

3.7 AGRICULTURE

3.7.1 Land Use

Land in the Minipe Scheme can be grouped in five categories in terms of land use. They are;

- (1) Paddy land
- (2) Highland
- (3) Uncultivated land
- (4) Rocky waste land, and
- (5) Other land including tanks, river courses and roads

The total land area in the Minipe Scheme is 18,660 ha. Out of the total area, 12,020 ha or 64 percent have been used for agricultural purposes in 1984/85, 8,180 ha being used for paddy cultivation, 1,940 ha, for the production of upland crops such as maize, chillies, kurakkan and cowpea, 840 ha, for fruit trees and 1,060 ha, for vegetables.

The terrace paddy fields lie on the gentle slope between the Minipe Canal and the Mahaweli River. The extent of cultivated land in Yala season is largely dependent on the amount of water available. In Stage I, more than 90% of the paddy lands are double cropped. The percentage of double cropped land gradually decreases as the Stage moves downstream. In Stage IV only about 40% of the fields are double cropped.

On the left bank of the Mahaweli River, there are narrow alluvial plains of 100 to 800 m wide which are not at present used for agricultural purposes. In particular, considerably large extents of land are to be found near the mouth of the Hettipola Oya in Stage III (180 ha) and in the flood plain near the river mouth of the Gamburu Oya in Stage IV (200 ha). The present irrigation system cannot supply water to this land because of its high elevation. The possibility of these lands being used for agricultural purposes should be examined. Location of these lands is shown in Fig. 3.7.1.

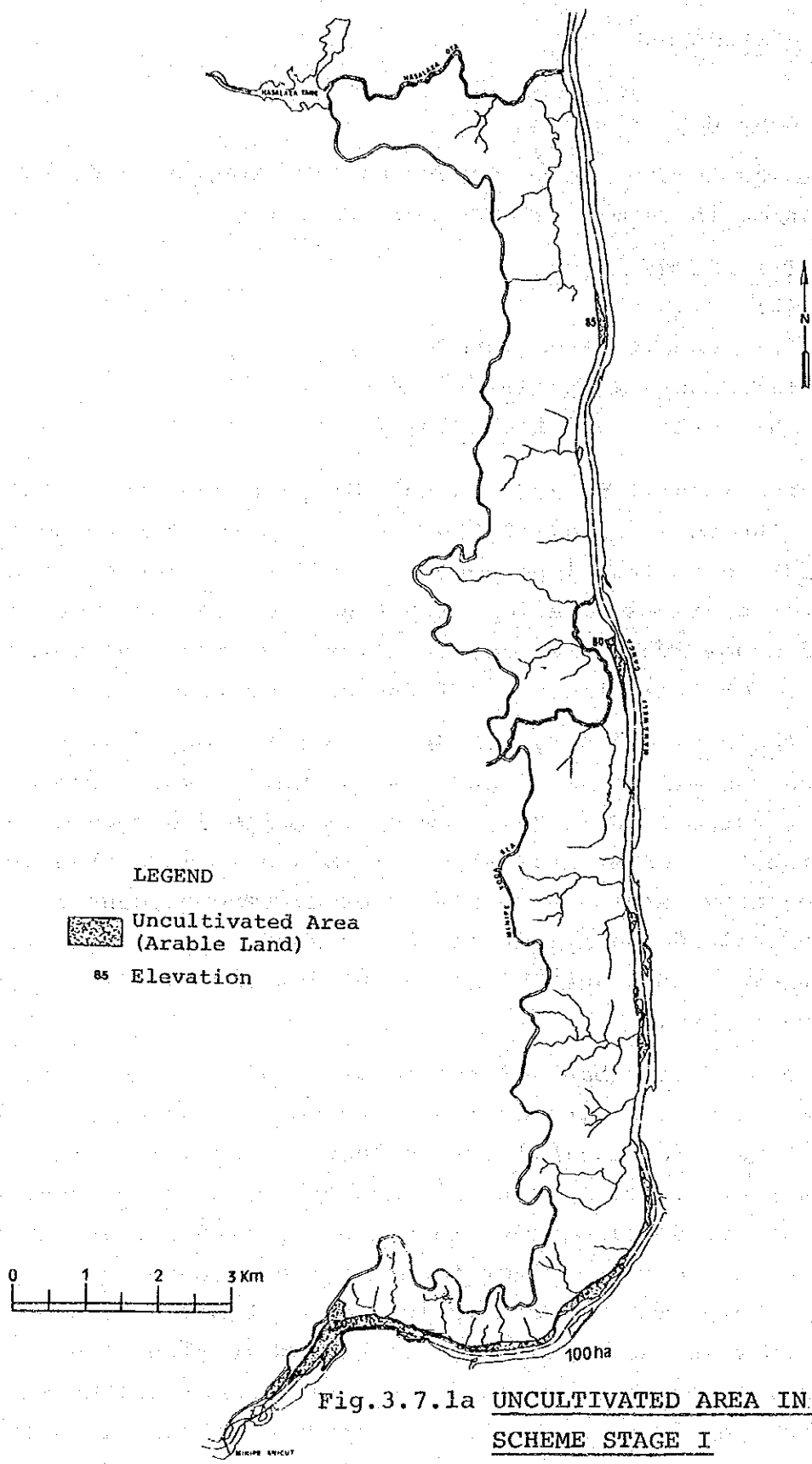


Fig.3.7.1a UNCULTIVATED AREA IN MINIPE
SCHEME STAGE I

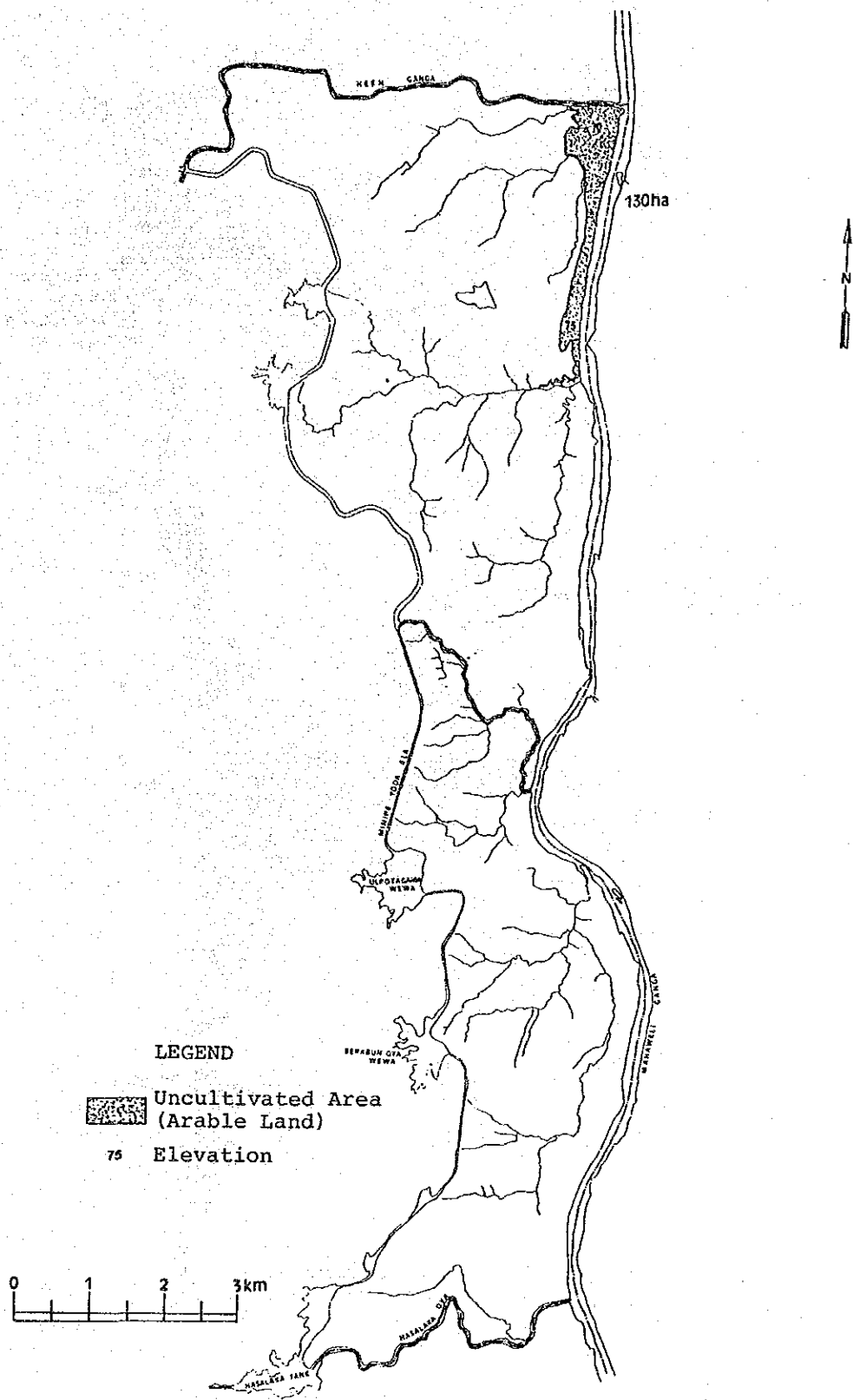


Fig.3.7.1b UNCULTIVATED AREA IN MINIPE SCHEME STAGE II

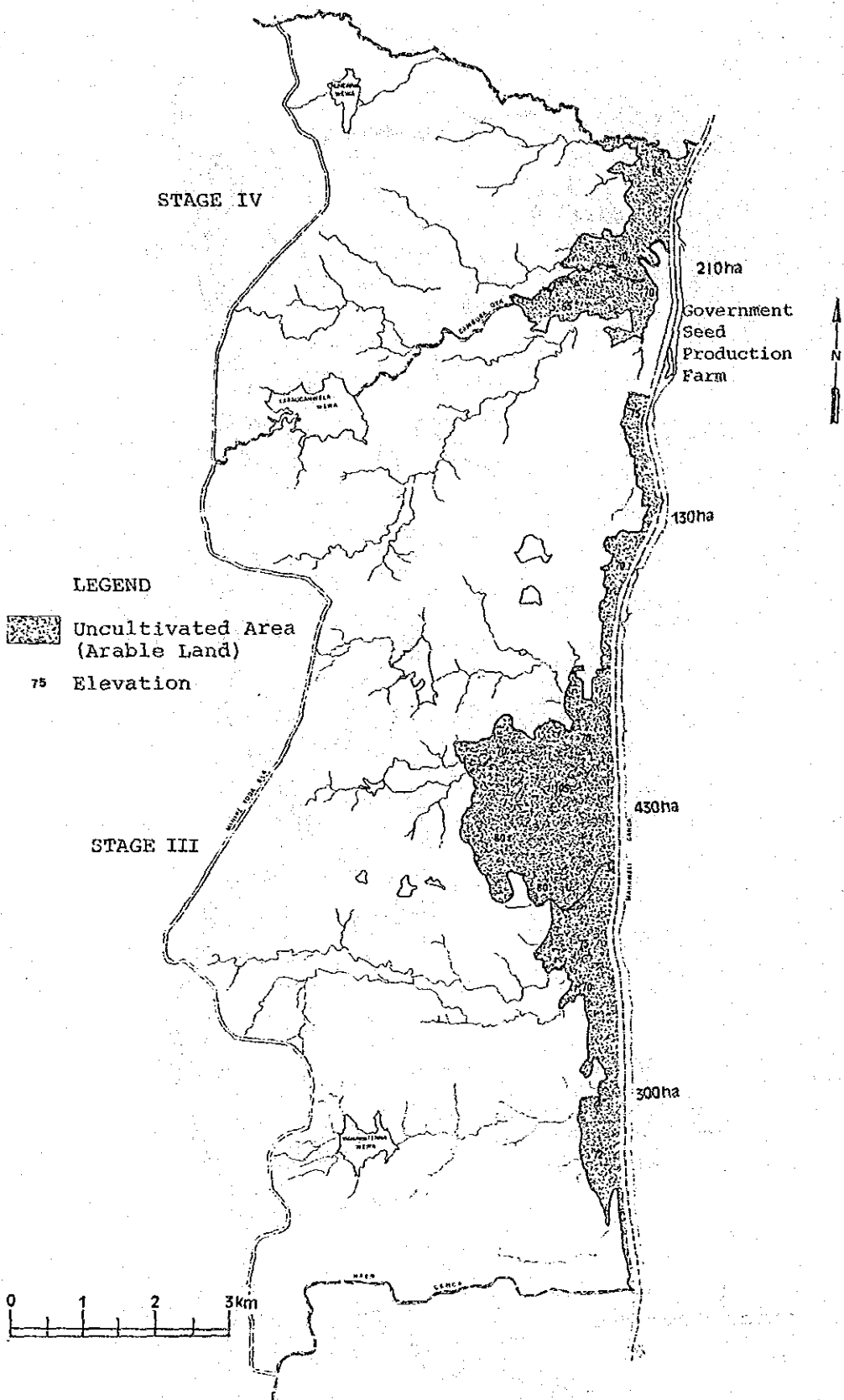


Fig.3.7.1c UNCULTIVATED AREA IN MINIPE SCHEME STAGE III & IV

The actual asweddumized and highland areas in Minipe in 1985 are summarized in the following table.

Table 3.7.1 ACTUAL ASWEDDUMIZED AREA AND HIGHLAND AREA IN 1985

Item	Area (ha)			Percentage (%)		
	Stage	Stage	Total	Stage	Stage	Total
	I,II	III,IV		I,II	III,IV	
Actual Asweddumized Area						
Irrigated	3,699*	2,408	6,107	61	39	100
Rainfed	459	1,608	2,067	22	78	100
Total	4,158*	4,016	8,174	51	49	100
Highland Area	3,762	1,179	5,481	69	39	100

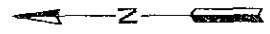
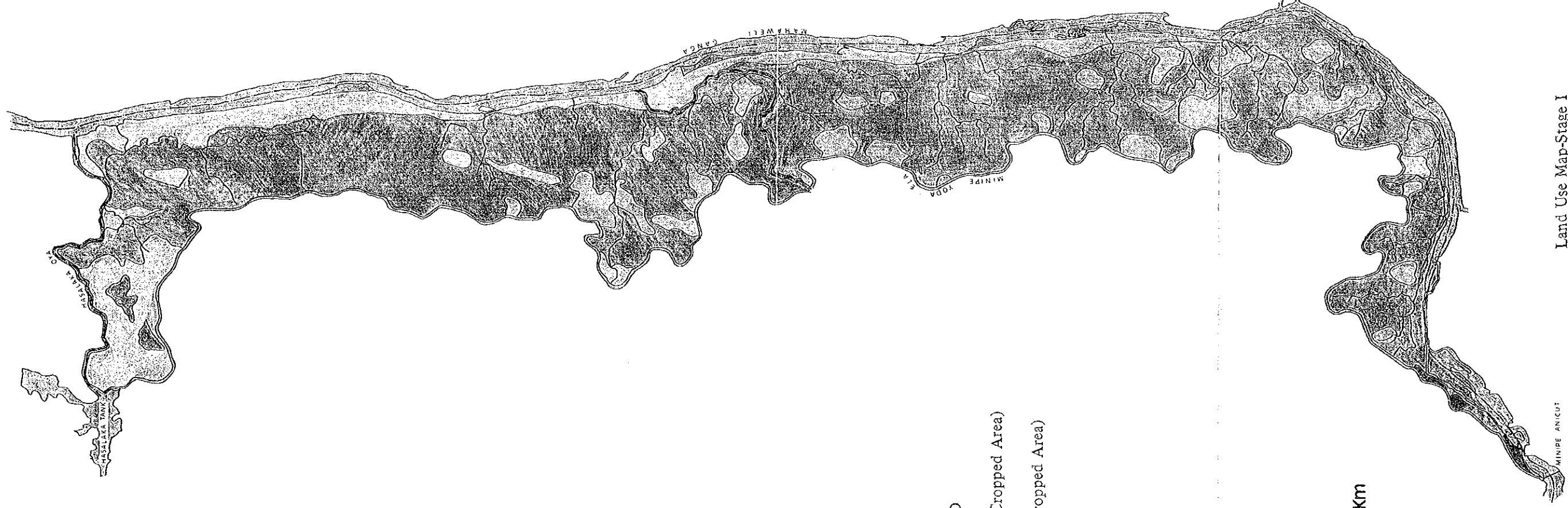
* Note: Temple land(448ha:1,180 ac) is included in allotment area in Stage 1.

3.7.2 Cropping Pattern of Main Crops







Prevailing cropping pattern of main crops in Minipe area is shown in Table 3.7.2.

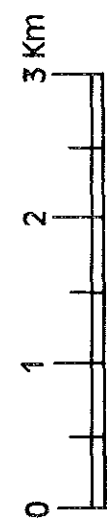
Table 3.7.2 MAIN CROPPING PATTERN IN MINIPE SCHEME

Item	Maha	Yala	Extent Estimated (%)	
			Stage I,II	Stage III,IV
A. Asweddumized Field				
Irrigated	Paddy	Paddy	77-10	22-67
	Paddy	Subsidiary		
		Food Crops	0.4-10	0.1-0.7
Rainfed	Paddy	Fallow	0-2	30-72
	Paddy	Fallow	100	100
B) Highland				
Subsidiary Food Crops	Subsidiary			
	Food Crops	Fallow	100	100
Fruit Tree	Fruit Tree	Fruit Tree	100	100
Vegetables & Other Crops	Vegetables			
	Other Crops	Fallow	100	100

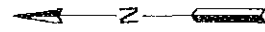
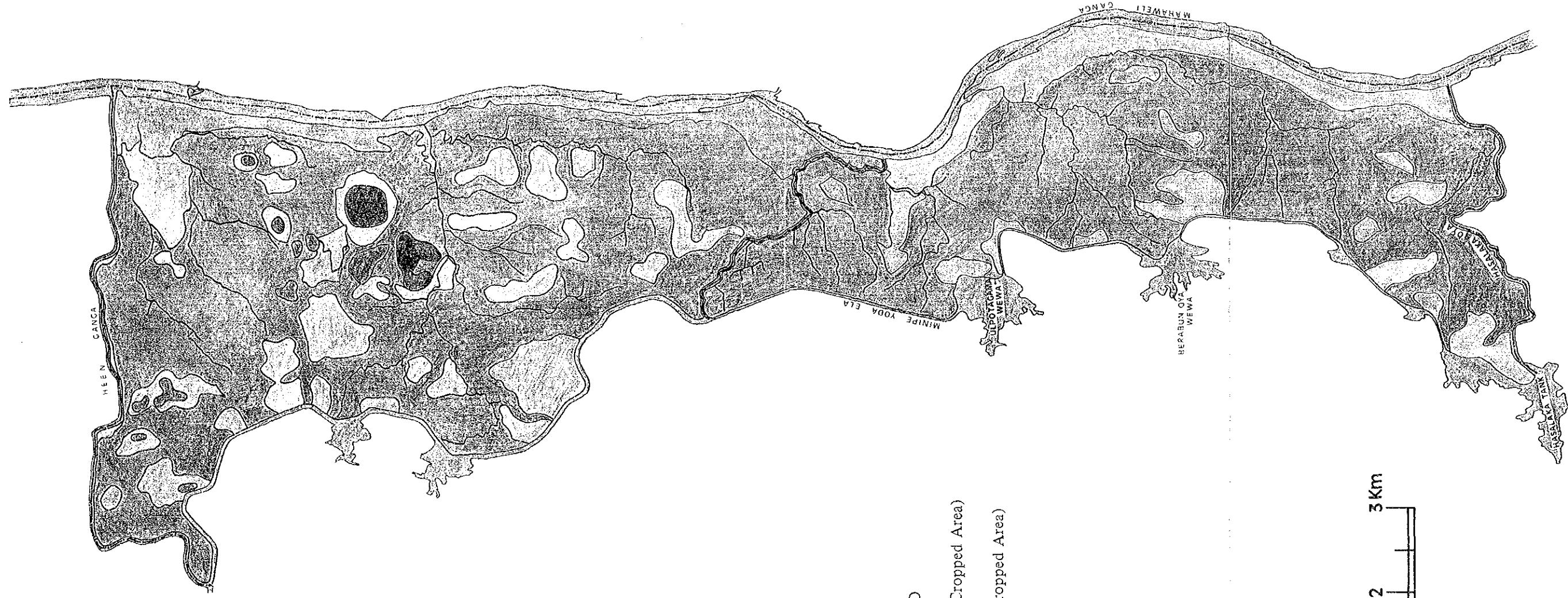


LEGEND







-  Paddy Land (Double Cropped Area)
-  Paddy Land (Single Cropped Area)
-  High Land
-  Uncultivated Land
-  Rock
-  River, Tank, Channel

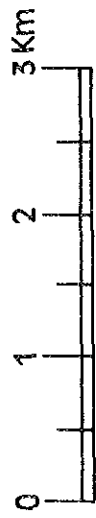


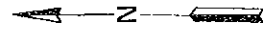
Land Use Map-Stage I









LEGEND

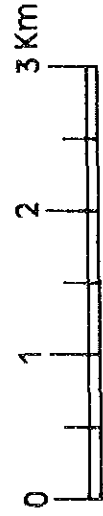
-  Paddy Land (Double Cropped Area)
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-  Rock
-  River, Tank, Channel





LEGEND

-  Paddy Land (Double Cropped Area)
-  Paddy Land (Single Cropped Area)
-  High Land
-  Uncultivated Land
-  Rock
-  River, Tank, Channel



Land Use Map-Stage III & IV

It is clear from the above table that paddy is the main crop of the area. As far as the irrigated fields are concerned, paddy is cultivated in both Maha and Yala season. But in Maha when there is ample rainfall, paddy is cultivated on high lands as well. In Yala season, the extent of land used for paddy cultivation is largely determined by the amount of available water. Upstream in Stages I and II, there is double cropping of paddy. However, downstream in Stages III and IV, about 60% of the arable land is kept fallow in Yala season because of difficulties in obtaining irrigation water.

In recent years, subsidiary food crops such as chillies, cowpea, green gram and soya beans have been cultivated on the experimental basis in the Yala season in each Stage of the Minipe area under irrigated condition, utilizing land which would otherwise have been kept to fallow. The cultivation of subsidiary crops accords with the national policy of promoting agricultural diversification and should prove to be of interest in the context of saving irrigation water, creating work opportunities and increasing farmers' cash income.

In the highland area, subsidiary crops and vegetables are cultivated in Maha season. Since there is total dependence on rainfall, cultivation on highland is quite unstable and it is not a principal source of income for farmers. For the cultivation of kurakkan and manioc, chena cultivation is practiced. There is no rotational cropping in the cultivation of highland crops.

3.7.3 Production of Main Crops

The average yields of paddy in Minipe Scheme after 1981 are shown Table 3.7.3 together with the harvested area and total production.

In the Agricultural Implementation Programme of 1984/85, the target of average yield of paddy production had been fixed at 3.7 t/ha in the Maha season and 3.6 t/ha in the Yala season. Comparing the figures in the above table with the target yield, no significant differences are recognized in Stage I and II, but in Stage III and IV the present yields are about 20% less than the target yield. This is because the supply of irrigation water is unstable. This situation makes it difficult to introduce modern cultivation methods such as the use of improved varieties, use of fertilizer and agro-chemicals and transplanting. The figures in the above table differ from the records in Kachcheri (Kandy) and AGA office. To be on the conservative side, the data obtained in the Kachcheri have been used for establishing an agricultural plan of the Project.

The production of subsidiary crops is shown in Annex 6. The production of these crops is unstable except under irrigated condition and the cultivation of these crops is not a principal source of income for farmers (as earlier indicated).

Table 3.7.3 HARVESTED AREA, PRODUCTION AND AVERAGE YIELD OF PADDY

Harvested Year	Harvested Area (ha)			Production (t)			Average Yield (t/ha)	
	Stage I, II	Stage III, IV	Total	Stage I, II	Stage III, IV	Total	Stage I, II	Stage III, IV
1980/81 Maha	3,841	1,866	5,707	13,865	5,051	18,916	3.6	2.7
1981 Yala	3,042	815	3,857	11,048	2,417	13,465	3.6	3.0
1981/82 Maha	3,909	3,059	6,968	13,963	8,701	22,664	3.6	2.8
1982 Yala	2,601	943	3,554	11,354	2,733	14,087	4.4	2.9
1982/83 Maha	3,983	2,756	6,739	18,183	9,286	27,469	4.6	3.4
1983/Yala	2,933	550	3,483	10,445	1,473	11,918	3.6	2.7
1983/84 Maha	4,316	4,017	8,333	14,457	14,186	28,644	3.3	3.5
1984 Yala	3,272	1,697	4,969	11,967	4,750	16,717	3.7	2.8
1984/85 Maha	3,997	3,991	7,988	14,542	15,341	29,883	3.6	3.8

3.7.4 Existing Farming Practice

(1) Use of Improved Varieties

In all the Minipe area, new improved varieties of paddy are cultivated in about 60% of the paddy fields in the Minipe Scheme. In Yala season the area cultivated with such varieties is smaller than in Maha. Improved varieties are grown in Yala season in about 10 to 20% of the area in Stage I/II and to negligible extent in Stage III/IV.

As regards other crops, improved varieties are adopted for the cultivation chillies, cowpea, green gram and soya beans. Local varieties are still used in the cultivation of maize, kurakkan and manioc.

(2) Transplanting

The area transplanted in Stage I and II in 1984/5 was about 83% and about 74%, of the total area cultivated in paddy in the Maha, and the Yala, season, respectively. In Stage III/IV, direct sowing has been the predominant facture. Transplanting had been adopted only to the extent of about 33% and 16% of the area in Maha and Yala, respectively. It is generally recognized that transplanting yields higher paddy production than direct sowing. Accordingly, change of planting method will be an important factor in increasing the yields and production of paddy. Other crops except chillies are cultivated with direct sowing.

(3) Use of Fertilizer

According to the survey on the fertilizer application, about 80% of the farmers are using fertilizer. The average amount of fertilizer per ha is about a half to two thirds of the amount recommended by the Government. Especially in Stage III/IV, only half the farmers are

using fertilizer in Yala season and the average amount of fertilizer per ha is also at a low level. The main reason of this is assumed to be the unstable supply of irrigation water. The detailed results of survey are given in Annex 6.

The unit fertilizer application is extremely low for all upland crops and paddy under rainfed cultivation. Though the application of cattle' and buffalo' dung is considered to be effective, it will be necessary to apply artificial fertilizers according to the recommendations by the Government.

(4) Diseases and Pests

It is estimated that insects cause more damages paddy crops than diseases. In recent years, the damage caused by rice leafroller (*Chaphalocrocis medinalis* Guenee) is significant and its urgent control is essential. For the cultivation of upland crops, no controls are exercised at present. In the future, intensive control of pests and diseases is required. The main diseases and pests affecting paddy are summarized in Annex 6.

(5) Farm Power

In the Minipe Scheme, many buffaloes and cattle are bred by farmers. Farm operations are mainly carried out by using animal power. The use of agricultural machinery is resorted to only in case of urgency. Methods of ploughing and threshing of paddy are shown in Annex 6 together with statistics of agricultural machinery owned by farmers in the Minipe Scheme.

(6) Farm Size

The average land area cultivated by a farm family differs from one stage in the Minipe Scheme to another. This is because settlement has taken place over a long

period and the extent alienated at the time of settlement has been different in the several one stages.

As the result of the sample survey, the average size of a family farm is estimated to be 0.8 ha (2 Acs) of paddy land and 0.5 ha (1 1/3 Acs) of highland.

(7) Input Supply

The routes of agricultural input supply vary depending on the kind of inputs such as seed, planting material, fertilizer, agro-chemicals, agricultural equipment and livestock. The multi-purpose Co-operative Societies and the Agrarian Service Centres located in the Minipe Scheme are the main organisations which supply agricultural inputs. Private traders have also been authorized to sell agricultural inputs in the Minipe Scheme.

(8) Farm Budget

The average farm budget (1981 - 85) from paddy cultivation per ha in Minipe Scheme is shown below.

		<u>Stage I, II</u>	<u>Stage III, IV</u>
Farm Income	Maha	Rs.5,385	Rs.4,981
	Yala	Rs.5,341	Rs.1,661
Farm Profit	Maha	Rs.1,157	Rs.2,671
	Yala	Rs.2,791	Rs. Δ757

3.7.5 Agricultural Supporting Services

- (1) In the Minipe Scheme, Co-operative Rural Banks, the People's Bank and the Bank of Ceylon provide agricultural credit to farmers. The locations of each bank and its service area are shown in Annex 6.

The Agrarian Services Department officials certified the loan applications on the basis of the farmers' eligibility to obtain loans. Only farmers who have the legal right to cultivate the land are only entitled to obtain loans. Loans are given on the mortgage of the land at an interest rate of 9% per annum which is the uniform rate both for the Co-operative Rural Banks and the two State Banks.

(2) Marketing and Processing

There are no organised marketing and processing system for purchasing/processing agricultural commodities except for paddy which is at present the major product in the area.

Paddy is purchased by the Stores under the control of the Paddy Marketing Board (PMB). The paddy is intended for the PMB Milling Centre at Hasalaka. After milling, the rice is transported to the Food Commissioner's Stores in Kandy, and distributed to the Co-operatives and private traders. The quantities of paddy purchased by PMB are shown Table 3.7.4. The prices of paddy and rice are shown below.

Farmers — PMB Stores — Food Dept. — Co-operatives

2.99 Rs/ks	6.37 Rs/kg	6.50 Rs/kg
(Paddy)	(Rice)	(Rice)

The quantity of paddy purchased in Yala has been less, and subject to greater fluctuation, than the quantity purchased in Maha.

(3) Prices of Agricultural Products

Agricultural products are purchased both by the Co-operatives and private traders. Private traders usually purchase agricultural products at 5 to 10%

Table 3.7.4 PADDY PURCHASES MINIPE SCHEME (1980-1985)

	Morayaya		Pallawatta		Kolongoda		TOTAL in kg	
	Maha (K.g)	Yala (K.g)	Maha (K.g)	Yala (K.g)	Maha (K.g)	Yala (K.g)	Maha	Yala
1980	2904768	2565	2688030	-	2287973	-	7,880,771	2,565
1981	1532228	36570	2412680	1263	2736345	50523	6,681,253	98,356
1982	1219485	-	1581661	-	4027666	-	6,828,812	-
1983	1446337	294079	2526575	435062	3919285	362867	7,892,197	1,092,008
1984	947966	311819	3093623	908908	4116696	-	8,158,285	1,220,727
1985	940573	-	2106915	-	2616446	-	5,663,934	-

Source : Regional Manager, Paddy Marketing Board, Kandy

higher prices than the Co-operatives. But at the time of harvest of paddy, the price at which Co-operatives purchase is generally higher than the price of the private trade. The current purchasing prices of Co-operatives are indicated in Table 3.7.5.

(4) Agricultural Extension and Training of Farmers

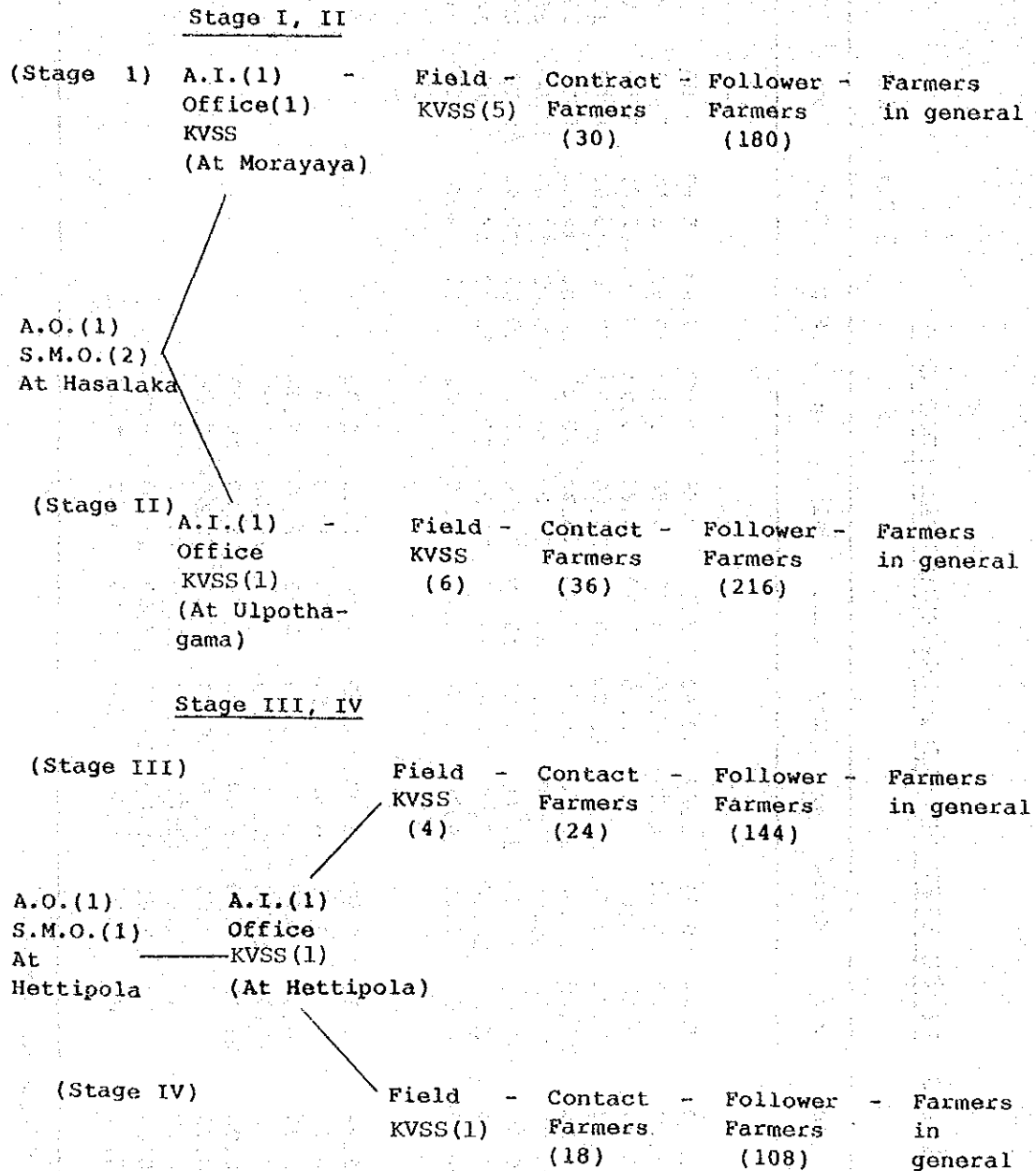
In the Minipe Scheme, agricultural extension and training of farmers are undertaken by two Agricultural Officers, three Subject Matter Officers, three Agricultural Instructors and several Agricultural Extension Workers (K.V.SS). The main activities and organisation of agricultural extension are shown in Fig. 3.7.2.

Table 3.7.5 PRICE LIST OF MAJOR AGRICULTURAL PRODUCTS

Unit : Rs.

KIND	Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec.
<u>1984</u>												
Paddy	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99
Rice	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.75	6.75	6.75
Kurakkan	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Ginger	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Potatoes	15.00	15.00	15.00	15.75	15.75	15.25	15.25	15.25	15.25	15.25	15.00	15.00
Chillies	30.00	30.00	30.00	35.00	35.00	35.00	35.00	30.00	30.00	30.00	30.00	30.00
Cowpea	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Soya Bean	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Manioc	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
<u>1985</u>												
Paddy	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99
Rice	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Kurakkan	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Ginger	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Potatoes	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Chillies	42.00	42.00	42.00	42.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
Cowpea	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Soya Bean	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Manioc	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

SOURCE : Co-operative Office at Hasalaka



Remarks: - A.O. Agricultural Officer,
S.M.O. Subject Matter Officer
A.I. Agricultural Instructor
K.V.S.S Agricultural Extension Worker
(Krushikarma Viyapthie Sevaka - In Sinhala)

Fig.3.7.2 SYSTEM OF AGRICULTURAL EXTENSION AND TRAINING

3.8 WATER MANAGEMENT

3.8.1 General

Past and present water management activities in Minipe from 1979 to 1985 were investigated in respect of:

- (a) Any Projects in Water Management in operation in Minipe during the above period and the continuation or otherwise of same after 1984 and
- (b) The water management activities in the total command area of Minipe in the study period and the continuation of otherwise of same after 1984.

These projects are referred to in this section as (P) and (W) respectively. Information was obtained from the Irrigation Department Office at Hasalaka and the Kandy, and Matale, Kachcheries. The farmers of Minipe were also a source of information, with a spokesman generally speaking on behalf of a group of farmers or with farmers speaking individually on their own behalf.

3.8.2 Project Detail (P)

(1) Name of Project

The 'Pilot Area Water Management' (PAWM) Project functioned in Minipe during the Study Period. It was located in Stage I in the head reach of the LB Main Canal in a hydrological area bounded by the main canal on the West, Mahaweli Ganga on the East and Drainage streams on the north and south. The Pilot Area was designated Section I of Stage I and comprised approximately 2,000 Acs - the actual extent being given in Table 3.8.1.

(2) Implementation Period

Preliminary action to establish the PAWM Project commenced in 1978. The Implementation Period of the Project was from Maha 1979/80 to June 1980.

(3) Administrative Agencies

The Administrative Agencies involved in the PAWM Project were as follows:

- Irrigation Department (ID)
- Agrarian Services Department (ASD)
- Agriculture Department (AD)

(4) Persons Engaged

Persons engaged in the PAWM Project were as follows:

- 01 Irrigation Engineer (ID)
- 01 Technical Assistant (ID)
- 03 Work Supervisors (ID)
- 03 Cultivation Officers (ASD)
- 02 KVSS (AD)
- 11 Farmer Representatives
- 04 Water Distributors (ID)

TABLE 3.8.1 SUB AREAS AND FARMER REPRESENTATIVES
PAWM PROJECT

<u>Distributary Canals</u>	<u>Extent in ha</u>	<u>No. of Farmer Representatives</u>
D1 to D7	86	1
D8 to D11	48	1
D12 to D17	211	3
D18 to D21	213	3
D22 to D24	35	1
D25 to D26	179	1
D27 to D28	37	1
	<hr/>	<hr/>
	809 ha	11

(5) Cost for Implementation

PAWM Project was not allocated additional/separate funds by any of the Administrative Agencies in sub-para (3) towards cost of implementation of the Project. To meet costs of operation and maintenance (currently called Water Management) funds were voted to the Irrigation Department on an annual basis as in Table 3.8.2. Almost the entire operation and maintenance cost in a Scheme is a charge to the Irrigation Department. Hence the cost of implementation of PAWM Project was met on a pro-rated acreage basis from the voted funds as shown in Table 3.8.2

Table 3.8.2. VOTED EXPENDITURE TO IRRIGATION DEPARTMENT FOR O & M

Extent maintained - 625,000 ac. average

Year	Maintenance of Major Works	Improvements to Major Works	Improvements to Water Management
1984	66,837,000	12,000,000	8,000,000
1983	66,070,000	16,000,000	8,000,000
1982	57,820,000	14,000,000	7,200,000
1981	56,000,000	10,000,000	9,000,000
1980	56,000,000	10,000,000	6,000,000
1979	43,830,000	7,000,000	6,000,000
	Rs.346,557,000	Rs.69,600,000	Rs.44,200,000
Av/Yr.	57,759,500	11,500,000	7,366,667
Rate/Ac.	Rs.92.42	Rs.18.40	Rs.11.79
TOTAL			
Rate/Ac.	92.42	+ 18.40	+ 11.79) = Rs.122.60
			say = Rs.125.00

Hence Annual O & M Cost for Minipe - $125 \times 12,073$
= Rs.1,509,125

Hence Annual O & M Cost for Nagadeepa - $125 \times 4,032$
=Rs.504,000

3.8.3 Water Management Organisation (P)

(1) Officials, Farmer Representatives

The officials and farmer representatives for PAWM Project were as follows:

- Officials - Technical Assistant in charge of area (ID)
- Work Supervisors (ID)
- Water Distributors (ID)
- KVS (AD)
- Cultivation Officer (ASD)
- Colonisation Officer (Land Commissioner's Department - LC)

Farmer Representatives

- As Statutory provision was not available then to elect Farmer Representatives, such Representatives were selected informally to represent specific sub-area in the PAWM Project. The sub-areas represented and the number of farmers informally selected are described in sub-para (2) and Table 3.8.1.

(2) Selection of Farmer Representatives

Criteria adopted by the farmers in the selection of a representative were the ability of the representative to have ready access to political interests to whom the farmers problems could be presented for solution and the extent of command and respect enjoyed by the representative in the community. Either of, or both, these criteria were applied by the farmers in the selection of the representative. The position in respect of Sub-areas and farmer representatives in PAWM Project is given in Table 3.8.1.

The layout of canals and blocking out of farms in the PAWM Project area as well as in the entire Minipe Scheme were not on the uniform basis of 16 to 20 ha (40 to 50 Acs) Turnout Areas and 1 cusec (0.02832 cumec)

canals. Hence there is a wide variation in the extent represented by each farmer representative, the average extent being 74 ha (182 Acs). Due to the absence of Turnout Areas, each farmer representative was to represent 40 ha (100 Acs). Though selections were initiated on this basis, consideration was given to length of canals in the area, the proximity of residence to the area represented, efficiency of the farmer representative etc. Such considerations too resulted in variation in the extent represented by each farmer representative.

(3) Organisation Chart

The period September '78 to about July '79 was utilized for the selection of the 11 farmer representatives, as indicated in Table 3.8.1, and for other preliminary activities in fowards securing farmer participation in the PAWM Project. As an interim measure, Farmer Management Committees comprising farmer representatives and field level officials were established consisting of:

- Farmer Representatives (Chairman)
- Technical Assistant (ID)
- Work Supervisor (ID)
- Cultivation Officer (ASD)
- KVS (AD)

The farmer representative represented a definite extent of the PWM Project as shown in Table 3.8.1. Thus 11 member Farmer Management Committees were in operation each with its own Farmer Representative as Chairman.

The technical assistant whose area of operation (usually 2,024 ha) covered the entire PAWM Project area attended all the 11 member Farmer Management Committee meetings.

The Work Supervisor's area of operation was usually 1,012 ha and his duties included over-seeing 5 water distributors each of them was in charge of 202 ha. However, in the PAWM Project there were three work supervisors, each of whom attended more than one Farmer Management Committee meeting.

Each water distributor covered an area of 202 ha on the basis of 10 Nos. of 20 ha Turnout Areas. A water distributor attended only one Farmer Management Committee meeting.

The farmer representatives, being chairman of the Farmer Management Committees in the above organisational set up, played a participatory role and was involved in the decision making process. An organigram is not provided for the above organisation as all the activities emerge from the single Farmer Management Committee.

(4) Rules of Operation of Organisation (P)

There are no written records of the 'Rules of Operation' of the Farmer Management Committees. The period of operation of these Committee was short (Maha '79/80 to June '80) and consequently no rules of operation as such were adopted. However, it is evident that the Committees met as often as required, especially to seek solutions to the following irrigation problems:

- Inadequate water supply to farms, especially at the tail end of canals and/or systems
- Wanton damage to canal bunds and structures and
- Illicit tapping of water for irrigation.

3.8.4 Water Distribution (P)

(1) Regulatory Rules

The Irrigation Department's "Regulation and Procedures in operating Major Irrigation Systems" have been

largely followed in the PAWM Project. However, specific regulatory rules were not framed as the PAWM Project was in operation for only the Maha 1979/80.

The flows in the Mahaweli and tributaries, and the rainfall were normal during the Maha 1979/80 season so that the cultivation was better than average though there were some equity problems in the distribution of water. This was another reason for not preparing regulatory rules. The recommended system of water delivery in all medium and major irrigation schemes operated by the Irrigation Department is the rotation system. In the rotation system, water is delivered to each farm in sufficient quantity for a fixed period of time under a pre-arranged schedule. However, an 'Interrupted' system of irrigation with arbitrarily selected issue and closed periods had been adopted in the PAWM Project. This could not be considered as a regulatory rule.

(2) Maha and Yala Seasons

In the study period of 1979 to 1984, records of cultivations in the Maha and Yala season were available only from Yala 1982 to Maha 1984/85. The extents cultivated for the Maha Season have been in excess of the specification of 5,056 ha but less than the total cultivated in each year depended on the resources of the encroacher to undertake that cultivation.

(3) Discharge Check of Distribution

The discharges were to be measured only in the LB Main Canal. During the Maha 1979/80 season in the PAWM Project, there were no gauge posts to measure the discharges. There are no records of such measurements having been made by any other means in the Maha 1979/80.

Subsequent records reveal that 6 Nos. gauge posts were established between the Anicut and Hasalaka Oya, the area of Stage I and the PAWM Project. A further 11 Nos. gauge posts have been established beyond Hasalaka Oya meeting the total requirements of gauge posts for Minipe. Rating curves have so far been prepared for gauge posts 1 to 8 in serial order.

(4) Operation and Maintenance

In the period of the PAWM Project (Maha 1979/80 to June 1980), water charges were not recovered from the farmers.

(5) Specific Matters (P)

The PAWM Project lasted only one Maha season, i.e. Maha 1979/80. The period had been too short to have had any impact on the farmers. As the flows in the Mahaweli and tributaries and the rainfall were normal, the cultivation was better than average without water conflicts. In order to identify specific matters, a longer period of operation was necessary.

(6) Outstanding Issues

The main outstanding matter at the end of the PAWM Project in June 1980 was the formulation of proposals thereafter for the water management in the Minipe Scheme. These proposals were to be effective from July 1980 up to December, 1984 when it was decided to introduce the INMAS Programme from January, 1985.

3.8.5 Water Management in Minipe from July 1980 upto the Present Time

(1) Administrative Agencies (W)

The administrative agencies for water management in Minipe (WMIM) were as follows:

- Irrigation Department (ID)
- Agrarian Services Department (ASD)
- Agriculture Department (AD)
- Co-operative Department (CD)

(2) Persons Engaged (W)

The persons engaged for WMIM were:

- 01 Irrigation Engineer (ID)
- 06 Technical Assistants (ID)
- 10 Work Supervisors (ID)
- 23 Cultivation Officers (AD)
- 16 KVS (AD)
- 23 Water Distributors (ID)
- 83 Farmer Representatives

The organisation chart is illustrated in Fig. 3.8.1.

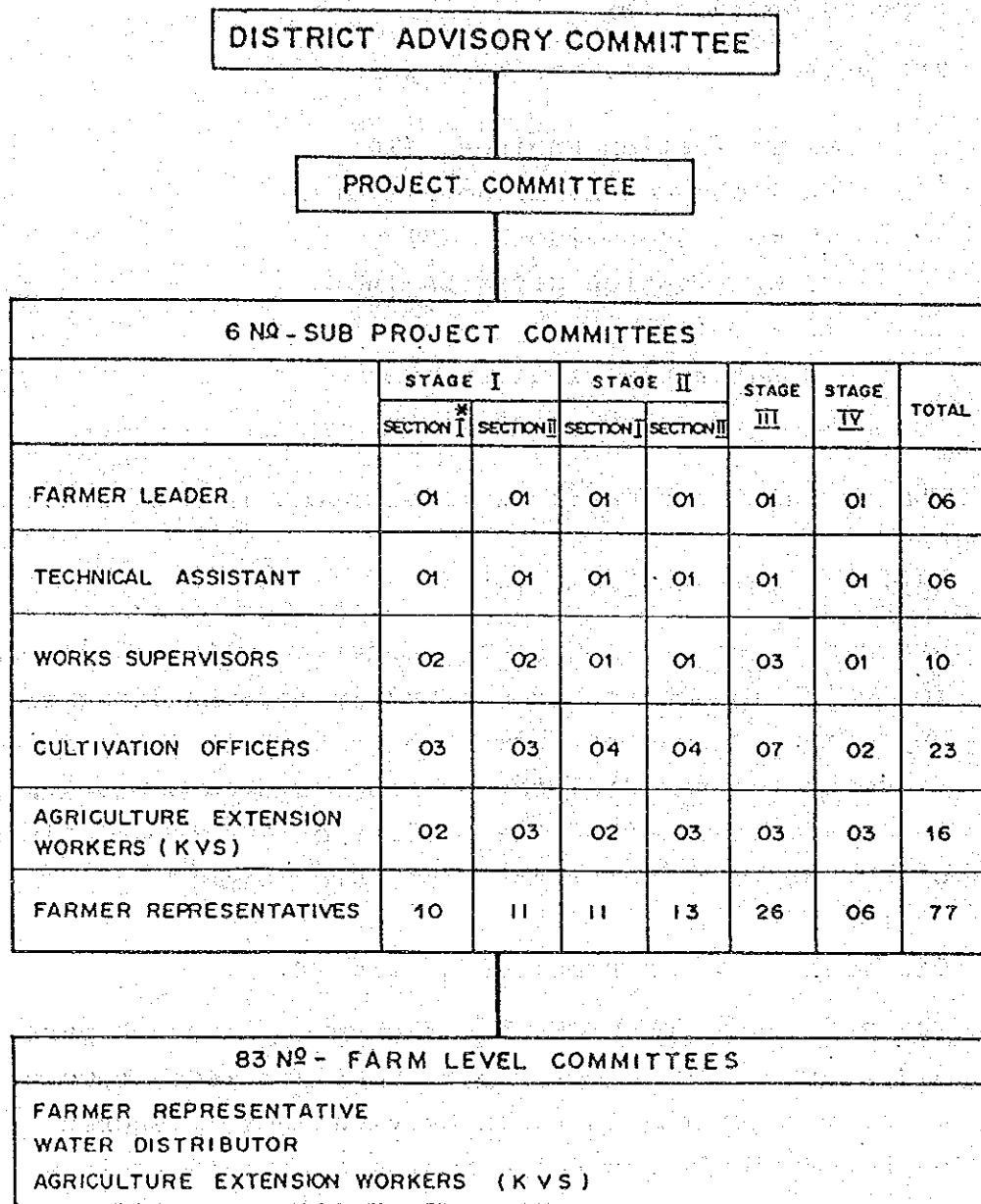
(3) Cost of Implementation (W)

Water management in Minipe is routine water management for which funds are voted annually for the Irrigation Department. However from 1985 onwards these funds will be voted for the Ministry of Lands and Land Development, to be administered by the Irrigation Management Division of the Ministry under the INMAS Programme.

(4) Officials, Farmer Representatives (W)

The officials for WMIM were the same as in sub-para 3.8.3 (1). The farmer representatives were, however, elected under the Agrarian Services Act by secret ballot at polls conducted by the Agrarian Services Department. Each of the farmer representatives served an area of 100 ha (250 Acs) approximately. A majority of the informally selected farmer representatives for the PAWM Project were elected at the secret ballot held in April, 1980 as farmer representatives for the organisation which was to be established.

Fig.3.8.1 ORGANISATION CHART IN MINIPE SCHEME
FROM JULY 1980 TO DECEMBER 1984



* SECTION I OF STAGE I IS A WATER MANAGEMENT AREA FROM JULY 1980 WHEN THE PILOT AREA CEASED TO FUNCTION

(5) Organisation Chart (W)

With the experience gained from the operation for the PAWM Project, the modified water management Organisation shown in Fig. 3.8.1 was established in July, 1980 at three levels of operation as indicated thereafter at (a), (b) and (c). Further a committee also functioned at their district level (see (d)).

(a) 1st - Farm Level Committees which consisted of:
At the Farm Level

- a. Farmer Representative
- b. Water Distributor
- c. KVS

As the farmer representative served about 100 ha (250 Acs), the water distributor and KVS who served larger extents respectively, each had to attend two or more of the Farm Level Committee meetings.

(b) 2nd - Sub-Project Committees consists of:
At the Sub-Project Level

- a. Farmer Leader (Chairman)
- b. Technical Assistant of the sub-project area
- c. Works Supervisors
- d. Cultivation Officers
- e. KVSS
- f. Farmer Representatives

The farmer leader who is the chairman is elected by open vote by the farmer representatives themselves. The numbers on the committee for 'e' through 'f' depended on the extent of the sub-project area which varied usually between 607 to 1010 ha (1,500 to 2,000 Acs).

(c) 3rd - Project Committee consists of:

At the Project Level

- a. Project Manager who is the Irrigation Engineer (Chairman)
- b. Technical Assistants in the Scheme
- c. Cultivation Officers
- d. Colonisation Officers
- e. Agricultural Instructors
- f. Farmer Leaders
- g. Farmer Representatives
- h. Representatives of State Banks
- i. Representative of Co-operative Department

(d) District Advisory Committee (D/AD/CO)

In addition to the above committees operating at the three respective levels, the organisation chart also includes a committee that functions at the district level as an advisory body.

This Committee known as the District Advisory Committee (D/AD/CO) ensures that Government policy is implemented. It consists of the following officials.

- a. Government Agent of the District
- b. Deputy Director of Irrigation (Range)
- c. Assistant Commissioner, Agrarian Services
- d. Assistant Director Agriculture

(6) Rules of Operation of Organisation (W)

(a) Farm Level Committee (FLC)

The FLC is expected to meet twice a month for the purpose of solving the day to day problems of the farmers. Problems that cannot be solved by the FLC were submitted to the Sub-Project Committee for solution.

Examination by the Team of records available with IE, Hasalaka showed that the only FLCC of Stage I Section 1 adhered to the required meeting schedule and the solution of day to day problems.

(b) Sub-Project Committee (SPC)

The frequency of meetings of the SPC was agreed as once a month, to be held in accordance with the following schedule:

Stage I, Sec. 1 - 1st Tuesday of month (AM)
Stage I, Sec. 2 - 1st Tuesday of month (PM)
Stage II, Sec. 1 - 1st Monday of month (AM)
Stage II, Sec. 2 - 1st Monday of month (PM)
Stage III - 1st Wednesday of month (PM)
Stage IV - 1st Wednesday of month (PM)

The Sub-Project Committee overlooks the functions of the Field Level Committees and advises the latter committees whenever necessary. The SPC renders a valuable service when the FLCC under it do not function according to expectations. The SPC has made significant contributions in ensuring equitable water distribution within its area, as well as in ensuring availability of necessary agricultural inputs in time.

The SPC of Stage I Section 1 had the same structure as the Farmer Management Committee in the PAWM Project and hence continued its functions uninterrupted. Thus the SPC of Stage I, section 1 was considered as a model by the rest of SPC of the Scheme. The other SPCC were encouraged to visit the SPC of Stage I, Section 1 to gather firsthand information on the functioning of an SPC.

(c) Project Committee

This Committee has the heaviest responsibility

at the operational level. The functions of the Committee are:

- Fixing of cultivation season
- Deciding on cropping pattern
- Deciding on crop extent
- Ensuring timely availability of seed paddy and other agricultural inputs excluding water
- Checking and re-distribution as far as possible of draft power
- Recommending special maintenance
- Preparation of programme of water management with special emphasis on sluice and distributary canal releases and rotational issues

The Committee was expected to meet once in two months. However, inquiries by the Team revealed that special meetings are held by the Committee during the cultivation season to solve urgent problems such as water shortages that crop up in the course of cultivation.

(7) Regulating Rules (W)

The Team after discussions with the operating staff, and an examination of the records at site found that following practices being followed for the issue and distribution of water.

(a) Land Preparation

- 4 ins in 5 days for soaking
- 2 ins in 2 days for ploughing
- Duration of one month for land preparation
- issues made in 3 to 4 staggers

(b) Growing Season

- The issue for the growing season commence one month after the first issue. Though these issues are called 'Rotational Issues' yet a more appropriate description would be 'Interrupted Issues' as would be evident from the tabulation below:

Stage	Distributary Canal Gates	
	Closed (in days)	Open (in days)
I	2	5
II	2	5
III	1	6
IV	Nil	7

3.9 LIVESTOCK

3.9.1 Livestock Population

Cattle and buffalo keeping by farmers in the study area is extremely popular mainly because of its use for cultivation purposes and the opportunity it provides for using the existing land resources for an alternate farming activity and thereby ensuring farm increased incomes. The vast resources of livestock available within the study area and the farmers' acceptance of the keeping of livestock, especially cattle and buffaloes, as a farming activity offers great potential for the enhancement of the economic conditions of the settler farmers in the area.

It is pertinent here to examine the statistics of the different species of livestock available, their types/breeds and the different uses for which they are mainly kept. The trends in the variation in numbers of different types of all livestock species in the study areas are shown in Table 3.9.1, while Table 3.9.2 gives the trends for cattle and buffaloes and the comparison of 1982 census data and the estimates as explained in the text below the table.

Additional statistical data relating to the keeping of goats, pigs and poultry are given in Table 3.9.4.

The above data show marked variation between the census data and those of estimates. The main reason for this difference is the fact that the census data correspond to the agricultural operators. This makes it possible for livestock

Table 3.9.1 SPECIES OF LIVESTOCK BY TYPES (CENSUS AND ESTIMATES)

Division	Meat Cattle				Buffaloes				Goats				Poultry				Av. monthly Prod.		
	Milk Cows	Other Cows	Bulls	Calves	Milk Cows	Other Cows	Bulls	Calves	Hc	She	Sheep	Pigs	Cock Birds	Laying Hens	Other Hens	Chc-ken		Ducks	Cow Mix
1982	662	731	719	653	-	1841	1486	1202	368	313	-	-	830	2649	275	3155	-	22725	
	Minipe Stages I & II																		
1982	797	1040	1151	667	28	1788	1085	622	156	98	-	8	1681	900	525	882	-	32435	
	Minipe Stages III & IV																		
	1459	1771	1870	1320	28	3629	2571	1824	524	412	-	8	2511	3549	800	4037	-	55160	
	TOTAL																		
1983	695	754	717	693	-	1905	1748	1216	370	358	-	-	1260	2930	411	2160	-	18365	
	Minipe Stages I & II																		
1983	720	882	1080	640	28	1701	1100	598	144	67	-	12	1430	795	468	870	-	30960	
	Minipe Stages III & IV																		
	1515	1636	1797	1533	26	3606	2848	1814	514	425	-	12	2690	3725	899	4030	-	48425	
	TOTAL																		
1984	686	910	838	803	-	2072	1855	1190	337	252	-	-	1931	2901	807	2127	-	44160	
	Minipe Stages I & II																		
1984	728	887	1114	644	26	1681	1126	625	155	80	-	15	1421	825	496	902	-	30120	
	Minipe Stages III & IV																		
	1414	1797	1952	1447	72	3753	2981	1815	492	332	-	15	3352	3726	1303	3029	-	74280	
	TOTAL																		

SOURCE - Annual estimates of Livestock Department of Census and Statistics

NOTE - The figures are estimates for the respective AGA Division as reported by the Cultivation Officers in those Divisions

numbers to be included in the district where the agricultural operator is living even though the animals he owns may be found in another district. The annual estimate as reported by the Cultivation Officers, however, relate to the livestock numbers found in the respective A.G.A. divisions.

The Census of Agriculture (1982) data provides some useful information on breed and sex distribution and the distribution of these animals according to the different uses. The cattle and buffalo population in the study area analysed on the above characteristics is shown in Table 3.9.3.

The above statistics reveal that the percentage of animals in milk in the study area is very low. This phenomenon is attributable to the low milk production potential of the indigenous animals, both cattle and buffaloes, which constitute the largest percentage of the two types and is also due to the absence of a market for milk and/or milk products. The most popular use for which both cattle and buffaloes are kept is for draught while a considerable number of farmers in the Minipe Scheme, particularly in Stage I & II, use cattle manure as fertilizer. Other objects for which cattle are kept as an insurance policy against losses from crop income, as a source of wealth, and for reasons of prestige in relation to which tradition seems to play a more important role in the case of cattle than buffaloes.

Table 3.9.2 THE TOTAL NUMBER OF CATTLE AND BUFFALOES

Area	Species	1982 Census Data	1982 Esti- mates	1983 Esti- mates	1984 Esti- mates
Minipe I & II	Cattle	6,566	2,765	2,859	3,237
	Buffaloes	9,877	4,529	4,869	5,117
Minipe III & IV	Cattle	3,354	3,655	3,622	3,373
	Buffaloes	5,050	3,523	3,425	3,454

Source : Dept. of Census and Statistics

Table 3.9.3 DISTRIBUTION OF CATTLE AND BUFFALOES OF AGE 3 YEARS AND OVER BY TYPE, PURPOSE AND SEX

Area	CATTLE LOCAL										CATTLE IMPROVED BREEDS					
	In Milk Female	Milk Other Females	Draught M	Draught F	Studs M	Other M	Uses F	In Milk Female	Milk Other Females	Draught M	Draught F	Studs M	Other M	Uses F		
Minipe Stages I & II	744	1933	725	281	12	181	480	9	10	20	9	1	-	-		
Stages II & III	816	283	304	207	34	114	203	3	2	13	7	3	1	13		
TOTAL	1560	2216	1029	488	46	295	683	12	12	33	16	04	01	13		
	BUFFALOES LOCAL										BUFFALO IMPROVED BREEDS					
Minipe Stages I & II	21	304	3423	3838	21	52	98	3	7	03	03	-	-	2		
Stages II & III	36	55	1543	2032	18	22	59	-	-	-	-	-	-	-		
TOTAL	57	359	4966	5870	39	74	157	03	-	03	03	-	-	02		

SOURCE : Department of Census and Statistics Agriculture Census 1982

NOTE In milk females - includes those that are being milked

Milk Other Females - means animals in milk but not milked.

3.9.2 Livestock as Farmers' Assets

The importance of livestock in the farmers' budget has been referred to earlier. Apart from its direct contribution to the farmer family income by way of sales proceeds from surplus animals, the keeping of livestock should be regarded as a means of ensuring uniform income distribution. It has been revealed by Farrington, Abeyratne and others in a study conducted on farm power and water use* that draught power ownership and accumulation of wealth are positively co-related in some farming communities. The ownership of large herd sizes of buffalo has created opportunities for buffalo owners to deploy their spare draught assets in the custom-hire market and to gradually extend the area of land under their control. In absolute terms buffalo owners recorded larger acreages under their control than non-owners, while the tractor owners controlled greater extents of land than owners of buffaloes. Both groups were able to plough land rapidly and early and consequently were able to absorb a proportionately greater amount of hire work available.

The ownership pattern of farm power in the areas studied is more evenly distributed and therefore, precludes the dangers of iniquitable wealth accumulation. The estimates of the percentage of farmers keeping cattle or buffaloes provided by the Cultivation Officers reveal that in Minipe Stage I and II, it is about 80%, and for Minipe Stage III & IV, it is 85%.

3.9.3 Ownership of Goats, Pigs and Poultry

As indicated in the statistics the numbers of the above species are very low. Because of the abundance of tree fodder in the study areas one would have expected a larger

* Farrington, Abeyratne, Ryan and Bundara "Farm Power and Water Use in the Dry Zone", ARTI Research Study, No. 43, 1980.

goat population. However, the information provided by the Cultivation Officers is that the goats are kept in herds ranging from 5-8 animals, and by a selected few, mainly Muslim farmers, and by women under Women's Bureau Projects. The rearing of pigs is virtually non-existent.

The keeping of goats, and pigs and the rearing of poultry can be obtained from the statistics given in Table 3.9.4 which have been abstracted from the Sri Lanka Census of Agriculture, 1982 (Small Holdings Sector) for the Districts of Kandy, Matale and Badulla).

3.9.4 Infectious Diseases

In Sri Lanka the most important infectious diseases like Foot and Mouth (FMD), Haemorrhage Septicemia (HS), