	12.3	16.9	14.0	5

Footnotes: All other maize is non-hybrid maize. The farm category (H) is omitted from the Table which accounts for discrepancies under Number of Observations.

Table 22. Labour Inputs per Acre recorded in Earlier Surveys

District/Location	(mandays/acre)						
	coffee	tea	pyrethrum	maize/beans	maize(LR)	maize(SR)	immature tea
Nyeri	250	336	104	109	-	-	146
Gem (Kakamega)	142	-	-	-	48	34	-
Bunyore (Kakamega)	183	-	-	-	42	42	-
S. Kabras (Kakamega)	73	-	-	-	23	-	-
Bokoli-Malakisi (Bungoma)	158	-	-	-	42	-	-
Buret (Kericho)	-	229	-	-	-	-	-
Konoin (Kericho)	-	182	-	-	-	-	-
Kitutu (Kisii)	-	368	-	-	-	-	-
Nyamira (Kisii)	-	287	-	-	-	-	-
Meru	314	-	-	-	-	-	-

Sources: Some Aspects of Agricultural Development in Nyeri District 1964, Report No. 25, Statistics Division, Ministry of Economic Planning and Development 1968, and A Report on Economic Studies of Farming in Nyanza Province 1963, Farm Economic Report No. 26, Statistics Division, Ministry of Economic Planning and Development, February 1969. An Econometric Analysis of Smallholder Tea Production in Kenya, D. Etherington, unpublished Ph.D. thesis, Stanford University, 1970. A. Waters, The Cost Structure of the Kenya Coffee Industry, unpublished Ph.D. thesis, Rice University, Texas, 1969.

Table 3. Labour Inputs for Coffee by District 1970/71

District	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour input			Enterprise Size (acres)			Farm Size (acres)			Hired Labour as % total labour on F+H farms
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Taita	7	5	12	70	83	76	75	86	49	0.4	0.7	0.6	3.5	3.6	3.6	26
Kisii	43	15	58	111	126	115	23	55	27	1.3	1.7	1.4	5.3	5.9	5.5	22
Meru	38	32	71	145	213	177	23	31	26	1.0	1.4	1.2	7.2	8.5	7.8	37
Nyeri	41	18	59	176	165	173	22	28	20	0.5	1.3	0.8	3.6	7.6	4.9	42
Bungoma	22	4	26	91	87	90	52	75	53	0.7	1.0	0.7	14.8	34.9	17.9	19
Muranga	22	47	69	242	350	316	22	31	27	0.9	2.0	1.6	4.2	8.1	6.9	29
Kiambu	27	47	74	178	151	161	14	20	15	1.1	2.4	1.9	7.2	9.8	8.9	33
Embu	28	31	60	238	207	220	26	30	27	0.7	1.0	0.8	6.3	5.1	5.7	33
Machakos	9	29	38	93	372	306	66	42	42	1.1	1.3	1.2	11.2	7.7	8.5	27
Kirinyaga	36	49	85	134	176	158	36	29	30	0.8	1.3	1.1	5.9	7.3	6.7	33

Footnote: The farm category (H) is omitted from the Table which accounts for discrepancies under Number of Observations.

Table 5. Labour Inputs for Mature Tea by District 1970/71

District	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired Labour as total labour on farms
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Nandi	4	6	13	114	194	192	38	36	27	1.1	1.5	1.4	16.0	19.3	19.8	87
Kisii	6	5	12	93	407	217	52	31	32	0.9	1.0	0.9	6.2	8.6	6.9	30
Nyeri	10	9	19	240	279	259	29	15	19	0.7	0.9	0.8	6.6	7.2	6.9	23

Footnote: The farm category (H) is omitted from the Table which accounts for discrepancies under Number of Observations.

Table 7. Labour Inputs for Unimproved Dairy Cattle by District 1970/71

District	Number of Observations			Annual Labour (mandays/animal)			C.V. of Monthly Labour Input			Herd Size			Stock Rate			Farm Size			Hired Labo as % of to or F+H far
	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
Machakos	47	25	76	44	43	43	3	9	4	6	14	9	0.4	0.5	0.5	21.2	31.5	25.6	35
Meru	20	12	34	46	50	46	10	9	7	5	7	6	1.2	1.5	1.3	11.6	16.2	13.1	57
Kirinyaga	27	5	34	39	25	36	8	24	8	5	8	6	2.7	2.2	2.7	6.9	14.4	8.3	30
Nandi	66	4	70	36	20	35	16	28	16	11	18	12	0.8	0.8	0.8	14.7	27.4	15.4	73
Embu	33	2	35	20	12	19	7	35	7	5	19	6	0.1	0.3	0.1	39.7	73.7	41.6	86
Nyeri	30	2	32	60	53	59	7	14	6	3	5	3	1.9	0.8	1.7	4.9	3.9	4.9	13
Kakamega	41	6	47	43	43	43	4	23	5	5	5	5	2.2	5.7	2.4	7.4	8.1	7.5	30
Kiambu	22	0	22	49	-	49	11	-	11	2	-	2	1.6	-	1.6	10.5	-	10.5	-
Bungoma	50	5	55	41	53	42	2	13	2	9	12	9	1.3	1.7	1.3	15.5	18.1	15.7	34
Kericho	89	3	93	12	24	12	8	23	8	11	19	11	1.2	1.4	1.2	11.7	30.3	12.3	55
Kisii	73	-	73	30	-	30	8	-	8	4	-	4	2.3	-	2.3	5.9	-	5.9	-
Siaya	34	2	38	20	28	21	4	14	7	6	7	6	1.6	1.6	1.6	8.8	10.5	8.9	62
Busia	28	3	31	44	52	45	7	19	7	8	13	8	1.5	2.2	1.5	15.9	16.2	15.9	9
S. Nyanza	52	5	59	27	12	25	3	16	3	9	15	10	1.2	1.6	1.2	13.9	14.8	14.2	12
Muranga	34	6	40	78	88	80	10	18	8	3	3	3	1.3	1.0	1.3	5.7	11.0	6.5	18
Kisumu	24	4	29	43	37	41	6	3	5	6	9	7	1.8	2.5	2.0	5.8	6.0	5.9	77

