A STUDY OF

FIVE SETTLEMENT SCHEMES PRIOR TO IRRIGATION MODERNIZATION

Vol. II - Mahakanadarawa

AGRARIAN RESEARCH AND TRAINING INSTITUTE
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A STUDY OF FIVE SETTLEMENT SCHEMES PRIOR TO IRRIGATION MODERNIZATION

Volume II - Mahakandarawa Scheme

Research Study No.31

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AGRARIAN RESEARCH & TRAINING INSTITUTE
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FOREWARD

On the recommendation of the World Bank the then Ministry of Irrigation, Power and Highways commissioned the Agrarian Research & Training Institute in May 1976 to undertake an in-depth evaluation of the impact of an Irrigation Modernization Project that covers five major tanks in the North Central dry zone of Sri Lanka. The tanks in question are: Mahawilachchiya, Mahakanadarawa and Padaviya in Anuradhapura district, pavatkulam in the Vavuniya district and Vavunikulam in the Mannar district. The total command area of these tanks consist of 31,500 acres of paddy land. The estimated cost of modernization is US$ 30 million.

The first study under this project was in respect of the Mahawilachchiya tank and it's report was released in February 1979. This second volume refers to a benchmark assessment of Mahakanadarawa Settlement Scheme. Similar reports on other tanks would be published as and when the studies are completed.

This study was conducted by Mr. A.S. Ranatunga and Mr. W.A.T. Abeysekera, Research and Training Officers in Production Economics. In the early stages of the study Mr. N. Vithanadurage and Miss T. Sanmugam, Research and Training Officers of the Institute were also associated with it. The officers responsible for the sociological aspects were Messrs. George Krause and Ishak Lebbe and Mrs. S. Abeyratne.

It is hoped that this study would be found useful by the authorities in their final assessment of the impact of the Tank Irrigation Modernization Project.

Finally I wish to record my appreciation of the assistance given by officers of other departments and of the Institute to make this publication possible.

T.B. Subasinghe
Director

AGRARIAN RESEARCH & TRAINING INSTITUTE
Colombo
25 September 1979

A C K N O W L E D G E M E N T S

The assistance given in the early stages of the study by Mr. N. Vithanadurage, Research and Training Officer (Agricultural Economics) in drafting the questionnaire, field data collection and data transference in office is thankfully acknowledged. The guidance and advice given in sample selection and designing the research strategy by Miss T. Sanmugam, Research and Training Officer, Statistics should also be recorded.

Messrs. Georg Krause and Ishak Lebbe made helpful comments in drafting the sociological aspects of the questionnaire for the interview survey. The analysis and presentation of this data were undertaken by Mrs. S. Abeyratne, Research and Training Officer, Sociology. A number of field investigators were involved in the study. Of them, Messrs. A.M. Gunasena and S.T. Jayatilleke who were involved in field data collection and Mr. S.J. Silva in data tabulation deserve special mention.

Mr. M.J.F.R. Senaratne, Deputy Director, Irrigation, Messrs. J.R.S. Gooneratne, DLO, and B. Jinendradasa, DAEO, Anuradhapura, were helpful in making administrative arrangements for data collection. The Colonization Officers in the scheme Messrs. T. Cruz, T.H. Jayasuriya, L.H. Jayawardena, J.A. Fernando and D.B. Dissanayake were most cooperative in organising the field survey and other data collection processes.

The authors specially thank Mrs. S. Wiratunga, Secretary of this Unit for efficient handling of correspondence as well as for typing the manuscripts.

A.S. Ranatunga
W.A.T. Abeysekera

PRODUCTION ECONOMICS & FARM MANAGEMENT UNIT
Agrarian Research & Training Institute
Colombo

22 May 1979

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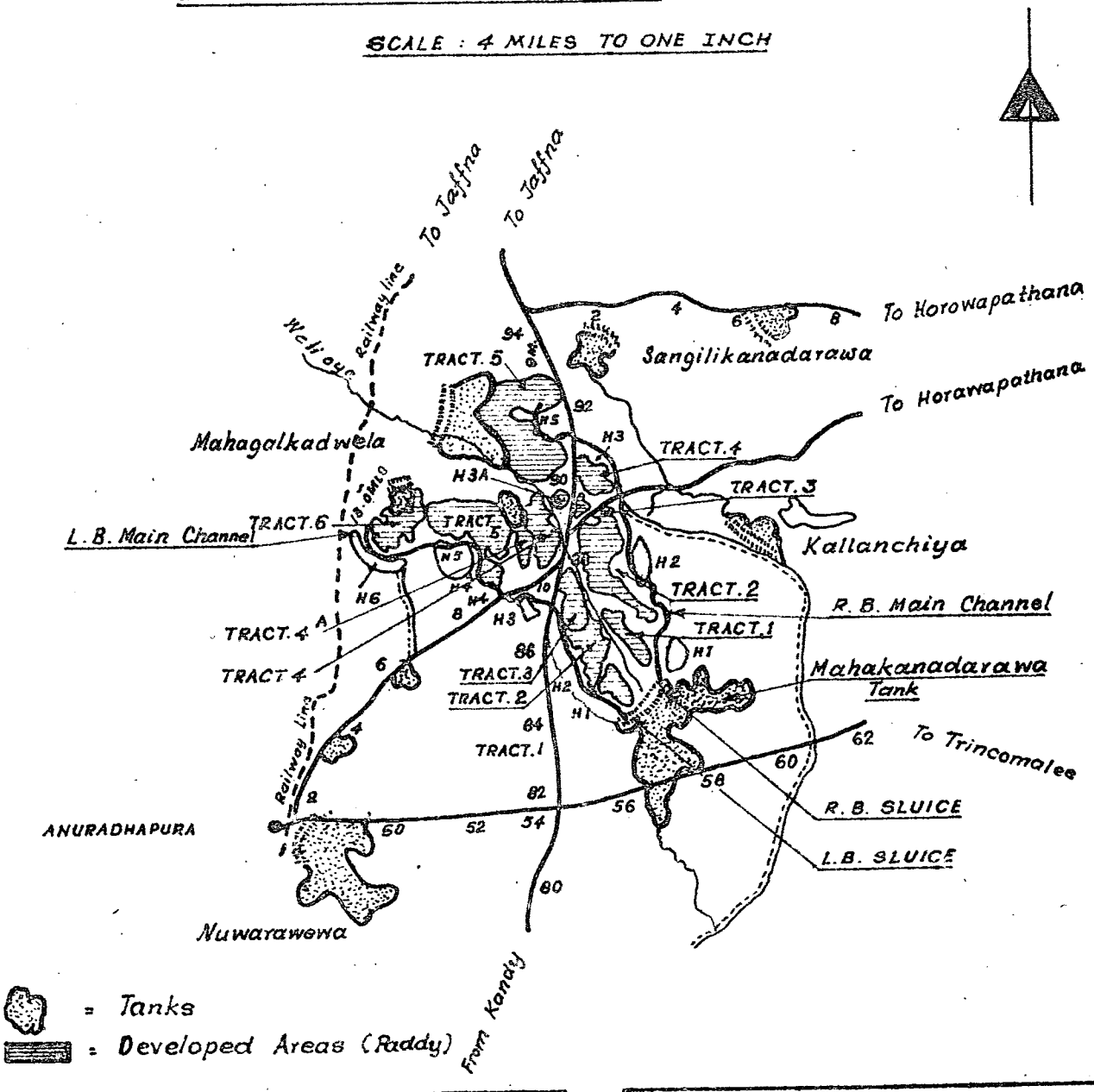
SCALE : 4 MILES TO ONE INCH



IRRIGABLE AREA		
NAME	ACREAGE	LENGTH
R.B MAIN CHANNEL	2944·8 Ac	9.0 MLS.
L.B. MAIN CHANNEL	2872·4 Ac	13.0 MLS

MAHAKANADARAWA SCHEME TANK DATA	
CATCHMENT AREA	126·0 SQ.MLS
CO-ORDINATE	F/5 (0.00X 2.00)
F.S.L	311.0
F.S.D	19.0
CAPACITY GROSS	36260 AC.FT.

A STUDY OF
FIVE SETTLEMENT SCHEMES
PRIOR TO IRRIGATION MODERNIZATION

Volume II - Mahakanadarawa Scheme

I. INTRODUCTION

1.1 THE SETTING

This study forms a part of a long term evaluation programme aimed at assessing the impact of a broader irrigation rehabilitation project concerning five colonization schemes in the dry zone[1]. The research investigation is undertaken by the Agrarian Research and Training Institute, in response to a request from the Ministry of Irrigation and Lands on a recommendation by the World Bank. The latter forms the main funding agency for the development project. According to the research strategy proposed, a detailed assessment of agronomic and socio-economic features of each of the colonization schemes concerned would be made at two points of time. The first, prior to irrigation modernization and the second, after a lapse of an appropriate adjustment period. This volume is concerned with a bench mark assessment of Mahakanadarawa colonization scheme, which forms one of the five settlement schemes under the modernization programme. This scheme is located 8 miles north-east of Anuradhapura. The other four concerned are Mahawilachchiya, Pavatkulam, Vavunikulam and Padaviya.

Mahakanadarawa scheme constitutes a major settlement area in the dry zone covering 6,000 acres of paddy. Of this, 4,000 acres had been developed under Stage I in 1958. The balance 2,000 acres

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[1] For a brief account of the proposed modernization project, see Annex 1. The entire project covers 31,500 acres of arable land benefiting 10,500 farm families. The total project costs are estimated at US $ 30.0 million equivalent.

belong to Stage II of the scheme which is a subsequent extension completed in the late sixties. Mahakanadarawa tank is formed by impounding the waters of *Kanadara Oya*, a tributory of *Malwatu Oya*.

The tank when full has a capacity of 34,000 acre feet with an area of water spread of about 3,500 acres and has a head of water 18 feet. Its catchment area covers 126 sq. mls. and falls within the dry area devoid of any perennial water streams. The channels of the left and the right banks of the reservoir are expected to irrigate 2,900 and 3,100 acres of lowland respectively.

The most critical constraint to agricultural production in this area is seen as the lack of a stable irrigation water supply. Generally, during the dry seasons extending from April - September, the availability of water even for domestic as well as for livestock needs is extremely limited. The specific problems in Mahakanadarawa as given in the proposed modernization project are[1]:

(i) insufficient use of Maha rainfall and wasteful use of stored water in the tanks;

(ii) inequitable irrigation water distribution;

(iii) lack of adequate farm power for timely land preparation;

(iv) poor access roads;

(v) ineffectiveness of the current agricultural extension services.

In the final analysis, the modernization programme envisages an improvement of living standards of the settlers in the schemes concerned by intensifying land use in the lowland allotments. In this regard, the key strategy is centred on rational use of available water resources. The basic features of the modernization programme are:

[1] The detailed objectives of the project as well as its strategy are given in the Appraisal Report of the Tank Irrigation Modernization Report No. 951-CE, World Bank.

(i) physical improvements to the present irrigation conveyance system;

(ii) adoption of better water management practices and the enforcement of rotational issues of irrigation water;

(iii) provision of farm equipment for timely field operations;

(iv) cultivation of field crops other than paddy in the lowlands during Yala;

(v) strengthening the currently existing agricultural extension services.

1.2 STUDY OBJECTIVES

Broadly this investigation is designed to serve as a bench mark for assessing the result of changes in farming and levels of living of Mahakanadarawa farmers as a consequence of project implementation. The terms of reference given in the study proposal were:

(i) to ascertain the current status of the project beneficiaries with reference to such criteria as social amenities, employment structure, labour application, agronomic practices, costs, incomes, credit, marketing and other services;

(ii) to identify available institutional support and infrastructural facilities for farming in the project area;

(iii) to ascertain the major obstacles that may hinder the future expansion of farm production envisaged under the proposed project;

(iv) to examine the existing patterns of settlement, social organisation and community living in the project area.

1.3 SAMPLING

The farm units chosen for this study were based on a stratified random sample with the left and right banks of the project as sampling strata. The total sample size was 275 (12%) farm units of which 136 were in the left bank and 139 in the right bank. Within this, a further sub sample of 85 settlers was used for intensive monitoring of data on farm production. The sub sample contained 45 and 40 households from the left and right banks respectively.

1.4 REFERENCE PERIOD

The analysis given here, relates to a single cropping year covering the period from May 1976 to April 1977. This coincides with the cropping year (comprising of Yala 76 and Maha 76/77 seasons) immediately prior to the proposed modernization attempts. This cropping year can be considered as one of the frequently encountered dry years in Mahakanadarawa.

1.5 DATA COLLECTION METHODOLOGY

The bulk of the information gathered in this study pertains to the data on economic and agronomic aspects of the farm units. Sociological investigations also formed another component of the analytical base.

The principal tools of data collection in this instance mainly involve (a) a single interview questionnaire administered to the entire sample of 320 households at the end of the first season (Yala 76), (b) maintenance of a set of records for regular monitoring of farm data of a sub sample of 85 households. These records were maintained in respect of the second season (Maha 76/77). Due to lack of cultivation during Yala, this season did not lend itself to a record keeping exercise. Secondary information from the Departments such as Irrigation, Land Commissioner and Agriculture were also sought to supplement farm data. The sociological data obtained

through the questionnaire survey were supplemented by field observations made by a trained investigator who was resident in the project for three weeks.

The maintenance of detailed records relating to crop enterprises of each of the farmers chosen formed the most important data source in this analysis. These records were designed to suit the three different types of farming activities engaged in by the settlers on their lowland and highland allotments as well as on chena. The information gathered included the details of all input applications in farming as well as the output realised and the modes of their disposal during the Maha season under reference. The task of visiting the selected farms for this purpose was assigned to two investigators who were resident in the area during this period. The investigators visited the farms assigned regularly on a weekly basis for purposes of data collection. The work of the investigating personnel was closely supervised by the researchers themselves during their fortnightly visits to the area.

The structured questionnaire mentioned above was pre-tested and administered at the end of the Yala 76 season by 12 trained investigators. Their work was closely supervised and checked by the researchers themselves who were also in the field throughout the survey period. The overall farmer response in the questionnaire survey was 97% while in the record keeping exercise, this was slightly lower (84%) mainly due to dropouts.

In order to facilitate more precise measurements of the project impact using the 'with' and 'without' concepts, this investigation at the designing stages envisaged a study of a 'control' area comparable to Mahakanadarawa. In identifying a suitable control area for this purpose, attention was focused on aspects such as catchment characteristics, rainfall behaviour and settlement patterns, etc. Furthermore, it was thought that the 'control' area to be selected should not be exposed to any major developmental changes during the next few years. It was extremely difficult to arrive at a suitable

control area within the above framework. In this regard, consultative opinions of the Irrigation Engineers were also sought, but despite this, a satisfactory solution could not be found and hence this approach was not followed up.

1.6 DATA PROCESSING

Processing of data was undertaken manually during the second half of 1978.

II. FARM FACILITIES, SETTLEMENT FEATURES & LABOUR FORCE

Major physical facilities currently available to the settlers such as housing and other household amenities as well as the key population characteristics such as settlement patterns, employment, and labour force are presented in this chapter.

2.1 ADMINISTRATIVE RESOURCES

At present a non-resident District Land Officer operating from Anuradhapura is primarily responsible for overall administration of Mahakanadarawa colonization scheme. At the field level he is assisted by four resident Colonization Officers together with 3 farm level workers. Their functions are mostly concerned with routine land administration matters. The agricultural extension network in the colony area comprises of a resident Agricultural Instructor and 4 field extension workers (KVSS). Services such as supervision, maintenance, etc., directly relating to irrigation water issues within the scheme form the responsibility of the Irrigation Engineer stationed at Mihintale. The Assistant Government Agent of the area operates from Rambewa, located within the settlement.

2.2 PHYSICAL INFRASTRUCTURE

The main trunk road from Anuradhapura to Jaffna passes through the scheme and as a consequence, the accessibility and transport facilities available to farmers at Mahakanadarawa are better than those found at Mahawilachchiya. However, within the scheme, road conditions are poor but penetrate to the most remote areas of the scheme. As the colony is situated on the main bus route to Anuradhapura, Jaffna, Vavuniya and Mannar, the bus service to Rambewa junction is frequent and convenient. However, travel within the colony is difficult due to lack of public transport. There exists only one bus

that plies four times a day from Anuradhapura to the colony which is utilised by school children and daily commuters. Another bus runs three times daily from Anuradhapura to Rotawewa which is six miles away from Rambewa.

In addition, there are three private hiring cars which charge Rs.50 to Anuradhapura and Mahakanadarawa and back. The principal mode of transport is the bicycle or the cart. Forty per cent of the families interviewed owned at least one bicycle. Carts are also popular and on an average, there are about fifteen of them to every tract. Few tractors are also available which apart from agricultural work are used for transporting agricultural produce.

An outdoor dispensary in the charge of an Assistant Medical Practitioner and an ayurvedic dispensary form the State health institutions available for servicing the settlers. In addition, one private western medical physician is also present. A common disease prevalent in the area is Malaria. Questions on the frequency of Malaria outbreak in the sample households showed that 45% of the respondents had suffered from Malaria during the past few years. Ninety two per cent of the sample respondents reported no incidence of infant deaths, still births or post natal deaths in the family.

Currently there are 9 schools of which 4 are in the left bank and 5 in the right bank. The total enrolment of students in these schools within the colony is 2,491. Of them, 2,362 are in Grade VIII and below.

Postal needs of the scheme are served by 4 sub post offices and the one at Rambewa has telephone facilities. There are no private telephones within the colony. Two branches of the Bank of Ceylon and a Rural Bank are also available here.

Rambewa town which is centrally located within the colony is currently supplied with electricity under the Rural Electrification Programme. None of the households here possesses their private

electricity generators. Gasoline pumping stations are not available within the settlement and retailing of fuel for domestic and other needs is undertaken by two private traders.

