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RESEARCH STUDY SERIES

COST OF PRODUCTION OF PADDY
MAHA 1972-73

A STUDY BASED ON FARM RECORD BOOKS
MAINTAINED IN FIVE SELECTED DISTRICTS

by

K. IZUMI

A. S. RANATUNGA

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PO Box 1522

COLOMBO 5

SRI LANKA

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ACKNOWLEDGEMENTS

INTRODUCTION

Since the production of paddy is a vital activity in the economy of this country, the collection of production cost data even on a restricted basis becomes extremely important. It is well known that the costs of the major inputs used in the production of paddy, labour, draught power, fertilizer and agro-chemicals, have increased during the past few seasons. In an effort to match the rising costs of inputs, the government on two recent occasions has revised the guaranteed price of paddy. In the first instance from Rs.14.00 to Rs.18.00 in February 1973 and again from Rs.18.00 to Rs.25.00 in October of the same year. During the period 1972-73, while the costs of inputs showed rapid increases, the price paid to growers also showed a sharp increase. In this situation, it becomes useful to maintain a continuing surveillance of the changes in the cost structure as well as the patterns of resource use.

This is the second study on the cost of production of paddy conducted by the authors using farm record books. The same form of record keeping as well as costing procedures followed in the earlier study conducted in Yala 1972 were adopted in this study. Data was collected from Hambantota, Polonnaruwa, Kurunegala, Kandy and Colombo Districts, with the assistance of the Agricultural Extension Staff.

The method of analysis in the present study differs from that of the Yala 1972 study in the following respects:

(a) The data collected from the Elahera colonisation scheme which is located in the Polonnaruwa district has been separately used in this analysis. Elahera is a "Special Project" where an intensive agricultural extension programme is operative.

(b) In Kandy, the data refers only to the Wet Zone part of the district. The settlement project in Minipe located in the Dry Zone has not been included in this study, as data was not available from this project area.

(c) In the Hambantota, Kurunegala, Kandy and Colombo Districts, the data collected has been further classified on the basis of tenurial status of farmers, with the object of ascertaining the pattern of resource use and cost structure of owners vis-a-vis tenant cultivators. The data collected from Polonnaruwa and Elahera have been excluded from this particular analysis in section V as all the record keeping farmers of these areas are from Colonisation Schemes and are owner cultivators.

The Objectives of the Study are as follows:

1. to ascertain the amount of labour, animal/tractor power and material inputs used in paddy production;

2. to ascertain the cost of production per acre as well as per bushel of paddy in the selected districts which are located in different agro-climatic zones;

3. to ascertain the labour distribution operationwise in paddy production, in order to explore possibilities of more intensive utilisation of family labour;

4. to ascertain the variations in production costs according to tenancy conditions in the districts selected for the study;

5. to provide training and experience to extension officers in farm record keeping work and to supply them with basic input and output data that would be useful to them in farm planning and budgeting.

Methodology

This is a study based on 114 paddy farmers in Hambantota, Polonnaruwa, Elahera, Kurunegala, Kandy and Colombo Districts, during 1972/73 Maha season. A farm record book prepared by the Production Economics Unit was used by Agricultural Instructors for recording the required information. This was considered expedient as it is difficult to obtain accurate information from farmers based on "recall" due to lapses in memory. Thus a supervised farm record keeping procedure was adopted to collect the necessary information. In view of the detailed nature of the record keeping involved and also the limited time of the Agricultural Instructors participating in this programme due to the other duties they had to perform, only a small number of farmers in each area were selected. The farmers were selected on the following basis:

1. Willingness of farmers to co-operate in a project of this nature which entailed the supply of information throughout a cultivation season (a period of 5-6 months).

2. The ability of the Agricultural Instructors to contact these farmers frequently without allowing their normal work to suffer. During the study, each of the record keeping farmers had to be contacted by the extension officer of the area at least 2-3 times a week throughout the cultivation season to obtain relevant information.

Since similar farm record books as well as costing procedures had been adopted in the previous season (Yala 1972), the Agricultural Instructors who participated in the earlier study had acquired sufficient experience in keeping farm records. Consequently no training classes were found necessary. The writers visited these project areas periodically and supervised the record keeping work.

Limitations of the Study

As stated earlier, this is a study primarily confined to five districts located in different Agro-Climatic Zones. In view of the small size of the sample and the restrictions placed on the selection of farmers, the results obtained from this study would not be free of bias and due caution would have to be exercised in the interpretation of results. Thus it is not proposed to draw general conclusions from the data obtained from these records. The information presented here is primarily intended for extension officers to serve as guidelines in their advisory work. Some of this data could also be used to indicate the possibilities of increasing family farm earnings. Despite these limitations, the results could be profitabily used as preliminary information for farm planning work by the extension staff. The study would also provide some insight on the pattern of resource utilisation in paddy production in areas with different agro-climatic as well as socio economic conditions. However, it should be stated that the data is insufficient for pricing policy.

Definitions

Maha — This season normally extends from about September-October to February-March and coincides with the North-East Monsoon which brings rain to the dry zone.

Yala — This season normally extends from April-August and coincides with the South-West Monsoon during which time the dry zone gets little or no rain.

Dry Zone — The drier parts of the country receiving on an average less than 75 inches of rain per year which is concentrated mainly during October-January.

Wet Zone — The wetter parts of the country receiving on an average more than 75 inches of rain per year. Wet Zone generally experiences heavy rainfall during South-West Monsoon.

Paddy Varieties — Varieties cultivated have been classified as Old High Yielding Varieties, New High Yielding Varieties and Traditional Varieties, as follows:

Old High Yielding Varieties:

H-4, H-7, H-8, H-105.

New High Yielding Varieties:

BG 11-11, LD 66, MI-273, BG 34-6, BG 34-8

Traditional Varieties:

All unselected local varieties.

SUMMARY

114 record books were maintained with the object of collecting data on the cost of production of paddy during the Maha 1972/73 season in five districts. *In view of the small number of cultivators who participated in this study and the restrictions placed on the initial selection of farmers, it is not intended to draw general conclusions particularly for policy decisions from the data presented in this report.*

The average size of holding cultivated is considerably larger in dry zone districts (approximately 4 acres) compared to wet zone areas (approximately 1 acre). During this season, water supply conditions were very satisfactory in all the study areas except in Kurunegala and Colombo. The new high yielding varieties were also found to be widely adopted, particularly in the dry zone districts. High yields were recorded except in Colombo District. Polonnaruwa District recorded the highest yields with 86 bushels per acre which is exactly double the yield reported from Colombo District.

The total number of man-days of labour utilised per acre shows considerable variation in the different districts. *More intensive use of labour is seen in the Kandy District, with 96 man-days per acre. In contrast at Hambantota only 52 man-days per acre were used. The proportion of hired labour used in Dry Zone districts such as Polonnaruwa and Hambantota is extremely high and has exceeded 75 per cent of the total labour input. Use of 'attan' labour is almost non existent in both these districts. It is also evident that tenant cultivators use more labour per acre than owners except in Colombo District. It is clear that tenant cultivators depend more on family labour compared to owner cultivators. The use of tractors is more popular both in Polonnaruwa and Hambantota Districts. However, in the Elahera Colonisation scheme located in the Polonnaruwa District considerably less tractor power is used per acre compared to the Polonnaruwa District as a whole.* At Elahera, Kandy and Colombo, buffaloes are the most important source of draught power.

In Elahera and Polonnaruwa where per acre yields are highest, cost of production is also found to be high and has ranged from Rs.734.00 to Rs.765.00 per acre. Both in Kurunegala and Colombo Districts where per acre yields are lowest, production cost per acre is also low and has amounted to Rs.625.00. *Hired labour is the most important item in the entire cost structure and ranged from 35 per cent to as much as 51 per cent of the total cost in different districts.* Cost of draught power is

the second highest item of expenditure. *It is clear that the cost of hired labour and draught power exceed 60 per cent of the total cost of production in all areas studied. Under such circumstances farmers are more likely to be adversely affected due to increases in the cost of labour and draught power rather than price increases of other purchased inputs.* In all the areas under study, fertilizer was the costliest input used followed by seed paddy. The farmers in Hambantota District appear to have used more fertilizer than the official recommendations. In contrast both in Polonnaruwa and Elahera, the quantity of fertilizer used was less than the official recommendation.

Profit margins per acre have exceeded Rs.700.00 in the three Dry Zone areas compared to Rs.425.00 and Rs.152.00 in Kandy and Colombo Districts respectively. In this instance since land rent is not included in the cost of items the profit margins really constitute returns to land and management (family labour). Family farm earnings too show considerable variation depending on the quantity of family labour and owned draught power used in cultivation work. *Highest family farm earnings have been recorded at Elahera where relatively more family labour as well as owned buffaloes have been used (Rs.970.00 per acre) and lowest in Colombo District with Rs.299.00 per acre.*

Production cost of a bushel of paddy shows considerable variation and is found to be higher in Wet Zone districts compared to irrigated areas in the dry zone. In Polonnaruwa District where per acre yields are highest, production cost of a bushel is very low (Rs.8.85) on the other hand in Colombo District where acre yields are lowest the cost of a bushel is found to be highest (Rs.15.15). *The data also shows that the cost of labour alone accounts for slightly over 50 per cent of the total cost of production per bushel.* Cost of draught power is the next highest component in the cost structure. *Fertilizer cost is relatively small being only about 8% of production cost of a bushel except in Hambantota District.*

The cost of production was also examined in relation to tenancy conditions of the farmers in the sample. *The data shows that the average crop share paid to landlords ranges from 24 per cent in Hambantota District to as much as 40 per cent of the harvested crop in Kandy District.* Tenants have used not only more man-days per acre but also more family labour compared to owner cultivators. It is also interesting to note that the tenants incurred almost identical costs on purchased inputs such as fertilizer and agro-chemicals as owner cultivators, except in the Kurunegala District, but have not been successful in obtaining yields higher than owner cultivators. *The crop share paid to landlords when included as an item of cost shows considerable variation in total cost per acre as well as per bushel among owners and tenants in all the districts. The production cost of a bushel of a tenant exceeds that of an owner cultivator by as much as Rs.7.00 in Kandy District and Rs.5.00 in Hambantota District. But if the crop share payment is excluded from production costs, differences in production cost per bushel between these two groups become marginal.* Profit margins computed with the inclusion of crop shares paid as an item of cost, show that they are negative except in Hambantota. *Negative profit margins realised in three of the districts is an indication that the production cost of tenants really exceeds the guaranteed price of Rs.18.00 per bushel when crop share is included as an item of cost.* But it is thought unlikely that tenants rely on such profit margins to arrive at decisions pertaining to production on lands that are rented in. For those who do not have a

marketable surplus, the guaranteed price of paddy is unlikely to have a great influence in arriving at production decision. Thus, it is hypothesised that the retail price of paddy in the open market is a more realistic measure for the evaluation of the economics of paddy production in small-holdings. When the open market price is used to evaluate production in small-holdings, a different picture emerges with regard to profit margins of tenant cultivators.

It was assumed that the relationship between yield per acre (y) and cost per bushel (c) could be expressed by the equation

$$c = a/y + by \quad (1) \quad \text{where} \quad a \text{ and } b \text{ are constants}$$

This equation was fitted to the data, but the estimates of b were non-significant except in Colombo.

The equation $C = a/y$ where a is a constant gave the best fit for other study areas.

Based on these equations, the relationship between per acre yield and cost per bushel for each study area was examined. The yields that break-even with production costs, when the guaranteed price is Rs.18.00 per bushel are given below.

Study area		Yield that corresponds to production cost of Rs.18/- per bushel
Hambantota	..	30.26
Polonnaruwa	..	38.53
Elahera	..	42.37
Kurunegala	..	36.67
Kandy	..	41.55
Colombo	..	30.44

It is observed that the yield per acre has to be above 30 bushels in Hambantota and Colombo Districts and 37 bushels in Kurunegala Districts in order to obtain any profit when paddy is priced at Rs.18.00 per bushel. In Polonnaruwa and Kandy when the yields are above 38 and 42 bushels per acre respectively the production cost breaks even with the guaranteed price.

Cost functions were also used to estimate profits per bushel as well as per acre. Profits per acre and per bushel differ substantially from district to district when the yields are low. At yields of over 70 bushels per acre, the profits both per bushel as well as per acre showed uniformity in all districts, except in Colombo. *It is imperative to note the limitations of the foregoing analysis due to the inadequate size and non-random nature of the sample; thus utmost caution has to be exercised in interpreting the results of the analysis.*

Price determination on the basis of cost of production raises a number of problems. A basic problem that has to be resolved is to locate the level of cost that would ensure a fair price to small producers in rainfed areas as well as to those who operate in relatively larger holdings under irrigated conditions. It should be stressed that the price of paddy fixed by the government has not only to cover the cost incurred but also be able to provide a profit margin to cultivators that could serve as an incentive for increasing production.

LIST OF TABLES

I. GENERAL INFORMATION

1.1 Particulars of farm record books maintained, according to areas of study and tenurial status of the farmers are given in Table 1-1.

Table 1-1 Particulars of Farm Record Books Maintained

District	Owner cultivators	Tenant cultivators	Total
Hambantota	4	10	14
Polonnaruwa	18	-	18
Elahera	12	-.	12
Kurunegala	22	3	25
Kandy	14	7	21
Colombo	16	8	24
Total	86	28	114

1.2 Average size of paddy holdings as well as the average yield per acre harvested in bushels in each of the six areas investigated are given in Table 1-2.

These figures show that the average size of holding cultivated during this season is largest in the Hambantota District amounting to 4.81 acres, while it is smallest in Colombo District with 1.1 acres. Highest average yields were recorded in Polonnaruwa with 86 bushels per acre which is exactly double the yield reported in Colombo District. The pattern of ownership of draught power viz. buffaloes and tractors shows considerable variation among the farmers under study in these districts. None of the farmers included in this study from Hambantota District owned buffaloes. In contrast, in the Kandy District not a single farmer has owned a tractor. At Elahera, except for one farmer, the rest owned buffaloes.

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Table 1-2 Farm Size, Yield per Acre and Ownership
            of Draught Power   -   Maha 1972/73

District	No. of records used for tabulation	Average extent sown per farm Acres	Total quantity of paddy harvested per farm Bushels	Average yield per acre Bushels	Number of cultivators who owned	
					Tractor	Buffalo
Hambantota	14	4.81	362	75.3	6	–
Owner	4	5.81	444	76.4	4	–
Tenant	10	4.40	329	74.8	2	–
Polonnaruwa	18	3.97	344	86.6	6	6 (5.0)
Elahera	12	3.98	338	84.9	–	11 (3.3)
Kurunegala	25	1.96	111	56.6	1	4 (2.0)
Owner	22	1.98	119	60.1	1	4 (2.0)
Tenant	3	1.83	55	30.1	–	– (–)
Kandy	21	1.23	80	65.0	–	4 (3.0)
Owner	14	1.43	95	66.4	–	2 (4.5)
Tenant	7	0.82	52	63.4	–	2 (1.5)
Colombo	24	1.11	48	43.2	2	6 (3.0)
Owner	16	0.84	38	45.2	2	4 (2.0)
Tenant	8	1.64	68	41.4	–	2 (5.5)

Note: The figures in parenthesis indicate the average number of
      pairs of buffaloes per owner.

1.3 Data relating to the pattern of draught power used for land preparation are reported in Table 1-3.

Table 1-3 Distribution of Cultivators by Type of Draught Power Used

Type of draught power	Hambantota No.	%	Polonnaruwa No.	%	Elahara No.	%	Kurunegala No.	%	Kandy No.	%	Colombo No.	%
Tractor only	13	92.9	8	44.4	-	-	10	40.0	-	-	5	20.8
Buffalo only	-	-	6	33.4	6	50.0	10	40.0	20	95.2	12	50.0
Tractors and Buffaloes	1	7.1	4	22.2	6	50.0	5	20.0	1	4.8	5	20.8
Mammoty only	-	-	-	-	-	-	-	-	-	-	2	8.4
Total	14	100.0	18	100.0	12	100.0	25	100.0	21	100.0	24	100.0

Very striking differences in the type of draught power used are seen particularly in Hambantota and Kandy Districts. In the Hambantota District 93 per cent of the farmers used only tractors for land preparation, while in Kandy none used any machinery. In fact 95 per cent of them used buffaloes for land preparation. On the other hand in Polonnaruwa District 44 per cent used only tractors for preparing fields, whereas at Elahera located in the same district, none of those who participated in this study depended entirely on tractors. In Colombo District too, buffaloes were the main source of draught power used.

1.4 Information on varieties cultivated and the methods of planting adopted is reported in Table 1-4.

With regard to varieties cultivated it is evident that the majority of farmers located in irrigated areas in the Dry Zone cultivate new high yielding varieties compared to those in the Wet Zone districts. Both in Polonnaruwa District and at Elahera the entire extent cultivated has been under NHYVs, whereas in Hambantota District 93 per cent of the extent has been under these varieties. These three areas also have reported substantially higher average yields per acre compared to the other 3 districts. In Colombo District 21 per cent of the extent culti- vated has been under traditional varieties. 89 per cent of the area cultivated by farmers in the sample studied at Elahera and Kandy have been transplanted, whereas in Hambantota, Kurunegala and Colombo District, broadcast sowing have been more widespread. In Polonnaruwa District too 77 per cent of the area was transplanted.

Table 1-4 Percentage Distribution of extent cultivated
in Maha 1972/73   Under (A) Different varieties of paddy.
(B)   "   methods of planting.

	Hamban-tota	Polon-naruwa	Elahera	Kurune-gala	Kandy	Colombo
Total area sown (acres)	67.25	71.50	47.75	49.00	25.75	26.58
Varieties	Percentage area					
A NHYV						
BG 11	80.4	94.4	100.0	71.5	49.5	42.6
LD 66	-	5.6	-	10.2	7.8	36.7
MI 273	2.1	-	-	-	5.8	-
IR	-	-	-	-	-	-
Others	10.3	-	-	2.0	3.9	-
Sub-Total	92.8	100.0	100.0	83.7	67.0	79.3
OHYV						
H-4	3.6	-	-	9.2	29.1	-
Others	-	-	-	2.0	3.9	-
Sub-Total	3.6	-	-	11.2	33.0	-
TV	3.6	-	-	5.1	-	20.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
B Method of Planting						
Transplanting	36.6	76.9	88.5	37.8	89.3	11.3
Broadcast-sowing	63.4	23.1	11.5	62.2	10.7	88.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

1.5 The water supply conditions during Maha 1972/73 season in the farms
included in this study as well as their location in relation to irri-
gation schemes are given in Tables 1-5 and 1-6.

Table 1-5 Percentage distribution of cultivators by
Water Supply Conditions that prevailed during
Maha 1972/73

	Hambantota	Polonnaruwa	Elahera	Kurunegala	Kandy	Colombo
Average Yield per acre ..	75.3	86.6	84.9	56.6	65.0	43.2
Number of cultivators	14	18	12	25	21	24

Water Conditions that prevailed during the season	Cultivators											
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Good	14	100	14	77.8	12	100	18	72.0	18	85.7	15	62.5
Bad	–	–	4	22.2	–	–	7	28.0	3	14.3	9	37.5
Total	14	100	18	100	12	100	25	100	21	100	24	100

Table 1-6 Percentage distribution of extents cultivated
according to Supply of Water

	Hambantota	Polonnaruwa	Elahera	Kurunegala	Kandy	Colombo
Total sown area in acres	67.25	71.50	47.75	49.00	25.75	26.58
Water Supply	Percentage area					
Major/Minor	100.0	82.9	100.0	31.6	10.7	16.9
Rainfed	–	17.1	–	68.4	89.3	83.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

In the six areas covered in this study, per acre yields have been lowest in the Colombo District where 37 per cent of farmers experienced poor water supply conditions. In fact the average per acre yields recorded in Colombo District was only 43 bushels which is only 50 per cent of the yields reported from Polonnaruwa District and Elahera which have a very dependable water supply, particularly during the Maha season. In Hambantota District where all the farmers enjoyed good water supply conditions, the average yield recorded was considerably high.

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II. USE OF MANUAL LABOUR, BUFFALOES AND TRACTORS

Among the major inputs used in paddy production such as labour, draught power, fertilizer and agro-chemicals, labour usually forms the largest component of total production costs. We shall therefore examine the pattern of labour and use of draught power first.

Table II-1 Pattern of Labour and Draught Power Use

| | No. of farms | Average size of paddy holding Acres | Average Number of man-days of manual labour used per acre [1] | | | | Tractor days [2] | Buffalo days [2] |
			Hired	Attan	Family	Total		
Hambantota	14	4.81	44.9	–	7.2	52.1	1.4	0.3
%			86.2	–	13.8	100.0		
Polonnaruwa	18	3.97	54.6	–	15.6	70.2	1.7	3.7
%			77.8	–	22.2	100.0		
Elahera	12	3.98	42.7	0.4	24.6	67.7	0.6	7.1
%			63.1	0.6	36.3	100.0		
Kurunegala	25	1.96	41.1	5.9	18.6	65.6	1.1	2.9
%			62.6	9.0	28.4	100.0		
K a n d y	21	1.23	56.8	11.5	28.0	96.3	0.2	7.9
%			59.0	11.9	29.1	100.0		
Colombo	24	1.11	34.5	6.1	21.0	61.6	0.7	7.2
%			56.0	9.9	34.1	100.0		

Note: 1. Also includes the number of days worked by both buffalo and tractor drivers, i.e. hired, attan or family labour.

2. Includes the number of days utilised for land preparation as well as threshing of paddy.

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Data presented in Table II-1 shows very intensive use of labour in Kandy District with 96 man-days per acre, where the average size of holding is small being only 1.2 acres. In contrast, in Hambantota District where the average extent cultivated is largest (4.8 acres), the amount of labour used is found to be smallest with 52 man-days per acre. On the other hand, in the other two Dry Zone areas, viz. Polonnaruwa District and Elahera, farmers have utilised more labour per acre. At both these locations, despite the average extent cultivated being large (4.0 acres), relatively more manual labour has been used per acre compared to Colombo and Kurunegala Districts where size of holding is less than 2 acres. Farmers in these two areas with intensive use of labour and assured water supplies have been able to produce more paddy from a unit area of land as mentioned earlier (Table I-2).

The data on labour use also reveals the important role of hired labour in paddy production, in all the areas covered by this study. The proportion of hired labour used in Dry Zone districts of Polonnaruwa and Hambantota is extremely high and has ranged from 78 per cent in Polonnaruwa to as much as 86 per cent in Hambantota of the total labour input. In both these districts the average size of holding is large. Farmers at Elahera operating in identical size holdings as in Polonnaruwa (3.9 acres) have used relatively less hired labour (63 per cent). Thus, the very high component of hired labour used in Dry Zone in paddy production cannot be attributed to larger size operational holdings alone. The total absence of the use of any 'attan' (exchange) labour both in Polonnaruwa and Hambantota districts may be a contributory factor for employment of extra hired labour in these areas. Even in Wet Zone districts of Kandy and Colombo, where the average operational holding size is around one acre, slightly over 50% of the total labour input falls into the category of hired labour. Due to the seasonal nature of paddy cultivation and the peak demand for labour during land preparation and harvesting, the use of a certain amount of hired labour even in smaller paddy holdings becomes necessary. A high ratio of hired labour use for production purposes also mean less family farm earnings for the producers.

Data on the use of manual labour classified on the basis of tenurial status of farmers are reported in Table II-2.

The number of owner cultivators in Hambantota and tenants in the other three districts used in this classification are inadequate to present a representative picture of the pattern of labour use based on the tenurial status of the cultivators. Yet, these figures give some idea of the pattern of labour use among the two main tenurial groups.

In general, Table II-2 indicates a tendency among tenants to use more man-days per acre except in Colombo District. In this respect the greatest difference is seen in Kandy District, where tenants have used 20 more man-days per acre, compared to owner cultivators. It is also of relevance to point out that tenant cultivators depend more on family labour for cultivation. The ratio of family labour to total labour used by the tenants is higher in all the five districts. Highest ratio is found in Kurunegala District, followed by Kandy and Colombo Districts.

Table II-2 Use of Manual Labour According to Tenurial Category

	No.of farms	Average size of paddy holding Acres	Average yield of paddy per acre Bushels	Manual labour used per acre Man-days			
				Hired	Attan	Family	Total
Hambantota							
Owner	4	5.81	76.4	42.3	–	5.2	47.5
%				*89.1*	–	*10.9*	*100.0*
Tenant	10	4.40	74.8	46.3	–	8.3	54.6
%				*84.8*	–	*15.2*	*100.0*
Kurunegala							
Owner	22	1.98	60.1	43.2	4.8	16.5	64.5
%				*67.0*	*7.4*	*25.6*	*100.0*
Tenants	3	1.83	30.1	24.3	15.6	35.6	75.5
%				*32.2*	*20.7*	*47.1*	*100.0*
K a n d y							
Owner	14	1.43	66.4	59.9	7.6	24.2	91.7
%				*65.3*	*8.3*	*26.4*	*100.0*
Tenant	7	0.83	63.4	46.0	24.3	41.3	111.6
%				*41.2*	*21.8*	*37.0*	*100.0*
Colombo							
Owner	16	0.84	45.2	41.1	7.3	21.3	69.7
%				*58.9*	*10.5*	*30.6*	*100.0*
Tenant	8	1.64	41.4	27.7	4.8	19.8	52.3
%				*53.0*	*9.2*	*37.8*	*100.0*

In Hambantota District the least amount of family labour is used by both groups. Despite more intensive use of labour, tenants have reported lower yields in all districts (Table I-2).

The pattern of labour utilisation and per acre yields as reported by the two tenurial groups is broadly summarised below:

Tenurial Status	Pattern of Labour Use	Yield
Owner Cultivator	(a) Relatively *less* labour used per acre	) Yield) per) acre
	(b) *Low* ratio of family labour used per acre	) higher)
Tenant Cultivator	(a) Relatively *more* labour used per acre	) Yields) per
	(b) *High* ratio of family labour used per acre	) acre) lower

With regard to use of draught power, the number of tractor days used per acre in Dry Zone areas except in Elahera, is substantially greater than in Wet Zone districts. In the Elahera scheme located in Polonnaruwa District itself, considerably less tractor power is used per acre (0.6 tractor days), compared to (1.7 tractor days) in Polonnaruwa District. Draught power use in Elahera is very similar to the pattern found in Kandy and Colombo Districts where buffaloes provide the bulk of the power required for cultivation. In the other three Dry Zone districts, tractor power is the most important source of draught power (Table II-1).

III. COST OF PRODUCTION PER ACRE

In order to present a general picture of the cost of production of
paddy, all the farmers in the study are treated as owner cultivators
in this section. Accordingly, the crop share payments made by tenants
have been excluded from the cost items in Table III-1. Production
costs including crop-share payments are discussed separately in section V.

The data in Table III-1 indicates a relationship between per acre
yields and costs in areas covered by the study, with the exception of
Hambantota District. *In Polonnaruwa District and Elahera where per acre
yields are highest, the cost of production per acre is also found to be
higher than in the other districts. On the other hand, both in Kurunegala
and Colombo Districts where per acre yields are lowest, production costs
per acre are also low. The costs incurred per acre in these two districts
are identical although the yields reported show a marked difference.
Generally, though the yields and costs tend to move in the same direction
except in Hambantota District, they do not vary in similar proportions as
indicated by the cost index and the yield index given in Table III-1*
The high per acre yields reported in Hambantota District could presumably
be explained by the favourable weather conditions and assured water
supplies experienced during the Maha season as observed in Table I-5.

*The breakdown of total costs incurred per acre on the basis of
main inputs used indicate that the cost of hired labour is the most
important item of expenditure. It varies between 35-45 per cent of
the total costs even in districts with the smallest holding size such
as Colombo and Kandy. In Polonnaruwa District proportion is even
greater.* Variation in the cost of hired labour is also partly due
to differences in the wage rates paid to hired labour in the different
districts. The average cost of hired labour per man-day inclusive of
food supplied was highest in Polonnaruwa District (Rs.8.00) and lowest
in Elahera and Kandy (Rs.6.00). In the other districts the reported
wages and food costs have amounted to around Rs.7.00 per diem. Cost
of hiring tractors and buffaloes for land preparation as well as threshing
of paddy constitute the second largest item of expenditure.

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Table III-1 Cost of Production per Paddy acre in Rupees
Maha 1972/73

	Hambantota	Polonnaruwa	Elahera	Kurunegala	Kandy	Colombo
No. of cultivators	14	18	12	25	21	24
Average Size of paddy holding, acres ..	4.81	3.97	3.98	1.96	1.23	1.11
Per acre yield of paddy, bushels ..	75.3	86.6	84.9	56.6	65.0	43.2
Yield Index *	87	100	98	65	75	50

L a b o u r ⨍

	Hambantota	Polonnaruwa	Elahera	Kurunegala	Kandy	Colombo
Hired	286.63	396.88	273.05	250.53	317.92	226.93
%	44.9	51.8	37.2	38.4	44.4	34.8
Attan	-	-	2.39	30.33	45.53	39.91
%	-	-	0.3	4.6	6.4	6.1
Family	29.58	63.63	134.40	85.54	83.75	109.30
%	4.6	8.3	18.3	13.1	11.7	16.8
Total	316.21	460.51	409.84	366.40	447.20	376.14
%	49.5	60.1	55.8	56.1	62.5	57.7
Tractors	179.94	134.85	74.91	117.90	14.18	51.10
%	28.2	17.6	10.2	18.1	2.0	7.8

Buffaloes

	Hambantota	Polonnaruwa	Elahera	Kurunegala	Kandy	Colombo
Hired	3.66	40.22	82.20	39.50	111.08	87.88
%	0.6	5.3	11.2	6.1	15.5	13.5
Owner	-	20.50	40.08	7.85	26.46	27.77
%	-	2.7	5.5	1.2	3.7	4.3
Input Materials	122.55	92.54	86.40	94.70	91.96	104.71
%	19.1	12.1	11.8	14.5	12.8	16.1
Miscellaneous	16.55	17.05	40.69	25.93	25.01	3.81
%	2.6	2.2	5.5	4.0	3.5	0.6
Total	638.91	765.67	734.12	652.28	715.89	651.41
%	100.0	100.0	100.0	100.0	100.0	100.0
Total cost index *	83	100	96	85	93	85

Note:

* Polonnaruwa district yield and cost figures have been used as the base in computing the Indices of yield and cost respectively.

⨍ Includes the estimated value of food supplied to hired as well as 'attan' (exchange) labour.

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The cost of hired labour and draught power when pooled together form a very substantial proportion of the total cost of production per acre as shown below.

Table III-2 Ratio of Cost of Hired Labour and Draught Power to Total Cost of Production

District	Cost of Hired labour %	Cost of Tractors %	Cost of Buffaloes %	Cost of Hired Labour and Draught Power %	Total Cost of Production %
Hambantota	44.9	28.2	0.6	73.7	100
Polonnaruwa	51.8	17.6	8.0	77.4	100
Elahera	37.2	10.2	16.7	64.1	100
Kurunegala	38.4	18.1	7.3	63.8	100
Kandy	44.4	2.0	19.2	65.6	100
Colombo	34.8	7.8	17.8	60.4	100

In all the areas studied, the cost of hired labour and draught power have exceeded 60 per cent of the total cost of production. In Polonnaruwa District the cost of these items have been as high as 77 per cent of total costs. If the above pattern of expenditure holds good, it is likely that farmers would be adversely affected more by increases in the cost of labour and draught power rather than price increases of purchased inputs such as seed paddy, artificial fertilizer and agro-chemicals. Thus the problems associated with the use of the latter group of inputs could be attributed mainly to their non availability rather than due to price changes.

The cost of purchased inputs per acre are given in Table III-3.

Table III-3 Cost of Purchased Inputs per acre in Rupees

	Seed Paddy	Fertilizer	Agro-Chemicals	Total Costs
Hambantota	24.58	75.35	22.62	122.55
%	3.8	11.8	3.5	19.1
Polonnaruwa	23.25	62.73	6.56	92.54
%	3.0	8.2	0.9	12.1
Elahera	17.90	60.71	7.79	86.40
%	2.4	8.3	1.1	11.8
Kurunegala	21.33	55.79	17.58	94.70
%	3.3	8.5	2.7	14.5
Kandy	20.40	60.57	10.99	91.96
%	2.8	8.5	1.5	12.8
Colombo	25.09	53.80	25.82	104.71
%	3.8	8.3	4.0	16.1

Note: The percentages reported indicate the ratio of the cost of inputs to the total cost of production.

The average costs incurred on purchased inputs show considerable variation. In Hambantota District the total cost of inputs used per acre amounts to Rs.122.00 compared to only Rs.86.00 at Elahera but in both areas high per acre yields were reported. On the other hand in Colombo District where per acre yields were lowest, total cost of material inputs per acre were considerably higher, Rs.104.00 per acre. *In all the areas studied, fertilizer was the costliest input followed by seed paddy. Costs incurred in respect of agro-chemicals show wide variations in the different areas. Both in Hambantota and Colombo Districts, the cost of this item has varied between Rs.22-25 per acre, whereas in Polonnaruwa District and Elahera it has been less than Rs.8.00 per acre. The records maintained show that farmers in Hambantota and Colombo Districts appear to use agro-chemicals rather liberally.* In Hambantota District the use of weedicides is more popular presumably due to the larger holding size operated. In Colombo District the use of insecticides were more widespread apparently due to the heavy incidence of pests during the Maha season.

Since fertilizer is the costliest purchased input used, the pattern of fertilizer use is examined in greater detail. The cost of subsidised fertilizer as per recommendation of the Department of Agriculture and the estimated cost of fertilizer if such recommendations had been adopted in relation to the varieties grown are given in Table III-4.

Table III-4   Estimated Cost of Fertilizer on the Basis
             of Recommendations

| District | Fertilizer Recommendation per acre of paddy 1 | | Percentage distribution of area under different varieties 2 | | Cost of fertilizer per acre if recommendations had been followed 3 |
	OHYV and TV Rs	NHYV Rs	OHYV %	NHYV %	Rs
Hambantota	57.48	68.35	7.2	92.8	67.56
Polonnaruwa	57.48	68.35	–	100.0	68.35
Elahera	57.48	68.35	–	100.0	68.35
Kurunegala	57.48	62.92	16.3	83.7	62.03
K a n d y	48.50	64.80	33.0	67.0	59.43
Colombo	56.70	67.58	20.7	79.3	65.33

Note: 1. Based on fertilizer recommendations of the Department of Agriculture. Cost of Subsidised Fertilizer has been computed on the basis of information furnished by the Department of Agriculture.

2. From Table I-4 in Section I.

3. Estimated from 1 and 2.
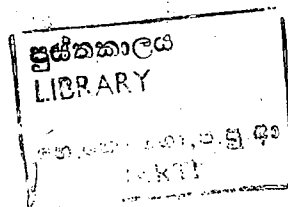
By comparing these computed costs with the actual costs reported in Table III-3, certain interesting aspects regarding fertilizer use emerge.

i. *In Hambantota District more fertilizer per acre appears to have been used. The actual cost of fertilizer used in this district was Rs.75.00 whereas the cost of this input should have been Rs.67.00, if official recommendations had been followed.*

ii. *In contrast, both in Polonnaruwa District and Elahera, farmers used less fertilizer than the official recommendations. Nevertheless, the highest yields per acre were obtained in these two areas.*

iii. *In Kandy District the quantity of fertilizer used is almost equal to the recommendations of the Department of Agriculture.*

iv. *Both in Kurunegala and Colombo Districts, farmers have applied lower levels of fertilizer per acre than the recommendations. Yields recorded in these two districts are also the lowest*

Profit margins per acre as well as family farm earnings are given in Table III-5.

Table III-5 Profit Margins and Family Farm Earnings Per Acre

	Hamban-tota	Polon-naruwa	Elahera	Kurune-gala	Kandy	Colombo
Yield per Acre/Bu.	75.4	86.6	84.9	56.8	64.9	43.0
Estimated Value of paddy produced per acre in Rupees (a)	1357.40	1558.80	1528.20	1022.40	1168.20	774.00
Cost of production per acre (b)	638.91	765.67	734.12	652.28	715.89	651.41
Expenses per acre (c)	609.33	681.54	557.25	528.56	560.15	474.43
Profit margin/ Acre (a) − (b)	718.49	793.13	794.08	370.12	452.31	122.59
Family Farm earnings per acre (a) − (c)	748.07	877.26	970.95	493.84	608.05	299.57
Average extent of paddy harvested in acres	4.81	3.97	3.98	1.96	1.23	1.11
Profit margins per farm in Rupees	3455.94	3148.73	3160.44	725.44	556.34	136.08
Family farm earnings per farm in Rupees	3598.22	3482.72	3864.38	967.93	747.90	332.52

Note: 1. To estimate the value of paddy produced per acre the guaranteed price at the time of harvest of these crops was used, viz. Rs.18.00 per bushel.

2. Expenses per acre are equivalent to cost of production per acre excluding the values of family labour and attan labour, as well as owned buffaloes used for cultivation work.

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It is clear that in districts with high per acre yields, farmers have been able to realise considerably higher profit margins per acre. Profit margins shown in Table III-3 are merely differences between estimated value of paddy produced and the related cost of items given in Table III-1. Since land rent is not included in the cost items given earlier, the profit margins really constitute returns to land and management. In the computation of family farm earnings, the value of family labour, attan labour and owned buffaloes used are not treated as costs. Consequently the family farm earnings per acre tend to differ from the profit margins depending on the type of labour and draught power used in the different districts. Both at Elahera and in the Colombo District where relatively more family labour as well as owned buffaloes are used, family farm earnings exceed profit margins by Rs.177.00 per acre. On the other hand in Hambantota District where most of the operations are done with hired labour and machinery, family farm earnings are slightly higher than the profit margins, being only Rs.29.00. Data in Table III-5 also shows a difference between profit margins and family farm earnings realised by farmers in the same district, viz. Elahera and Polonnaruwa. At these two locations almost the same amount of labour are used (Table II-1), and production costs per acre incurred. But farmers at Elahera used relatively more family labour as well as more owned buffaloes for cultivation compared to those in Polonnaruwa District. Thus, in spite of the similarity in the amount of total labour used and very similar costs incurred per acre, farmers at Elahera realised Rs.93.00 more per acre as family farm earnings.

It may be postulated that paddy producers are generally profit motivated, since, cultivators even in small holdings employ a very high component of hired labour, draught power and low dependence on family labour, except in Kandy District and Elahera. The seasonality of cultivation operations and the limited time available for field preparation and harvesting necessitiates the employment of a certain amount of hired labour to overcome peak seasonal labour demands. Also, the relatively low wage rates prevailing in some of these areas may be contributing to the greater employment of hired labour. The disinclination for family labour to get involved more actively in field work could also be partly due to the tedium of actually working with outdated hand tools. In this regard it should be stated that very little progress has been made in improving and modernising implements used in paddy cultivation for a number of decades. Even the owner cultivators in this country really do not operate 'family farms', in the strict sence of the term[1]. The absence of real 'family farms' may be adduced as a possible reason for the failure to generate self supporting village institutions which could service farmers

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1. 'Family Farm' According to definitions used in developing countries, in a farming unit, where a very high proportion of labour and management is provided by the operator and his family.

IV. COST OF PRODUCTION PER BUSHEL

Production cost of a bushel of paddy calculated on the basis of the cost of
production per acre as well as per acre yield are reported in Table IV-1.

Table IV-1 Cost of Production per Bushel of Paddy

Yield/acre in bushels	Hambantota	Polonnaruwa	Elahera	Kurunegala	Kandy	Colombo
	75.4	86.6	84.9	56.8	64.9	43.0
I N P U T S						
Labour	4.19	5.32	4.83	6.45	6.89	8.75
%	49.41	60.11	55.84	56.14	62.47	57.76
Tractors	2.39	1.56	0.88	2.08	0.22	1.19
%	28.18	17.63	10.17	18.10	1.99	7.85
Buffaloes	0.05	0.70	1.44	0.83	2.12	2.69
%	0.60	7.91	16.65	7.22	19.22	17.76
Seed Paddy	0.33	0.27	0.21	0.38	0.31	0.58
%	3.89	3.05	2.43	3.31	2.81	3.83
Fertilizer	1.00	0.72	0.72	0.98	0.93	1.25
%	11.79	8.14	8.32	8.53	8.43	8.25
Agro-chemicals	0.30	0.08	0.09	0.31	0.17	0.60
%	3.54	0.90	1.04	2.70	1.54	3.96
Other Miscellaneous	0.22	0.20	0.48	0.46	0.39	0.09
%	2.59	2.26	5.55	4.00	3.54	0.59
Total cost per bushel	8.48	8.85	8.65	11.49	11.03	15.15
%	100.00	100.00	100.00	100.00	100.00	100.00
Profit margin per bushel	9.52	9.15	9.35	6.51	6.97	2.85

Note: Profit margins indicated in this Table are the difference
      between guaranteed price of Rs.18.00 and the cost of production
      per bushel.

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The cost of production of a bushel of paddy shows considerable variation in the six areas under study. *It is evident that the cost per bushel is higher in the Wet Zone districts of Colombo and Kandy, compared to irrigated areas in the Dry Zone, viz. Polonnaruwa, Elahera and Hambantota. As expected the production cost of a bushel of paddy varies inversely with per acre yields. In Polonnaruwa District where per acre yields are highest, production cost of a bushel is very low (Rs.8.85). Whereas in Colombo District where acre yields are lowest the cost of a bushel is found to be highest (Rs.15.15).*

The data in Table IV-1 shows that the cost of labour is the main component of production cost of a bushel. This alone accounts for slightly over 50 per cent of the total cost of production of a bushel in the farms covered by this study. The cost of draught power, e.g. tractors and buffaloes forms the next highest component in the cost structure. In Hambantota, Kurunegala and Polonnaruwa Districts, tractor charges constitute the second highest item of cost. In Elahera, Kandy and Colombo, the cost of buffaloes is higher than the cost of tractors. Fertilizer cost forms only a relatively small component of total costs and does not exceed more than Rs.1.00 per bushel except in Colombo District. *Only about 8 per cent of the production costs of a bushel is accounted for by fertilizer costs except in the Hambantota District. In this particular district, farmers have incurred higher costs per acre for fertilizer even exceeding the Cost of official recommendations as observed in section III.*

On examining the cost of production data reported in Table IV-1, if is possible to identify some relationship between per acre yields and cost of production per bushel with the exception of Hambantota District.

The following yield-cost relationships could be postulated:

Yield of Paddy (bushels per acre)	Cost per bushel Rupees
85	8.50 - 9.00 approx.
65	11.00 -"-
55 - 60	12.00 -"-
40 - 45	15.00 - 16.00 -"-

A more exhausive discussion on the relationship between per acre yields and costs is undertaken in section VI, using a cost function derived from the data collected.

V. COST OF PRODUCTION AND LAND TENURE

Since the pattern of resource use in production varied according to tenurial conditions, production cost was also analysed on the basis of the two main tenurial groups. As far as national income is concerned, land rent generally paid by tenant farmers to landlords is a portion of total product, resulting from the production process, but the total income from production remains at the same level irrespective of the amount of rent paid.

From the point of view of the individual tenant (ande) cultivator, land rent paid is one of the costliest item of expenditure. Majority of peasant farmers who do not own any land, either rent or lease paddy holdings by paying a relatively large proportion of the harvested crop as rent.

The cost of production classified on the basis of tenurial pattern of cultivators is given in Table V-1. Data from Polonnaruwa District and Elahera are not included in this classification as the farmers from these areas included in this study are owner cultivators from Settlement Projects. As the number of cultivators included is very small and have not been selected on a random basis, it will not be possible to draw any inferences on the economics of paddy production by tenant cultivators based on this data. However, this data could throw some light on the unsatisfactory position of tenant farmers due to the existing system of crop share payment as rent. Information pertaining to the crop share paid to landlords as reported by the farmers is reported in Table V-2.

It is observed that the average crop share paid to landlords varies from 24 per cent in Hambantota District to as much as 40 per cent of the harvested crop in Kandy District. Only one tenant in Hambantota District has received collateral assistance. The data in Table V-1 shows that the average yield per acre reported by owners and tenant cultivators vary only slightly except in Kurunegala District. In this district, yields of tenants amounts only to about 50 per cent of the per acre yields obtained by owner cultivators. In view of the similarity of yields reported by the two tenurial groups in the other areas, it would be useful to examine the variation in the pattern of resource use.

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Table V-1 Cost of Production, Farm Expenses, Profit Margins and Family Farm Earnings, per Acre, according to Tenurial Conditions

	Hambantota		Kurunegala		Kandy		Colombo	
	O	T	O	T	O	T	O	T
No.of farms	4	10	22	3	14	7	16	8
Average size of holdings (acres)	5.81	4.40	1.98	1.83	1.43	0.83	0.84	1.64
Yield/acre (bushels)	76.0	74.8	59.9	30.2	65.4	63.3	44.4	41.4
Estimated value of paddy produced per acre in rupees	1368.00	1346.40	1078.20	549.60	1177.20	1139.40	799.20	745.20

Cost per Acre (Rupees)

	O	T	O	T	O	T	O	T
A. Labour:								
Hired	274.90	292.83	259.49	179.59	350.20	205.63	236.30	217.25
Attan	–	–	20.39	8.94	28.30	105.45	41.40	38.38
Family	13.61	38.01	73.68	179.32	69.11	134.70	135.89	81.87
B. Tractors:	176.13	181.94	119.70	103.63	18.25	–	42.18	60.24
Buffaloes Hired	4.95	2.98	36.03	67.01	120.35	79.15	93.67	81.95
Owned	–	–	8.00	6.63	20.06	48.51	31.22	24.24
Seed Paddy	22.06	25.91	20.21	30.18	19.33	24.12	24.56	25.65
Fertilizer	79.46	73.18	57.51	42.13	62.01	55.55	53.77	53.83
Agro-chemicals	16.45	25.88	16.10	29.30	12.37	6.22	22.10	29.66
Miscellaneous	11.78	21.40	26.35	22.55	31.66	1.91	6.23	1.30
Crop shares paid	–	323.14	–	179.39	–	455.76	–	283.18
T o t a l	599.34	985.27	637.46	848.67	731.64	1117.00	687.32	897.55

	O	T	O	T	O	T	O	T
Cost per bushel	7.89	13.17	10.64	27.68	11.19	18.15	15.48	21.68
Farm expenses /acre	585.73	947.26	535.39	653.78	614.17	828.34	469.81	753.06
Profit margins /acre	768.66	361.13	440.74	-305.07	445.56	22.40	111.88	-152.35
Family farm earnings/acre	782.27	399.14	542.81	-110.18	563.03	311.06	329.39	- 7.86

Table V-2 Distribution of Tenants according
to Crop Share Paid as Land Rent

	No. of tenants	Crop shares paid to Landlord						Average crop share paid to landlord [2]
		10%	15%	20%	25%	33%	50%	
Hambantota	10	1	1	1	5	1	1 [1]	24%
Kurunegala	3	–	–	–	2	–	–	33%
K a n d y	7	–	–	1	2	–	4	40%
Colombo	8	1	1	–	1	–	5	38%

Note: 1. This tenant had received two bushels of seed paddy per acre from his landlord,

2. Weighted mean of each district.

In Section II considerable differences were observed particularly with regard to the use of labour between these two tenurial groups. Data in Table II-2 indicated that tenant cultivators used more man-days per acre compared to owner cultivators even in the Hambantota District, where the general tendency is to use labour more extensively. It was only in Colombo District that tenant cultivators used less man-days per acre. Also the percentage of family labour used per acre by tenant cultivators was observed to be greater compared to owner cultivators in all four districts.

Even with regard to the use of 'attan' labour, the pattern was similar particularly in Kurunegala and Kandy Districts. *The differences in labour use are most striking in Kandy District, where tenants used 20 man-days per acre more as shown in section II. Of the total labour used by tenant cultivators, 65 man-days (58%) are provided by family and attan labour in Kandy District. In contrast, owner cultivators used considerably less family and attan labour; 31 man-days which is only 35 per cent of the total labour used per acre. These figures show that tenant cultivators in the Kandy District use not only more man-days per acre, but, also more family and attan labour for various cultivation operations.*

With regard to the use of other purchased inputs, it is observed that fertilizers and agro-chemicals used per acre by the two groups show very little variation except in the Kurunegala District (Table V-1). *It is interesting to note that in Kandy District and although more intensive use of labour and other purchased inputs are reported, tenant cultivators have not been able to obtain higher yields. This may be partly due to physical and environmental factors such as differences in soil fertility and water supply conditions of the fields cultivated by these two groups.*

Crop share paid to landlords when included as an item of cost (Table V-1) leads to a considerable variations in total cost per acre as well as per bushel among owners and tenant cultivators in all the districts.

In Kandy, Colombo and Hambantota Districts, although per acre yields of the two tenurial groups are very similar, production costs per bushel for tenant cultivators becomes considerably higher with the inclusion of crop-share payments. The cost of production of a bushel of paddy of a tenant *exceeds that of an owner cultivator by as much as Rs.7.00 in the Kandy District and Rs.5.00 in the Hambantota District under such circumstances. On the other hand when the crop-share payment is excluded from production costs, differences in cost per bushel between these two groups becomes very small. The production cost of tenant cultivators, in fact declines very markedly. In Kandy District this amounts to Rs.0.25 per bushel. While in Hambantota District, the cost of a bushel for tenant cultivators then exceeds that of owner cultivators only by Rs.0.96. These variations in production costs give some idea of the large burden that tenants bear under the existing system of crop-share rental payments for land.*

Profits per acre for the two tenurial groups are also given in Table V-1. The figures reported are really the differences between the estimated value of paddy produced and production cost per acre, inclusive of the crop share paid as land rent [1]. *This computation shows that profit margins of tenant cultivators are negative except in Hambantota District. In this district tenants have realised a profit of Rs.361.00 per acre due to the relative low crop share paid by tenants and also the very high yields recorded. Negative profits realised in the other three districts clearly indicate that production costs of tenants exceed the guaranteed price of Rs.18.00 per bushel. However, it is very unlikely that tenants rely on such profit margins to make decisions pertaining to production on lands that are rented in.*

Tenants in small holdings are hardly able to produce surplus paddy for sale. Paddy produced in such holdings are used primarily for domestic consumption. For such farmers, without a marketable surplus, the guaranteed price of paddy cannot be expected to have a great influence in decision making with regard to paddy production. If a tenant ceases to be a paddy cultivator, it becomes necessary for him to purchase a certain quantity of rice in the open market for consumption purposes. *Under such circumstances it is hypothesised that the retail price of paddy in the open market is a more realistic measure for evaluating the economics of production. Such an assumption applies equally well even to owner cultivators in small holdings where the marketable surplus is negligible.*

If such a measure is used to evaluate production in small holdings, a different picture will be observed. The retail price of rice during the Maha 1972/73 season was Rs.2.00 per measure [2]. Based on this market

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1. Paddy produced as well as crop share paid has been valued at Rs.18.00 per bushel, the guaranteed price at the time of harvest.

2. In March 1973, under the Rice Rationing Scheme, one measure of rice was issued free and the second measure was priced at Rs.1.60.

price of rice, the estimated value of a bushel of paddy produced amounts to Rs.31.40 approximately [1]. Profit margins as well as family farm earnings of tenant cultivators computed on the basis of this value are given in Table V-3

Table V-3   Profit Margins and Family Farm earnings of Tenant
Cultivators computed on the Basis of Retail Price
of Rice that prevailed in study areas at the time
of Harvest of Maha 1972/73 Paddy Crop

	Kurnuegala	Kandy	Colombo
Estimated value of paddy produced per acre [1]	948.28	1,987.62	1,299.96
Cost per acre [2]	848.67	1,117.00	897.55
Profit Margins per acre	99.61	870.62	402.41
Profit Margins per bushel	3.30	13.75	9.72
Family farm earnings per acre	294.50	1,159.28	546.90
Family farm earnings per farm	538.94	962.20	896.92
Net quantity available in bushels for disposal per farm [3]	37.0	31.5	42.1

Note: 1. A bushel of paddy worked out at Rs.31.40 (hypothetical value)

2. Costs per acre given here are the same as the costs given in Table V-1.

3. Net quantity available per farm = yield per acre x % crop share retained by tenant cultivators x average size of paddy holding per farm in acres.

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1. Price of a measure of rice in the open market = Rs.2.00

Bushel of Paddy   ..   ..   .. = 32 measures

Conversion rate of paddy   ..   .. = 50% (by volume)

Number of measures of rice converted from a bushel of paddy   ..   ..   .. = 16 measures

.. Gross Value of a bushel of paddy
32 x ½ x Rs.2.00   ..   .. = Rs.32.00

Milling charges   ..   ..   .. = "   .60

Net Value of a bushel of paddy   ..   .. = Rs.31.40

The figures reported in Table V-3 show that both the profit margins as well as family farm earnings of tenant cultivators calculated on the basis of the open market price of paddy in Kurunegala, Kandy and Colombo Districts, are markedly different from the earlier figures given in Table V-1 and are no longer negative. Even in Kurunegala District where the average yield per acre reported by tenants is very low (30 bushels) the profit margin per acre become positive and amounts to Rs.99.00. Similarly family farm earnings per acre show a considerable increase in all three districts. These earnings have ranged from Rs.307.00 per acre in Kurunegala District, to as much as Rs.1,127.00 in Kandy District even after the deduction of land rent. Family farm earnings shown in Table V-3, are thought to be of some economic significance to tenants who cultivate paddy in small holdings. *Earnings shown in Table V-3 are never realised by subsistence farmers in terms of cash. However, such figures become useful in understanding the attitudes and behaviour of tenants particularly with regard to use of inputs in paddy production. For a subsistence farmer the value of the paddy he produces tends to be more than the guaranteed price. In the discussion on the use of inputs it was observed that, tenant cultivators used new high yielding varieties as well as fertilizer and agro-chemicals more or less at the same levels as owner cultivators. Costs incurred on these purchased inputs, particularly in Kandy District by the two tenurial groups were almost identical as observed in Section III.* Since the majority of tenants as well as owner operators in small holdings have hardly any surplus for sale, it is likely that such cultivators often are not in a position to raise the finances required for purchase of essential production inputs from the incomes realised in paddy production. Cultivators in small holdings would be able to use purchased inputs such as fertilizer and agro-chemicals at recommended levels only when supplementary sources of income such as from the highlands or outside employment are available. In the Kandy District it was found that only 57 per cent of tenant cultivators had incomes of over Rs.500.00 from sources other than paddy during the year 1971/72 [1].

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1. The Agrarian Situation Relating to Paddy Cultivation in five selected Districts of Sri Lanka - Part II, Kandy District.

VI. THE RELATIONSHIP BETWEEN YIELD PER ACRE AND COST PER BUSHEL

The data on cost of production per acre, yield per acre and cost of production per bushel of paddy was examined in order to study the relationship between yield per acre and cost of production per bushel.

It was assumed that the relationship between yield per acre (y) and cost per bushel (c) could be expressed by the equation

$$c = a/y + by \ldots \ldots (1)$$ where a and b are constants

Using this equation, the relationship between cost per acre (c) and yield per acre could be expressed as:-

$$C = a + by^2 \ldots \ldots (2)$$

Equation (1) represents a U shaped curve which is asymptotic to the vertical axis. This equation was fitted to the data pertaining to each of the study areas and the estimates of 'b' were found to be non-significant at the 5% level in all areas other than in Colombo which indicated that this equation gives the best fit only for the Colombo District.

Accordingly the equation; $c = a/y \ldots \ldots (3)$

where 'a' is a constant (an estimate of the average cost per acre, the estimate being a weighted average) which gives the best fit to the data was used for the other districts. This equation represents a curve which is asymptotic to both axes. Based on this equation, the relationship between per acre yield and cost per bushel for each study area are given in Table VI-I. The curves derived are shown in Figures I and II.

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RELATIONSHIP BETWEEN YIELD ACRE AND COST PER BUSHEL

Fig. I

ELAHARA

$c = 762.69/y$

HAMBANTOTA

$c = 544.75/y$

POLONNARUWA

$c = 693.46/y$
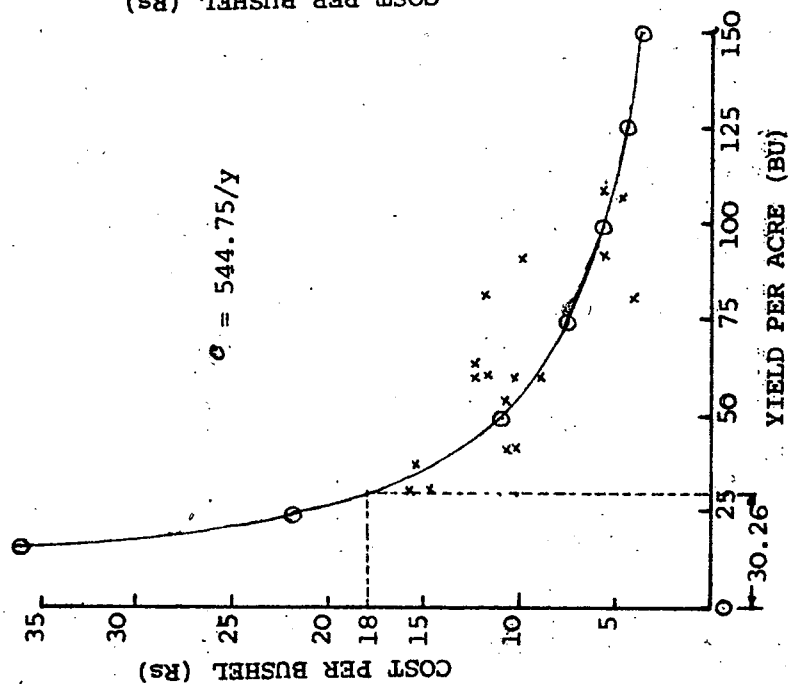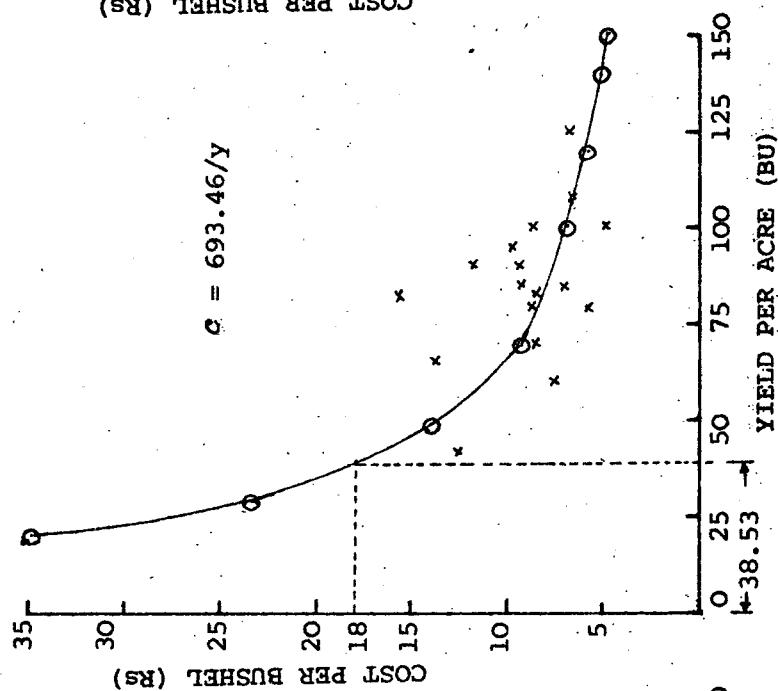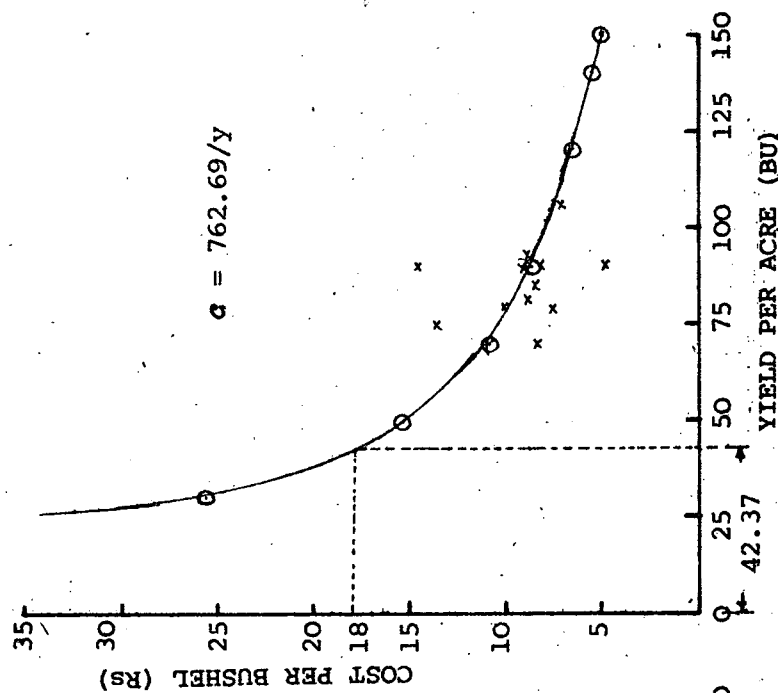
Fig. II   RELATIONSHIP BETWEEN YIELD ACRE AND COST PER BUSHEL

KURUNEGALA

$c = 660.01/y$

KANDY

$c = 747.86/y$

COLOMBO

$c = 463.415/y + 0.089 y$
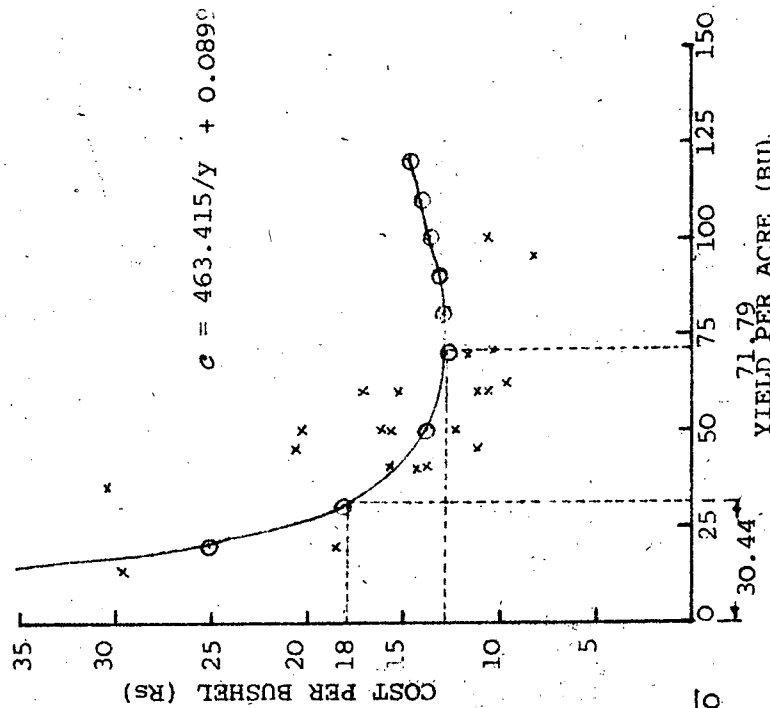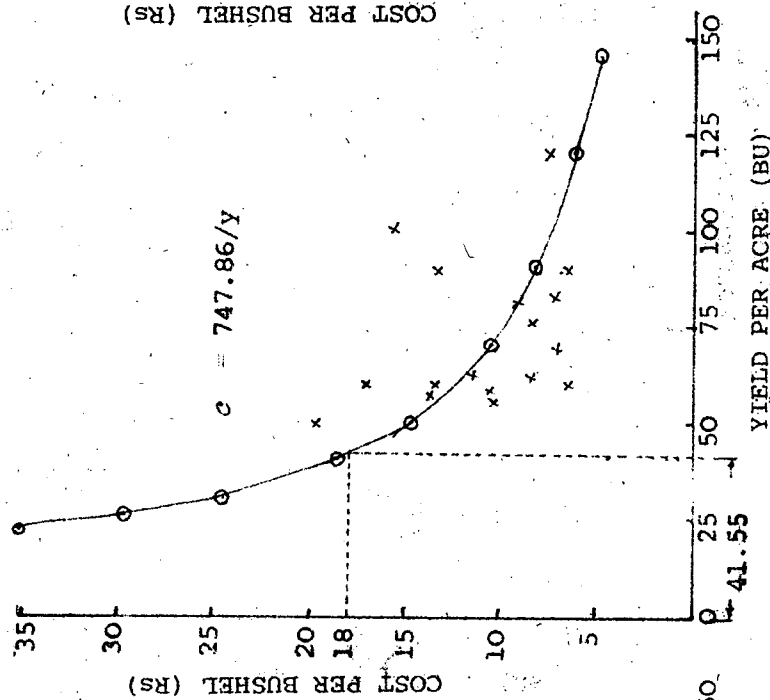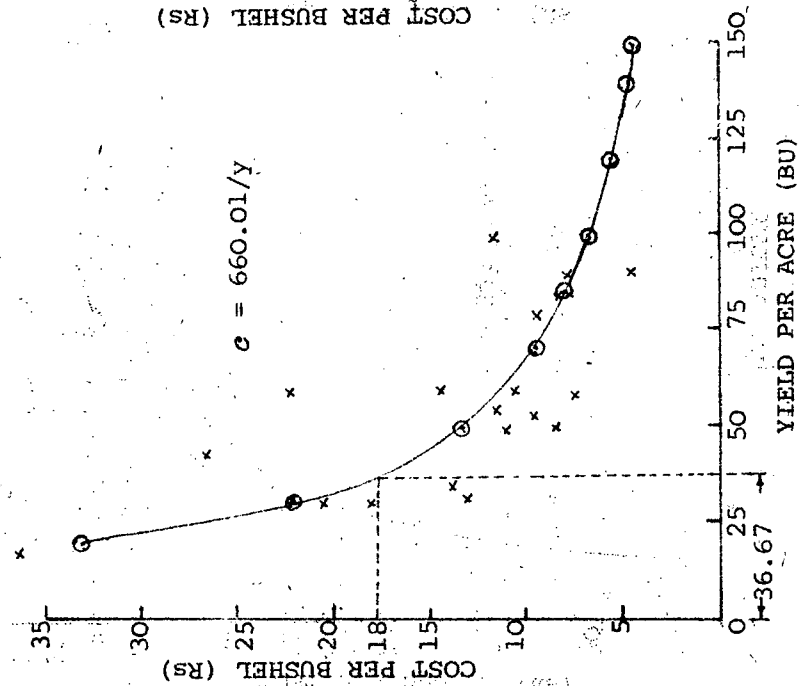
Table VI-I   Cost of Production and Yield Relationship

Area	No. of observations	Range of observed values of yield per acre (bushels)	Curve of best fit	r^2 [1]	Average yield per acre [2]	Average cost of production per bushel [3]
Hambantota	17	30.00 - 109.30	$c = 544.75/y$	0.947	53.30	10.22
Polonnaruwa	18	41.66 - 125.30	$c = 693.46/y$	0.907	77.57	8.94
Elahera	12	72.00 - 107.00	$c = 762.69/y$	0.929	..	..
Kurunegala	22	31.30 - 100.00	$c = 660.01/y$	0.914	40.90	16.14
Kandy	17	50.00 - 120.00	$c = 747.86/y$	0.914	66.52	11.24
Colombo	23	10.00 - 100.00	$c = 463.415/y + 0.0899y$	0.913	35.55	16.23

1. Coefficient of determination

2. Estimates obtained from the Crop Cutting Survey of Maha 1972/73 season reported by the Department of Census and Statistics

3. Value corresponding to average yield - derived from the cost function

.. Not available.

Table VI-2 Estimated Cost per Bushel, Profit per Bushel and Profit per Acre

	Hambantota			Polonnaruwa[1]			Kurunegala			Kandy			Colombo		
	Estimated cost/bushel	Estimated profit/bushel	Estimated profit/acre	Estimated cost/bushel	Estimated profit/bushel	Estimated profit/acre	Estimated cost/bushel	Estimated profit/bushel	Estimated profit/acre	Estimated cost/bushel	Estimated profit/bushel	Estimated profit/acre	Estimated cost/bushel	Estimated profit/bushel	Estimated Profit/acre
20	27.24	-9.24	-184.80	34.67	-16.67	-333.40	33.00	-15.00	-300.00	37.39	-19.39	-387.80	24.97	-6.97	-139.40
25	21.79	-3.79	-94.75	27.74	-9.74	-243.50	26.40	-8.40	-210.00	29.91	-11.91	-297.75	20.78	-2.78	-69.50
30	18.16	-0.16	-4.80	23.12	-5.12	-153.60	22.00	-4.00	-120.00	24.93	-6.93	-207.90	18.14	-0.14	-4.20
35	15.56	2.44	85.40	19.81	-1.81	-63.35	18.86	-0.86	-30.10	21.38	-3.38	-118.30	16.39	-1.61	56.35
40	13.62	4.38	175.20	17.34	0.66	26.40	16.50	1.50	60.00	18.70	-0.70	-28.00	15.18	2.82	112.80
50	10.89	7.11	355.50	13.87	4.13	206.50	13.20	4.80	240.00	14.96	3.04	152.00	13.76	4.24	212.00
60	9.08	8.92	535.20	11.56	6.44	386.40	11.00	7.00	420.00	12.46	5.54	332.40	13.12	4.88	292.80
70	7.78	10.22	715.40	9.91	8.09	566.30	9.40	8.60	602.00	10.68	7.32	512.40	12.91	5.09	356.30
80	6.81	11.19	895.20	8.67	9.33	746.40	8.20	9.80	784.00	9.35	8.65	692.00	12.98	5.02	401.60
90	6.05	11.95	1075.50	7.71	10.29	926.10	7.30	10.70	963.00	8.31	9.69	872.10	13.24	4.76	428.40
100	5.45	12.55	1255.00	6.93	11.07	1107.00	6.60	11.40	1140.00	7.48	10.52	1052.00	13.62	4.38	438.00
110	4.95	13.05	1435.50	6.30	11.70	1287.00	6.00	12.00	1320.00	6.80	11.20	1232.00	14.10	3.90	429.00
120	4.54	13.46	1615.20	5.78	12.22	1466.20	5.50	12.50	1500.00	6.23	11.77	1412.40	14.65	3.35	402.00

[1] Since Elahera is located in Polonnaruwa District and as the range of observed values of yield per acre in this study was narrow separate computations were not made in respect of this area.

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Yield at which the production cost per bushel breaks even with the sale price of Rs.18.00 the guaranteed price of paddy that prevailed at the time of the study are given below:

Study area	Yield that corresponds to productin cost of Rs.18/- per bushel
Hambantota	30.26
Polonnaruwa	38.53
Elahera	42.37
Kurunegala	36.67
Kandy	41.55
Colombo	30.44

It is observed that the yield per acre has to exceed 30 bushels in the Districts of Hambantota and Colombo, while in Kurunegala District yields should exceed 37 bushels in order to obtain profits when paddy is priced at Rs.18/- per bushel. In Polonnaruwa and Kandy when the yields are above 38 and 42 bushels per acre respectively, the production costs break even with the guaranteed price, but as these computed yields do not fall within the range of observed values, much reliance cannot be placed on these values. The average yield per acre in Polonnaruwa District is generally high mainly due to assured water supply and therefore it is realistic to assume that the proportion of farmers who obtain uneconomic yields in the district is low. Though the average yield in Kandy is high compared to many other districts, due to socio-economic constraints such as very small size of holding and tenurial problems, a fair proportion of farmers are likely to obtain uneconomic yields. In Colombo and Kurunegala Districts, the average acre yields are low and the average production costs per bushel are close to the guaranteed price that prevailed at the time of study, the relevant figures being Rs.16.23 and Rs.16.14 respectively (Table VI-1). In the districts of Colombo and Kurunegala, considering the various physical and environmental limiatations, and the low average yields, it could be assumed that generally a fair proportion of farmers obtain yields below 30 bushels per acre. Due to the inadequacy of the size of the sample and its non-random nature, it is not possible to estimate the percentage of farmers who obtain uneconomic yields.

Based on the cost functions, cost of production per bushel, profits per bushel as well as per acre corresponding to varying acre yields were estimated and the results are reported in Table VI-2.

In this study, the observed values of yields ranged from about 30 to 40 bushels per acre to as much as 100 to 120 bushels per acre in all Districts other than Colombo. Thus, the costs and profits corresponding to yields ranging from 20 to 30 bushels per acre for these districts in Table VI-2 have to be treated with caution. On examining the data, it is observed that the profits per bushel differ substantially from area to area when yields are low, and show uniformity among all study areas other than Colombo District when yields exceed 70 bushels per acre. However, profits per acre differ by a constant among all study areas than Colombo District irrespective of the yield.

In the case of Colombo district the curve $c = 463.415/y + 0.0899y$ gives the best fit, indicating a minimum cost per bushel around 70 bushels per acre. The profit per acre reaches a maximum at a yield of 100 bushels per acre. In this district, both the profits per acre and profits per bushel aere low when yields exceed 50 bushels per acre, compared to other districts.

It is imperative to note the limitation of the foregoing analysis due to the inadequate size and non-random nature of the sample. Thus, utmost caution has to be exercised in interpreting the results of this analysis.

Price determination on the basis of the cost of production of agricultural commodities raises a number of problems. A fundamental problem that has to be resolved is to locate the level of cost that would ensure fair prices to small producers in rainfed areas in the wet and intermediate zones as well as to those who operate in relatively larger holdings under irrigated conditions in the dry zone. The fixing of guaranteed price for paddy has to be determined from a much broader point of view than on mere production costs incurred. However, it is important to stress that the price of paddy fixed by the government should not only cover the costs incurred, but, also be able to provide a sufficient profit so as to provide an adequate incentive for increasing production. Thus the determination of a policy that could motivate cultivators particularly in small-holdings and also cover the costs of production is complex and far too difficult to attempt by merely estimating a simple cost function.

COSTING PROCEDURE

In costing the various items, the following procedure was followed:

I. LABOUR

    (a) *Hired* - the actual hiring charges incurred by the farmers were used in compiling cost of hired labour. Besides the cost of food and drinks supplied to such labour was estimated in consultation with the farmers and added to the actual money payments.

    (b) *Attan* - in the case of attan (exchange) labour used, the prevailing labour rates in the respective areas were used in estimating costs. In this instance too, the value of food supplied to such labour was estimated and added to the costs.

    (c) *Family* - in costing family labour, the principle of opportunity cost was not used. In fact the opportunity cost of family labour in rural areas in Sri Lanka is almost zero. The family labour used, however, was costed using the same wage rates paid to hired workers by the farmers concerned. However, the value of the food consumed by family labour was not accounted in costing, as expenses on food are incurred by family labour irrespective of whether such labour is engaged in paddy cultivation or not.

II. BUFFALOES

In the case of buffaloes hired, the actual payment made in hiring buffaloes was used in computing costs. In instances where the farmers' own buffaloes have been used, the local rate for hiring buffaloes was used in costing.

III. TRACTORS

In instances where tractors were hired, the actual payments made were used as costs. Where the farmer's own tractor was used, the local hiring charges were used in arriving at costs of services provided by the tractor.

IV. MATERIALS USED

In the case of materials used such as seed paddy, fertilizer, chemicals and gunny bags, etc., the purchase price was used, whether the supplies were provided by the farmer or the land owner.

V. LAND RENT

Land rent was included as costs depending on the share-cropping pattern prevailing in the area, in the case of tenant farmers. Similarly where acreage taxes have been paid, such expenditure was included as costs.

VI. PAYMENTS IN KIND

Where payments were made in kind to labourers, tractor owners, land owners, etc., cost has been computed on the basis of the guaranteed price of paddy.

VII. TRANSPORT

The cost of transport of inputs to the farms as well as produce from the farms have been included in the computation.

EXPLANATORY NOTE ON THE DETAILS
OF CULTIVATION OPERATIONS

In the tabulation, field operations were classified into the following eight categories:

1. Land preparation
2. Nursery
3. Planting
4. Irrigation
5. Top dressing of fertilizer - Pest and Weed Control
6. Harvesting
7. Processing
8. Transport

The details of operations in each category are given below:

1. Land Preparation including Nursery

   Land preparation work includes clearing of channels, ploughing, application of organic manure, irrigation for field preparation, harrowing, puddling, cleaning and repairing of lands, levelling, etc.

2. Nursery

   Preparation of seed paddy, including cleaning and germination, sowing of seed in nursery, application of fertilizer for nursery, etc.

3. Planting

   Broadcast-Sowing aod/and Transplanting

   Broadcast Sowing - the following operations have been included under this item, i.e. final levelling of fields, basal applications of fertilizers, sowing, etc.

   Transplanting - the following operations have been included under transplanting, i.e. uprooting and transplanting of seedlings; draining and final levelling of fields, application of basal fertilizer, transplanting, etc.

4. Irrigation

Irrigation operations in this page includes only labour used for the purpose, for planting until harvesting.

5. Top Dressing of Fertilizers, Pests and Weed Control

Top dressing of fertilizers, hand-weeding, rotary weeding, spraying of weedicides, insecticides and/or fungicides, etc.

6. Harvesting

Reaping, spreading, bundling of sheaves, transport of sheaves to, and stacking near threshing floors, etc.

7. Processing

Processing includes the following operations:

Cleaning and repairing of threshing floors, breaking of paddy stacks, spreading of sheaves, threshing, winnowing, bagging, drying, etc.

8. Transport

Transport here includes, transport of threshed paddy from a threshing floor to a homestead and/or a Co-operative Society.

Appendix Table 1 — Operationwise Labour Distribution per Acre in Man-days Maha 1972/73
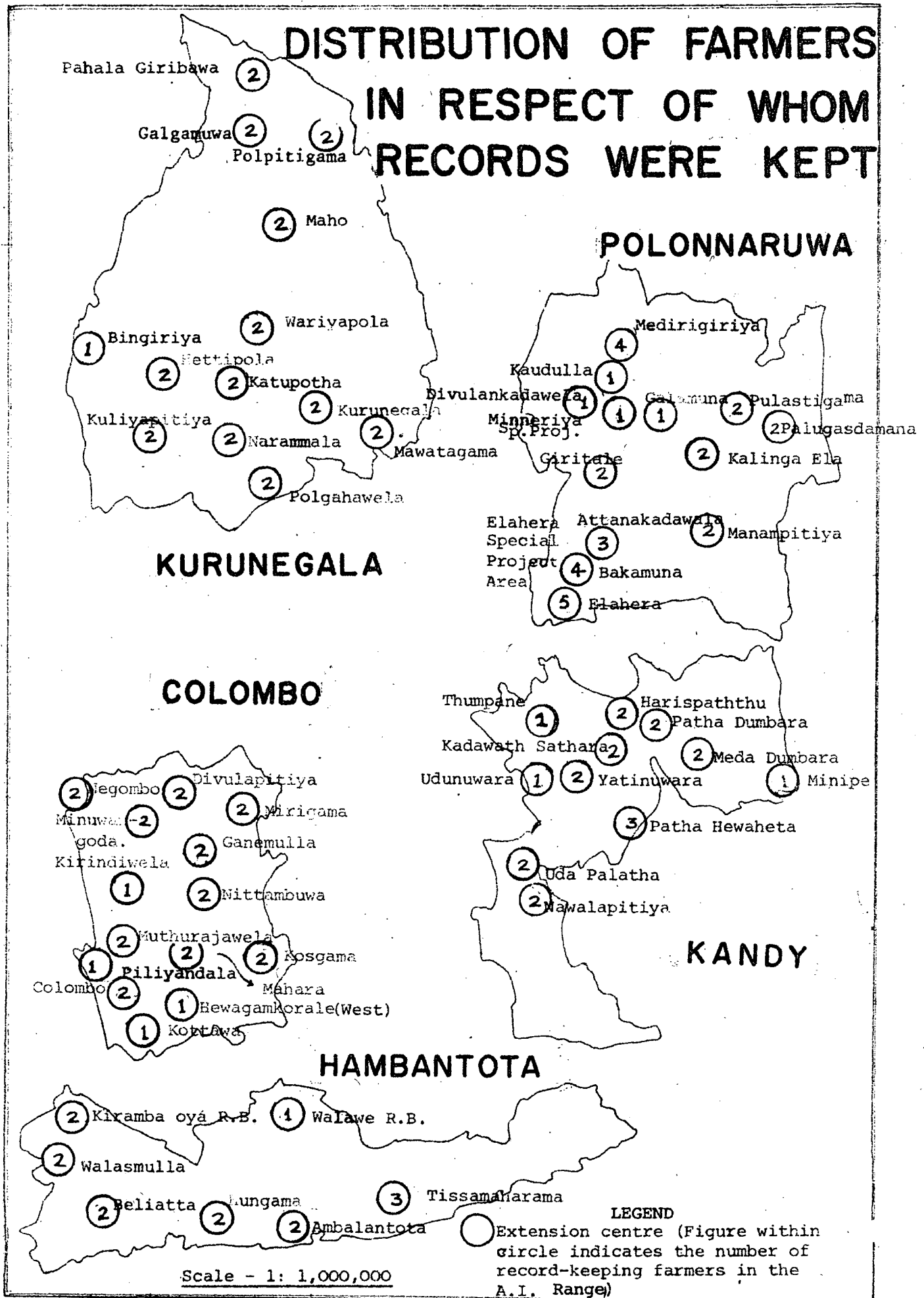
Average of all Record Keeping Farms

Note: H — Hired labour
A — Attan labour
F — Family labour

	Hambantota				Polonnaruwa				Elahera				Kurunegala				Kandy				Colombo			
	H	A	F	Total	H	A	F	Total	H	A	F	Total	H	A	F	Total	H	A	F	Total	H	A	F	Total
No. of farms				14				18				12				25				21				24
Total area grown under Maha Paddy				67.34				71.46				47.76				49.00				25.83				26.64
Area of Maha Paddy grown during season				4.81				3.97				3.98				1.96				1.23				1.11
Land Preparation %	10.1	—	1.6	11.7 (22.5)	8.5	—	1.8	10.3 (14.8)	5.6	0.1	4.9	10.6 (15.7)	8.1	0.3	2.8	11.2 (17.1)	12.0	2.0	6.3	20.3 (21.1)	9.2	0.7	4.5	14.4 (23.4)
Nursery %	1.0	—	0.5	1.5 (2.9)	0.9	—	0.5	1.4 (2.0)	0.5	—	1.5	2.0 (3.0)	1.1	—	0.3	1.4 (2.1)	3.5	—	1.7	5.2 (5.4)	1.5	—	0.7	2.2 (3.6)
Irrigation %	0.5	—	2.2	2.7 (5.2)	2.0	—	6.2	8.2 (11.8)	0.5	—	7.4	7.9 (11.7)	1.6	—	3.4	5.0 (7.6)	0.6	—	7.0	7.6 (7.9)	0.5	—	3.5	4.0 (6.5)
Planting %	13.9	—	0.3	14.2 (27.3)	16.0	—	1.6	17.6 (25.4)	11.2	0.1	3.5	14.8 (21.9)	6.2	0.8	2.5	9.5 (14.5)	15.4	2.9	2.4	20.7 (21.5)	4.8	1.8	2.8	9.4 (15.3)
Aftercare %	4.2	—	1.4	5.6 (10.7)	2.1	—	1.7	3.8 (5.5)	1.9	—	3.0	4.9 (7.2)	5.3	—	4.6	9.9 (15.1)	6.9	0.1	3.6	10.6 (11.0)	3.5	0.3	2.7	6.5 (10.6)
Harvesting %	9.1	—	0.5	9.6 (18.4)	13.4	—	1.8	15.2 (21.9)	14.7	—	1.0	15.7 (23.1)	13.3	2.7	2.8	18.8 (28.6)	9.4	4.6	2.5	16.5 (17.1)	10.1	2.2	3.5	15.8 (25.6)
Threshing %	5.6	—	0.2	5.8 (11.1)	9.6	—	1.7	11.3 (16.3)	7.8	0.2	2.4	10.4 (15.4)	4.5	2.1	1.7	8.3 (12.7)	8.0	1.9	3.8	13.7 (14.2)	4.3	1.0	2.5	7.8 (12.6)
Transport %	0.5	—	0.5	1.0 (1.9)	1.3	—	0.3	1.6 (2.3)	0.5	—	0.9	1.4 (2.0)	1.0	—	0.5	1.5 (2.3)	1.0	—	0.7	1.7 (1.8)	0.6	0.1	0.8	1.5 (2.4)
T o t a l %	44.9	—	7.2	52.1 (100.0)	53.8	—	15.6	69.4 (100.0)	42.7	0.4	24.6	67.7 (100.0)	41.1	5.9	18.6	65.6 (100.0)	56.8	11.5	28.0	96.3 (100.0)	34.5	6.1	21.0	61.6 (100.0)

Appendix Table 2. Man-days used per acre for Field Operations according to Tenurial Status of Cultivators Maha 1972/73

	Hambantota		Kurunegala		Kandy		Colombo	
	Owner Cultivator	Tenant Cultivator	Owner Cultivator	Tenant Cultivator	Owner Cultivator	Tenant Cultivator	Owner Cultivator	Tenant Cultivator
Number of farms	4	10	22	3	14	7	16	8
Total area cultivated (acres)	23.24	44.00	43.56	5.49	20.02	5.81	13.44	13.12
Average extent cultivated per farm (acres)	5.81	4.40	1.98	1.83	1.43	0.83	0.84	1.64
Man-days of labour used per acre:								
Hired	42.3	46.3	43.2	24.3	59.9	46.0	41.1	27.7
Attan	-	-	4.8	15.6	7.6	24.3	7.3	4.8
Family	5.2	8.3	16.5	35.6	24.2	41.3	21.3	19.8
Total	47.5	54.6	64.5	75.5	91.7	111.6	69.7	52.3
Operationwise Labour Distribution Man-days used per acre								
Land preparation %	12.6 (26.5)	9.6 (17.6)	11.3 (17.5)	9.5 (12.6)	16.5 (18.0)	15.8 (14.2)	12.6 (18.1)	9.7 (18.6)
Nursery %	1.5 (3.2)	1.5 (2.8)	2.0 (3.1)	0.7 (0.9)	6.0 (6.5)	9.2 (8.2)	4.4 (6.3)	- (-)
Irrigation %	2.0 (4.2)	3.6 (6.6)	6.0 (9.3)	6.8 (9.0)	8.2 (8.9)	15.8 (14.2)	3.6 (5.2)	4.4 (8.4)
Planting %	11.8 (24.8)	15.5 (28.4)	12.3 (19.1)	17.6 (23.3)	20.5 (22.4)	28.3 (25.4)	14.3 (20.5)	10.6 (20.3)
Top dressing and pest control etc. %	2.9 (6.1)	6.0 (11.0)	5.0 (7.8)	8.8 (11.7)	8.0 (8.7)	5.8 (5.2)	7.5 (10.8)	4.5 (8.6)
Harvesting %	9.9 (20.8)	12.1 (22.2)	18.4 (28.6)	19.9 (26.3)	17.7 (19.4)	19.2 (17.1)	15.9 (22.8)	15.8 (30.3)
Threshing %	5.4 (11.4)	5.5 (10.0)	8.0 (12.3)	11.0 (14.6)	13.3 (14.5)	15.2 (13.6)	9.8 (14.0)	5.8 (11.1)
Transport %	1.4 (3.0)	0.8 (1.4)	1.5 (2.3)	1.2 (1.6)	1.5 (1.6)	2.3 (2.1)	1.6 (2.3)	1.4 (2.7)
Total %	47.5 (100.0)	54.6 (100.0)	64.5 (100.0)	75.5 (100.0)	91.7 (100.0)	111.6 (100.0)	69.7 (100.0)	52.2 (100.0)

DISTRIBUTION OF FARMERS IN RESPECT OF WHOM RECORDS WERE KEPT

POLONNARUWA

KURUNEGALA

Pahala Giribawa ②

Galgamuwa ②

Polpitigama ②

② Maho

② Wariyapola

Bingiriya ①

Pettipola ②

② Katupotha

② Kurunegala

Kuliyapitiya ②

② Narammala

②

Mawatagama

② Polgahawela

Medirigiriya ④

Kaudulla ①

Divulankadawela ①

Minneriya ①

Sp.Proj. ①

Gal muna ①

② Pulastigama

② Palugasdamana

② Kalinga Ela

Giritale ②

Elahera Special Project Area

Attanakadawala ③

② Manampitiya

④ Bakamuna

⑤ Elahera

COLOMBO

KANDY

Thumpane

①

②

② Harispaththu

② Patha Dumbara

Kadawath Sathara ②

② Meda Dumbara

Udunuwara ①

② Yatinuwara

① Minipe

③ Patha Hewaheta

② Uda Palatha

② Nawalapitiya

② Negombo

② Divulapitiya

② Mirigama

Minuwan- ②

goda.

Kirindiwela ②

② Ganemulla

①

② Nittambuwa

② Muthurajawela

②

① Piliyandala

② Kosgama

Colombo

②

Mahara

① Hewagam Korale(West)

① Kottawa

HAMBANTOTA

② Kiramba oya R.B.

① Walawe R.B.

② Walasmulla

② Beliatta

② Lungama

② Ambalantota

③ Tissamaharama

LEGEND
◯ Extension centre (Figure within circle indicates the number of record-keeping farmers in the A.I. Range)

Scale - 1: 1,000,000

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