Table 9. Labour Inputs by Ecological Zone : Embu (1970/71)

Zone/Crop.	Number of Observations			Annual Labour (mandays/acre)			C.V. of Monthly Labour Input			Enterprise Size (acres)			Farm Size (acres)			Hired Labour as % total labour on F+H farms
Zone 22	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	F	F+H	ALL	
All other Maize	11	5	16	98	98	98	47	29	39	1.1	1.2	1.1	3.7	7.1	4.7	21
Coffee	7	10	17	220	136	171	34	33	32	0.8	1.0	0.9	4.3	4.9	4.6	22
Zone 23																
All other Maize	21	6	28	91	98	92	21	44	21	1.3	1.1	1.2	7.8	8.0	7.8	21
Coffee	15	11	27	193	139	168	29	40	29	0.8	1.1	0.9	6.5	5.8	6.2	25
Zone 24																
(Mavuria)																
All other Maize	29	-	29	121	-	121	66	-	66	1.3	-	1.3	3.3	-	3.3	-
Cotton	20	-	20	84	-	84	81	-	81	1.2	-	1.2	3.5	-	3.5	-
(Evurore)																
All other Maize	16	3	19	75	65	73	22	35	21	1.1	2.0	1.3	74.7	52.2	71.1	44

Table 24. Aggregate

DISTRICT	APR	MAY	JUNE	JUL	AUG	SEP
						(thousand mandays)
Kiambu	697	633	802	733	753	713
Busia	1188	873	834	831	932	883
Nyeri	1674	1304	1281	1149	1127	1178
Meru	5861	5413	4289	4285	4411	3785
Kisii	3347	3221	2977	2522	2486	2474
Kirinyaga	2624	1943	1630	1782	1428	1526
Embu	1775	1575	1467	1444	1616	1105
Kisumu	6249	4000	6096	3811	3374	2990
Murang'a	5415	4054	2668	2423	3845	3582
Nandi	597	393	268	228	374	159
Machakos	10676	11188	8248	6352	7089	7341
Kakamega	3932	2744	1921	2064	2317	1993
Bungoma	2112	2316	1907	1241	1080	1557
S. Nyanza	4592	3891	3473	3565	3792	3347
Kericho	1152	736	616	331	307	388
Siaya	4566	3307	1054	1283	996	1136

*for method of derivation, see text.

Crop Labour Profiles for Districts*

OCT	NOV	DEC	JAN	FEB	MAR	CV	No. months 5 of peak
703	635	650	687	525	641	10.4	0
767	762	746	796	737	775	14.7	0
1169	990	1055	960	1069	1208	15.9	0
4584	5348	4098	3494	3410	3502	18.5	0
2559	2367	2371	2218	1530	1652	21.9	2
1774	1674	1245	1330	1297	1645	22.4	2
1104	1628	845	939	1056	1566	23.3	1
2604	2184	2233	4414	4487	4175	34.3	4
4165	3073	1808	1718	2002	3051	35.3	5
262	281	275	208	207	316	39.0	8
4930	8275	6784	4366	2575	3158	39.9	4
1633	1366	1261	1422	1484	1131	40.5	7
1420	904	816	612	575	633	47.8	6
2506	1536	1160	1024	1333	1290	49.1	5
386	228	229	365	454	532	54.7	9
935	212	144	301	136	791	109.1	10

Table 25. Average Wages in Small Scale Agriculture by Type of Employment, 1970/71

District	Reg/Cas wage	Casual wage	Regular wage	Average All labour	Farms Hiring Regular Labour as percent of Farms Hiring Labour	No. of Observation
Muranga	2.7	2.4	2.3	2.6	30	64
Meru	2.5	2.1	2.0	2.2	66	64
Bungoma	-	2.5	-	2.6	28	18
Kirinyaga	2.6	2.5	-	2.6	32	56
Nandi	1.7	2.1	-	1.8	30	37
Taita	2.6	1.9	-	2.0	19	36
Kilifi	-	3.2	-	3.1	67	16
Siaya	-	-	-	1.8	23	17
Kisii	-	3.1	-	3.0	10	31
Kisumu	-	1.5	-	1.4	38	24
Nyeri	2.6	3.2	-	2.8	52	29
Machakos	2.4	3.9	2.1	2.5	60	60
Kakamega	-	2.5	-	2.5	33	18
Kiambu	3.1	3.0	-	3.0	27	70
Kericho	2.3	2.7	2.2	2.3	82	72
Busia	-	1.6	-	1.6	14	43
Embu	-	3.2	2.5	2.7	38	45

Source: Farm Enterprise Cost Survey 1970/71, Ministry of Finance and Planning.

Footnote: the average wage for a given type of employment is only given if the number of farms hiring that type of labour in the sample exceeds 9.