Five branch cooperative societies located at Rambewa, Wahamalgollewa, Doramadalawa, Mahawewagonewa and Nabadagaswewa are available within the colony. These cooperatives primarily serve as distributory outlets of consumer goods and serves a minor role in supplying agricultural inputs. In addition, 31 retail shops, a meat stall, 4 bicycle repair shops, 3 hair dressing saloons are also found. The main marketing centres are at Rambewa and Mihintale.

The Mahakanadarawa tank with seven of its smaller feeder tanks form the main source of water to the colonists not only for irrigation but also for domestic use. Eighty per cent of them reported tank or channel as their only source of water for bathing. Availability of drinking water becomes extremely problematic particularly during the long spells of dry weather. Forty one per cent use community wells provided by the State and 23% had their own wells to obtain domestic water supplies, for drinking and cooking.[1]

The total storage capacity of paddy within the scheme amounts to about 4,800 bushels in five small store houses. Two of them with a capacity of 3,000 bushels are located in the left bank. These facilities are grossly inadequate in a season of full cultivation. Fertilizer is stored in one warehouse located in the left bank with a capacity of 5 tons. Due to the low demand for fertilizer, even this storage capacity is presently under utilised. Four privately owned small scale rice mills operate in the area for servicing the domestic needs.

At the time of the survey, 2 two-wheel tractors and 8 four-wheel tractors owned by residents were available within the scheme. These are owned not by colonists, but by traders, most of whom live at Rambewa. Two cars were owned by colony residents.

[1] During droughts drinking water is brought mainly by women in pots from wells often more than a mile away.

2.3 SETTLEMENT PATTERNS

In Mahakanadarawa scheme, besides the land alienated under the colonization scheme, there are also a few *purana*[1] villages sandwiched within the colony. These villages are normally associated with small tanks and are not seen today as clear cohesive social units as they were earlier.

Socially, settlement patterns show distinct variations. Many of the irrigation tracts within the colony were settled with mixed populations with some racial heterogeneity, from various parts of the island (mixed tracts). A part of the remaining tracts were settled with people from the neighbourhood areas where lands had got submerged with the restoration of the tank. They are *'varige'* specific, and often caste specific. Tracts 1, 2 and 3 of the left bank in the colony, for instance, are inhabited by people from one specific *'varige'* in each tract, who exchange labour, money, goods amongst themselves. Since these colonists had not been selected on the criterion of landlessness as in the case of others in the scheme from outside the area, they seem to be economically better off even today in relative terms than the other settlers.

The mixed tracts are mainly inhabited by Sinhalese from other districts. There are 23 Muslim families concentrated in a few tracts on the right bank. The Muslims have embraced many of the Sinhalese customs and are very fluent in the Sinhalese language. Social interaction between the Sinhalese and the Muslims was evidenced especially during peak cultivation periods when they exchange labour. Office bearers from both Sinhala and Muslim communities were also found within the same rural institution in the area. Many of the Muslim settlers are engaged in commercial activities and they tend to adopt a relatively more conspicuous life style in the areas.

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[1] Old, ancestral villages that were in existence in the areas.

[2] *Varige* is an endogamous group based on equal caste and familiarity.

Caste is an important feature of stratification especially in the tracts settled with allottees from the neighbourhood. Settlement patterns for instance, showed certain areas made up entirely of a particular caste. The *Govigama* caste is in preponderance, within which one witnesses elitist groups stratified through *varige* and economic standing. Further, marked social cleavages were found to exist between the *Govigama* and other castes, which allowed the former to maintain their social distance from the latter. The contacts between the *Govigama* and other castes are limited to instances such as hiring them for work and to perform certain services for ritual occasions and not *vice versa*. However, occasions involving the entire community like *'shramadana'* activities and some religious ceremonies witness some intercaste interaction.

Since settlers in this scheme took residence about 20 years ago, a fair proportion of the present population belongs to the second generation. Seventy two per cent of the heads of households were originally from Anuradhapura district. Settlers from upcountry were from Kandy (8%) and Kurunegala (5%). The remaining 15% were mainly from the low country wet zone areas. It was observed that the 'upcountry category' appears to hold a superior status in relation to the low country colonists. This is displayed for instance in the case of the temple at Rambewa junction, which is frequented by the low country colonists and is therefore eschewed by the upcountry category.

2.4 POPULATION CHARACTERISTICS

The total population within the colony is currently estimated to be around 13,000. The survey information revealed a considerable abandonment of allotments by the original allottees in tracts at the tail end of the project. (see annex 7) It may also be noted that tract 3A and 5 of right bank had never received irrigation water up till the time of survey. The main reason for the abandonment of these allotments is the lack of irrigation water to sustain regular cultivation.

tracts migrate temporarily to their original villages during adverse periods.

The average composition of the population in Mahakanadarawa scheme classified according to age and sex is given in Table 2.1. Two fifths of the population is below 14 years of age and a further one fifth is between the ages of 14 and 20 years. This shows a distinctly prominent young population. Individuals of more than 30 years of age constitute only 24% of the project population[1].

Table 2.1 Percentage Composition of Population According to Age & Sex

Age Group (Yrs)	Male (%)	Female (%)	Total (%)
0 - 13	39	43	40
14 - 20	20	20	20
21 - 25	9	9	9
26 - 30	7	7	7
31 - 40	8	10	9
41 - 50	8	7	8
51 - 65	6	3	5
Over 65	3	1	2
Total	100	100	100

The size distribution of farm families given in Table 2.2 shows that nearly half the households comprised of 5 - 8 members and incidence of smaller families is less frequent. The youthful nature and the larger size of the farm family is indicative of the magnitude of the problems that need attention in future development programmes of the project.

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[1] Persons of 30 years and above account for 26% of the population in the rural sector in Anuradhapura district - Census of Population 1971, Department of Census and Statistics.

Table 2.2 Size Distribution of Households

Family Size (No.)	Households (%)
2 and less	6
3 - 4	16
5 - 6	31
7 - 8	24
9 - 10	16
11 - 12	6
13 - 14	1
All	100

Farm operators in Mahakanadarawa scheme were next examined on the basis of their educational achievements which are summarised below.

Table 2.3 Farm Operators Classified According to Educational Achievements

	(%)
No schooling	22
Upto Grade 5	55
Upto Grade 10	21
Passed OL	2
All operators	100

Nearly a fifth of the operators had no formal schooling. Half the operators had school education upto Grade 5, but 21% had studied upto Grade 10. However, except in a rare instance, all operators had the ability of both reading and writing. Attitudes towards education and especially for higher education by the respondents were also assessed. Since education is free in Sri Lanka, it is believed that one of the determinants of education, besides aptitude, is the parental attitude towards educating their young ones.

Fifty five per cent of the respondents were keen on educating their sons at least to General Certificate of Education (Ordinary Level) and 18% were specifically in favour of university education. As regards educating their daughters, 82% of the respondents wanted them to complete at least secondary education and 20% desired a university education. The desire for a higher education apparently stems from an expectation to secure regular employment as 70% of those interviewed in fact were in favour of their sons being employed outside agriculture and particularly in white collar jobs. In the case of female children, only a fourth of the parents expressed a specific desire for employment outside their homes.

2.5 EMPLOYMENT & LABOUR FORCE

As may be expected, the most important means of gainful employment in this area is within agriculture. Eighty two per cent of the male labour force had reported this as their primary occupation and 43% of the female labour depended mainly on cultivation of their own farms (Table 2.4). Eight per cent of the male labour are exclusively engaged in hiring out their labour both within and outside the colony. Activities such as trading accounted for only a handful of the project labour. Four per cent of the labour had stated specifically that they are unemployed and actively seeking employment elsewhere. However, in view of the marked seasonality of agricultural activities here, a substantial amount of underemployment is also bound to exist.

Table 2.4 Sexwise Breakdown of Available Labour Force According to Primary Activity

Type of Primary Employment	Male (%)	Female (%)	All (%)
Self employed in agriculture	82	43	66
Hired labour in agriculture	5	-	3
Hired labour outside agriculture	3	-	2
Household work	-	55	23
Traders	1	-	-
State services	4	-	2
Unemployed (excluding housewives)	5	2	4
All	100	100	100

The data shows that 13% of the male labour force are primarily involved in non farm activities, mainly as hired labour.

The labour data collected also involves the type of secondary employment of the labour force.

Table 2.5 Sexwise Breakdown of Available Labour Force According to Secondary Employment

Type of Secondary Employment	Male (%)	Female (%)	All (%)
Self employed in agriculture	30	75	48
Hired labour in agriculture	41	7	28
Hired labour outside agriculture	19	-	12
Household work	-	17	7
Traders	5	-	3
Others	5	1	2
All	100	100	100

Hiring out of labour is the principal means of secondary occupation for most (60%) of the adult males in Mahakanadarawa. This form of employment is undertaken in the neighbourhood villages mostly during Yala season when other avenues of employment are lacking within the colony. Among females, three fourths had worked in their own farms as secondary occupation.

2.6 FAMILY LABOUR COMPOSITION

The family size in Mahakanadarawa averages to about 6.5, the composition of working adults in agricultural activities is as follows:

		Males	Females	All
Adults engaged in their own farm work (full time)	(No.)	1.5	0.5	2.0
	(%)[a]	23	8	31
Adults engaged in farm work (part time)[b]	(No.)	0.3	0.6	0.9
	(%)[a]	4	9	13

a. as a percentage of average family size of 6.5

b. those devoting less than half their time.

2.7 HOUSING & RELATED AMENITIES

Unlike most other settlement schemes, permanent houses for many of the colonists in Mahakanadarawa were not provided by the government at the time of land alienation. However, in such instances, financial assistance for house construction had been provided. Consequently, a majority of colonists in Mahakanadarawa had built their own dwellings by themselves. This is particularly seen in tracts 5 and 6. In the left bank, it was reported that 13% had houses made of brick and cement, while 29% had homes with tiled roofs. The corresponding situation in the right bank was seen to be 11% and 19% respectively. Unavailability of any toilet facilities for 34% households surveyed is a notable feature. This situation is a reflection of the degree of dependence of colonists on government for providing basic amenities. Six per cent of the households in the left bank had water sealed latrines, while in the right bank this was rare (2%).

The survey showed that 37% of the left and 24% of the right bank are living in standard colony houses provided by the State. They conform to a common plan with two rooms and a verandah, a tiled roof, permanent walls and cemented floor. A majority of them are badly neglected and in a dilapidated condition. Only in a handful of houses were some definite improvements witnessed. Apart from the basic household furniture, only a very narrow range of utilities constituted the material wealth of the sample households. Among the important utility items in possession of the farmers were wall clocks (12%), pressure lanterns (27%), sewing machines (18%), radios (27%), bicycles (40%) and carts (12%). In general, those households at the tail end of the project in tracts 4A, 5 and 6 were notable for their lower levels of living conditions.

Farmers hardly own any agricultural appliances. A sprayer was owned by one in fifty farmers and a water pump by one in one hundred and fifty. Equipment such as paddy seeders, rotary weeders and dusters were not found in any of the sample households. Animal drawn wooden ploughs were owned by 24% and iron ploughs by 3% of the

colonists. Based on this data, it is seen that farming in Mahakanadarawa is currently not associated with capital assets but centred on family labour.

2.6 LIVESTOCK ASSETS

Of a total sample of 275 households, 11% reported rearing buffaloes averaging to 10 animals per herd reporting. Neat cattle rearing is more common (28%) with an average of 9 animals per farm reporting. Other types of livestock rearing is not undertaken on a significant scale, except for limited poultry rearing for domestic use in some Muslim households.

III. FARM COMPOSITION, LAND USE & IRRIGATION

This chapter primarily focuses attention on the composition of farm holding, type of land use and intensity. In the latter half of the chapter, its interest is directed on the existing irrigation status and farmer attitude towards the contemplated changes in irrigation water issues.

3.1 PATTERN OF LAND ALIENATION

The total extent of irrigable land under Mahakanadarawa colonization scheme approximates to 6,000 acres of which 2,850 are in the left bank and 3,150 in the right bank. The scheme has been developed in 2 stages; Stage I commenced in 1958 is designed to irrigate 4,020 acres consisting of 1,500 acres under the right bank and 2,520 acres in the left bank. The area falling under Stage II approximates to 2,000 acres and forms a subsequent extension of the scheme undertaken in the late sixties covers tracts 3A, 5 and 6. Around this time, lift irrigation facilities too were provided by the State. This programme included about 171 acres of highland allotments on the main channel under tracts 1 and 2 for cultivation of subsidiary food crops. For this purpose, pumps were installed on the main channel and the necessary channel systems on highland had been laid at State expense. However, this programme remains abandoned at present.

Table 3.1 Tractwise Distribution of Lowland Allotments

Tract No.	Lowland acreage under Left Bank		Tract No.	Lowland acreage under Right Bank	
	Allotted	Others[1]		Allotted	Others[1]
1	267	-	1	435	20
2	402	-	2	492	261
3	423	10	3	111	-
4	363	120	4	141	34
3A	266	-	4A	356	75
5	552	120	5	960	260
6	250	100			
	2,553	350		2,495	650

[1] Pockets of village paddy lands served by a number of small tanks within the scheme.

3.2 OPERATIONAL HOLDING

The basic farm unit allotted per settler in this scheme typically consists of 3 acres of lowland and 2 acres of highland. However, in tracts 3A and 5, the unit of land holding is smaller, consisting of 2 acres of lowland and 1 acre of highland.

Table 3.2 Composition of Operational Land Holding per Farm - Maha 76/77

Ownership Status	Lowland (Acres)	Highland (Acres)	Chena (Acres)
Allotted land	2.7	1.5	-
'Purana' land[1]	.5	.2	-
Encroachments	.1	.3	1.8
Total	3.3	2.0	1.8

[1]Lands in the traditional villages adjoining this settlement scheme.

In addition to their allotments, the farmers here operate lands in the nearby *'purana'* villages as well as encroachments within as well as outside the colony. As a result, the total extent operated per farm during the Maha under reference averages to 7.6 acres. Of this, 1.8 acres are in chena. In comparison to Mahawilachchiya, the incidence of chena cultivation here is less. Around 60% of the farmers had chena cultivation during the season under reference. A lesser frequency of chena cultivation in this instance is primarily due to the shortage of suitable forest lands in the vicinity of the scheme. The average extent of chena per farm reporting in Maha is found to be 3 acres. In Yala season, chena cultivation is still less - 40% of farmers. The extent of individual chena per farm reporting in Maha varies considerably in size and ranges from 0.5 to 9 acres as seen in Table 3.3. Of the chenas cultivated, one third is less than 2 acres and another one fourth ranges from 2 to 3 acres in extent.

Table 3.3 Size Distribution of Chena Operated - Maha 76/77

Size (Acres)	Farmers reporting (%)
0 - 0.9	16
1.0 - 1.9	16
2.0 - 2.9	24
3.0 - 3.9	10
4.0 - 4.9	20
5.0 - 8.9	14
	100

In many cases, chena is located fairly far from the farmstead. One in every four of the chenas considered was at a distance of more than 4 miles away from the farm house (Table 3.4). Consequently, such locational aspects have an important bearing on the use of labour for chena work since substantial demands would be made on labour for travelling to and from chena. Whenever chenas were located far away, it was observed that a substantial portion of the family labour is detained continuously in the chenas to attend to work there

Table 3.4 Distance to Chena from Farm House

Distance (Miles)	Farmers reporting (%)
/ 1.0	33
1.0 - 1.9	25
2.0 - 3.9	18
4.0 - 5.9	16
6 and over	8
	100

In the case of lowland cultivation, it is seen that 30% of farmers operate extents larger than three acres. This includes paddy

lands in the adjoining *'purana'* villages as well as encroached irrigable lands. Nearly half the farmers here operate paddy lands of less than 2 acres in extent.

Table 3.5 Size Distribution of Lowland Operational Holding* - Maha 76/77

Extent cultivated per farm (Acres)	Farmers reporting (%)
0 - 0.9	3
1.0 - 1.9	42
2.0 - 2.9	25
3.0 - 3.9	14
4.0 - 7.9	16
All sizes	100

*Inclusive of *'purana'* lands.

The extent of unirrigable highlands operated per farm in Mahakanadarawa averages to 2.0 acres as seen earlier. However, the extent cultivated on this land is only a fraction of the physical acreage. Nearly half the farm population had cultivated less than one acre of highland per farm (Table 3.6)

Table 3.6 Size Distribution of Cultivated Extents per Farm in Highland Allotments - Maha 76/77

Extent cultivated per farm (Acres)	Farmers reporting (%)
0 - 0.4	18
0.5 - 0.9	35
1.0 - 1.4	22
1.5 - 1.9	12
2.0 - 2.4	10
2.5 and above	3
All sizes	100

3.3 SYSTEMS OF CULTIVATION

Despite the provision of a developed highland allotment along with an irrigable lowland for regular cultivation, the degree of dependence by the farmers on their allotted land varies to a marked degree (Table 3.7). It is of interest to note that only 25% of the allottees had depended exclusively on the cultivation of both highland and lowland allotments in Maha.

Table 3.7 Classification of Farms According to Systems of Cultivation by Season

Type of Cultivation	Yala season		Maha season	
	Farmers reporting (%)	Average extent per farm reporting (Acres)	Farmers reporting (%)	Average extent per farm reporting (Acres)
No cultivation	30	-	-	-
Only lowland	-	-	-	-
Only highland	29	1.3	1	0.9
Only chena	18	2.4	1	3.8
Lowland+highland	-	-	25	3.2
Lowland+chena	-	-	16	7.1
Highland+chena	23	4.06	6	4.0
Lowland+chena+highland	-	-	51	6.7
All farms	100	1.7	100	4.7

In contrast to Yala, farming patterns in the area during Maha season show a marked shift in emphasis towards cultivation of paddy land. However, the above data indicates that more of the farmers rely solely on paddy in the two seasons concerned. In Yala, paddy cultivation is entirely absent. This data shows that in Maha, paddy cultivation is central to all farming activities. Paddy is often supplemented by cultivation of chenas and highland allotments to varying degrees. The most common form of cultivation practiced by farmers in Maha as seen in 51% of the cases is a combination of cultivation of all three types of land.

3.4 LAND USE

The intensity of cultivation on highland allotments appears to be low. The extent cultivated is only a half of the land available.

Total extent of highland holding per farm	2.0 acres
Extent under crops in Yala	1.1 acres
Extent under crops in Maha	1.0 acre

A major portion of this land is found to be occupied by a variety of common tree crops haphazardly grown as home garden crops. These include perennials such as mango, *murunga*, jak, lime and coconut. On these unirrigable highland allotments, there appears to be a conscious attempt by settlers to grow permanent crops such as coconut rather than cultivating seasonal crops. *Murunga* and mango on the other hand fit well to the dry climatic conditions, devoid of any attention. In addition these two crops serve as an important means of cash income during the dry season.

Cultivation of seasonal crops on highland allotments at present is not practiced on a wide scale. Those grown are mainly non-cash crops such as manioc and *kurakkan*. Important cash crops like chillies and tobacco are not commonly grown and one of the main reasons given by farmers for this is the lack of depandable water supplies. The types of annual crops grown here were:

Crop	Extent as a % of the total area cultivated
Manioc	18
Kurakkan	16
Maize	15
Cowpea	14
Chillies	13
Black gram	8
Other crops[1]	16
	100

[1]Includes small extents of tobacco, green gram, groundnut and vegetables, etc.

Currently, the lowland allotments are cultivated exclusively with paddy during Maha. As common to this area, lowland cultivation during Yala was absent during the reference year, due to lack of water.

Period	Cropping Intensity (%)
Yala 76	0
Maha 76/77	45
Annual	45

The low cropping intensity of 45% in Maha was due to lack of irrigation water experienced during this season. In fact, due to shortage of water, paddy cultivation was confined to a number of paddy tracts near the main sluice. According to information obtained, even the attainment of a cropping intensity of 100% in a Maha season becomes a reality once in a few years. This is related mainly to rainfall patterns in the season.

Chena land use is mainly centred around the cultivation of a number of seasonal crops such as *kurakkan*, chillie, cowpea, maize and vegetables. Extentwise, other chena crops of minor importance are tobacco, green gram, upland paddy, black gram and mustard. *Kurakkan* occupied a predominant place in the chena cropping system with 60% of the cultivated extent. Maize cultivation covered about 10% and chillie around 15% of chena lands. The distinct emphasis on *kurakkan* which is a traditional substitute for rice seems largely due to the uncertainty centering around paddy cultivation in Mahakanadarawa. Besides, it is well adapted to the chena system of cultivation and needs very low levels of labour and other inputs.

3.5 IRRIGATION & LOWLAND ALLOTMENT

Paddy cultivation within this scheme is confined almost exclusively to Maha season. The success of the paddy crop even in this season depends on the availability of tank water in the latter part of Maha. The two years immediately preceding the survey were notable

for crop failures towards the tail end of the season due to lack of irrigation.

Water problems became aggravated as a result of non-compliance by the farmer with cultivation calendars decided at cultivation meetings due to a variety of reasons. Staggered sowing is a common phenomenon observed here. The late sown crop often runs into irrigation water difficulties and crop failures. The past performance of paddy cultivation in Mahakanadarawa can be gauged from Table 3.8.

Table 3.8 Status of Paddy Cultivation in Mahakanadarawa (71 - 76)

			Maha Season			
	70/71	71/72	72/73	73/74	74/75	75/76
Percentage of colony farmers who attempted paddy cultivation	71	67	34	18	20	25
Percentage of farmers who cultivated and reported crop losses	48	51	70	95	80	75
			Yala Season			
	71	72	73	74	75	76
Percentage of colony farmers who attempted paddy cultivation	20	7	6	-	-	-
Percentage of farmers who cultivated and reported crop losses	40	35	1	-	-	-

According to the above data, cultivation of lowland holdings in this colonization scheme even in Maha seasons is less than satisfactory. This situation is a direct outcome of lack of assured water supplies. The past five years had generally been low rainfall years for the dry zone as a whole, which explains the declining trend of cultivation seen above.

During the Maha season under reference, as is customary in times of drought, all farmers in the colony cultivated paddy under the *"bethma"* system. This system permits all allottees to concentrate

cultivation on a contiguous block of paddy land closer to the tank purely for water conservation purposes. The availability of a reasonable amount of irrigation water in the tank is no doubt a pre-condition for adopting this system. Under this arrangement, all allottees in the scheme were provided with irrigation water to cultivate about 1 - 1.5 acres of paddy each in tracts 1, 2 and 3. Consequently the paddy lands outside the above tracts remained fallow during the Maha season under reference.

Even in seasons of full tank storage, lowland allotments at the tail end of the scheme experience problems of irrigation. Nearly a third of such problem cases reported an insufficient flow of water in their distribution channels due to defective gradients at certain parts in the channel as well as the poor state of the channel bunds. Tracts 5 and 6 of the left bank and tracts 3A and 5 of the right bank are notable in this regard. The latter two tracts with about 600 allotments had been opened up in 1968 as a subsequent extension of the scheme and had so far not been provided with irrigation. A majority of the original allottees in these tracts had vacated their allotments years ago and such abandoned allotments had been occupied by others afterwards. In the left bank, of the 174 allotments in tract 5, only 94 are occupied by authorised allottees. Similarly in tract 6 of this bank, out of 135 allotments only 39 had been regularised. In both these cases, most of the lowland allotments are covered with shrubs due to non-cultivation for years.

On the basis of the re-charging pattern of the tank during the last 10 - 15 years, many respondents had expressed some doubts as to whether paddy lands at the tail end could obtain satisfactory supplies of irrigation water for paddy cultivation even if the channel system is improved. According to their impressions, the tank gets filled up to its spill level only in a rare year.

Enquiries on current problems other than those associated with irrigation of lowland holdings showed that about 8% of the farmers reported poor drainage and other soil problems. Another 3% had reported unsuitable location of their paddy lands arising from rocky and gravelly soils.

3.6 FARMER ATTITUDES TOWARDS PROPOSED IRRIGATION CHANGES

One of the principal changes envisaged in the modernization project involve a more rational use of irrigation water for cultivating paddy land through rotational issues in Maha. Another is to expand the cultivation of other field crops in well drained paddy fields.

On the question of rotational issues of water for paddy, a majority of farmers seem to hold the view that such a procedure is likely to have limited success. Almost all such farmers were located in the tail end of the channel system.

Table 3.9 Farmer Responses to Proposed Rotational Issues of Irrigation Water

Growth Stage	Yes (%)	No (%)
Land preparation	15	85
Seedling stage	22	78
Tillering stage	48	52
Heenbandi[1] and flowering stage	20	80

[1]Refers to flower initiation stage.

Perhaps this kind of reaction would have been conditioned by the acute shortages of irrigation water experienced in the recent past, reinforced by the absence of an efficient conveyance system. Besides, a substantial proportion of paddy allotments in Stage II appears to be well drained soils[1] which are more suited for upland crops than for

[1]Classification of soil types is given in Annex 2.

paddy. Paddy could be grown here but its consumption of irrigation water is bound to be high and in such instances, a programme for rotational issue of water is likely to be less effective. Furthermore, paddy farmers are traditionally accustomed to innundate their fields as a weed control measure and this may also provide a partial explanation for their unfavourable attitude to this programme. Colony officials were in favour of adopting a scheme of rotational issues for paddy in Maha. However, they stressed that a rigid enforcement of farmer discipline in water management is vital for its success. Given a system of rotational issues of water, the most appropriate irrigation intervals for paddy in a Maha season as desired by farmers are:

Table 3.10 Irrigation Intervals Desired by Paddy Farmers

Growth Stage	Percentage of farmers desiring		No response
	2-3 day intervals	4-6 day intervals	
Land preparation	10	5	85
Seedling stage	13	9	78
Tillering stage	37	11	52
Heenbandi[1] and flowering stage	17	3	80

[1]Refers to pannicle initiation stage.

Farmer responses given towards the proposed programme of introducing other field crops to paddy fields during Yala, indicates a strong preference for paddy whenever water is available. Given sufficient irrigation facilities, only 14% of the farmers indicated their willingness to cultivate other field crops in paddy fields in Yala. The main reason for this bias towards paddy are:

Main Reason	Farmers reporting (%)
requires paddy for home consumption	63
less cash expenses for cultivation	10
less labour required	8
poor drainage	7
no experience with other field crops in paddy fields	5
higher profit margins from paddy	2
others	5
	100

It is obvious that rice being the staple food, its production assumes the primary goal of settlers wherever conditions permit. Perhaps a reluctance of these farmers to experiment with new cropping systems in place of their traditional food crop may also offer partial explanation. Other constraints cited by farmers hindering the expansion of subsidiary food crops in paddy fields in Yala included soil problems, higher cash expenses,,lack of technical guidance and difficulties of obtaining seed material.

Investigations on the possible types of subsidiary food crops reported by farmers to be grown in their paddy fields during Yala showed the following:

Crop	Farmers reporting[1] (%)
Cowpea	92
Green gram	60
Chillies	52
Ground nut	16
Onions	16
Black gram	8
Maize	6
Vegetables	6
Tobacco	3

[1]Includes multiple responses

Cowpea, green gram and chillie had assumed the highest priority in the list of crop mix suggested by farmers. These cash crops are already well established in the rainfed dry zone and the farmers are sufficiently familiar with their cultivation on chena lands. Maize and sorghum are at the bottom end of the spectrum as seen by the farmers. The main reasons for the very low farmer preference for these two crops were their unremunerative prices and lack of marketing facilities.

The foregoing discussion pinpoints that a successful implementation of a programme for introducing non paddy crops to irrigable lowlands in Yala rests on a number of key issues. The provision of an adequate and dependable irrigation water supply during Yala would only be one among them.

IV. FARM PRACTICES, CROPPING PATTERNS & OUTPUT

Paddy receives priority in the farming system in the colony and hence this chapter concentrates on farm practices relating to this crop.

4.1 FARM POWER USE

Utilisation of draught power services for tillage and other farm operations is confined only to the cultivation of paddy. Cultivation of highland allotments as practised at present utilises only manual labour. The commonest forms of farm power used here for paddy land preparation and threshing are four-wheel tractors and buffaloes. Neither of these tasks had been undertaken solely by manual labour in any of the colony farms. Tractors with tyne tiller attachments are generally deployed for first ploughing and in this connection animal power plays a minor role. Second ploughing is undertaken by both buffaloes and tractors, the former being more common.

Farmers who hired tractors for their work reported that the normal tractor hire rates for both ploughings were around Rs.150 per acre at the time of the survey. Threshing charges per acre of paddy using tractors were estimated to be around Rs.40. In the case of buffaloes, the prevailing charges were in the region of Rs.15 per pair of animals. Normally, at least 3 pairs of animals are required for a single ploughing of an acre of land in a day. If buffaloes as well as the men needed for driving them were hired, the estimated total cost of ploughing an acre of land in this area amounts to about Rs.150 for both operations. However, in practice, farmers using buffaloes are unlikely to incur this level of costs since personnel needed for driving the animals are often provided from within the farm family.

Preparatory tillage operations in paddy holdings were seen to commence only after the outbreak of the monsoon rains when the tank

is full to a satisfactory level. As would be shown later, a time lag of a few weeks is seen to occur between the first Maha rains and the commencement of field preparation. This allows the land preparation to be undertaken when the soil is soft and moist. Paddy land preparation in dry conditions prior to rains is not seen. A continuous dry period of 3 - 4 months prior to Maha rains coupled with physical characteristics of the soil barely permits the breaking of the 'rock hard' soil with animal power or with mammoties. Tilling of soil in dry conditions normally practised under the system of *'kekulan'* (dry sowing) was not observed. Uncertainty of rainfall as well as problems of draught power supply were cited by farmers as major impediments for practicing dry sowing. The weak financial situation of the settlers particularly at the end of a lean Yala season would not allow them to gamble with their meagre resources on dry sowing of paddy.

On the question of farmer preference for draught power, it was observed that 2-wheel tractors are at the lowest end of the preference scale - farmers seem to be hardly convinced of the capability of these machines to perform the varied tasks involved in their farming. The work here includes not only tilling soil and threshing of paddy, but also involves relatively long distance haulage of farm produce on poor roads. However, as between buffaloes and 4-wheel tractors, no particular preference for either of these was seen (Table 4.1).

Table 4.1 Type of Farm Power Preferred by Operators

Type	Preference inidcated for	
	Land preparation (%)	Threshing (%)
Buffaloes	50	47
4-wheel tractors	47	51
2-wheel tractors	3	2
	100	100

The most important determinant of the preference for 4-wheel tractors among colony farmers is the speediness of operations. Farmers in this regard had indicated that preparation of land by tractors are in many instances less than satisfactory in comparison to those ploughed by buffaloes. Specific references had been made to the problem of coarse seed bed and difficulties in burial of weeds. Some of these problems relating to tractor ploughed land arises due to the fact that a majority of farmers here depend on hired tractors where the payment is governed by acreage rather than on a time basis. Here, the implement used is the tyne tiller which does not really bury weeds, unlike a conventional plough. This implement only scratches the soil and thus permits faster outturn of work of poor quality.

Table 4.2 Reasons for Preferring Tractors

	Farmers reporting (%)
Timeliness	68
Buffaloes were not available	19
Soil too hard to plough	7
Others	6
	100

The preference for buffaloes among Mahakanadarawa farmers mainly stems from quality considerations and on grounds of economy. In cases where buffalo ploughing is done, often the farm family members also participate which allows them to do the work to their satisfaction. This is not the case when tractors are hired.

Table 4.3 Reasons for Preferring Buffaloes

	Farmers reporting (%)
Better quality of work	68
Cheaper than other forms of draught power	21
Own buffaloes	5
Tractors not available at the required time	2
Others	4
	100

4.2 VARIETAL ADOPTION

Ninety five per cent of the paddy cultivators during the Maha under reference had adopted improved paddy varieties. Nearly three fourths of them had grown new high yielding varieties - almost all comprising of BG 34-8. The five per cent who cultivated traditional rice varieties were found to be concentrated at the lower end of the scheme. The entire requirement of farmers seed paddy in the scheme during this season had been issued by the Department of Agriculture under the Agricultural Credit Scheme.

4.3 PLANTING METHODS

Broadcast sowing of germinated paddy under wetland conditions was reported in 96% of the cultivated extent. The practice of transplanting is extremely rare or non-existent. Dry sowing of seed *(kekulan)* was not practised in lowland allotments during this season. However, in chenas and on highlands dry sowing of seeds is a common practice for crops such as upland paddy, *kurakkan*, gingelly and mustard, etc. Here, ungerminated seeds are broadcast sown and covered with soil before the initiation of rains.

In the case of paddy, farmer preferences for different methods of planting are as follows:

Table 4.4 Method of Planting Preferred

		Farmers reporting (%)
Mud sowing		57
Transplanting	(a) Ordinary	35
	(b) In rows	3
Dry sowing		5
		100

It is striking to note that although colony farmers themselves do not adopt transplanting, a substantial proportion of them prefer this method to broadcast sowing. In fact many farmers were aware of the higher yield potential as well as the ease of weed control associated with transplanting. The most critical factor hindering the spread of this practice is seen to be the uncertainty of water supplies. Apart from other considerations, transplanting requires a substantially heavy labour input most of which invariably should be drawn from outside as hired labour. Under the present circumstances it is highly unlikely that the settlers would invest extra expenditure on this technique.

Dry sowing of paddy is a method traditionally adopted under low rainfall conditions to take advantage of first showers. In Mahakanadarawa, there seems to be considerable farmer reluctance to follow this practice in their paddy fields. Many farmers who had attempted this method of sowing have had disappointing experiences during the last few years owing to the cessation of rain after seeding. Some of the other difficulties given by paddy farmers in this regard were draught power shortages and profuse weed growth.

4.4 FERTILIZER USE

Application of chemical fertilizers to paddy crops is hardly seen in the area. Only about 12% of the paddy extent in the scheme

had been given some fertilizer dressings during the Maha season. The only form of fertilizer used is Urea and there is no application of balanced nutrient mixtures. The average quantity of urea applied per acre was as low as 10 pounds per acre.per farmer reporting. Owing to the presence of long fallow periods in their paddy allotments farmers felt that there was no necessity for fertilizing their fields. However, their weak financial position, lack of assured water as well as problems of farm level supplies would also have been the overriding reasons for lower fertilizer use.

Fertilizer application was totally lacking on highland allotments. In an occasional case, chillie crops in chenas were given some Urea application. Enquiries on farmer awareness of the fertilizer recommendations for paddy made by the Department of Agriculture for this area revealed that only about a third of the allottees knew the existence of such recommendations. Among those who were aware, only a handful were knowledgeable about the precise quantities and the specific times of fertilizer application.

4.5 WEED CONTROL

Farmers seem to pay scant attention to the competition offered by weed growth to the paddy plant. Two major reasons particularly favouring the weed growth in the scheme are a poor water supply as well as a hasty land preparation. This no doubt, would reduce their yields substantially. Practically all farmers seem to rely on standing water as a measure of suppressing weed growth whenever conditions permit. Only about 50% of the extent cultivated had been subject to some kind of weed control measures. Chemical applications form the major means of weed eradication used in almost the entire extent weeded. Manual weeding is non-existent. In any case, under conditions of lack of standing water coupled with inadequately levelled *'liyaddes'* (bays), hand weeding of a broadcast sown crop is difficult.

4.6 PEST & DISEASE CONTROL

Paddy bug and paddy stem borer were the important pest problems recorded during this season for which 38% of the farmers had used chemical control measures. The chemicals had been purchased from private traders. Applications of chemicals for chillie crops in controlling of leaf curl disease was reported by some chena farmers.

4.7 YIELDS

Table 4.5 Distribution of Yields per Acre of Paddy in Mahakanadarawa - Maha 76/77

Yield Category (Bushels per Acre)	Farmers reporting
Less than 20	5
20 - 29	12
30 - 39	20
40 - 49	36
50 - 59	12
Over 60	15
	100

The yields of paddy of the individual farmers in the project varied from 15 to 65 bushels per acre during the Maha season under consideration with an overall average for the entire scheme of 38.3 bushels. The per acre yield of individual farms is given in Table 4.5. In this case, it may be noted that paddy cultivation was undertaken in limited areas (ranging from 1 - 1.5 acre units) in tracts closer to the tank under the *'bethma'* system.

V. LABOUR UTILISATION

As shown in Chapter II, the available labour force in Mahakanadarawa settlement scheme is primarily engaged in agriculture. All households surveyed within the colony centred their activities around crop production. Arising from the seasonality of cropping, the use of labour is greatly activated in the Maha season extending from October - March. During the remaining months of the year, agricultural labour available within the project shows a distinctly partial utilisation due to lack of other avenues of employment.

Agricultural labour in this instance is associated with three main kinds of activity, namely paddy cultivation, chena cultivation and production of arable crops on highland allotments. In all farm households where chena is cultivated, the family labour is mostly tied up with chena work.

5.1 FEATURES OF LABOUR USE

Computations based on labour data collected from the farm record keeping exercise indicated an average labour input of 319 man-day equivalents per farm at Mahakanadarawa during the Maha season under reference.

Table 5.1 Composition of Farm Labour Application
Man-day Equivalents per Farm - Maha 76/77

Type	Highland	Lowland	Chena	Total
Family labour	86 (27)	47 (15)	143 (45)	276 (87)
Hired labour	7 (2)	21 (6)	15 (5)	43 (13)
Total	93 (29)	68 (21)	158 (50)	319 (100)

Figures in parenthesis indicate percentages.

A marked feature of farm labour application patterns are the relatively lower emphasis placed on paddy cultivation (67 man-day

equivalents per farm) and the greater weightage given to chena (158 man-day equivalents per farm). The main reason for the low labour application per farm on paddy in this region is due to the limited extent of paddy cultivation under the *'bethma'*.

It is also seen that the hired labour accounts for around a tenth of the total seasonal farm labour input, thus indicating a family labour dominant farming system. The demand for hired labour is greatest in paddy, where the ratio of hired labour to family labour is 1:2. In the case of highland and chena, this ratio is about 1:12 and 1:10 respectively. Unlike paddy, both chena and highland cultivation involves a longer time period while obtaining a greater degree of flexibility in timing of most of their field operations. Paddy, on the other hand, is more time specific in its field operations. Hence a greater possibility of utilising family labour is seen in the case of chena. A further understanding of the application of hired labour can be made by examining its use in relation to different field operations (Table 5.2).

Table 5.2 Operationwise Distribution of Labour Application per Farm by Source of Labour - Maha 76/77 Season (Man-days)

Field Operation	Highland			Lowland			Chena		
	Family	Hired	Total	Family	Hired	Total	Family	Hired	Total
Land preparation	39	2	41	17	6	23	27	4	31
Sowing/planting	8	1	9	5	3	8	30	2	32
Crop care	20	1	21	9	-	9	63	5	68
Harvesting and processing	19	3	22	16	12	28	23	4	27
	86	7	93	47	21	68	143	15	158

Operationwise distribution of labour shows that the highest labour input requirements for highland cultivation had been in respect of land preparation (41 man-day equivalents per farm). In lowland, two marked peaks occur in times of land preparation and harvesting. In contrast the crop care activities for chena which includes not only weeding and earthing of crops, etc., but also physical care of the

crop on a continuous basis had utilised 68 man-day equivalents. It may be pointed out that the crop care activities in chena are spread over a period of 3 to 4 months. The above data also shows that in both chena and highland allotment cultivation, hired labour use is not concentrated to a particular time period. However, in paddy almost 60% of hired labour involvement is confined to harvesting and threshing.

5.2 TEMPORAL DISTRIBUTION OF FARM LABOUR INPUT

The labour data collected at regular intervals also lend themselves to an analysis of its allocation with respect to time dimension. A summary of the results is presented in Table 5.3 (see figure 2 also).

The information suggests that the basic rhythm of labour activities in cultivation of both highland allotment and chena shows similarities. The labour use pattern on paddy shows a distinct contrast. (Fig. 3).

The initial labour application for Maha season in the former two cases commences as early as August and is continued almost until April. In the paddy crop, the activities are seen to commence later in the season (in the month of November) and are continued until June or so. It may be added, that the delay in arrival of Maha rains in this particular season had the general effect of postponing the cultivation activities as a whole. Yet, the usual sequence of farm operations in the area had not undergone any change. The data suggests that the labour application for the lowland cultivation commences only after the peak labour demand period for chena and highland cultivation is over.

Table 5.3 Percentage Distribution of Monthly Labour Application for Farming - Maha 76/77

Farm Operations	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Total
Chena												
Land preparation	7.4	1.4	0.3	-	-	-	-	-	-	-	-	9.1
Planting and sowing	1.3	3.5	3.9	0.8	0.1	-	-	-	-	-	-	9.6
Crop care	-	-	2.8	5.1	5.8	4.5	3.5	1.0	-	-	-	21.7
Harvesting and post harvesting	-	-	-	-	0.5	4.6	2.6	0.6	0.4	-	-	8.7
Sub-total (A)	8.7	4.9	7.0	5.9	6.4	9.1	5.1	1.6	0.4	-	-	49.1
Highland												
Land preparation	4.1	4.0	2.7	1.2	0.3	-	-	-	-	-	-	12.3
Planting and sowing	0.3	1.3	0.5	0.5	0.3	-	-	-	-	-	-	2.9
Crop care	-	-	0.7	2.6	1.6	1.2	0.8	-	-	-	-	6.9
Harvesting and post harvesting	-	-	-	-	0.4	1.2	1.5	2.0	2.2	-	-	7.3
Sub-total (B)	4.4	5.3	3.9	4.3	2.6	2.4	2.3	2.0	2.0	-	-	29.4
Lowland												
Land preparation	-	-	-	0.9	1.3	1.4	1.1	1.6	0.9	-	-	7.2
Planting and sowing	-	-	-	0.2	0.4	0.8	1.5	0.9	0.1	-	-	3.9
Crop care	-	-	-	-	0.3	0.6	0.6	0.6	0.5	0.3	-	2.9
Harvesting and post harvesting	-	-	-	-	-	-	-	2.0	1.8	1.6	2.1	7.5
Sub-total (C)	-	-	-	1.1	2.0	2.8	3.2	5.1	3.3	1.9	2.1	21.5
Total labour application (A+B+C)	13.1	10.2	10.9	11.3	11.0	14.3	10.6	8.7	5.9	1.9	2.1	100.0

Fig. 2

MONTHLY DISTRIBUTION OF LABOUR FOR CULTIVATING CHENA, LOWLAND AND HIGHLAND ALLOTMENTS - 76/77 MAHA SEASON.

MAHAKANADARAWA

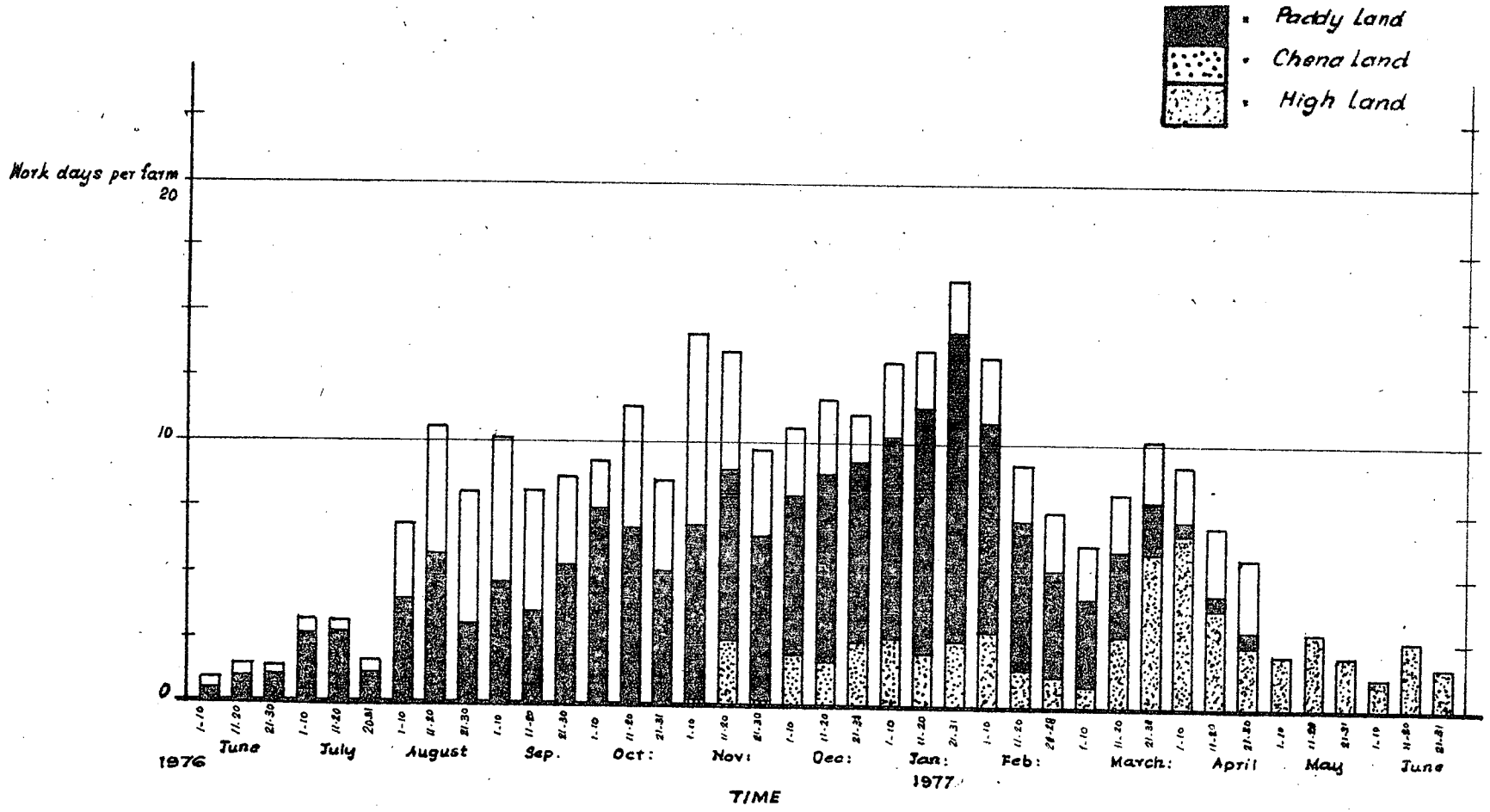
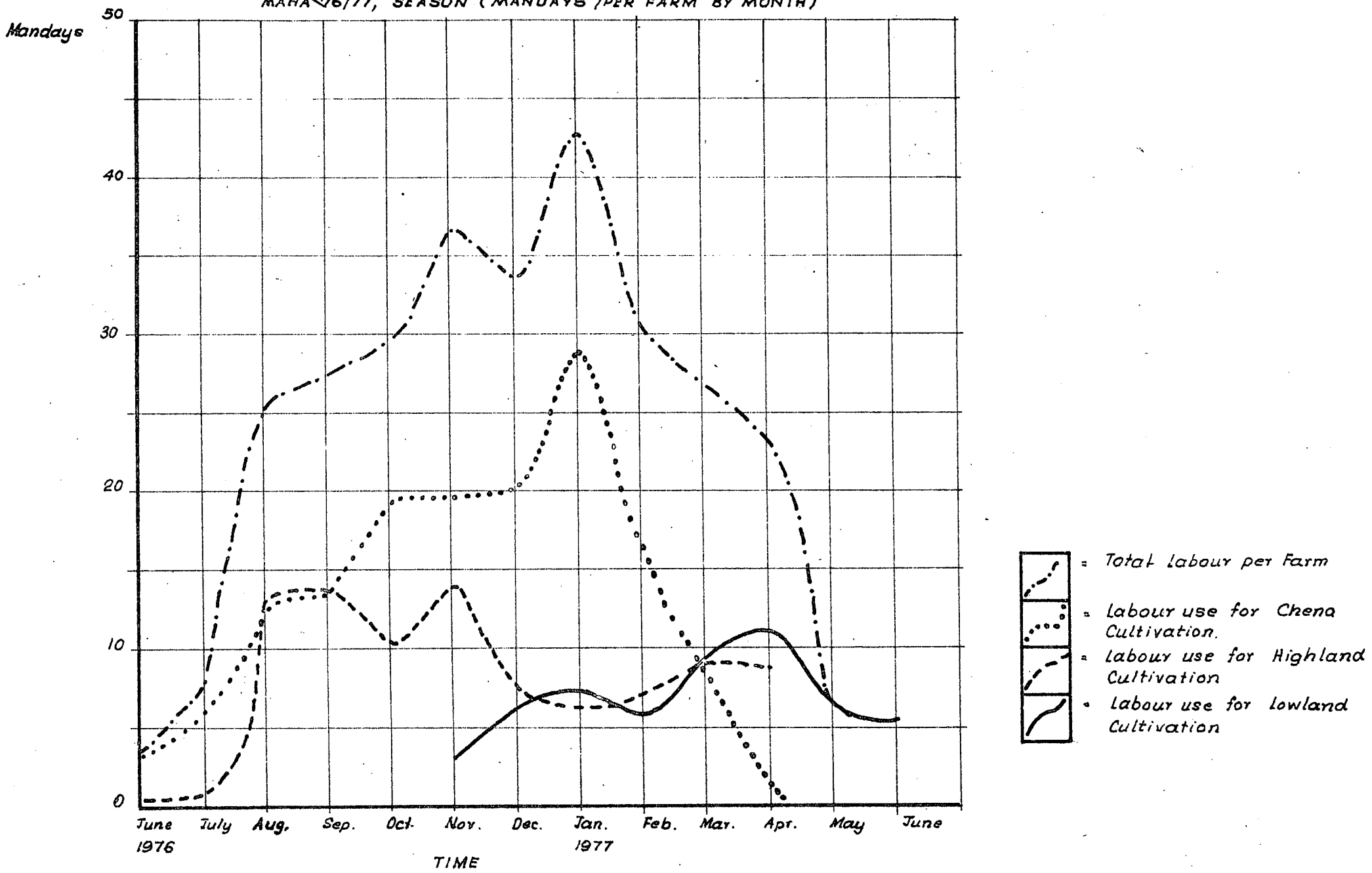


Fig. 3

DISTRIBUTION PATTERNS OF LABOUR USE IN FARMING

MAHAKANADARAMA SCHEME

MAHA 76/77, SEASON (MANDAYS /PER FARM BY MONTH)



VI. COSTS & RETURNS

A. PRODUCTION COSTS

6.1 GROSS PRODUCTION COSTS

The gross production costs given here includes both expenses for purchased inputs (cash costs) as well as the value of farmer's domestic resources (non cash costs) used. During the Maha season under reference, the gross value of production costs averaged closer to Rs.3,000 per farm (Table 6.1). Since there was no cultivation in this area during the Yala season, this value may also be an approximation of the annual gross production costs per farm. Cultivation of lowland and chena assume the highest importance in the computation of the production costs accounting for around three fourths of the total.

Table 6.1 Gross Production Costs per Farm[1] Classified by Cash and Non-Cash Costs - Maha 76/77

	Cash costs (Rs)	Non cash costs (Rs)	Total costs (Rs)
Lowland	719	395	1,114
Highland	134	537	671
Chena	216	893	1,109
All	1,069	1,825	2,894

[1]Consisting of: 1.5 acres of lowland
1.0 acre of highland
1.7 acres of chena

Forty per cent of the farmers gross production expenditure is in terms of cash (Rs.1,069) showing that a major portion of the value of production resources used originates from the farm itself. Raising paddy crops on the lowland holding makes the greatest demand on cash (Rs.719) as compared to Rs.134 and Rs.216 on highland and chena respectively. Accordingly, paddy cultivation in the lowland allotments utilised the least amount of farmer's owned resources. In both high-

land and chena systems of cultivation, the non cash component is almost four times their cash costs. This data indicates the cash intensive nature of lowland cultivation as compared to that of chena and highland allotments.

6.2 CASH PRODUCTION COSTS

As mentioned earlier, cash production costs constitute the expenses incurred for purchase of materials and services such as hired labour and hired draught power used. Owing to lack of cultivation in Yala the farmer's annual cash production costs are confined mainly to Maha. The following data would provide the level of cash production expenses per farm reporting.

Table 6.2 Cash Production Expenses per Farm

Production Unit	Average cost per farm	
	Yala 76	Maha 76/77
Lowland	-	719
Highland	-	134
Chena	135	216

An analysis of the cash production expenses for paddy into its components shows that expenses in cash refers mainly (39%) to hiring of draught power consisting of tractors and buffaloes. Payments for hired labour ranks next in importance (27%)(Table 6.3).

In contrast to paddy, the main form of cash expenditure in chena is in respect of wage payments for hired labour showing some departure from the conventional chena system based on family labour. The relative position of hired labour used here is a reflection of the involvement of cash crops in these chenas.

Table 6.3 Percentage Distribution of Cash Production Expenses per Farm Classified by Inputs Maha 76/77

Input	Paddy (%)	Highland (%)	Chena (%)
Hired labour	27	28	54
Tractor hire charges	32	1	-
Buffalo hire charges	7	-	-
Seed/planting material	16	27	14
Fertilizer and agro chemicals	5	23	5
Other	13	21	27
Total (%)	100	100	100
(Rs)	(719)	(134)	(216)

Most of the hired labour used in chena work is in respect of operations prior to sowing and also for weeding and earthing up of crops. The former includes jungle clearing and fencing (Table 6.4).

Table 6.4 Percentage Composition of Wage Payments Classified by Operations - Maha 76/77

Field Operations	Lowland cultivation (%)	Highland cultivation (%)	Chena cultivation (%)
Pre-sowing operations	20	34	36
Sowing and planting	13	13	10
Weeding	1	29	31
Harvesting	32	16	21
Post harvest operations	34	8	2
Total (%)	100	100	100
(Rs)	(194)	(38)	(117)

In the case of paddy, hired labour expenditure is seen mainly for harvesting and threshing.

6.3 NON-CASH PRODUCTION COSTS

Non-cash production costs included here represent the input of farmer's own resources valued at market prices. As seen in Table 6.5, family labour forms the most important owned input used by the farmers for production purposes.

Table 6.5 Percentage Composition of Non-Cash Production Costs Classified by Type of Input and Production Unit Maha 76/77

Type of Input	Lowland	Highland	Chena
Family labour[1]	72	96	96
Own seed and planting material	15	4	4
Own buffalo services	13	-	-
Own tractor services	-	-	-
Total (%)	100	100	100
(Rs)	(395)	(537)	(897)

[1] Valued at Rs.6 per man day equivalent.

B. INCOMES

6.4 GROSS INCOME

The gross income figures given here consist of the total value of incomes from all sources including that of total agricultural output which averages to about Rs.7,200 per year per farm. It also shows a predominance of agricultural income as well as a marked seasonality of the income stream. (Table 6.6).

In Yala the gross farm incomes are substantially lower being about a third of that of Maha. The entire gross income during Yala is only Rs.1,694, i.e. about Rs.280 per mensem. On the other hand, during Maha season the average gross monthly income is around Rs.900 per farm.

Table 6.6 Annual Gross Income per Farm Classified by Season and Source

Source	Yala 76	%	Maha 76/77	%	Annual	%
	Rs	%	Rs	%	Rs	%
Chena	237	14	977	18	1,214	18
Highland	322	19	751	14	1,073	15
Lowland	-	-	2,301	42	2,301	32
Livestock	280	17	230	4	510	7
Hired labour in agriculture	204	12	362	6	566	8
Hired labour in non-agriculture	281	17	334	6	615	9
Self employment	59	3	49	1	108	1
Trade	76	4	103	2	179	2
Regular employment	235	14	378	7	613	8
Total	1,694	100	5,485	100	7,179	100

It is also seen that the livelihood of farmers in Mahakanadarawa is centred on raising seasonal crops and off-farm sources of income play a lesser role. However, during Yala seasons, farming on chena and highland allotments becomes relatively more prominent. In Maha, paddy production in lowland alone accounts for 42% of the total gross farm income. Permanent crops on highland allotments are relatively of less significance as a means of income.

Hiring out of farm labour in the study area is common among settlers and such wage earnings are a principal means of supplementing farm income in Yala. During this particular Yala season, 29% of the farm income has been derived from hiring labour. Employment opportunities for hired labour during Yala is almost non existent within the scheme and consequently this type of work is undertaken outside the settlement. Incomes from avenues such as regular salaried employment and trade, etc., are meagre. It is also seen that activities such as trade reaches a minimum during Yala season as a result of the weak agricultural base in the colony. In Yala seasons, in many of the farm households in Mahakanadarawa, the settlers are reduced to a state of wage labour.

Income from livestock activities refers mainly to the sale of cattle for slaughter. The scope for development of this activity as an income stabiliser particularly in the lean agricultural season is marked.

6.5 CASH INCOME

Gross income as the only measure of farm income has the weakness of not reflecting the level of cash generation per farm. This is particularly important in instances as in the present case where a major proportion of farm production is domestically consumed, leaving only little room for cash sales.

Table 6.7 Annual Cash Income per Farm Classified by Season and Source

Source	Yala 76 (Rs)	(%)	Maha 76/77 (Rs)	(%)	Annual (Rs)	(%)
Lowland	-	-	885	27	885	19
Highland	66	5	442	14	508	11
Chena	217	16	516	16	733	16
Livestock	209	15	175	5	384	8
Wage labour	485	36	696	22	1,181	26
Others	370	28	530	16	900	20
Total	1,347	100	3,244	100	4,591	100

As was observed in the case of gross incomes, the cash receipts per farm also show a wide seasonal variation. In the Yala season monthly cash income amounts to Rs 224 per farm while in Maha this increases to Rs.540 per farm. The importance of incomes from wage labour alone is further highlighted by this data since it contributes around a third of the total cash income during Yala. In comparison, crop production activities provide only a fifth of the total cash farm income during this season.

Crop production as a means of farm revenue assumes importance only in Maha which constitutes only 57% of total seasonal income. Of this almost half comes from paddy.

6.6 COMPOSITION OF CASH INCOME DERIVED FROM CROP PRODUCTION

Since crop production is the main form of income among settlers in Mahakanadarawa, cash income derived from crops grown on chena and highland was analysed to its components.

Table 6.8 Composition of Cash Incomes Derived from Chena

Crop	Yala 76		Maha 76/77	
	Farmers reporting (%)	Average income per farm reporting (Rs)	Farmers reporting (%)	Average income per farm reporting (Rs)
Gingelly	93	566	12	123
Chillies	10	600	54	1,004
Cowpea	3	360	49	357
Paddy	-	-	7	488
Kurakkan	-	-	27	73
Maize	-	-	44	135
Vegetables	3	200	36	152
Mustard	-	-	10	125
Ground nut	-	-	2	9
Tobacco	-	-	5	2,206

As seen from the above, gingelly forms the exclusive cash crop in Yala followed by chillie. However, in Maha, chena is cultivated with a variety of crops and the predominant ones generating cash incomes are chillie, cowpea and maize. Tobacco is a recent introduction to chenas with a wider future potential as a cash crop in chena.

The tree crops grown on highland allotments though yielding small incomes are important to many farmers in Yala season. The main

crops concerned here are *murunga* (drumstick), mango and coconut. In Maha seasons, the principal seasonal crops that yield cash revenues from the highland allotments are chillie, pulses and tobacco (Table 6.9).

Table 6.9 Composition of Cash Income Derived from Highland Allotment

Crop	Yala 76		Maha 76/77	
	Farmers reporting (%)	Average cash income per farm reporting (Rs)	Farmers reporting (%)	Average cash income per farm reporting (Rs)
Tree crops	83	149	53	55
Gingelly	8	142	-	-
Chillie	6	247	40	263
Cowpea	8	55	44	173
Manioc	6	130	4	170
Vegetables	8	78	16	61
Maize	-	-	35	42
Kurakkan	-	-	5	108
Black gram	-	-	32	111
Green gram	-	-	4	255
Tobacco	-	-	23	698

6.7 NET RETURNS PER FARM

The net return figures indicate the difference between gross returns per farm minus gross production expenses and hence could be used as one of the satisfactory profitability measures used in farming. In this regard, one of the problems that may be encountered is the imputation of values for owned inputs used as well as for domestically consumed farm output. As seen from Table 6.10, during the Maha season under reference, the net returns from the cultivation of lowland allotment amounts to about Rs.1,200 per farm, while it is only Rs.80 in the case of highland allotment . In the chena, the net

return figures are seen to assume a negative value which is mainly due to the very high component of family labour used for work here.

Table 6.10 Net Returns per Farm (Maha 76/77)

	Lowland	Highland	Chena
Gross returns per farm	2,301	751	977
Gross production expenses per farm	1,114	671	1,109
Net returns per farm	1,187	80	-132

6.8 NET CASH RETURNS PER FARM

The net cash returns per farm indicate the differences between cash income and cash expenses. Accordingly, this measure has an important bearing on farmers liquidity position.

Table 6.11 Net Cash Returns per Farm - Maha 76/77

Item	Lowland Rs/farm	Highland Rs/farm	Chena Rs/farm
Cash income	885	442	516
Cash expenses	719	135	216
Net cash income	166	307	300

In terms of cash, the net returns per farm from both highland and chena are substantially higher than from paddy. The lower margin between cash output and cash input in paddy cultivation mainly stems from the consumption orientation of the producer unlike in the other two cases.

6.9 PRODUCTIVITY OF LAND, LABOUR & WORKING CAPITAL

Productivity status of the three principal farm inputs, land, labour and working capital during the main cultivation season was measured in terms of their average productivity.

Table 6.12 Average Productivities of Land, Labour & Working Capital on Lowland, Highland & Chena[1] - Maha 76/77

Production Unit	Land		Labour[2]		Working Capital	
	Gross returns per acre (Rs)	Cash returns per acre (Rs)	Gross returns per man-day (Rs)	Cash returns per man-day (Rs)	Gross returns per rupee spent (Rs)	Cash returns per rupee spent (Rs)
Lowland	1,534	590	33.80	13.00	3.20	1.20
Highland	751	442	8.17	4.80	5.60	3.20
Chena	575	303	6.20	3.30	4.50	2.40

1. Average farm consisting of 1.5 acres of lowland, 1.0 acre of highland, 1.7 acres of chena.

2. Includes both family and hired labour.

On a per acre basis, the gross returns from paddy are distinctly higher than from highland or chena. This is less marked in terms of cash returns per acre. As regards returns to labour input, paddy again stands out prominently. Chena shows the lowest return per man-day. This primarily arises due to large doses of family labour applications used here. At the time when most family labour is used for chena work, the opportunity cost of such labour is almost near zero due to lack of alternative employment means. Hence even at a relatively low labour productivity of around Rs.6 per day, chena farming is still seen to be viable. The returns to working capital in both highland and chena are markedly higher than in the case of paddy.

6.10 INCOME DISTRIBUTION OF FARMS

The pattern of annual income distribution among the sample farmers at Mahakanadarawa was examined from the standpoint of cash income (Table 6.13).

The cash income per farm shows a wide variation with predominance of low income groups. The lowest decile of farmers earned less than Rs.1,000 of cash income per annum, while the highest decile received cash incomes ranging from about Rs.8,000 to Rs.13,000. One fifth of

Table 6.13 Distribution of Annual Cash Income Among Project Farmers (Yala 76 and Maha 76/77)

Annual cash income per farm (Rs)	% of farmers	Cumulative percentage	% of income	Cumulative percentage
0 - 1,000	8	8	1	1
1,001 - 2,000	12	20	4	5
2,001 - 3,000	22	42	13	18
3,001 - 4,000	13	55	10	28
4,001 - 5,000	13	68	13	41
5,001 - 6,000	5	73	6	47
6,001 - 7,000	5	78	7	54
7,001 - 8,000	10	88	15	69
8,001 - 9,000	5	93	9	78
9,001 - 11,000	4	97	10	88
11,001 - 13,000	3	100	12	100

the settlers reported cash earnings of less than Rs.2,000 per annum and another one fifth between Rs.2,000 - Rs.3,000. A graphical presentation of the income distribution is given by the Lorensz curve in Figure 4. Similarly the distribution of gross incomes of the colonists was also examined (Annexes 3 and 4).

6.11 IMPACT OF CHENA CULTIVATION ON FARM INCOME

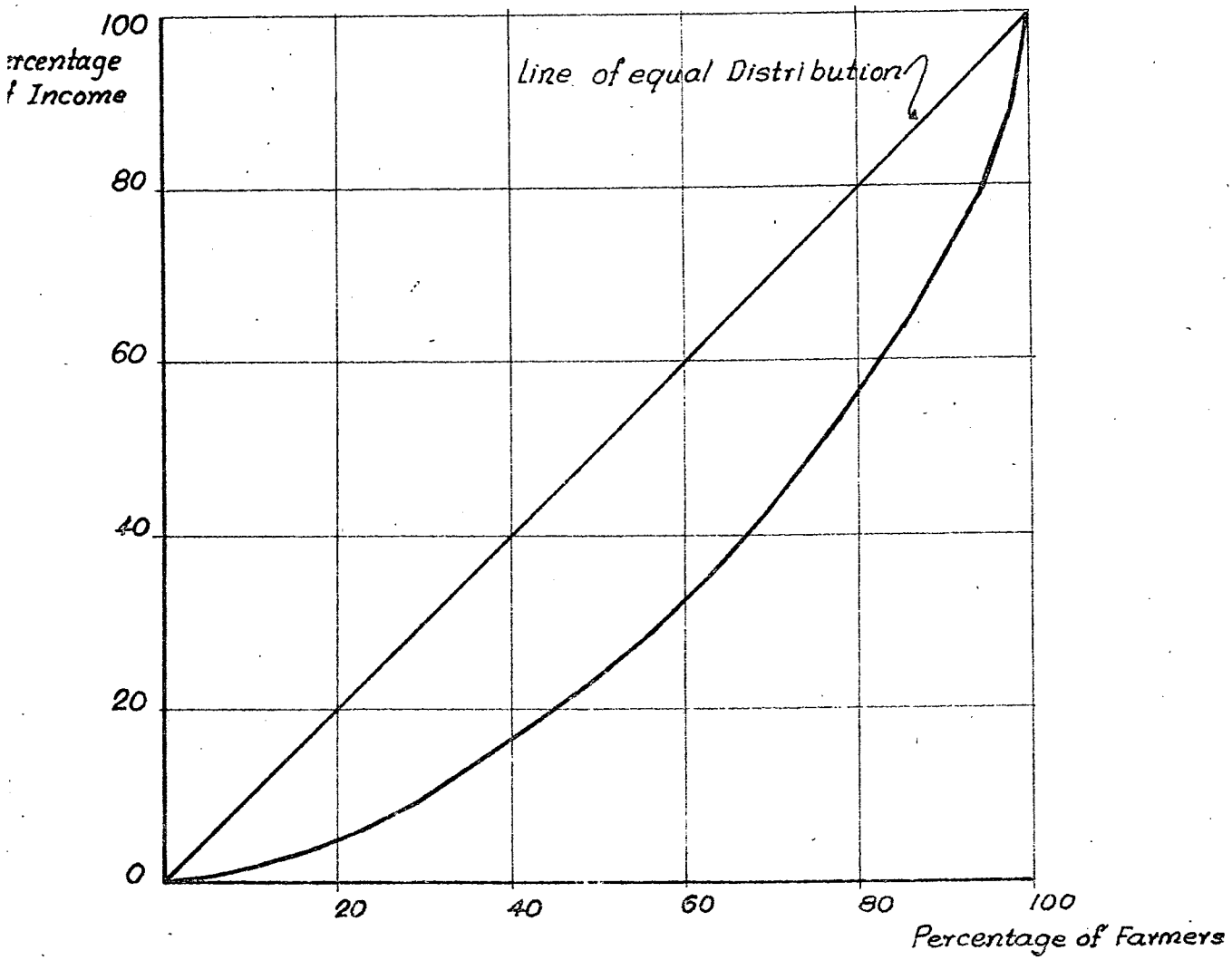
The practice of chena cultivation is less prevalent in Mahakanadarawa compared to Mahawilachchiya. Only 59% of farms reported cultivating chena with an average size of 1.8 acres per unit. The unavailability of forest lands in the vicinity explains the low incidence of chena. Even among those who cultivated chena, it was seen earlier that the average chena holding size is small (1.8 acres). However, the general preference of the dry zone farmer to engage in chena cultivation whenever possible was seen even here.

Consideration of incomes of farmers with and without chenas shows that the incomes accruing from chena have a positive impact

Fig. 4

DISRIBUTION OF ANNUAL CASH INCOME PER FARM

MAHAKANADARAWA - 76 YALA AND 76/77 MAHA



notably on the poorer income segments of the farm population. As seen from Table 6.14 only about 8% of those who cultivated chenas reported farm incomes less than Rs.4,000. In contrast to this, among the category of non-chena farmers, 50% earn less than Rs.4,000. Furthermore, in the case of farmers cultivating chena, the income distribution is heavily weighted towards larger incomes. In the absence of chena the distribution of non-chena farmers shows a marked skewness towards low incomes.

Table 6.14 Influence of Chena on Farm Income
Maha 76/77

Income	Farmers operating chena (%)	Farmers not operating chena (%)
0- 2,000	2	25
2,001- 4,000	6	25
4,001- 6,000	26	8
6,001- 8,000	30	8
8,001-10,000	16	18
Above 10,000	20	16
	100	100

An examination of the distribution of incomes of the two groups of farmers shows that the category of farmers operating chenas exhibit a more favourable pattern (Annexes 5 and 6). In the case of non chena farmers the data also shows a heavy concentration of farms at both ends of the income range. The lower half of the non-chena farmers reported gross incomes of less than Rs.4,000 during Maha 76/77 while the upper third received Rs.8,000 and above. A distribution of this nature is not discernible among those who cultivated chenas.

6.12 FARM CASH FLOW

A cash flow chart such as given in Table 6.15 reflects the nature of cash transactions on a periodic basis. The cash outflow

figures indicate the levels of cash spent while the cash inflow signifies the amount of cash generated from farming.

Table 6.15 Average Cash Flow per Farm From November 1976 to June 1977

Item	Nov. (Rs)	Dec. (Rs)	Jan. (Rs)	Feb. (Rs)	Mar. (Rs)	Apr. (Rs)	May (Rs)	Jun. (Rs)
Outflow (A)								
Lowland	53	100	90	54	140	140	53	21
Highland	18	9	5	11	9	6	9	-
Chena	17	8	30	15	14	1	-	-
Sub-total	88	117	125	80	163	147	62	21
Inflow (B)								
Lowland	-	1	-	-	23	68	55	28
Highland	20	30	24	84	96	171	233	10
Chena	15	10	38	163	147	88	37	8
Sub-total	35	41	62	247	266	327	325	46
Netflow (B - A)								
Lowland	-53	-99	-90	-54	-117	-72	2	7
Highland	2	21	19	73	87	165	224	10
Chena	- 2	2	8	148	133	87	37	8
Total	-53	-76	-63	167	103	180	263	25

This data shows that in the case of chena and highland, the monthly financial expenses incurred by farmers in connection with cultivation is distinctly low and is fairly well distributed over time. The situation in paddy is markedly different. Here, the cash expenses are not only high but also concentrated to a few months of the season.

As regards the cash inflow (revenue) is concerned, the data indicates that the lowland cultivation is remarkable in having earnings confined to a short duration. The net inflow figures given in the table show the net movement of cash in and out of the farm. In

most months of the season, mainly due to the presence of non paddy enterprises, there occurs a substantial inflow of cash. From these figures it is also clear that an exclusively paddy based farming unit is unlikely to maintain financial viability unless outside finances are injected into the system. Both highland and chenas have positive cash flows during the greater part of the season and would act as strong income stabilisers of the farm unit. This offers a major reason underlying the farmer preference to cultivate chenas whenever opportunities permit.

VII. MARKETING & OTHER SERVICES

Farm supporting services such as disposal of agricultural produce, storage and input supplies, farm credit, irrigation control, extension and farmer organisations are discussed in this chapter.

7.1 MARKETING

According to information available in respect of paddy production Mahakanadarawa colonisation scheme can not be considered as an important surplus paddy producing area. A surplus of paddy in substantial amounts is witnessed here only in an occasional year when adequate rainfall is experienced. The year under reference can not be considered as one with very favourable weather and this is also seen from the output levels and marketing patterns.

The mean paddy output per settlement in Mahakanadarawa scheme amounts to 93 bushels in Maha 76/77. Since there is no Yala cultivation, this also coincides with the annual paddy output. One half of the farmers reported a total production ranging from 26 to 75 bushels (Table 7.1). On the basis that an average household with 6 individuals requires around 60 bushels of paddy per annum to meet their minimum food requirements alone, this estimate suggests that only half the farm families in Mahakanadarawa during the year had been able to produce over and above their bare food needs. However, if an allowance is made for retention of seed requirements and payments in kind, the proportion of self sufficient paddy farmers would invariably fall much below the 50% level. This implies that though nearly 80% of the farmers had sold at least part of the harvest, many of these transactions are merely sales necessary to secure cash for immediate family requirements and do not represent the sale of a time surplus.

Table 7.1 Distribution of Paddy Output per Farm Mahakanadarawa - Maha 76/77

Output (Bushels)[1]	Farmers reporting (%)
0 - 25	3
26 - 50	31
51 - 75	23
76 - 100	14
101 - 125	10
126 - 300	19
	100

[1]Includes output from paddy holdings under the project and *purana* lands.

The sample data shows that 37% of the paddy output in the colony had been disposed of as sales and consequently the remaining 63% represents home retention for domestic consumption, seed purposes and payments in kind.

The pattern of paddy disposal observed at the farm level was as follows:

Table 7.2 Pattern of Paddy Disposal - Maha 76/77

	No. of farmers reporting (%)	Amount per farm reporting (%)
Home consumption	97	32
Sales to cooperatives	74	39
Sales to private traders	54	10
Payments in kind	30	4
Retention for use	92	12
Others	51	15

Except for limited purchases made by private trade, the principal point of paddy procurement is the village cooperative, 4 of which operate in the scheme. The share of produce handled by the cooperatives is about 80% of the total paddy sales. However, many farmers reported inconveniences in selling to cooperatives due to inadequate storage and handling facilities at the purchasing points. Non-availability of cash for prompt payment and malpractices were among other complaints made by farmers in some instances.

Almost all farmers who sold their paddy to private traders had received a price lower than the guaranteed price of Rs.40 per bushel. In many such instances, the purchases had been made on the farm itself, thus relieving the farmer of the problems of transport. A major compelling reason for selling to private trade by farmers seems to be the promptness in paying cash. In some cases, lesser rigidity in quality specifications was also offered as a reason. Nevertheless, these farmers did not rule out the possibility of existence of fraudulent practices such as faulty measuring in sales to private traders.

On-farm storage of saleable paddy is not observed among settlers and whatever to be disposed of is mainly sold immediately after harvest. However, it is common to observe sales of 'home' retained' paddy in smaller quantities to the local boutiques in exchange for other basic consumption needs, particularly during the Yala season.

As regards the non paddy crops produced in the project such as pulses, grains and vegetables, Rambewa town forms the main marketing centre. Private buyers operating here in the form of assembly traders collect agricultural produce and transport them to Anuradhapura which is only 8 miles away. State sponsored procurement programmes for such produce are totally lacking. Farmers do not appear to derive any benefits from floor prices that are fixed periodically for seasonal crops. This is mainly due to absence of a suitable mechanism to handle such programmes at the village level. Consequently, sharp fluctuations of the prices of these seasonal highland crops is a marked feature in the settlement scheme. The

production of these crops as at present is entirely dependent on rainfall and consequently harvesting of many of them is confined to a very short period of time. Besides, some of the principal crops grown here, cowpea, green gram, and black gram, etc., have low keeping qualities. In this regard, vegetable produce is more notable. As a result of this situation, there occurs a drastic depression of prices offered by local traders at harvest time. In fact, the price data collected during the survey showed substantial fluctuations of farm gate prices of these crops. Such unfavourable price movements would have depressed farmers incomes substantially. There seems to be a strongly felt need for a suitable institutional device for purchasing farm produce other than paddy. This is particularly so in view of the proposals for expanding the acreage under these.

7.2 STORAGE FACILITIES

Large scale storage facilities available in Mahakanadarawa are confined to government paddy and fertilizer stores. Of the 5 paddy stores with a total capacity of 4,800 bushels, 2 are located in the left bank and have a capacity of 3,000 bushels. These facilities are inadequate for a season of full cultivation of 6,000 acres of paddy. At the farm level there are no specific storage structures for paddy since the entire saleable stock of paddy is generally disposed of immediately after harvest. However, in the case of non perishable commodities such as *kurakkan* and chillie, a majority of farmers resort to on-farm storage. For non paddy crops hardly any storage facilities are available. With more intensive use of land envisaged, expansion of storage faciltieis for agricultural produce becomes vital. One fertilizer store is available in the left bank with a capacity of 5 tons. This is seen to be heavily under utilised.

7.3 INPUT SUPPLIES

Among the major production inputs supplied from outside the farm certified seed paddy assumes special importance. The demand for government certified seed is considerably high in most seasons. Farmers

indicated frequent breakdowns in their seed paddy supplies. Sale of certified seed paddy to project farmers is undertaken through the primary cooperative societies from stocks obtained from the Department of Agriculture and is linked with the production credit scheme. In the case of some field crops such as *kurakkan*, chillie, maize, etc., farmers primarily depend on their own seed. However, in the case of cowpea, green gram and ground nut, farmers rely more on the extension network for seed supplies (Table 7.3)

Table 7.3 Sale of Seed Material from the Extension Office in Mahakanadarawa[1]

Type	Quality	
	Yala 76	Maha 76/77
Chillies (pounds)	-	15
Cowpea	5	75
Green gram	-	20
Maize	-	5

[1]Information provided by District Officer, Anuradhapura

A range of agro chemicals are used by the farmers for insect and weed control, the purchases of which are made from private traders mostly in Anuradhapura. The cooperative societies in the area do not stock an adequate range of chemicals needed by the farmers. Fertilizer issues to farmers are organised through the cooperatives. Due to many reasons, the practice of fertilizer application is not popular and as a consequence the demand for this input at present is extremely low. In some instances, the stocks obtained had remained unsold. Though in some instances farmers complained of supply difficulties, the basic problem of organising supplies for an uncertain market appears to be more important from a supplier standpoint.

7.4 SAVINGS & CREDIT

The financial facilities to the colony community is offered by a branch of the Bank of Ceylon and also by a Rural Bank, both located

at Rambewa. The former was opened in October 1973 and has a staff strength of 3 officers at present. As at July 1978 it had 884 savings accounts with about Rs.126,000 to credit along with 33 current accounts totalling to about Rs.128,000. Banking habits among settlers were not widespread and the farm survey revealed that a majority of them did not operate bank accounts. The main users of banking services were the traders at Rambewa town as well as salaried employees working elsewhere. The use of saving facilities available at the post offices was slightly more common among farm households. Owing to their subsistence nature of living, the farm community on the whole was characterised by marginal saving habits.

Information was sought from farmers regarding loans taken for cultivation and other purposes. In the absence of Yala cultivation, farmers did not report any cultivation loans taken during this season. However, about a fourth of the operators had taken loans mainly for consumption amounting to about Rs.300 per borrower. During Maha, three fourths of the paddy farmers had reported cultivation loans averaging to Rs.503 per farmer. The most important souce of financing these loans was the cooperative society.

7.5 IRRIGATION MANAGEMENT

The distribution of irrigation water from the tank up to the field channels is the responsibility of the Irrigation Engineer at Mihintale. A Technical Assistant and 3 Irrigation Maintenance Overseers function under him. The irrigation water requirements of the farmers are conveyed to them through the 4 Colonization Officers in the project. The exact dates of water issues are decided at the cultivation meetings by the cultivators themselves prior to commencement of the season. Under the Irrigation Ordinance, the decisions arrived at in these meetings are binding on all paddy operators under the scheme. However, it was observed that a majority of cultivators do not adhere to the calendar of field operations previously decided at the meeting. Consequently, this results in undue stretching of the cultivation season creating major problems of water management for the personnel concerned with water distribution.

According to colony officials, the administration of water distribution is faced with frequent problems owing to non-cooperation and sectarian interests of farmers. These officers hold the view that even after modernization of the conveyance system, such problems are likely to increase in magnitude unless stringent measures to instil discipline in irrigation matters are adopted. It was also their experience that occurrence of such incidents are relatively less frequent in the *"bethma"* system of cultivation.

During seasons of low rainfall, water distribution is centred on equity considerations as a means of survival. Under these circumstances, the allottees adopt a *"bethma"* system of cultivation where a limited extent of paddy land closer to the main tank is cultivated by all allottees in the colony. Here, the total extent of land cultivated is dependent on the availability of tank water and this acreage is shared equally by all concerned irrespective of the location of their individual allotments. The *"bethma"* system is a fairly common feature in Mahakanadarawa and even the Maha under consideration was such a case where 1 - 1½ acres of land per allottee was cultivated in tracts closer to the tank.

The Cultivation Committees of the area though expected to handle water distribution at the field level as a part of their duties, did not seem to be effective in this regard. Many farmers had little or no concern for the ability of these Committees in handling their water problems.

7.6 EXTENSION SERVICES

Agricultural extension activities in the colony are currently handled by an Agricultural Instructor assisted by 4 village level extension workers. On an average this represents one field extension worker for every 1,500 acres of paddy land. These personnel currently seem to focus their attention exclusively on paddy than on other field crops. Their activities centre around providing the needed technical information on crop production while functioning as

training agents. These functions demand closer personal contact between the extension staff and the farmers. In this respect an attempt was made to measure the mutual involvement of the farmer and the extension worker using a number of criteria.

Table 7.4 Farmer Contact with Extension Staff

	Village level worker (KVS)		Agricultural Instructor	
	Yes (%)	No (%)	Yes (%)	No (%)
i. Knew extension worker	66	34	42	58
ii. Closely associated with him	36	64	20	80
iii. Contacted him regarding farm problems	42	58	31	69
iv. Able to contact him when in need	67	33	51	49

The KVS being a link with the farmer at the grass root level, a relatively closer level of contact between him and the farmer may be expected than in the case of Agricultural Instructors. In fact, this is borne out by the above data. However, the scope for improvement of levels of contact between the farmer and the extension personnel seem to be considerable.

The survey information also revealed that only one fifth of the farmers had the occasion to visit the extension centre for contacting the KVS on matters relating to cultivation during Maha season concerned. The commonest issues raised were on pest problems and procurement of seed and planting material. During the year under reference, farmer exposure to training calsses and demonstration plots etc., was almost insignificant.

The above information supported by field observations made during the survey period is suggestive of a passive role of the extension services in farm adivsory work in this area. This remark is more relevant in a colonization scheme such as the present where substantial investments have been made for improving its agricultural sector over the last two decades.

The low levels of activity of extension services in Mahakanadarawa may be attributed to a variety of factors. Of these the most crucial would be the lack of opportunities available for regular farming due to constraints of irrigation water supply. In such constrained situations the effective demand for extension services would be low. However, with the envisaged stabilisation of the irrigation system, the opportunities for intensive extension programmes are likely to be greater.

7.7 RURAL INSTITUTIONS

Certain institutions in the project which are either government sponsored or voluntary form a part of the servicing infrastructure[1]. They are Cooperative Societies, Agricultural Productivity Committees (APC), Cultivation Committees (CC), Rural Development Societies (RDS) and Death Donation Societies.

The five primary cooperatives of the settlement scheme are branches of Multi Purpose Cooperatives based at Rambewa town. The activities of the cooperatives cover such matters as the distribution of consumer food items, issues of cultivation loans and purchasing of paddy. However, these institutions are primarily consumer oriented and make little contribution to production programmes by way of supply of agricultural inputs. The main source of income of these societies comes from the commissions paid for handling paddy purchases under the Guaranteed Price Scheme. Owing to the very low levels of paddy output in the area during the last few years, the incomes of the societies from this source have dwindled. Nearly all heads of households interviewed were members of cooperative societies. Sixty six per cent of

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[1] Many changes, including a change of government have taken place since the collection and writing up of data on rural institutions. The APCs and CCs have been abolished and replaced by an Agrarian Services Centre and Cultivation Officers and new emphasis has been given to the RDSs.

them had taken cultivation loans during the season under reference for purchase of agro chemicals and seed paddy etc. The comments of the farmers on the working of these societies indicated a low efficiency and the reasons given were not different from the general complaints regarding the cooperative movement in other areas. The commonest criticisms were centred around its poor management.

Mahakanadarawa colonisation scheme falls within two Agricultural Productivity Committee regions, namely Rambewa and Kallanchiya. The Rambewa APC has 17 Cultivation Committees under its jurisdiction of which 8 are within the colony. Except for 2 Cultivation Committees, the remainder in the right bank comes under the Kallanchiya APC. From the overall development point of view of this project, it would have been more desirable if the entire scheme was accommodated under a single Agricultural Productivity Committee. The current activities of this APC are confined mainly to the maintenance of the Land Register, collection of Land Tax and Crop Insurance premia. It also recommends agricultural loan applications to the Bank of Ceylon branch and the MPCS in the issue of production credit.

On interviewing the members of the Agricultural Productivity Committee it was stated that two of the major problems that confront the APC were the lack of working capital as well as absence of storage and transport facilities. On the other hand, the farmers interviewed were mostly dissatisfied with the functioning of APCs; the main cause of which seems to arise from the system of appointing committee members on political considerations. Those appointed on political criteria often have been outsiders with little interest or experience in agriculture.

Cultivation Committees comprise the village level organization of the APC. There are 8 of them in the colony. With regard to their performance, almost 60% seem to lack confidence in the working of their committees. The CC members interviewed felt that the two main drawbacks to their successful operation were the lack of capital and the authority to prosecute for infringement of legislation under

the Agricultural Productivity Law. The Cultivation Committees in the past were vested with sufficient authority and financial resources to take immediate action on an issue. Today, many of the problems have to be referred back to the APC or to the Grama Sevaka and the procedure involves delays and inconvenience to the farmer.

The Cultivation Committee members themselves feel that they should be given monetary compensation for the work they perform. Such attitudes would no doubt negate the basic concepts underlying a voluntary farmer organisation such as the present case. Among the members there were complaints regarding lack of communication between the Cultivation Committees and the APC.

Six Rural Development Societies are stated to be functional within the colony. However, of them, only 2 appear to have some activity. In fact, 40% of the farm households were completely unaware of the existence of any Rural Development Societies in the area. Another 30% reported that these Societies are not engaged in any activity. The two societies that are reported as functioning seem to engage marginally in organising activities such as *"shramadana"*. These societies have also been associated with the formation of a Death Donation Society. In fact, half the respondents ranked the Death Donation Society as the most active organisation in the area and pointed out that it served a very useful function especially for the low income groups in the scheme. Most respondents in fact, felt that the RDSs activities should involve running organisations efficiently as the Death Donation Society.

The existence of a somewhat active Rural Development Society for women at Pandukabhaya was observed. This has been cited as the most active women's RDS in the area. It was started in 1972 and currently has 75 members with the same President continuing throughout the period, while the rest of the body was appointed in 1975. Most respondents interviewed stated that the RDS should concentrate their attention on organising community facilities such as creches, adult education classes, a reading room and play ground, etc. On enquiring

from people whether they felt the current Rural Development Society could perform these functions effectively, only a third felt that the societies are capable of doing so. The obstacles in involving this institution in village development activities in the area were inherent in the attitude of the membership such as the lack of interest and disputes amongst them.

SUMMARY

This volume forms a benchmark assessment aimed at assessing the impact of a broader irrigation modernization programme of the Mahakandarawa colonization scheme located in the North Central Dry Zone of Sri Lanka. It seeks to present a detailed account of the important agronomic and socio-economic features of the colonization scheme. The reference period covers one single cropping year extending from August 1976 to July 1977. The study involved basic data collection of 275 farm households of which a further sub-dample of 85 households was used for detailed studies using a regular data monitoring approach. The highlights of the findings are as follows:

1. The project administration is directly handled by 4 Colonization Officers assisted by 3 farm level workers. Their main tasks at present seems to be to attend to routine land administration matters which makes only a marginal demand on their time.

2. Accessibility and transport facilities available to farmers at Mahakandarawa are relatively better than those found at Mahawilachchiya. Within the scheme, roads are poor but penetrate to the most remote areas of the colony.

3. Population in the colony is currently estimated to be around 13,900. In tracts 5 and 6 located at the tail end of the project, the survey revealed a considerable abandonment of allotments by the original allottes due to lack of irrigation facilities. Two fifths of the population are below 14 years and a further one fifth is between 14 - 20 years of age. Nearly half the households comprised of 5 - 8 members with an average of 5.9. Currently there are 9 schools in the area with a total student enrolment of 2,491. Nearly 20% of the farm operators had no formal education and 50% had education up to Grade 5. However, most operators were able to both read and write.

4. Eighty two percent of the male labour force and 43% of the female labour force respectively had reported self employment in agriculture as their primary occupation. Fifty five per cent of the female labour reported attending to household work as their primary occupation. Hiring out of labour is the principal means of secondary occupation for 41% of the adult males and 7% of the females.

5. About 37% of the households located in the left bank and 24% in the right bank live in standard colony houses provided by the State. Toilet facilities were not available for 34% of the settler households and only a narrow range of utility items constituted the material wealth of the settlers. Farmers hardly own any agricultural appliances. Neat cattle are owned by 28% of the households. About a tenth of the settlers had reared buffaloes averaging to 10 animals per head. Other types of livestock rearing is not undertaken by the settlers.

6. The lift irrigation scheme initiated for cultivation of subsidiary food crops in 171 acres of highland in Stages I and II remains abandoned at present, mainly due to an absence of irrigation water in the channels.

7. The basic farm unit per allotment typically consists of 3 acres of lowland and 2 acres of highland. However, in tracts 3A and 5, the unit of land holding is smaller, consisting of 2 acres of lowland and 1 acre of highland. The average operational holding in the project comprised of 3.3 acres of lowland, 2 acres of highland and 1.8 acres of chena.

8. Around 60% of the settlers operated chena during Maha season. The mean size was about 3 acres. In Yala, 40% had cultivated chenas. In general chenas are located far from the farmstead and 25% of them were more than 4 miles away from the house.

9. Study data shows that the farmer dependence on the cultivation of highland allotment is low. In Yala half the allottees reported no cultivation at all on their highland allotments. In Maha, nearly

a fifth had attempted some cultivation on their highland allotments. Around one quarter of the farmers had cultivated both chenas and highland allotments.

10. In Maha, the commonest form of cultivation seen in Mahakandarawa is the operation of both lowland and highland allotments along with some cultivation of chena. In the season considered, only 25% were dependent solely on cultivating their lowland and highland allotments.

11. The highland allotments are grossly underutilised. Only half the land available is cultivated mostly with tree crops grown as home garden crops. Adoption of seasonal crops is not practiced widely. Farmers attribute the neglect of these lands to lack of dependable water supplies.

12. Lowland allotments are cultivated with paddy in Maha. Even here, the cropping intensity is only 45% due to lack of irrigation water. It is only once in a few years that the entire lowland extent in the project is cultivated in Maha.

13. Paddy holdings in the lower end of the scheme in tracts 5 and 6 of the left bank and 3A and 5 on the right bank experience regular problems of irrigation. The latter two tracts opened in 1978, with about 600 allotments had so far not been provided with irrigation. Most of the land in these two tracts are covered with shrubs and a majority of original allottes had vacated their allotments. The problems here need urgent attention.

14. On the question of the proposed rotational issues of water for paddy, a majority of farmers were seen to be not in favour of the system. This reaction may be an outcome of the frequent occurence of extreme shortages of irrigation water in the past, reinforced by the absence of an efficient conveyance system at present. However, if a rotational irrigation for their paddy fields in Maha season is introduced, farmers indicated 2-3 day intervals as the most appropriate.

15. It was observed that a majority of cultivators do not adhere to the calendar of field operations previously decided at their cultivation meetings. Consequently, this results in undue stretching of the cultivation season creating major problems of water management for the personnel concerned. The cultivation committees of the area though expected to handle water distribution at the field level, many farmers had little or no faith on these committees to handle their water distribution problems.

16. Farmer response towards the introduction of other field crops in paddy fields during Yala indicated a strong preferance for paddy if irrigation water is available. The important types of subsidiary crops indicated were cowpea, green gram and chillie. Crops such as maize and sorghum seem to have a very low preferance among them.

Some of the problems posed by farmers regarding the envisaged field crop production programme are high cash as well as labour input requirements for field crops, drainage problems in some of the lowlands and the lack of farmer experience with such crops in paddy fields. Successful implementation of a programme of this nature requires not only a dependable irrigation water supply, but also intensive farm level extension efforts which take full account of the responding farmers skills, their attitudes, risk-taking potential, needs and limitations. This is all the more necessary, as the present experiences of Mahakandarawa farmers with such crops are confined mostly to chenas. Satisfactory marketing arrangements for field crops is another important aspect in this regard.

17. Draught power is utilised only in paddy cultivation for which four wheel tractors and buffaloes are commonly adopted. First ploughing is undertaken usually by four wheelers with a tyne tiller. Second ploughing is done mostly by buffaloes using a wooden plough. Field preparation is hurried and often weeds are not properly buried. Poor seed bed preparation results in heavy weed growth within a couple of weeks after sowing. Qualitative improvements in land preparation are necessary to raise land productivity levels in this scheme.

18. The tractor hire rate for the two ploughings of paddy land varies around Rs.150 per acre. The threshing charges per acre of paddy using these tractors were around Rs.40. If buffaloes alone are used, the estimated total cost of ploughing amounts to about Rs.150 per acre. However, in practice, farmers using hired buffaloes are unlikely to incur this level of cost since personnel needed for driving the animals are often provided from within the farm family itself.

19. Tilling of soil in dry condition is not seen. The prolong dry period in Yala prior to Maha rains barely permits tillage with animal power or mammoties. A time lag of a few weeks is seen to occur between the first Maha rains and commencement of field preparation until the soil becomes soft and moist. The high cropping intensities envisaged under the Irrigation Modernization Programme rely considerably on dry land preparation and early sowing of Maha paddy crops. Consequently, the introduction of appropriate tillage implements and provision of adequate farm power should receive the attention of the Project administrators.

20. Two wheel tractors are at the lowest end of the farmers preference scale for draught power. HOwever, as between buffaloes and four wheel tractors no particular preferance for either of these was seen among them. The most important factor determining the preference for four wheel tractors among the colonists is its speediness of operations. Qualitywise, farmers felt that ploughing with buffaloes is superior to work done with tractors..

21. Ninety five per cent of the paddy cultivators had adopted improved paddy varieties. Nearly three fourths of them had grown new high yielding varieties - almost all comprising of BG 34-8.

22. Almost all paddy farmers had adopted broadcast cowing and transplanting is non-existent. Dry sowing of seed (*kekulan*) was not practiced in lowland paddy during this season. A little over half the sample farmers preferred the practice of mud sowing. Dry sowing was preferred only by a marginal proportion (5%).

23. Application of chemical fertilizer to paddy is hardly practised. Only about 12% of the cultivated extent had been given some fertilizer dressing and Urea has been the only type used.

24. Weed control in paddy is not seen to receive adequate attention. Only about half the extent cultivated had been subjected to some kind of weed control measures. Manual or mechanical weeding is non-existent. Chemical control is the major means of weed eradication in lowland paddy.

25. Paddy bug and stem borer were among the common pest problems recorded during this season. Thirty eight per cent of the farmers had used chemicals for pest control.

26. The mean paddy yields of the entire colony was 38.3 bushels per acre. The yields of the individual allottees varied widely ranging from 15 - 65 bushels per acre. These yields are quite low for a major irrigation scheme. The envisaged improvements in irrigation facilities have to be backed up by a great deal of extension effort to improve crop production production practices.

27. During the Maha under consideration, the input of labour for agricultural production averaged to 319 man-day equivalents per farm of 4.2 acres. Of this, 67 and 158 man-days were utilised for paddy and chena cultivation respectively. The major reasons for the relatively lower level of labour use for paddy in this instance is due to the non adoption of improved cultivation practices such as weeding and transplanting etc.

28. Hired labour accounts for around a tenth of the total farm labour input thus indicating a family labour dominant farming system. Demand for hired labour is remarkably high in paddy, where the ratio of hired labour to family labour is 1 : 2. In the case of highland and chena this ratio is about 1:12 and 1:10 respectively.

The high demand for hired labour in paddy is due to the time specificity of most of the field operations.

29. An analysis of the timewise distribution of farm labour input during Maha showed a number of important features. It reveals that the basic rythem of labour activities in both chena and highland allotment are similar in a number of criteria. In the case of paddy cultivation labour application shows two distinct peaks coinciding with land preparation and harvesting operations. Intense labour use in paddy is also seen to commence only after the peak labour demand in chena and highland is over as was seen in Mahawilachchiya. Farmers in Mahakandarawa too tend to postpone their paddy land preparation until the tank storage reaches a minimum level so as to ensure them with an uninterrupted supply throughout the season.

30. Gross production costs including both direct cash expenditure as well as the imputed value of farmers own inputs amount to Rs.2,894 per farm for the Maha 76/77 season. Of this, the cash and non cash expenses account for Rs.1,069 and Rs.1,825 respectively. The average extent cultivated per farm in this Maha consist of 1.5 acres of paddy, 1.0 acres of highland and 1.7 acres of chena. Lowland paddy had utilised the highest amount of cash production cost (Rs.719 per farm) as compared to Rs.134 and Rs.216 on highland and chena respectively. In the case of paddy, the cash expenses refer mainly to hired draught power (39%) and hired labour (27%).

31. The total cash income per farm from all sources averaged to Rs.4591 per annum of which 70% has been received during Maha Season. An analysis of income data shows that wage labour as the single most important source of cash among allottes. The fact that wage labour contributes a quarter of the annual cash income of the allottes is significant in that, it reflects the weakness of the existing agricultural production base in the Mahakandarawa settlement scheme. The significance of wage labour is more striking in Yala season when allottes derive a third of their cash income by hiring out their labour.

Crop production in lowland and highland allotments along with chena had contributed only 46% of the total cash income. Lowlands had provided 19% of the annual cash income closely followed by chena with 16%. The more important cash crops in chena are chillies, gingelly, cowpea and maize. Incomewise, tree crops are more important in Yala season on highland allotments despite their smaller incomes. In these allotments chillies and cowpea are the major cash crops cultivated, but their extents are limited. Income from livestock are meagre and refer mainly to the sale of cattle for meat purposes.

32. The net returns from the cultivation of lowland allotments amounts to about Rs. 1,200 per farm, while it is only Rs. 80 in the case of highland allotments. In the case of chena, the net return figure computed shows a negative value. This is mainly due to the problems associated with the imputation of values for family labour used in chenas. Here, family labour forms the almost exclusive production input applied on land.

33. The net cash returns indicate the differences between cash income and cash expenses. Chena and highland allotment show higher net cash returns per farm with Rs.300 and Rs.308 respectively followed by lowland cultivation with Rs.166. The higher net cash returns in chena and highland could be attributed to a number of reasons. In chena production is undertaken solely with family labour and devoid of purchased inputs. Thus cash expenses are considerably low in chena. Besides, the bulk of chena and highland produce is sold for cash resulting in higher cash incomes. In contrast, paddy produced in lowlands is mostly consumed, thus resulting in lower cash incomes. On the other hand, cash costs are higher in paddy cultivation due to employment of hired labour.

34. The gross returns from paddy per acre (Rs.1534) are remarkably higher than those obtained from highland (Rs.751) or chena (Rs.575). As regards returns to labour input, paddy again stands out predominantly with Rs.33.80 per-man day, compared to Rs.6.20 in chena.

The more attractive returns to labour from paddy may partly be explained on the basis of the beneficial effects accruing to paddy growers under the guranteed price scheme for this commodity and low labour usage as seen in this case. Absence of a scheme of price stabilisation for other field crops tend to depress their farm gate prices considerably during peak harvesting seasons. This in turn results in lower returns to labour from most of the crops grown on chena and other highlands. However, in chena, the entire labour input is from family labour and this too is used mostly at times when no alternative employment for such labour is available in the locality. In such circumstances, the opportunity cost of family labour used in chena could be considered as almost zero. Hence even at a relatively low labour productivity of around Rs.6.10 per day, chena farming would still be a viable proposition for Mahakandarawa farmers under the existing conditions. On the other hand, the returns to working capital in both chena and highland are markedly higher than in the case of paddy.

35. The cash income per farm shows a wide variation with a predominance of low income groups. The lowest 10% of the farmers earned less than Rs.1,000 of cash income per annum, while the highest decile received cash incomes ranging from Rs.8,000 to Rs.13,000 per household. One fifth of the settlers reported cash earnings of less than Rs.2000 per annum. On a monthly basis the cash income per farm varies from Rs.220 during Yala and Rs.540 in Maha.

36. Non-cash production costs mainly represent farm family labour. In both highland and chena this accounted for 96% of the total non-cash expenditure while in paddy family labour accounted only for three fourths of the total.

37. Gross income per farm averaged to Rs.7,200 per year per farm of 4.2 acres. It shows a predominance of agriculture as well as marked seasonality of the income. During Yala season the income is as low as Rs.300 which rises to Rs.900 per month in Maha.

38. The practice of chena cultivation is less prevalent in Mahakandarawa compared to Mahawilachchiya, due to the limited availability of forest lands in the vicinity of the colony. Only 59% of farmers reported cultivating chena with an average size of 1.8 acres per unit. The incomes generated from chena seem to have a markedly favourable impact on the group of poorer households. Only 8% of those who cultivated chenas reported farm incomes less than Rs.4,000. However, among the farmers who did not cultivate chena in the same season, 50% earned incomes less than 4,000. The incomes accruing from chena have a positive impact notably on the poorer income segments of the farm population. In the case of farmers cultivating chena, the income distribution is heavily weighed towards larger incomes. In contrast, the distribution of non - chena farmers show a skewness towards low incomes.

39. An examination of the monthly cash flow from cropping in chena land, highland allotment and lowland allotment also showed interesting features. In the case of chena and highland, the monthly cash expenses incurred by farmers for cultivation purposes is distinctly low and is fairly well distributed over the season. The situation in paddy is markedly different, in that the cash expenses are high and are confined to a short duration. Both highland and chena cultivation are capable of generating incomes for a longer period within the season and act as a strong income stabiliser of the farm unit. This perhaps offers a major reason underlying the farmers anciety to cultivate chenas whenever opportunities exist. The net flow of cash from lowland, chena and highland show that an exclusively lowland paddy based farming in Mahakandarawa is unlikely to provide financial viability to colony farmers unless outside finances are injected into the system. These findings also raises another key issue relating to the problems associated with operationalizing the proposed cropping systems based mainly on irrigated lands as in the present case. The dry zone agriculture, typically comprises of an inter-related farming system based not only on irrigated land (paddy) alone but also on rainfed chena as well.

Such a diversified farming activity has provided the much needed stability to the traditional farm economy in an uncertain production environment. Hence, even under the envisaged modernization programme, the process of weaning out the settlers from chena cultivation seem to be a complex problem than usually thought of. This requires more attention by the researchers, extension personnel and planners alike.

40. The study data also shows that the chena cultivation in general, forms an integral part of the farming system of the allottes in Mahakandarawa scheme. Despite numerous attempts made by the government to make the settler rely fully on his allotted land the analysis reveals less satisfactory results. The settler at present, seem to prefer chena cultivation as a complimentary enterprise to their allotted holdings. The reasons for this situation are many; the more important of which are their subsistance level of operation, heavy risks involved in cultivation of lowlands under the existing irrigation conditions and poor access to cash resources. In fact as seen earlier, a quarter of the farm cash income of the farm family is derived from working as hired labourers which indicate the weakness of the existing agricultural production base in this scheme.

41. The total paddy output per allotment (with 1.5 acres of paddy cultivated) during the Maha under reference averaged to 57.5 bushels. As regards the production of individual farmers, the output ranged considerably; 26 - 75 bushels per allotment. Nearly two thirds of the total paddy production was observed to be retained by the allottes themselves for their own consumption. Consequently, only a third of their produce enters the market as sales. It was significant to note that about a quarter of the settlers did not report any paddy sales from their paddy harvests.

42. The principal point of local paddy procurement is the village cooperative which handles about 80% of the paddy sales.

However, many farmers indicated problems regarding its inadequate storage and handling facilities, non-availability of ready cash for prompt payment as well as malpractices such as incorrect measurements, etc.

43. The farm gate price offered for paddy by the private marketing channels was seen to be lower than the government guaranteed price. Despite this, the main reason for the farmers to adopt private marketing channels is associated with their on-farm purchases and prompt payment of cash.

44. Marketing facilities for seasonal crops other than paddy is undertaken entirely by private marketing channels. State sponsored procurement programmes and storage facilities are lacking. This often results in unfavourable price movements at the farm level and needs particular attention. An expansion of field crop production in Mahakandarawa is a major element in the proposed irrigation modernization programme. Satisfactory marketing arrangements for these crops is vital to sustain farmer interests on the new crops.

45. The storage facilities available for paddy at the project level at present seem to be inadequate particularly in view of the envisaged increases in output.

46. For purposes of seed supply in paddy and other cash crops such as green gram, cowpea, etc. farmers rely heavily on the Department of Agriculture. Agrochemicals are supplied by the private dealers. Institutional devices for the supply of agrochemicals and fertilizer in the area were not seen to be actively functioning and the basic problems of organising these supplies for an uncertain market appeared to be one of the crucial problems seen in this regard.

47. Despite the presence of two banks primarily meant to cater to the agricultural community, banking habits among settlers were not widespread. This is not surprising as farming activities were minimal due to prolonged draught conditions experienced during the last 4 years. In the absence of Yala cultivation, about 25% of the operators had taken consumption loans amounting to Rs.300 per borrower. In Maha 75% had reported cultivation loans averaging to Rs.503 per farmer. Cooperative societies formed the most important source of agricultural credit.

48. Agricultural extension activities currently concentrate around crop production, almost exclusively on paddy. On the average, one field extension worker services around 1,500 acres of paddy land. The survey noted that there is considerable scope for improving the levels of extension activities in this settlement scheme as improved farming practices are hardly adopted on lowlands and the highland allotments are more in a state of neglect. Besides, some of the key elements in the intended irrigation modernization programme such as dry tillage early in the Maha season, raising of paddy crops with rotational issues of water, day light irrigation, and cultivation of other field crops in lowlands in Yala are entirely new concepts for almost all the farmers at Mahakandarawa. Accordingly a very heavy responsibility is cast on the agricultural extension services to launch well designed farmer education programmes with a view to introduce these concepts to project farmers. Firstly, farmers have to be convinced of the economic benefits of the new practices. Secondly, the necessary skills and knowledge about new practices have to be imparted to the farmers. Thus the need for a massive extension effort backed up by a team of subject matter specialists in areas such as; Farm Management, Irrigation Water Management and Farm Machinary can not be over emphasized. A major bottleneck for expanding the extension activities of the area at present is the lack of opportunities available for regular cultivation due to constraints of irrigation water supply.

49. Among the rural institutions set up at village level to support farming activities, the cooperatives are the most important; However, as these societies are primarily consumer oriented, little contribution is made by them to production programmes at present, by way of supply of agricultural inputs. A common criticism regarding the low efficiency of these institutions is centered around their poor management.

50. The Mahakandarawa colonization scheme falls within two agricultural productivity committee regions, namely, Rambewa and Kallanchiya. The former has 17 cultivation committees of which 8 are within the colony. All Cultivation Committees in the right bank except for two, come under the Kallanchiya Agricultural Productivity Committee. From an overall development point of view it would have been desirable if the entire scheme was accommodated under a single Agricultural Productivity Committee. According to the committee officials, two of the major problems that confront the working of these organisations were the lack of capital as well as absence of storage and transport facilities. Farmers seemed to be mostly dissatisfied with the functioning of these institutions, the main reason for which being the system of appointing committee members on a political basis.

51. There are 8 Cultivation Committees in the area and little over half the respondents had little or no confidence in the working of these committees. Lack of authority and insufficient capital funds were cited as major problems in this regard.

52. Six Rural Development Societies are stated to be functional within the colony, of which 2 of them appear to have some activities such as *"shramadana"*. On inquiring from people whether they felt these societies could perform these functions effectively, two thirds felt that they were not capable of doing so.

THE PROJECT

The following details on selected aspects of the project are presented with a view to provide a fuller picture of the irrigation modernization project proper[1].

General

The project would increase cropping intensities in the command areas of the tank schemes by making better use of rainfall and water stored in the tanks. It would also ensure an equitable water distribution through strictly enforced rotational delivery schedules. The proposed improvement in water use would require: rehabilitation and modification of the existing conveyance system; measurement of water flows at various points along the canals; reduction in delivery losses, and improved water use on the field.

To derive full benefits from the project, the extension service would be strengthened and supplies of farm inputs would be improved. Also, to cope with the tightened crop calendars and more intensive cropping patterns, the project would provide for a substantial increase in the number of farm tractors for land preparation. Finally, for proper handling of the increased farm production, the farm roads would be improved.

Cost Estimates

Total project costs are estimated at US $ 30.0 million equivalent, including about US $ 8.0 million in import taxes and duties. The foreign exchange component is estimated at US $ 9.1 million or about 41 per cent of the total net of taxes and duties. Estimates are based on preliminary design, with unit prices at January 76 levels. The

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[1] Extracted from the appraisal report No.951-CE of the World Bank on Tank Irrigation Modernization Project.

major elements included in the cost estimate are civil works (US $ 8.7 million), construction equipment and vehicles (US $ 7.0 million), agricultural equipment and vehicles (US $ 4.5 million), technical assistance (US $ 0.2 million), and engineering and administration (US $ 1.3 million), totalling to a base project cost of US $ 21.7 million. Physical contingencies of US $ 1.7 million (20 per cent of civil works costs) and price contingencies of US $ 6.6 million (28 per cent of the base cost plus physical contingencies) bring the total project cost to US $ 30.0 million.

Civil Works

(i) desilting and enlarging the entire water conveyance system (main and branch canals, 120 ml; distributaries, 180 mls; and field channels about 500 mls) to provide sufficient capacity for a seven day rotation with only daylight irrigation (estimated earthwork: 0.6 M. cu. yd);

(ii) repairing, enlarging and surfacing with gravel the embankments used as farm roads (estimated earth work: 1.3 M. cu. yd. and gravel work: 0.4 M cu. yd);

(iii) excavating some 300 mls. of drains to improve the drainage (estimated earth work: 1.6 M cu. yd);

(iv) where necessary, brick lining of the conveyance system to reduce excessive seepage or erosion, and to provide the necessary degree of water control. In addition, all irrigation canals and field channels under the Mahawilachchiya tank would be lined, with different kinds of lining, as a pilot programme for determining the effect on seepage losses, and capital and maintenance costs (estimated lining requirements — main and branch canals: about 6 mls; distributaries: about 7 mls, and field channels: about 50 mls);

(v) repairing and modifying the existing structures in the irrigation system to enable daylight irrigation for each farm on a seven day rotation schedule;

(vi) installation of some 170 new regulators in the main and branch canals to increase water control in the conveyance

system. Similar regulating structures would also be installed in distributaries and field channels;

(vii) installation of Parshal flumes to measure releases from the tanks and water flows at various points in the system and

(viii) provision of offices, workshops, stores and housing for supervisory and construction crews. For each 6,000 ac. units such buildings will include: 2,400 sq. ft. for temporary officers; 4,000 sq. ft. each for storage and workshops; temporary quarters for three senior officers; six units of 500 sq. ft. each for bachelor officers quarters, and 2,000 sq. ft. of dormitory space for labourers. After construction is completed, all buildings, except the temporary offices and quarters would continue to be used in connection with the expanded operation and maintenance (O & M) programme for the project.

Technical Assistance

(i) a water management specialist would be engaged for a period of at least two years to assist in layout and design (particularly the field channels and farm drains), in the development of the operating schedules for the tanks and the rotation schedules for the water supply system and to train local engineers, technicians and Cultivation Committee (CC) members on intermittent irrigation. These local staff would then train farmers to help them adapt to the new irrigation practices.

(ii) engaging of an independent organization such as the Agrarian Research and Training Institute (ARTI) to conduct appropriate benchmark and follow-up surveys in order to evaluate the impact of the project on the efficiency of water utilisation, equitable water distribution, O & M costs, cropping patterns, and yields and production levels. Emphasis would also be

placed on evaluating the merits of various types of canal linings proposed for the Mahawilachchiya tank.

Revised Construction Schedule

Scheme	1978 (Acres)	1979 (Acres)	1980 (Acres)	1981 (Acres)
Mahawilachchiya	1,500	1,100	-	-
Mahakanadarawa	4,000	2,000	-	-
Vavunikulam	500	2,500	3,000	-
Padaviya	500	4,000	4,000	4,000
Pavatkulam	500	1,500	2,400	-
	7,000	11,100	9,400	4,000

Source: Department of Irrigation, January, 1978

ANNEX 2

CLASSIFICATION OF PADDY LAND HOLDING ACCORDING TO SOIL TYPES

Soil Type	Left Bank	Right Bank	Total
Soil types mainly suitable for paddy and not for upland crops			
1. RBE (IM), + LHG + AL	47	35	82
Soil types mainly suitable for upland crops but rice could be grown particularly in Maha			
1. RBE (WD)	32	26	58
2. RBE (WD) + RKP + FR	-	1	1
1. RBE (WD) + RBE (IM) + LHG	8	21	29
2. RBE (WD) + RBE (IM)	22	46	68
3. Others	4	2	6

Others - include not marked on map, not surveyed, etc.

RBE (WD) - moderately deep to deep, moderately fine textured, well drained Reddish Brown Earths. Slope 2-3%;

RBE (IM) - moderately deep to deep, moderately fine textured imperfectly drained, Reddish Brown Earths. Slope 1-2%;

LHG - moderately deep to deep, moderately fine textured poorly drained low humic gley soil. Slope 0-1%;

AL - deep Alluvial soils of variable texture and drainage. Slope 0-2%;

VSS - Very Shallow Soils and/or rock outcrops. Slope 3-4%.

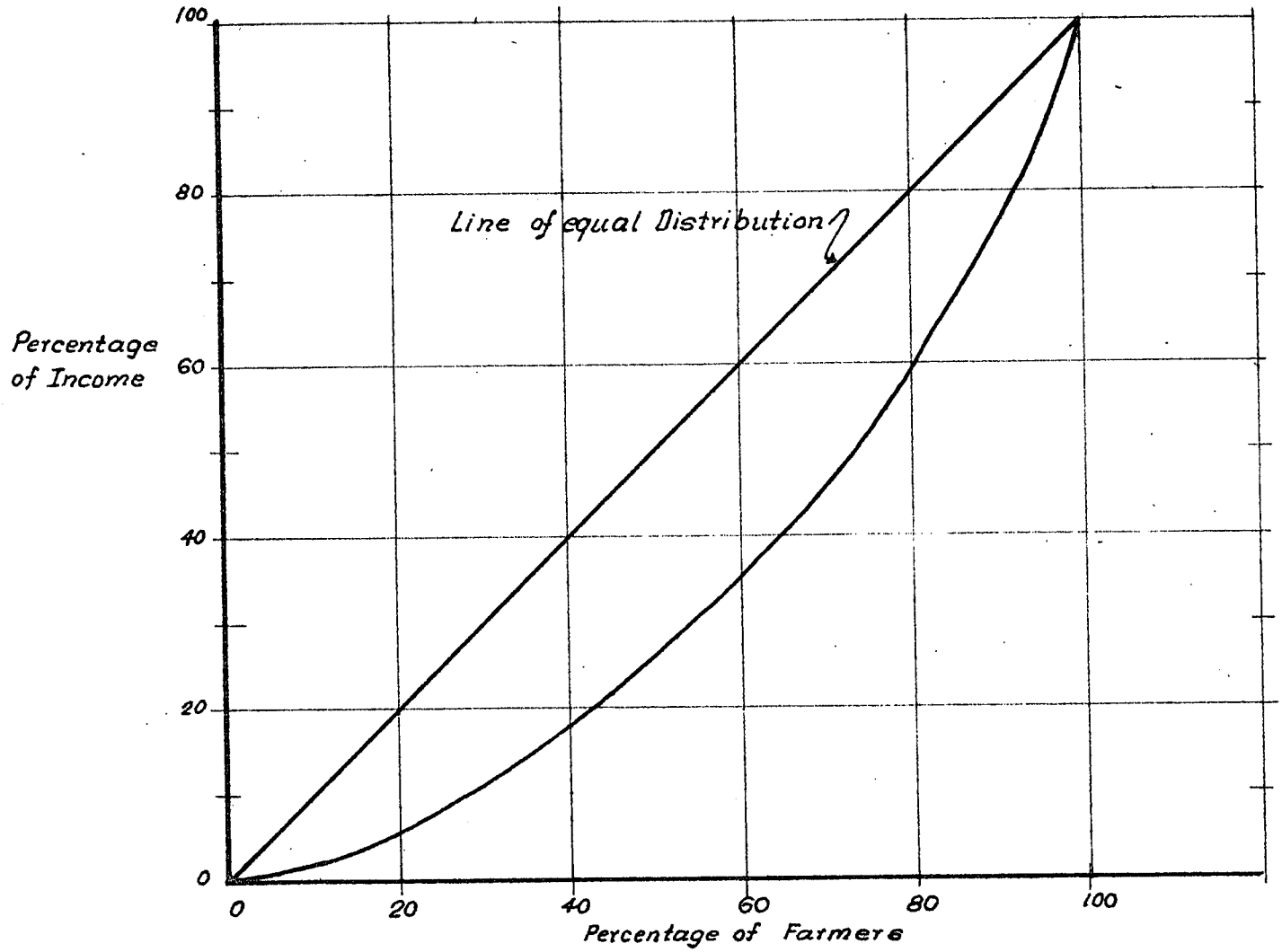
ANNEX 3

DISTRIBUTION OF ANNUAL GROSS INCOME PER FARM - MAHAKANADARAWA
Yala 76 and Maha 76/77

Income Category	% of farmers	Cumulative percentage	% of income	Cumulative percentage
0 - 1,000	3.5	3.5	0.1	0.1
1,001 - 2,000	8.2	11.7	1.7	1.8
2,001 - 3,000	4.7	16.4	1.7	3.5
3,001 - 4,000	9.4	25.8	4.9	8.4
4,001 - 5,000	10.6	36.4	6.6	15.0
5,001 - 6,000	8.2	44.6	6.2	21.2
6,001 - 7,000	14.1	58.7	12.9	34.1
7,001 - 8,000	7.0	65.7	7.4	41.5
8,001 - 9,000	8.6	74.3	9.7	51.2
9,001 - 11,000	8.2	82.5	11.8	63.0
11,001 - 13,000	4.7	87.2	7.7	70.7
13,001 - 15,000	5.8	93.0	11.6	82.3
15,001 - 17,000	7.0	100.0	17.7	100.0

DISTRIBUTION OF ANNUAL GROSS INCOMES PER FARM

MAHAKANADARAWA - YALA 76 & MAHA 76/77



GROSS INCOME DISTRIBUTION OF CHENA FARMERS & NON CHENA FARMERS IN MAHAKANADARAWA
Maha 76/77

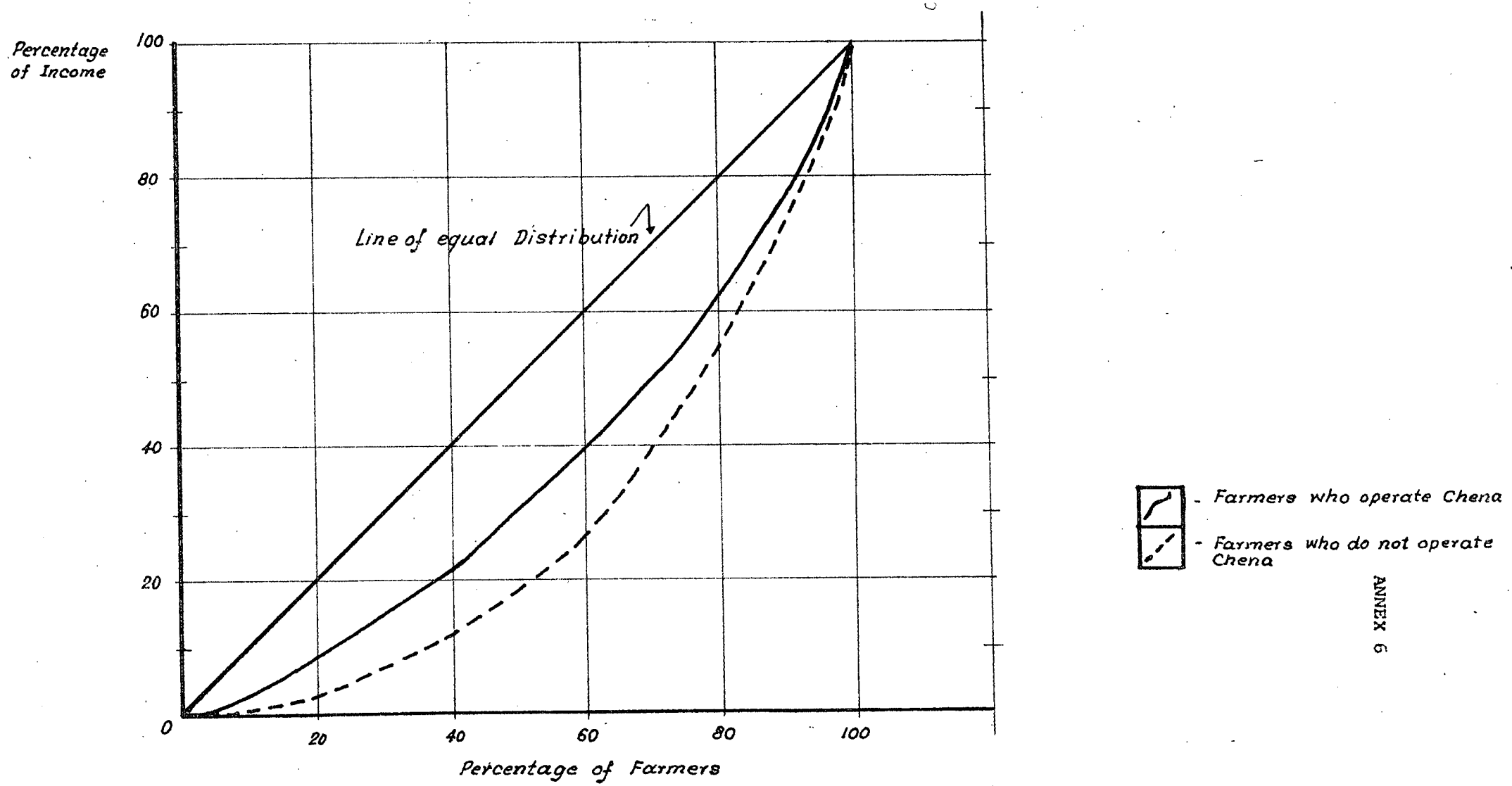
Income Category	Farmers who operate chena				Farmers who do not operate chena			
	% of farmers	Cumulative percentage	% of income	Cumulative percentage	% of farmers	Cumulative percentage	% of income	Cumulative percentage
0 - 1,000	-	-	-	-	8	8	*	-
1,001 - 2,000	2	2	*	-	17	25	5	5
2,001 - 3,000	4	6	1	1	5	30	2	7
3,001 - 4,000	2	8	1	2	20	50	12	19
4,001 - 5,000	12	20	7	9	8	58	6	25
5,001 - 6,000	14	34	9	18	-	58	-	25
6,001 - 7,000	20	54	16	34	5	63	6	31
7,001 - 8,000	10	64	9	43	3	66	4	35
8,001 - 9,000	8	72	9	52	9	75	13	48
9,001 - 11,000	8	80	10	62	9	84	15	63
11,001 - 13,000	8	88	12	74	-	84	-	63
13,001 - 15,000	6	94	11	85	7	91	14	77
15,001 - 17,000	6	100	15	100	9	100	23	100

*Less than one per cent.

Annex 6

DISTRIBUTION OF ANNUAL GROSS INCOMES OF FARMERS OPERATNG CHENAS AND NOT OPERATING CHENAS

MAHAKANADARAMA (YALA 76 AND MAHA 76/77)



ANNEX 6

Annex 7

ABANDONMENT OF ALLOTMENTS IN THE TRACTS AT THE TAIL END OF THE SETTLEMENT SCHEME

	Left Bank				Right Bank	
	T R A C T				T R A C T	
	4	4A	5	6	3A	5
Total number of allotments available	125	133	174	135	316	360
Number of regularised allottees	119	109	94	39	135	260
Number abandoned by the regular allottees[1]	6	24	60	96	181	100

Source : Reports from Colonization Officers

[1]Some of these are occupied by encroachers.