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PROFITABILITY AND RESOURCE CHARACTERISTICS OF PADDY FARMING

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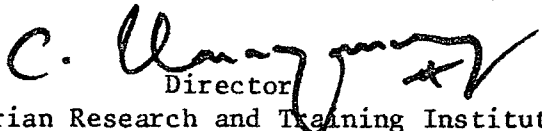
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FOREWORD

Paddy cultivation in Sri Lanka forms the main source of livelihood of thousands of small farmers in Sri Lanka. The importance of this crop to the national economy need not be over-emphasised. However, it is not always that due attention is given to the examination of the multifarious socio-economic constraints that confront the small paddy producer. The Agrarian Research and Training Institute with its focus on the small farmer has through a programme of action oriented research endeavoured during the last six years to highlight some of the problem areas that demand continuous government intervention and assistance. The comprehensive Agrarian Situation Survey as well as the Cost of Production studies undertaken during the last few years gave considerable attention to some of the issues relating to paddy production.

Aspects relating to costs of production had not been the subject of any in-depth investigation by either the Institute or any other organisation in Sri Lanka after 1973. In the light of cost escalation of inputs such as fertilizer, agro-chemicals and farm equipment, the Institute felt it desirable and appropriate to undertake a study on the profitability and resource characteristics of paddy farming during the 1976/77 Maha season. We are happy to note that the study was initiated at the most opportune time as subsequent events have proved. Some of the policy perspectives emerging from the study have already been found to be helpful.

This document sets out the resource characteristics and profitability associated with paddy farming and raises certain issues for policy consideration. It is hoped that the contents of this document would prove to be useful for both policy makers and researchers. The Institute would be grateful for any comments and observations that will help to improve on both the methodological as well as the scope of such studies in the future.


Director
Agrarian Research and Training Institute

10th DECEMBER 1977

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INTRODUCTION

The dearth of up to date information on resource allocation, costs and returns in paddy cultivation had often made the decision making relating to Government programmes of price support, credit disbursement and input subsidies, etc., for this crop a difficult one. In this context, the significance of systematic and periodic studies on detailed aspects of resource application in paddy production hardly needs emphasis. Yet in the past, studies of this nature were too few and the latest available published information pertains only to 1972/73 Maha season.¹

Objectives

In broad terms, this study seeks to examine the important production situation in the paddy sector so as to understand it's production costs, returns and the nature of the inputs. The period under reference is Maha 1976/77.

More specifically the study objectives are to:

- i. identify the cost of production and it's main structural components;
- ii. ascertain the levels of returns and profitability in paddy farming;
- iii. gain insights into the important characteristics of the inputs in paddy farming and to assess it's level of technological status.

¹Cost of Production of Paddy - Maha 1972/73, Agrarian Research and Training Institute, Research Study No.12.

Methodology

The analysis is based on information relating to a sample of 333 paddy farmers chosen from eight selected Cultivation Committees so as to represent a cross section of the production conditions in the three main agro-ecological zones of the country.

Within the three main zones, low country dry zone, low country wet zone and mid country wet zone, five districts were next identified for the purpose. The districts chosen were Polonnaruwa and Hambantota - representing the dry zone paddy farming under irrigation; Colombo - Cultivation under rainfed conditions in the low country wet zone; Kegalle and Kandy districts - to cover rainfed cultivation in the mid country wet zone.

On the basis of available agricultural statistics and the knowledge of the personnel of the Extension Division of the Department of Agriculture, Departments of Census and Statistics and Rural Institutions, seven Agricultural Productivity Committees (APCs) were chosen to represent the district conditions. Evidence in respect of water supply, holding size and tenancy conditions relating to the Cultivation Committees within the selected APC areas were further examined and the following eight Cultivation Committees were arrived as final sample units. Random samples of 15 per cent or 50 farmers, whichever ever more, were selected with equal probability of selection of a farmer in each of the Cultivation Committees.

The details of sample are as follows:

Agro-Ecological Zone	District	Cultivation Committee	Total No. of farm house-holds	Effective sample size
Low country dry zone	Polonnaruwa	Wijayarajapura	180	47
		Alutwewa	174	46
	Hambantota	Yodakandiya	284	38
		Superintengama	450	51
Low country wet zone	Colombo	Hiripitiya	217	32
		Dedigammuwa	348	35
Mid-country wet zone	Kegalle	Kehelpannala	134	44
	Kandy	Giragama	133	40
Total ..			1,920	333
			=====	====

Primarily on considerations of data homogeneity, it's analysis was done by aggregating at the district level, except for Kegalle and Kandy districts. In these two districts, the data from the two corresponding Cultivation Committees were pooled together to represent paddy farming in the mid country wet zone.

In instances where the paddy holding is composed of more than one parcel per operator, the input-output data collected in the present study was restricted only to operator's of principal holdings. In such cases it was hoped that this would facilitate the data collection on a more precise basis.

Data collection was undertaken through a farm survey designed and pretested for the purpose. A team of trained investigators was employed for field data collection immediately after the Maha 1976/77 harvest under the personal supervision of the researchers concerned.

Study Limitations

Broadly speaking, the use of average production costs for pricing and other related policy matters poses a variety of problems. Therefore, any information on production costs, in general, needs careful interpretation due at least to two major limitations commonly encountered.

One of the important problems in ascertaining average production costs stems from the extent of coverage of the sample chosen. Due to the presence of numerous variations of production conditions, both within and between regions, a wide range of production costs per unit of produce could be expected. A study in one particular location is grossly inadequate to provide an average cost figure at the national level. On the other hand, the limitations imposed by resource constraints in undertaking a countrywide investigation are considerable. To overcome this problem and to effect as much representativeness, this study resorted to a careful selection of representative blocks of production units, namely Cultivation Committees, within which farmers were selected on a random basis.

The second problem arises due to the heavy involvement of owned resources such as family labour, owned draught power and land

in paddy farming. This necessitates the use of imputed values for such resources, on the basis of the opportunity cost principle. Therefore, a certain element of subjectivity of the estimated cost in respect of owned resources is unavoidable.

Chapter Organisation

The study findings are presented in three chapters. The first, examines the detailed cost structure in paddy farming and the associated credit requirements. The second, centres around the yields, disposal of produce and input-output relationships. The last, deals with major characteristics of production inputs and levels of their application.

Chapter 1

PRODUCTION COSTS AND CREDIT

This chapter deals with a detailed analysis of production costs and credit needs in paddy farming and comprises of six sections. The first four examine the varied aspects of operating costs involved in production. The operating costs in this study refer to the variable costs which are incurred during the cultivation season and includes the value of both purchased as well as owned resources used except land. In this connection, it may be added that the cost of production figures of paddy used in previous studies are therefore equivalent to the operating costs of this study. Section VI indicates the total production costs inclusive of both the operating costs as well as the opportunity cost of land input. In the last section attention is focused primarily on credit requirements relating to paddy cultivation.

1. Cash and Non-Cash Operating Costs

The cultivation of paddy is generally associated with a substantially high cash outlay. The precise identification of this becomes crucial, particularly for the formulation and administration of credit schemes. The following section examines the magnitude of cash and non-cash operating costs in different areas.

Under all production situations examined, the significance of cash requirements for purchase of materials and services cannot be under-estimated. Cash needs account for a little over two-thirds of the total operating costs per acre. This ranges from Rs.485 in Colombo to Rs.1,162 in Polonnaruwa. The main elements of cash costs are wage labour, fertiliser and draught power. Of these, wage payments to hired labour form the most important single item and range around

Table 1 Operating Costs Classified According to
Cash and Non-Cash Inputs
(Rupees per Acre)

	Polon- naruwa (Rs)	Hamban- tota (Rs)	Kegalle -Kandy (Rs)	Colombo (Rs)
Cash Inputs¹:				
Labour	613	352	327	184
Buffalo	41	10	130	77
Tractor	135	211	1	54
Seed paddy	58	63	22	24
Fertiliser	223	111	143	100
Agro-chemicals	52	55	31	37
Crop Insurance, Acreage Tax	16	12	13	6
Transport	24	8	15	3
Sub total	1,162	822	682	485
Non-Cash Inputs:				
Labour	210	109	228	202
Buffalo	118	1	12	7
Tractor	30	30	-	6
Seed paddy	29	31	44	49
Sub total	387	171	284	264
Total Operating Costs	1,549	993	966	749

40-50 per cent of cash costs. Such large proportions of cash costs for hiring outside labour is of particular interest in the two wet

¹Includes payments in kind as well.

zone districts where production is primarily for home consumption. In the two dry zone areas, the patterns of spending on hired draught power and fertiliser per acre reveals notable differences. In this regard, Polonnaruwa farmers channel more cash for purchase of fertiliser (Rs.223) and less on hired draught power (Rs.176). In Hambantota more cash is spent on hired farm power (Rs.221) and less on fertiliser (Rs.111). The relatively low cash expenditure on hired draught power in Polonnaruwa is attributed to the fact that slightly less than half the total draught power requirements are supplied by buffaloes owned by the farmers themselves.

The non-cash costs¹ represent the value of owned resources used for paddy cultivation. This component constitutes little less than a third of the operating costs in all the areas in which the value of family labour input ranks the highest. However, in Hambantota the value of family labour applied is lowest being one half of that in other areas. The value of services provided by owned buffaloes is highest in Polonnaruwa.

11. Operationwise Analysis of Costs

A breakdown of operational costs according to field practices is given in Table 2.

¹The opportunity cost of family labour used in the two dry zone cases for men, women and children are Rs.8.00, Rs.6.00 and Rs.5.00 respectively. The corresponding values for Kegalle-Kandy areas are Rs.7.00, Rs.5.00 and Rs.3.00, whilst in Colombo the figures are Rs.5.00, Rs.4.00 and Rs.3.00 per diem.

The services of owned draught power are valued at prevailing hire rates. The corresponding values for land input is given in Table 6.

Table 2 Operating Costs Classified According to
Field Operations
(Rupees per Acre)

Operation	Polonnaruwa		Hambantota		Kegalle-Kandy		Colombo	
	Amount Rs.	%	Amount Rs.	%	Amount Rs.	%	Amount Rs.	%
i. Field preparation	452	29	294	30	255	26	239	32
ii. Transplanting/ sowing ¹	334	21	230	23	240	25	100	13
iii. Fertiliser application ²	244	16	118	12	159	16	113	15
iv. Weed and pest control ³	92	6	71	7	66	7	53	7
v. Harvesting and post-harvest operations	396	26	238	24	230	24	237	32
vi. Others	31	2	42	4	16	2	7	1
Total cost	1,549	100	993	100	966	100	749	100

¹Includes cost of seed paddy and nursery preparation.

²Inclusive of cost of fertiliser.

³Includes cost of labour.

The above analysis shows that preparatory tillage, harvesting and processing form the major cost items in paddy cultivation. On a proportionate basis around a quarter of the cultivation costs is incurred for land preparation, while almost an equal proportion is utilised for harvesting and post harvest operations. However, in absolute amounts, field preparation costs are highest in Polonnaruwa with Rs.452 per acre, which in all other areas is in the region of

Rs.250. Harvesting and processing costs are seen to be highest in Polonnaruwa with Rs.396. The value of fertiliser used together with application cost forms another significant cost item ranging from Rs.113 in Colombo to as high as Rs.244 per acre in Polonnaruwa. The cost of weed and pest control accounts for nearly 7% of the cultivation costs in all the locations. For this, Rs.92 per acre is reported from Polonnaruwa. Hambantota ranks next with Rs.71 per acre. The cost of stand establishment which includes broadcast sowing, nursery preparation, transplanting and value of seed, varies widely from Rs.100 in Colombo to Rs.334 per acre in Polonnaruwa. Particularly high values in the latter instance are associated with the practice of transplanting widely prevalent in the area (See Table 31).

III. Inputwise Distribution of Costs

The operating costs analysed on the basis of major production inputs used is given below.

Table 3 Operating Costs Classified According to
Production Inputs
(Rupees per Acre)

Input	Polonnaruwa		Hambantota		Kegalle-Kandy		Colombo	
	Amount Rs.	%	Amount Rs.	%	Amount Rs.	%	Amount Rs.	%
1. Labour	823	53	461	47	555	57	386	52
2. Tractors & Buffaloes	324	21	252	25	143	15	144	19
3. Fertiliser	223	14	111	11	143	15	100	13
4. Agro-chemicals	52	3	55	6	31	3	37	5
5. Seed paddy	87	6	94	9	66	7	73	10
6. Others	40	3	20	2	28	3	9	1
Total	1,549	100	993	100	966	100	749	100

Labour constitutes the single most important production input in paddy cultivation and accounts for nearly half the operating costs. The value of this item is Rs.823 per acre in Polonnaruwa and Colombo reports the lowest amount (Rs.386) on this account. In Hambantota and Kegalle-Kandy labour costs are in the region of Rs.461 and Rs.555 respectively. Remarkably higher values for this input in Polonnaruwa and Kegalle-Kandy are partly associated with a greater use of labour for land preparation and transplanting (see Table 13). In the case of Polonnaruwa, higher wage rates is another contributory factor (see Table 20).

A few points of interest emerge from the data relating to labour and draught power use presented above. It shows that the costs of tractor and animal power use per acre of paddy is considerably higher in the dry zone than in the wet zone. In the two wet zone areas, the cost on this account is Rs.144 per acre. In Hambantota this amounts to Rs.252, with a still higher value in Polonnaruwa (Rs.324). In the data, a certain degree of substitution between human labour and draught power is observed under different production situations. Although in both Hambantota and Kegalle-Kandy the total cost of labour along with draught power is almost the same, around Rs.700 per acre, their allocation between the two input types is seen to be contrasting. In Kegalle-Kandy the paddy farmer incurs less costs in respect of draught power and more on human labour, while in Hambantota a complete reverse situation is observed.

In view of the significance of draught power costs in paddy cultivation, this item is further examined in relation to the type of power and operations performed.

Table 4 Composition of Draught Power Costs
Used in Paddy Cultivation
(Rupees per Acre)

Operation	Polonnaruwa		Hambantota		Kegalle-Kandy		Colombo	
	Trac-	Buffa-	Trac-	Buffa-	Trac-	Buffa-	Trac-	Buffa-
	tor Rs.	lo Rs.	tor Rs.	lo Rs.	tor Rs.	lo Rs.	tor Rs.	lo Rs.
Land preparation	71	159	183	12	-	96	43	57
Threshing	60	-	44	-	-	48	14	27
Winnowing	34	-	13	-	-	-	3	-
Total draught power costs	165	159	240	12	-	144	60	84

The above figures illustrate the dominance of tractors in the two dry zone areas. It forms almost the exclusive source of farm power in Hambantota with an average cost of Rs.240 per acre. In Polonnaruwa, the value of mechanical power input is less than in Hambantota due to greater use of buffaloes for land preparation. Costwise, both animal and tractor power assume equal importance in this particular district. A substantial proportion of draught power costs in the two dry zone areas arise from mechanical threshing and winnowing of the crop. In the wet zone, buffalo is the principal source of farm power. In the Kegalle-Kandy areas it forms the sole means of draught power.

Consideration of the costs incurred in land preparation using alternative draught power sources, buffalo and tractor, indicates that the former is less expensive compared to the latter. For instance, Polonnaruwa cost data indicates that the exclusive use of buffalo for this purpose amounts to a cost of about Rs.150 per acre. On the other hand, if a 4-wheel tractor is used, the cost on this account would be Rs.200 per acre.

Of the material inputs used in production, fertiliser ranks first with the cost ranging from Rs.100 in Colombo to Rs.223 in Polonnaruwa (see Table 3). In all areas covered, the cost of fertiliser accounts for about 13 per cent of the cultivation costs. The value of agro-chemicals used ranges from Rs.31 in Kegalle-Kandy to Rs.55 in

Hambantota. On a percentage basis this input accounts for nearly 5 per cent of the operating costs. Most farmers in the dry zone had undergone severe hardships in obtaining the required pesticides during the season under reference. Accordingly, the cost of this item under normal supply conditions may be slightly higher than those shown above.

IV. Operating Costs by Ownership

Tenancy forms an important feature of paddy cultivation in certain areas in Sri Lanka. This is particularly so in the wet zone and in limited areas in the dry zone. The tenurial arrangements are usually considered as a major determinant of resource application in the paddy sector. Accordingly, the cost situation in the owner and tenant operated paddy lands was examined and the results are presented in Table 5. For this purpose two study locations where tenancy is a more common feature were chosen: Hambantota in the dry zone and Kegalle-Kandy in the wet zone.

The information in the Table shows that the per acre operating costs of tenants in both cases are higher by about 30 per cent compared to those of owner operators. Higher production costs of tenants arise mainly from the payment of land rent primarily in the form of a crop share. The commonest form of land rent payment is one fourth of the harvest in Hambantota as reported by 70 per cent of the tenants. In Kegalle-Kandy all tenants except one, had paid one half

Table 5 Operating Costs by Ownership
(Rupees per Acre)

	Hambantota		Kegalle-Kandy	
	Owner N=40	Tenant N=46	Owner N=57	Tenant N=25
Farm size (Ac)	2.80	4.15	.72	.84
Yield (Bu/Ac)	54.2	47.2	50.8	42.8
	(Rs.)	(Rs.)	(Rs.)	(Rs.)
Cash:				
Fertiliser	115	109	163	103
Agro-chemicals	60	52	35	24
Seed paddy	68	54	24	19
Labour	330	365	352	276
Buffalo	22	4	138	114
Tractor	188	225	2	-
Crop Insurance, Acreage Tax	11	12	14	11
Transport	9	8	21	2
Sub total	803	829	749	549
Non-Cash:				
Seed paddy	34	26	48	37
Labour	103	113	222	241
Buffalo	4	-	10	15
Tractor	74	10	-	3
Landlord's share	-	329	-	563
	215	478	280	859
Total operating costs	1,018	1,307	1,029	1,408

of the harvested paddy crop on this account. This explains the relatively high land rents in this region; Rs.563 in comparison to that in Hambantota - Rs.329 per acre. However, it should be noted that the tenants in Kegalle-Kandy receive some form of collateral help from the land owner mainly by way of fertiliser.

The value of total cash inputs used in Kegalle-Kandy vary markedly between the owner and tenant cultivators. The lower cash outlay of tenants, Rs.549 as against, Rs.749 by owners in this area is mainly due to their reduced expenses on fertiliser and hired labour. The provision of inputs such as fertiliser, by the landlord to his tenant would also reduce the cash production costs of tenants in this area. In Hambantota the cash production cost of the tenant and owner cultivators does not reveal an appreciable difference.

An attempt was also made to study the cost variation in relation to farm size using Polonnaruwa data. This district was specifically considered as satisfactory for the purpose primarily due to absence of other influencing factors such as tenancy. Accordingly, four size groups were identified; less than 2 acres, 2.01-3.00 acres, 3.01-4.00 acres, and more than 4.00 acres. The results of the analysis indicate the absence of any systematic variation in respect of either total costs or cash costs among the different size categories. This perhaps may be due to the insufficient range of holding sizes offered by the sample.

V. Total Production Costs

Total production costs comprising both operating costs as well as opportunity cost of land is given in Table 6. The operating costs as

already mentioned refer to variable costs in respect of both purchased and owned inputs used during the season.

The cost of using land input in the production process is represented by its estimated rental value. One of the important criteria guiding the assessment of this cost was the prevailing long term rental rates in the area.

Table 6 Total Cost of Production
(Rupees per Acre)

Item	Polonnaruwa	Hambantota	Kegalle-Kandy	Colombo
i. Operating cost	1,549	993	966	749
ii. Rental value	300	300	250	200
Total Production cost	1,849	1,293	1,216	949

As seen from above, the total cost of cultivating an acre of paddy in Polonnaruwa and Hambantota are Rs.1,849 and Rs.1,293 respectively, whereas in Kegalle-Kandy and Colombo the corresponding figures amount to Rs.1,216 and Rs.949.

VI. Production Credit

In the paddy sector where the cash resources of a large majority of operators are minimal, the role of production credit for increasing output hardly needs emphasis. Accordingly, some of the more important aspects of production credit utilised by the farmers are discussed in this section. The aspects dealt with are the liquid cash requirements for production, levels of utilisation of cultivation credit and finally, a comparison of cash production costs with the approved credit ceilings for an acre of paddy.

A. Cash Requirements for Paddy Production

Table 7 Cash Requirements for Paddy Cultivation
(Rupees per Acre)

Study Area	Cash Production Costs		Average size of farm (Acres)
	Per Acre Rs.	Per Farm Rs.	
Polonnaruwa	1,162	4,172	3.59
Hambantota	822	2,902	3.53
Kegalle-Kandy	682	518	0.76
Colombo	485	354	0.73

It is seen that the requirements of liquid cash for paddy cultivation per farmer among the study areas exhibit considerable differences. In general, the cash needs of the wet zone paddy farmer is relatively small, varying from Rs.350 in Colombo to about Rs.520 in Kegalle-Kandy. In the irrigated areas in the dry zone such as Hambantota and Polonnaruwa, the cash requirements per farmer per season are exceedingly high and ranges from about Rs.2,900 to Rs.4,200 respectively. In fact, the cash needs of an average paddy farmer in Polonnaruwa are twelve times as high as in Colombo or eight times that of Kegalle-Kandy. Such variations in cash costs are attributable to differences in

(a) intensity of cash input use (b) the holding size. Having established the magnitude of cash requirements for paddy cultivation, it is relevant to examine its distribution over the season.

Arising from the time specific nature of field operations, the total quantum of farmer's cash needs for purchase of materials and

services are not uniformly distributed over the entire cultivation season. In fact, a major proportion of cash costs incurred relates to a few activities involving pre-planting operations, transplanting and harvesting. The concentration of cash costs within few specific time periods is clearly evident from the following illustration.

Table 8 Distribution of Liquid Cash Requirements
per Farm During the Season - Polonnaruwa
Maha 1976/77

Period	Average duration (Days)	Cash Costs (Rs.)
Pre-planting operations ²	30	1,539
Transplanting	5	694
Crop care ³	100	769
Harvesting and post- harvesting operations ⁴	7	<u>1,170</u>
		4,172

1. Average size of holding - 3.59 acres;
2. Includes land preparation, basal fertiliser, purchased seed paddy and nursery preparation;
3. Includes top dressing of fertiliser, application of agro-chemicals, weeding and irrigation;
4. Reaping, threshing, winnowing, drying and transport of produce

This information reveals that the acuteness of cash needs at different times vary widely during the cultivation season. The two most critical periods of acute cash needs for paddy farming are

associated with pre-planting and harvesting. In respect of pre-planting activities, farmers incur an average expenditure of Rs.1,500 per farm within a period of one month. The demand for liquid cash is even higher at harvesting time which in this case had amounted to Rs.1,200 per farm during a period of about one week. This evidence highlights the nature of financial requirements and its time specificity in paddy cultivation in areas such as Polonnaruwa.

B. Utilisation of Cultivation Credit

The information relating to credit utilisation for paddy cultivation in the study areas is given below.

Table 9 Levels of Credit Utilisation for Paddy Cultivation
Maha 1976/77 Season

Source of Credit	Polonnaruwa	Hambantota	Kegalle-Kandy	Colombo
<u>1. Institutional</u>				
% of farmers reporting	46	22	*	*
Amount per farmer reporting (Rs.)	1,517	1,736	721	200
<u>2. Private</u>				
% of farmers reporting	30	38	*	*
Amount per farmer reporting (Rs.)	2,323	1,284	246	204

*Less than 1% of the sample had availed of production credit.

Of the four areas studied, institutional credit channelled through cooperatives is important only in Polonnaruwa and Hambantota.

Even here, less than half the number surveyed had utilised credit from this source. In comparison to institutional sources, private lenders play an equal or perhaps more dominant role as creditors to paddy farmers in both these districts. In fact, nearly a third had borrowed from private sources. The borrowings from such sources in Polonnaruwa amounts to Rs.2,323 per borrower as opposed to Rs.1,517 from the cooperative.

The detailed aspects of institutional credit such as low utilisation, unsatisfactory recovery and the prevailing interest rates, etc., were not examined in this study since it is outside its scope.

The data in Kegalle-Kandy and Colombo shows that these farmers hardly depend on production credit for paddy cultivation. This situation can be explained to a large degree by considering the low cash expenses per farm coupled with farmer's heavy involvement in activities outside the paddy holding. The observation - the negligible or total absence of credit utilisation by the wet zone paddy farmers in this study - has important implications in disbursement of institutional credit. The government credit programmes designed to benefit paddy cultivators in general would have very limited impact on this category of farmers.

C. Cash Costs and Institutional Credit

Institutional arrangements for disbursement of cultivation loans to the paddy sector are made by the People's Bank and the Bank of Ceylon. These two institutions channel credit at the village level through cooperative societies and bank branches. The quantum of credit given to a farmer is subject to a maximum limit. In the following

discussion an attempt is made to assess the position of institutional credit in terms of the actual cash requirements for paddy cultivation in respect of the two dry zone study areas.

Table 10 Comparison of Actual Cash Costs and Approved Credit Ceilings According to Field Operations (Rupees per Acre)

Item	Approved credit ceiling (Rs)	Cash Production Cost	
		Polonnaruwa (Rs)	Hambantota (Rs)
Land preparation	150	239	219
Seed paddy	45	58	63
Fertiliser application	195	231	113
Transplanting/sowing	100	206	119
Pest and disease and weed control	200	84	69
Harvesting and post-harvest operations	75	326	228
Others	-	18	11
	765	1,162	822

It is observed that the maximum credit limit that a farmer is entitled to is 65 per cent of his actual cash costs in Polonnaruwa and 93 per cent in Hambantota. Theoretically this follows that the existing credit ceilings of the institutional credit programme in these two areas could accommodate the average paddy farmer's cash requirements to a very substantial degree.

The information in Table 10 also reveals that there are considerable differences between the reported cash costs and the approved credit

limits for certain field operations. In the case of land preparation, transplanting and harvesting the actual costs exceed the approved ceilings. On the other hand, the maximum level of credit granted for weeding, disease and pest control, appear to be in excess of the actual cash expenses. In the light of these observations, some adjustments in the structure of the ceilings of the current credit programme for paddy need consideration.

YIELDS AND PROFITABILITY

This chapter focusses its attention on three aspects of production. They are yields, disposal and underlying input-output relationships.

1. Output Levels

Table 11 Mean Yields and Distribution - Maha 1976/77
(Bushels of Paddy per Acre)

Area	Mean yields	Range	Modal yield
Polonnaruwa	75.8	43-120	60-80
Hambantota	56.2	37- 96	40-60
Kegalle-Kandy	47.8	22- 89	40-60
Colombo	31.9	15- 57	20-40

The average productivity per unit of land is highest in Polonnaruwa with a mean of 76 bushels per acre and a modal value of 60-80. In Hambantota, the average acre yields are 56 bushels with a mode of 40-60. The considerable differences in the land productivity in these two areas despite some basic similarities in climatic conditions seem to stem primarily from the qualitative differences in water supply conditions and the differences in ownership patterns of paddy lands (see Table 17). The mean acre yields of Kegalle-Kandy and Colombo study areas are around 47.8 and 31.9 bushels per acre respectively.

An examination of the levels of output in relation to cash production expenses per unit of land reveals a direct correspondence between the two as shown below. This relationship emphasises the need for providing higher levels of cash inputs for raising land productivity.

Table 12 Comparison of Level of Output and Cash
Production Expenses per Acre

Item	Polon- naruwa	Hamban- tota	Kegalle- Kandy	Colombo
Output (Bushels)	76	56	48	32
Cash Expenses (Rupees)	1,162	822	682	485

II. Disposal of Output

The following Table presents the information on modes of disposal of paddy at farm level.

Table 13 Modes of Disposal of Paddy Output
(Quantity Disposed as a Percentage of Total Output)

Mode of Disposal	Polon- naruwa (%)	Hamban- tota (%)	Kegalle- Kandy (%)	Colombo (%)
a) Sales				
To cooperatives	67	23	10	-
To private traders	3	32	12	13
	<u>70</u>	<u>55</u>	<u>22</u>	<u>13</u>
b) Payments in Kind				
Landlord's share	-	9	10	5
Others ¹	3	12	5	4
	<u>3</u>	<u>21</u>	<u>15</u>	<u>9</u>
c) Home Retention				
For consumption	24	20	59	75
For seed	3	4	4	3
	<u>27</u>	<u>24</u>	<u>63</u>	<u>78</u>
Total output per farm:				
(Percentage)	100	100	100	100
(In Bushels)	273	197	36	23

¹ Includes loan repayments, payments in kind to hired labour and draught power

The saleable output in the two dry zone cases range from half to three-fourths of the total farm produce whereas among the two wet zone areas the maximum amount sold is still less than a quarter. In absolute terms the marketable surplus in Polonnaruwa and Hambantota averages to 191 and 109 bushels in contrast to a meagre 3 to 8 bushels per farm in the wet zone. The small quantities of paddy offered for sale per farm as seen later does not constitute a real surplus production but merely a case of "hunger sales".

The substantial differences in the quantity of paddy marketed per farm as observed in the study areas have important welfare implications to producers in the operation of the Guaranteed Price Scheme. With the occurrence of a very small surplus per farm in the wet zone it follows that the average producers in this area would reap only marginal benefit from the existing price support programme. In this context it may be noted that any ~~slight~~ increase in the guaranteed price ~~in~~ would result in a differential impact on the cash incomes of the producers in surplus and deficit areas.

The data also show that the channelling of the marketable surplus in Polonnaruwa is undertaken almost exclusively through the cooperatives with the private trader playing a minor role. However, in Hambantota purchases through cooperatives is less dominant in comparison to private trade.

Payments in kind constitute a considerable proportion of output only in Hambantota and Kegalle-Kandy. In the former case a fifth of the output or 42 bushels per farm have been disposed of on this account and in the latter this amounts to only 5 bushels per farm. In both these areas land rent payment in kind is a common feature, but in Hambantota an appreciable proportion of this payment has been made on account of tractor hire charges.

The farmers' cash sales along with payments in kind constitute the surplus entering the market. In this regard Polonnaruwa and Hambantota clearly emerged as a surplus producing area since on an average 75% of the farm produce is disposed of in this manner.

The data relating to two wet zone areas clearly highlights the subsistence orientation of paddy farming in this region. Here, home consumption alone had accounted for the largest share of the total harvest (59 to 75%). In bushels this amounts to about 20 bushels per farm and this quantity of paddy even if supplemented by the free weekly rice ration is seen to be inadequate for an average farm family of six for their normal consumption.

III. Profitability

The ensuing discussion on returns and profits from paddy relates to three criteria namely, per acre, per farm and per bushel.

As indicated (Table 14), the value of total output of paddy or the gross income per acre of paddy is remarkably high in Polonnaruwa with Rs.2,501 followed by Hambantota with Rs.1,855. It is lowest in Colombo, Rs.1,053. The income from cash sales from an acre of paddy varies from Rs.1,751 in Polonnaruwa to only Rs.137 in Colombo. Hence, a marked divergence between the gross income and the cash income is observed in all four study locations. This is particularly so in the wet zone. This difference depends on the amounts of paddy consumed along with payments made in kind.

The profit margin between gross income and the total cost of production is represented by the net income which is close to Rs.600 per acre in both dry zone areas. This shows that, despite their lower gross output per acre, Hambantota farmers still make a profit margin almost equivalent to those in Polonnaruwa due to much

lower production costs. The net income per acre in the wet zone ranges from Rs.104 in Colombo to Rs.361 in Kegalle-Kandy. The magnitudes of farm business income and family's cash income per acre even within a study area show a marked difference. The significance of these criteria is discussed in more detail in Section B.

A. Returns and Profits per Acre

Table 14 Returns and Profits from Paddy - Per Acre
Maha 1976/77

Item ¹	Polonnaruwa (Rs)	Hambantota (Rs)	Kegalle-Kandy (Rs)	Colombo (Rs)
a) Returns ²				
Gross income	2,501	1,855	1,577	1,053
Family income	2,351	1,391	1,278	926
Cash income	1,751	1,020	347	137
b) Profits				
Net income	652	562	361	104
Farm business income	1,339	1,033	895	568
Family's cash income	589	198	-335	- 348
Gross value added	2,139	1,595	1,337	843

¹Definitions:

Gross income value of total output;

Cash income = value of cash sales;

Family's income = cash income, plus value of paddy consumed on the farm;

Net income = gross income minus total costs;

Farm business income = gross income minus payments in kind and cash;

Family's cash income = cash income minus payments in kind and cash;

Gross value added = gross income minus value of material inputs;

² Paddy valued at the guaranteed price of Rs.33/- per bushel.

B. Returns and Profits per Farm

Data relating to returns and profits from the principal paddy holdings of sample farmers are given in Table 15. This extent is almost equivalent to the farmer's entire paddy acreage¹ and hence the returns and profits indicated below can be treated as reflecting the total farm situation.

Table 15. Returns and Profits from Paddy - Per Farm,
Maha 1976/77

I t e m*	Polon-	Hamban-	Kegalle-	Colombo
	naruwa (Rs)	tota (Rs)	Kandy (Rs)	(Rs)
a) Returns				
Gross income	8,979	6,548	1,199	769
Family income	8,440	4,910	971	676
Cash income	6,286	3,601	264	100
b) Profits				
Net income	2,341	1,984	274	76
Farm business income	4,807	3,647	680	415
Family's cash income	2,115	699	-255	-254
Gross value added	7,679	5,630	1,016	615
Farm size (ac.)	3.59	3.53	.76	.73

*For definitions see page 22.

¹ See page 29.

The gross income from paddy per farm indicated above shows a phenomenal variation ranging from nearly Rs.800 in Colombo to as much as Rs.9,000 in Polonnaruwa per season. Although paddy by itself does not constitute the main source of income in the two wet zone cases (see Table 32), these figures are still suggestive of marked inter-regional disparities in the income of the paddy operators. This follows that any increase in the Guaranteed Price of paddy would have differing impacts depending on their output. Substantially higher gains would be made by higher output farmers who operate mostly in irrigated areas in the dry zone compared to small scale operators in the wet zone.

Cash income generated from paddy sales per farm is distinctly high in the dry zone - Rs.6,300 in Polonnaruwa, Rs.3,600 in Hambantota. In the wet zone the amount realised in this respect is relatively insignificant. The net income figures indicate the farmer's profits from paddy and is around Rs.2,000 in the two dry zone cases and amounts to Rs.274 to Rs.76 per farm in Kegalle-Kandy and Colombo respectively.

Farm business income indicates the difference between the gross income and value of purchases in kind and cash indicating the returns to farmer's own resources from paddy production. This, among other things, determines the willingness to devote farmer's own resources for the production of this commodity. In this respect operators in Polonnaruwa and Hambantota had realised relatively high incomes about Rs.5,000 and Rs.4,000 per farm per season respectively. The corresponding figures in the two wet zone cases range around Rs.700 in Kegalle-Kandy to Rs.400 in Colombo.

Thus on a monthly basis the farm business income from paddy per household during this Maha season is highest in Polonnaruwa, about Rs.800 followed by Hambantota, Rs.600. It is considerably less in Kegalle-Kandy,

Rs.110 and in Colombo Rs.70. The family's cash income-equivalent to cash returns minus value of purchases is about Rs.2,000 per farm in Polonnaruwa and Rs.700 in Hambantota. The marked decline of this income measure observed in Hambantota is attributable to the high proportion of the output diverted in settlement of draught power charges and land rent. Furthermore, this measure shows negative values for both Kegalle-Kandy and Colombo indicating that the value of payments in cash and in kind are in excess of cash returns in these two areas. This is understandable in terms of their low cash sales per farm as pointed out earlier.

Besides indicating the levels of income and profits of the average paddy farmer these measures also provide useful evidence on their loan utilisation and repayment capacity. It can be seen that due to their larger cash incomes as well as family's cash incomes generated from paddy, dry zone paddy farmers are much better placed in securing and repaying cultivation loans. In fact, this may serve as one of the factors explaining the high incidence of borrowing for production purposes.¹ The very low levels of credit utilisation in wet zone paddy farming,² as discussed earlier, can also be explained on the same reasoning. Here, not only is the cash income from paddy very low, but also the family's cash income is negative. Hence this suggests that income from paddy alone is grossly inadequate to repay cultivation loans taken, if any in Kegalle-Kandy and Colombo areas.

¹ 60-75% of the sample farmers in Hambantota and Polonnaruwa had obtained production credit from Rs.1,300 to Rs.2,300 per farmer respectively.

² Less than 1% of the sample farmers in Kegalle-Kandy had obtained production credit during this season

C. Per Bushel Costs and Returns

The identification of production costs per bushel of paddy is important from both the policy maker and the grower standpoint. This, in relation to farmers' selling price is indicative of the levels of producer profits. The following table presents the average costs and returns per bushel in the four study areas.

Table 16 Average Production Costs and Profit Margins per Bushel of Paddy

Item		Polonnaruwa	Hambantota	Kegalle-Kandy	Colombo
Production Costs	(Rs)	24.39	23.00	25.44	29.75
Profit margins in relation to the Guaranteed Price of Rs.33.00 per Bushel ¹	(Rs)	8.61	10.00	7.56	3.25
Profit margin as a percentage of production costs	(%)	35	43	30	11

¹Care must be taken in attempting to compute profit margins by relating the production costs presented in this study to the recently revised Guaranteed Price of Rs.40.00 per bushel. This is because, the cost situation relevant to the revised price is likely to be in variance from the one reported here. The draught power costs would be a case in point.

Given due allowance for all production costs it is seen that the average cost of producing a bushel of paddy is lowest in Hambantota and highest in Colombo, ranging from around Rs.23.00 to Rs.30.00. The corresponding figures in Polonnaruwa and Kegalle-Kandy are Rs.24.39 and Rs.25.44. respectively. Accordingly, the Guaranteed Price of Rs.33.00 per bushel offered to growers is capable of accommodating the production costs of the sample farmers in all study areas, albeit with varying levels of rewards. In this connection, it may be recalled that the areas chosen for the study represent a good cross section of paddy production situation in the country.

The average profit margin realised by growers in respect of a bushel of paddy is Rs.7.56, Rs.8.61 and Rs.10.00 respectively, in Kegalle-Kandy, Polonnaruwa and Hambantota, whereas in Colombo it is only Rs.3.25.

The cost per unit of output among farmers even within a Cultivation Committee is likely to vary widely. Consequently, the possibility exists for some of the high cost producers to reap even negative profits. This may be particularly so, among farmers in Colombo, in view of the low margin of Rs.3.25 realised per bushel.

The profit margin expressed as a per cent of production costs indicates the average rate of return from paddy farming. It is highest in Hambantota, 43 per cent followed by Polonnaruwa and Kegalle-Kandy, 35 per cent and 30 per cent, respectively. In connection with the above levels of profitability and the rate of return, it must be stressed that a support price offered to farmers should not only cover the production costs of the average farmer but also sufficiently be high so as to provide an adequate margin for the producer.

The profit margin should be able to take care of a number of major issues relating to paddy farming in this country: the presence of a set of farmers whose costs are invariably above the average, the large element of uncertainty in production mainly due to uncertain weather conditions leading to some unforeseen increases in production costs, and finally, the necessity to provide an economic incentive for motivating the producer to fall in line with the national priority of attaining self-sufficiency in rice.

Chapter 3

RESOURCE CHARACTERISTICS AND LEVELS OF TECHNOLOGY

This chapter attempts to highlight the features of the major physical inputs used in paddy farming. The first part is concerned with the significant characteristics of the inputs and the latter discusses the levels of management and state of technology of the paddy farmers studied.

I. INPUT CHARACTERISTICS

I. Land

The present study being primarily a cost analysis, investigations were directed at obtaining relevant data in respect of principal paddy holdings of the respondents as mentioned earlier. Accordingly, the ensuing discussion on land resource is confined to the characteristics of the farmer's principal holding, the ownership patterns of which together with the size are given in Table 17.

The data shows that all farmers in Polonnaruwa are exclusively owner cultivators whereas in Hambantota, Kegalle-Kandy and Colombo, cultivation of paddy on rented land is a common feature. Tenancy is particularly marked in Hambantota where almost one half of the paddy farmers surveyed are tenants. In this district, holding sizes of the tenants¹ are large (4.15 acres), compared to those of owners (2.80 acres).

¹Rental arrangements are discussed in page 8.

Table 17. Pattern of Ownership and Average Extent of Principal Paddy Holdings¹

Ownership	POLONNARUWA		HAMBANTOTA		KEGALLE-KANDY		COLOMBO	
	No. report- ing	Extent per farmer report- ing (ac.)	No. report- ing	Extent per farmer report- ing (ac.)	No. report- ing	Extent per farmer report- ing (ac.)	No. report- ing	Extent per farmer report- ing (ac.)
Owned	93	3.59	40	2.80	57	.72	38	.87
Rented in	-	-	46	4.15	25	.84	29	.55
Others	-	-	3	3.87	2	.84	-	-
Total	93	3.59	89	3.53	84	.76	67	.73

¹The extent under principal holdings in the two dry zone locations is almost identical with the total extent under paddy per farm. In these two areas it was observed that the principal holding accounted for 93% in Polonnaruwa and 91% in Hambantota. However, in Kegalle-Kandy and Colombo the relevant figures were 75% and 81% respectively.

The size of operational holdings in both wet zone study areas is particularly small, around three-quarter acre. However, in both dry zone cases, the average size of paddy holding is nearly five times larger than in the wet zone and amounts to three-and-a-half acres. An examination of the holding size distribution shows that in both Hambantota and Polonnaruwa 3-5 acre units form the modal size group. In Kegalle-Kandy and Colombo the predominant size group is less than an acre, (see Table 18). In these two cases, around 40 per cent of the holdings is less than half an acre in extent.

The land resources used for paddy farming in Kegalle-Kandy and Colombo are characterised by fragmented holdings with a wide spatial distribution in contrast to the situation in the two dry zone cases.

Table 18. Size distribution of the Paddy Holdings

Area	Percentage Distribution of Extent Operated						All sizes
	Up to 0.5	0.5-1.0	1.0-2.0	2.0-3.0	3.0-4.0	5.0-10.0	
Polonnaruwa	2	8	24	16	40	10	100
Hambantota	-	2	16	15	61	6	100
Kegalle-Kandy	39	41	15	5	-	-	100
Colombo	43	40	16	1	-	-	100

The smallness and the dispersion of the paddy holdings in the wet zone is a major constraint for organising production programmes in this area, in respect of supply of inputs, extension activities and marketing. Furthermore, paddy cultivation in the two wet zone areas are entirely dependent on rainfall, in contrast to the two dry zone cases both of which are located in major irrigation schemes.

II. Labour

A. Levels of Application

As already pointed out in the first chapter, labour input forms the single most important cost item in paddy cultivation. The structure of physical labour input in paddy cultivation is indicated in Table 19.

A striking feature of the labour distribution pattern presented in Table 19 is the marked variation in the intensity of labour application in the four study areas. In this respect, both Polonnaruwa and Kegalle-Kandy show a similarity in having a high intensity of labour use, around 95 man-day equivalents per acre. In contrast, Hambantota and Colombo with about 50 man-day equivalents per acre represent areas with less intensive labour application. The higher intensities of labour use in Polonnaruwa and Kandy is mainly due to greater use of labour for land preparation and transplanting as shown in this table.

Table 19. Distribution of Physical Labour Input¹ by
Production Operations (man-day equivalents per acre)²

Operation	POLONNARUWA		HAMBANTOTA		KEGALLE-KANDY		COLOMBO	
	Days	%	Days	%	Days	%	Days	%
Land preparation	25.3	28	11.1	22	27.4	28	14.2	28
Planting/Sowing ³	26.5	28	14.4	28	30.4	31	8.1	16
Fertilizer application	2.7	3	.9	2	3.0	3	2.0	4
Weed control	3.6	4	1.4	3	5.7	6	1.7	3
Pests and Disease control	.7	1	.5	1	.6	1	.7	1
Aftercare	1.7	2	3.9	8	.5	1	.1	-
Harvesting	21.2	23	12.0	24	15.0	15	11.1	22
Threshing and processing	8.9	10	5.9	11	13.2	13	12.3	24
Produce transport	1.2	1	.6	1	1.7	2	.9	2
T o t a l	91.8	100	50.7	100	97.5	100	51.1	100

¹ includes family, hired and attan labour

² man-day equivalent = 1 man day or 0.8 woman day or 0.5 child day

³ includes nursery preparation

Heavy reliance on buffaloes for land preparation in both Polonnaruwa and Kegalle-Kandy has also contributed to dependence on more human labour for field work. On the other hand, in Hambantota where tractors provide the bulk of farm power and broadcast sowing is more common, less use is made of human labour.

Another factor contributing to intensive labour use in Kegalle-

Kandy is the practice of hand-weeding. These farmers operating small extents, traditionally resort to hand-weeding. Hambantota, in this respect, is an extreme case where chemical weeding is popular.

Harvesting, threshing and processing are much labour intensive and constitute well over a quarter of the total labour inputs in all instances. In a high productive area like Polonnaruwa, the amount of labour used for harvesting is almost twice that in Colombo. The highest labour utilization for threshing and processing per acre of paddy is seen in Kegalle-Kandy and Colombo, where buffalo threshing is most common. On the other hand, in Polonnaruwa and Hambantota where threshing is completely mechanised, the demand for labour is least on this account.

B. Wage Rates

Under normal circumstances one would expect to find relatively uniform wage rates for agricultural labour within a village. However, data collected on wages display considerable variation even within a Cultivation Committee area suggesting the influence of some rigidities in the rural labour market. The reported modal wage rates are presented in Table 20.

Table 20. Daily Wage Rates of Hired Labour in Paddy Cultivation

Area	W a g e s p e r d a y		
	Men (Rs)	Women (Rs)	Children (Rs)
Polonnaruwa	10.00	8.00	7.50
Hambantota	10.00	8.00	7.00
Kegalle-Kandy	9.00	7.00	4.00
Colombo	6.50	5.00	4.00

In addition to the above wage payments provision of a mid-day meal to hired labour for paddy is customary in all areas. In Polonnaruwa and Hambantota, the bulk of the labour supply during the peak periods comprises of migrant labour from wet zone. Normally, the migrant labour is "on-farm-resident" and in such cases Rs.3.00 - Rs.4.00 are set off against daily wage in respect of meals provided. This data shows that in the two wet zone districts, wage payments in the paddy sector are relatively low, particularly in Colombo. This is perhaps due to the restricted demand for hired labour in the paddy sector with its subsistence orientation and low output.

The occurrence of a seasonally migrant labour force in the two dry zone areas is suggestive of the acute labour shortage during the peak periods in paddy cultivation. In fact, this hypothesis is further substantiated by the presence of a differential wage rate even within a Cultivation Committee area.

C. Source of Labour

Since paddy cultivation draws labour from within as well as outside the farm, the relative importance of these two sources of labour supply is examined in Table 21.

Labour utilisation data presented above clearly indicate the heavy dependence on hired labour for paddy production. In both dry zone areas, where hired labour accounts for two-thirds of the total input it is more crucial. Even in the wet zone, hired labour has accounted for nearly one-half the total requirement. Besides, seasonality considerations, as discussed subsequently, the relatively high input of hired labour in the wet zone mainly stems from the high incidence of part-time paddy operators in the region particularly in Colombo.

Dependence on hired labour for paddy cultivation is further highlighted by the fact that not a single operator in the sample has raised a paddy crop exclusively on family labour.

Table 21. Labour Utilisation for Paddy Cultivation
by Operation and Source¹

(Man-day equivalents per acre)

Operation	Polonnaruwa		Hambantota		Kegalle-Kandy		Colombo	
	Hired Labour	Family Labour	Hired Labour	Family Labour	Hired Labour	Family Labour	Hired Labour	Family Labour
Land Preparation	15.3	10.0	7.3	3.7	17.2	10.2	8.7	6.1
Planting ²	20.6	5.9	11.9	2.5	16.8	13.6	5.0	3.1
Crop care ³	3.8	5.0	1.4	5.4	3.1	6.7	1.0	3.4
Harvesting	14.8	6.3	9.6	2.4	6.9	8.1	3.8	7.0
Threshing)								
Winnowing)	6.3	3.8	5.0	1.5	6.5	8.4	6.0	7.0
and)								
Transport)								
Total	60.8	31.0	35.2	15.5	50.5	47.0	24.5	26.6

¹ Data in respect of family labour also includes exchange labour as well. However, the use of exchange labour is seen only in the two wet zone cases and even here to a very limited degree;

² includes nursery preparation;

³ includes fertilizer and agro-chemical application and other after-care operations.

Most amount of family labour application is observed in Kegalle Kandy with 47 units per acre as against only 15 in Hambantota. The low input of family labour in Hambantota may largely be explained in terms of intensive use of machines for land preparation, threshing and winnowing

(Table 4), and the presence of affluent cultivators owning large extents of land, who rely almost exclusively on hired labour for field work.

The analysis also shows, that hired labour is utilised largely in respect of field preparation, transplanting, harvesting and processing. In Polonnaruwa and Kegalle-Kandy where transplanting is more popular, it accounts for 21 and 17 hired labour units per acre respectively. In the case of harvesting and post harvesting operations, more family labour is used in the wet zone in comparison to the dry zone. Female labour participation in paddy cultivation is restricted almost exclusively to transplanting and weeding except in Hambantota where women are engaged for reaping as well.

D. Family Labour Composition and It's Supply

The minor role of family labour in relation to hired labour commonly observed in paddy cultivation has evinced much interest among researchers. This is particularly so in a peasant setting, where a large supply of family labour is supposed to be available for farming. In this context, the present study attempted to make an assessment of the available family labour, it's composition and the level of its utilisation for paddy cultivation.

The composition of family labour available for paddy farming and it's estimated total supply is indicated in Table 22.

In the dry zone, the supply of family labour available for full-time paddy farm work, in terms of man-equivalents range from 1.9 to 2.4 compared to only 1.1 to 1.5 in the wet zone. The smaller number of full-time male workers for paddy farming in the wet zone study areas is indicative of the limited opportunities for gainful employment in one's own paddy farm. In this regard, the small size of holding in itself is a major constraint in the wet zone.

Table 22 Composition of Family Labour available for Paddy Farming

				Polon- naruwa	Hamban- tota	Kegalle- Kandy	Colombo
a) Full Time Workers ¹	(No. per farm)						
Males ..	..	..	..	2.2	1.7	1.4	1.0
Females	..	..	..	0.4	0.2	0.1	0.1
Children	..	..	..	0.2	0.1	-	0.1
Total man equivalents ²	..	..	..	2.4	0.9	1.5	1.1
b) Part Time Workers	(No. per farm)						
Males	..	..	..	0.1	0.1	0.3	0.5
Females	..	..	..	0.2	0.2	0.2	0.4
Children	..	..	..	-	0.2	-	-
Total man equivalents				0.3	0.4	0.5	0.8
Total potential supply ⁴							
(man equivalents)				2.5	2.0	1.6	1.3

¹ refers to those who devote more than half their time for paddy cultivation.

² a woman-day and child-day is treated as equivalent to 0.8 and 0.5 man-day respectively.

³ includes those devoting less than half of their time for paddy cultivation.

⁴ one part-time worker is treated equivalent to 0.25 of a full-time worker.

The quantity of potential labour supply for paddy farming, inclusive of both full time and part time workers is about two and a half man equivalents in the dry zone and one and a half in the wet zone per farm.

Table 23 Family Labour Utilisation in Relation to its availability in Paddy Cultivation during Maha 1976/77 Season¹

	Family labour available per farm during the season (man day equivalents)	Family labour used per farm	Family labour used as a percentage of it's potential availability %	Labour used per farm during the season (man day equivalents)	Average size of holding
Polonnaruwa	375	111	30	330	3.59
Hambantota	300	55	31	179	3.53
Kegalle-Kandy	240	36	15	74	0.76
Colombo	195	20	10	37	0.73

¹Based on 25 working days per month for a period of six months.

The above data relating to the utilisation of family labour presents a few points of interest. Consideration of the figures given in Columns 1 and 4 indicate that the total available family labour for owned paddy farm work is much in excess of the actual amounts of total labour used per farm during the season. This is particularly striking in the two wet zone districts. Judging purely by these figures, it appears that the family labour supply alone is more than adequate to meet the total labour demands of the paddy farmer. However, the analysis reveals that the actual family labour utilised (Column 2), is only a small fraction of the available supply (Column 1), which is less than a third in all cases considered (Column 3).

Hence on a cumulative basis, this information indicates a substantial under utilisation of available family labour within the paddy farms.

Furthermore, as was observed earlier (see Table 21), the hired labour constitutes at least 50 per cent of the total labour input in paddy farming. In areas such as Polonnaruwa the average wage bill for hired labour is around Rs.2,000 per farm. Hence, the existence of an apparently surplus family labour on the one hand and employment of a large hired labour force on the other within the same farm appears contradictory.

A closer look at the patterns of labour application with reference to timing of field operations, reveals that use of hired labour for paddy cultivation is indispensable even in the small holdings in the wet zone. The agronomic requirements of this crop, coupled with the necessity to fit specific farming operations to the climatic rhythm makes the labour input heavily condensed in short periods within the season. The outcome of such concentration of labour use to specific periods compels the paddy farmer to depend heavily on hired labour. The following analysis of Polonnaruwa data illustrates this point.

As shown in Table 24, distribution of labour application on an operationwise basis, indicates three distinct peak demand periods, namely, land preparation, transplanting and harvesting. The harvesting and post harvest operation which usually is completed within a week had required 112 man day equivalents. Similarly for transplanting, 95 labour units had been utilised within a five day period. On the other hand, the growing season representing a relatively lull period of labour use, had required 31 units for a period of almost three months.

Table 24 Potential Supply of Family Labour in Relation to
Total Labour demand for Paddy Cultivation by
Operations - Polonnaruwa¹
Maha 1976/77

Operation	Average duration (days)	Potential Family Labour available per Farm (man-day equivalents)	Total Labour utilised per farm (man-day equivalents)	Additional Labour requirements per farm
	(1)	(2)	(3)	4 = (3 - 2)
1. Land preparation inc. nursery	30	75	91	+ 16
2. Transplanting	5	13	95	+ 82
3. Crop care during the growing period	100	250	31	-219
4. Harvesting, thresh- ing, winnowing and transport	7	18	112	+ 94
Total	142	356	329	- 27

¹ Average extent of paddy farm is 3.59 acres with a potential supply of 2.5 man-equivalents of family labour.

Of the three peak labour demand periods, the most crucial is the harvesting and processing followed by transplanting and land preparation as evident from Column 4. In order to ensure that the output is not adversely affected by weather, harvesting and processing needs to be completed within a very short period by employing a large stock of hired labour 94 man-equivalents. The demand for hired labour is relatively less intensive during land preparation as this operation is spread out for nearly a month. Yet, this work needs an additional 16 units of hired labour. Therefore, this analysis indicates that the apparent surplus of family labour referred to earlier, is relevant only to the growing period of the crop lasting nearly three months. During this period very little labour is used for weeding, spraying and irrigation.

In conclusion it may be mentioned that for a better appreciation of the role of hired labour in paddy farming, due consideration has to be given more to the seasonal distribution than to total labour criteria. Seasonality in field work such as land preparation, transplanting and harvesting implies a specific pattern of demand for hired labour and in this context the measure of total family labour supply per paddy farm serves little purpose. The economic significance of the labour demand characteristics associated with this crop is further highlighted by the presence of a large seasonal migrant labour force, in the major dry zone paddy areas such as Polonnaruwa and Hambantota. Recognition of such micro-aspects of the labour demand in paddy farming is vital for planning the expansion of production programmes, e.g. adoption of intensive techniques, designing of programmes to synchronise the calendar of field operations on large extents of paddy land etc. In such programmes, the labour resources may act as a major production constraint, particularly under irrigation schemes unless supplemented with appropriate labour saving devices.

III. Draught Power

The significance of draught power input, i.e. tractors and buffaloes as a supplement to human labour was examined on a cost basis in the first chapter. The ensuing discussion relates to a further examination of its use, ownership status, and rates of hire. The pattern of draught power use in the paddy locations is given in Table 25.

Exclusive dependence on human labour for tillage and threshing in paddy cultivation is rare, except in isolated instances in Colombo. The bulk of farm power requirements in the study areas is provided through both tractors and buffaloes. In this respect, Hambantota is unique as 87 per cent of the farmers have relied solely on tractors for draught purposes. Two aspects of interest observed in this area are the complete

Table 25 Pattern of Draught Power Use in
Paddy Cultivation

A r e a	Tractors Only (%)	Buffaloes Only (%)	Tractors and Buffaloes (%)	Human labour Only (%)	All Types (%)
Polonnaruwa	7	1	92	-	100
Hambantota	87	-	13	-	100
Kegalle-Kandy	-	90	10	-	100
Colombo	10	60	17	13	100

absence of buffaloes for threshing and the popularity of two-wheel tractors for land preparation. Polonnaruwa on the other hand, presents a different picture with only 7 per cent of farmers entirely dependent on tractors. In fact, the commonest type of draught power usage found here is a mix of both tractors and buffaloes; animals are used mostly for land preparation and tractors for threshing and winnowing. In Colombo and Kegalle-Kandy, the buffalo constitutes a crucial element in supplying the needed farm power, as around 60-90 per cent of sample farmers had used buffaloes alone for draught purposes. The very limited use of tractors in the wet zone locations is mainly for threshing.

The type of tillage implements used in association with buffaloes and tractors is found to vary in the areas covered. The light iron plough is most common in Polonnaruwa whereas in Kegalle-Kandy the wooden country plough, a much less efficient implement is popular. The tyne tiller is used in most instances with four-wheel tractors, whereas the two-wheeler is used mostly with a rotovator.

Table 26 Disbribution of Farmers Owning Tractors and Buffaloes
(Percentage of the Sample)

Item	Polonnaruwa (%)	Hambantota (%)	Kegalle- Kandy (%)	Colombo (%)
Tractors	9	8	-	2
Buffaloes	60	8	20	6

In the dry zone study areas where mechanical power is popular, around 7-8 per cent of those surveyed owned tractors. A very small proportion of the sample in each location reported as owning buffaloes, except in Polonnaruwa with an average of eight animals per farmer. As buffaloes are needed only for certain specific operations in paddy cultivation, there is a high degree of seasonality in their use. This inevitable low utilisation apparently acts as a disincentive for paddy farmers to rear them particularly when grazing facilities are grossly inadequate.

In the areas covered draught power hire rates also show variation. The modal hire rates of tractors in the two dry zone areas is shown below:

Table 27 Hire Rates for Four-Wheel Tractors by Operation

Operation	Polonnaruwa (Rs. per ac.)	Hambantota (Rs. per ac.)
Land preparation	200	175
Threshing	60	40
Winnowing	40	21

The hire rates for all tractor operations in Polonnaruwa is higher than in Hambantota. The farmers in the dry zone who customarily hire tractors for field work indicated that rates have almost doubled during the last five years.

Higher rates observed in Polonnaruwa is also a reflection of the limited supply of tractors for paddy field work. Even in the case of buffalo hire rates, Polonnaruwa charges are shown to be greater.

Table 28 Hire Rates for Buffaloes by Operation
(Rupees per pair per day)

Operation	Polonnaruwa (Rs)	Kegalle-Kandy (Rs)	Colombo (Rs)
Land preparation	20.00	15.00	15.00
Threshing	-	12.00	12.00

IV. Fertilizer and Agro-Chemicals

With a widespread adoption of new high yielding varieties, fertilizers and agro-chemicals form a vital component in paddy production inputs. In terms of the numbers of farmers using fertilizers, the adoption rate is seen to be high. In all areas more than 80 per cent have used some kind of fertilizer during the season under reference, however, the amount applied per acre shows a considerable variation (Table 29).

Table 29 Fertilizer Application, by Type and Amounts
per acre

Type of Fertilizer	Polonnaruwa (cwt.)	Hambantota (cwt.)	Kegalle-Kandy (cwt.)	Colombo (cwt.)
1. Basal mixture	1.44	0.52	0.96	0.74
2. Urea	2.02	0.94	1.00	0.41
3. Top dressing mixture	0.01	0.44	0.24	0.33
Total	3.47	1.90	2.20	1.48

Level of fertilizer application is highest among Polonnaruwa farmers averaging nearly 3.5 cwt. and it is lowest in Colombo with 1.5 cwt per acre. In Hambantota and Kegalle-Kandy, the rate of application approximates to 2 cwts. per acre. Urea is the most widely used type of fertilizer except in Colombo where pelleted fertilizer is popular. Use of basal mixture is more marked in Polonnaruwa where the pattern of fertilizer use is closer to the official recommendations. It may be of interest to note that almost all farmers included in the study except in Colombo region applied some kind of fertilizer, though in varying quantities.

Application of agro-chemicals particularly for pests and disease control has become increasingly important in the context of present day paddy cultivation. This tendency is more evident in the dry zone than in the wet zone. Furthermore, data from Hambantota indicate the extensive use of weedicides as a standard practice for weed control. The less intensive labour use associated with Hambantota farmers is partly an outcome of their greater dependence on weedicides.

2. MANAGEMENT AND STATE OF TECHNOLOGY

In a detailed study of the nature of resource application, the management input of the operator deserves equal consideration as any other conventional production input. However, the precise identification and assessment of the farmer's management input poses some methodological problems. Nevertheless, this section presents some key indicators of the management level of the paddy farmers and it is hoped that this information would be useful in ascertaining the current state of development of this crop in reference areas.

A. Adoption of New Varieties

The intensity of use of a number of production inputs is rather closely associated with the variety of paddy, and hence, the degree of adoption of new varieties is an important indicator of the shift from traditional paddy culture.

Table 30 Area Planted According to Varieties
- Maha 1976/77
(Percentage of the Total Extent Cultivated)

Variety	Polonnaruwa (%)	Hambantota (%)	Kegalle-Kandy (%)	Colombo (%)
Traditional ¹	3	12	16	69
OHYV ²	4	25	54	5
NHYV ³	93	63	30	26

¹Traditional: indigenous varieties

²OHYV : Old High Yielding Varieties such as H-4

³NHYV : New High Yielding Varieties such as BG 11-11,
BG 34-8 and BG 34-6, etc.

High yielding varieties are extensively cultivated in both dry zone locations and range from 88-97 per cent of the total extent. Polonnaruwa in this regard, is distinct by having the almost entire extent under new improved varieties. The most popular variety here is BG 11-11. This together with BG 90-2 forms the most predominant new varieties in Hambantota. It is interesting to note that, Hambantota in spite of being a major paddy growing district, still retains 25 per cent of the cultivated extent under H-4, introduced twenty years ago.

In Kegalle-Kandy area too, improved varieties have gained wide

acceptance among farmers, covering 84 per cent of the extent of which a major proportion is under OHYVs. Colombo, in this respect presents a distinct contrast with three-quarter of the extent still under traditional varieties.

The predominance of traditional varieties here, can be traced more to the environmental factors prevailing in the area, such as poor soil drainage, heavy and erratic rainfall and occurrences of flash floods.

B. Adoption of Other Improved Cultivation Practices

Table 31 Adoption of Some Important Farm Practices
- Maha 1976/77

	Polonnaruwa	Hambantota	Kegalle- Kandy	Colombo
	(Percentage	of	total	sample
a) Farmers who had used certified seed (%)	40	35	10	7
b) Area transplanted (%)	88	38	93	16
c) Farmers who applied agro-chemicals (%)	79	83	67	62
d) Farmers who applied some kind of fertilizer (%)	95	96	93	62
e) Amount of Nitrogen applied (lbs/ac)	107	66	63	36
f) Average yield (bu.ac)	76	56	48	32

The above information reveals the overall direction of technological progress in each of the study areas. The high adoption rates of fertilizer and agro-chemicals is indicative of the awareness of their usefulness among farmers. However, in the case of fertilizers, the quantities applied per acre and the timing of application vary considerably. This

is partly evident from the amount of Nitrogen applied ranging from 36 to 107 pounds per acre. (see also, Table 29).

Transplanting, which requires large labour applications — around 16-20 labour units per acre — is popular in both Polonnaruwa and Kegalle-Kandy. Ready availability of an assured water supply in both these study areas during Maha seasons seem to favour this situation. Furthermore, the popularity of transplanting in Polonnaruwa may also be explained by the fact that the original settlers in this area had mostly come from Kegalle-Kandy where transplanting is traditional in paddy farming. In this context, it may be mentioned that 90 per cent of the transplanted extent in Polonnaruwa area had been planted in rows which reflects the high management standards of these farmers. This practice introduced from Japan, in 1955, is really a more refined technique of planting that requires larger doses of labour application and is usually associated with higher yields compared to ordinary transplanting. The above data suggest that the management skills of farmers in Polonnaruwa are considerably higher whereas those in Colombo rank the lowest in this regard.

C. Farmers Involvement with Paddy Cultivation

A criterion that provides further insights into the management status of the paddy cultivator is the degree of involvement of the operator with his paddy holding. The results of this investigation is given in Table 32.

It is seen that in all areas except in Colombo, paddy cultivation constitutes the major preoccupation of farmers. In Colombo, half the paddy operators are really part-time farmers whose main interest lie outside their paddy holding. The data also shows that as a source of income, paddy crop provides the principal form of

Table 32 Operator's Involvement in his own Paddy Farm

	Polon- naruwa %	Hamban- tota %	Kegalle- Kandy %	Colombo %
1. Operators reporting paddy cultivation as their full-time occupation	93	89	87	52
2. Operators reporting income from paddy cultivation as a percentage of total income:				
(a) Less than 25 per cent -		8	45	52
(b) 26 - 50 per cent 9		8	21	30
(c) 51 - 75 per cent 17		23	14	12
(d) more than 75 per cent 74		61	20	6

sustenance of farmers in the two dry zone study areas both of which are under major irrigation schemes. Here, over 80 per cent of the respondents derive more than half their total income from this crop. On the other hand, in the two wet zone areas the proportion of those deriving more than half their total income from paddy cultivation is small, and ranges from 18-34 per cent. The relatively loose kind of association observed among the operators in Colombo, with their paddy holdings may therefore largely explain the low levels of management prevalent here. This situation also makes the task of extension services more difficult.

SUMMARY AND IMPLICATIONS FOR POLICY

This analysis is primarily concerned with the production costs and resource characteristics of a sample of paddy farmers representing a cross section of the more important production situations in Sri Lanka. The study data refer to paddy cultivation in Maha 1976/77 season. The districts covered by the sample are Polonnaruwa, and Hambantota representing paddy farming in the dry zone under irrigation. Kegalle, Kandy and Colombo districts in this study present paddy cultivation under rainfed conditions in the wet zone.

1. The operating costs per acre of paddy which include all production costs except the rental value of land are:

Average operating Costs per Acre of Paddy

	Polonnaruwa (Rs)	Hambantota (Rs)	Kegalle- Kandy (Rs)	Colombo (Rs)
Cash costs ¹	1,162	822	682	485
Non-Cash Costs ² ..	387	171	284	264
Total operating costs	1,549	993	966	749

¹ Value of all purchased inputs

² Imputed values of all owned inputs, except land

2. Total production costs per acre inclusive of the imputed rental value for land input are:

Average Production Costs per Acre of Paddy

	Polonnaruwa	Hambantota	Kegalle- Kandy	Colombo
	(Rs)	(Rs)	(Rs)	(Rs)
Operating cost ..	1,549	993	966	749
Imputed rental value of land ..	300	300	250	200
Total production cost	1,849	1,293	1,216	949
Yield per acre (bushels)	76	56	48	32

The major components of cash costs incurred in production are wage payments for hired labour, followed by the cost of draught power and fertilizer. The wage payments constitute about half the operating cash costs. A quarter of the cash costs is spent for draught power and around a fifth on fertilizer purchases. Of the non-cash production inputs, the operator's family labour forms the single most important item in the study areas covered. However, in Polonnaruwa, the buffaloes owned by paddy farmers are also a major non-cash resource used.

3. The operating costs examined in relation to the different field operations indicate that the land preparation alone accounts for nearly 30 per cent and harvesting operations around 25 per cent of the total.
4. The analysis of the levels of physical inputs in the study shows a wide variation in the labour use intensity among the study areas. It is around 95 man day equivalents in both Polonnaruwa and Kegalle-Kandy. In Hambantota and Colombo the labour input is lower, the corresponding value being 51. This difference in labour use is largely attributable to the popularity of transplanting and thoroughness of land preparation in the former cases. The data also highlights the predominance of hired labour even among the wet zone producers. The main reason for heavy dependence on hired labour

stems from the seasonality aspects of production. In cases such as Colombo, the incidence of part time farming also appears to be important in this regard. The use of exchange labour is almost insignificant in all areas.

5. The labour use data in the dry zone areas such as Polonnaruwa indicates the presence of a labour shortage during the peak cultivation periods. Therefore, in organising labour intensive production programmes in the paddy sector in similar areas, this resource is likely to act as a constraint unless supplemented with appropriate labour saving devices.
6. The operating costs of an acre of paddy analysed in terms of ownership in Hambantota and Kegalle-Kandy reveal that production costs of the tenants are higher than those of owners by about 30 per cent. The higher production costs of the tenants mainly arise from the payment of land rent which averages to Rs.330 and Rs.560 per acre, in Hambantota and Kegalle-Kandy respectively. The significantly high land rents in respect of tenants in the latter area is due to the payment of half the crop share. This is much in excess of the rent stipulated under the Paddy Lands Act and this non-compliance is due to a variety of factors which deserve investigation. Furthermore, tenants in both locations appeared to obtain lower yields in relation to owner operators.
7. An examination of the disposal patterns of the paddy output indicates that farmers in Hambantota and Polonnaruwa have considerable marketable surpluses. Here, on an average more than 50 per cent of the produce is disposed in the form of cash sales. In contrast, the maximum quantity sold per farm in the wet zone lands is less than a quarter of the average farm output and over 60 per cent of the produce is retained for home consumption. Investigations relating

to marketing of this surplus indicate that the cooperative channels are more important in Polonnaruwa. In Hambantota, private traders dominate the marketing activities.

8. The almost negligible marketable surplus of paddy per farm observed in the wet zone in contrast to the dry zone situation, bears important welfare implications relating to the operation of the guaranteed price scheme. The average producers in the wet zone would reap only marginal benefits from the existing price support programmes. Furthermore, any increase in the guaranteed price of paddy would result in a differential impact on the cash incomes of the producers in surplus and deficit areas.
9. The farm business income, indicating the returns to farmer's owned resources from paddy cultivation is relatively high in the dry zone, ranging from Rs.5,000 to Rs.4,000 per farm during the Maha season under consideration. The corresponding figures for Kegalle-Kandy and Colombo are around Rs.700.00 to Rs.400.00 respectively.
10. Production costs and profit margins computed per bushel of paddy in relation to the guaranteed price of Rs.33.00 per bushel, prevailing at the time of harvest is as follows:

	Polonnaruwa (Rs)	Hambantota (Rs)	Kegalle-Kandy (Rs)	Colombo (Rs)
Average production costs per bushel	24.39	23.00	25.44	29.75
Average profit margin per bushel in relation to guaranteed price of Rs.33.00 per bushel ..	8.61	10.00	7.56	3.25

11. The cost per bushel among farmers even within a Cultivation Committee is likely to vary widely. Consequently, the possibility exists for some of the high cost producers to reap even negative profits. This may be particularly so, among farmers in Colombo, in view of the low margin of Rs.3.25 realised per bushel.
12. The profit margin determined by the guaranteed price should be able to take care of a number of major issues relating to paddy farming in this country; the presence of a set of farmers whose costs are invariably above the average, the large element of uncertainty in production mainly due to uncertain weather conditions leading to some unforeseen increases in production costs, and finally, the necessity to provide an economic incentive for motivating the producer to fall in line with national priority of attaining self-sufficiency in rice.
13. The study also points out that the projection of profit margins in future production by using direct cost figures in this study and the recently revised guaranteed price of Rs.40.00 need to be attempted with care. This is because the draught power and wage rates in the future are most likely to vary from those presented here.
14. In the four study areas considered, institutional credit is important only in Polonnaruwa and Hambantota. Even here, only 46 and 22 per cent of the respondents had utilised credit from this source. Non-institutional sources play an equal or perhaps more dominant role as creditors to paddy farmers in both these dry zone areas. In Kegalle-Kandy and Colombo districts, borrowing for paddy cultivation from private or institutional sources is almost non-existent in this particular season. It is also seen

that the maximum credit limit from institutional sources could accommodate farmer's actual cash requirements for paddy cultivation to a large extent. In the case of land preparation, transplanting and harvesting operations, the reported costs of the farmers exceed the ceiling of the approved credit scheme. On the other hand, the ceiling of credit granted for weeding, disease and pest control operations appear to be in excess of the reported cash expenses. In the light of these findings some adjustments in restructuring current levels of credit programmes for paddy need consideration.

15. The bulk of farm power required for tillage and threshing in all areas is provided by tractors and buffaloes. However, in Hambantota the tractor is the almost exclusive means of power whereas in Polonnaruwa the buffalo plays a dominant role in land preparation. Investigations reveal a steep rise in draught power hire rates in the recent past. This is particularly so in the case of tractor hire. The prevailing rates of land preparation in the dry zone range from Rs.175-Rs.200 per acre. During the peak cultivation period there appears to be an acute shortage of draught power and the hire rates for 4-wheel tractors had risen above Rs.200 per acre. This shortage is made more acute due to the diversion of the existing fleet of machinery for road haulage as well. Areas such as Polonnaruwa and Hambantota also experience a short supply of labour. Such shortages of farm power if allowed to continue would drastically hinder the efforts of increasing paddy production and this problem in the dry zone needs urgent attention. In view of its importance, farm power problem can be cited as an area requiring a thorough investigation.

16. A consideration of the levels of fertiliser use among study farmers indicates that the average quantities used per acre in Polonnaruwa are outstandingly high in relation to other study areas. The amounts of agro-chemicals used in the dry zone could have been greater but for a serious breakdown in supplies as indicated by farmers.
17. In terms of the overall adoption of improved technological innovations, farmers in Polonnaruwa are distinctly above the others. In both dry zone areas the operators main pre-occupation is found to be paddy cultivation. In Colombo the findings in this regard are to the contrary.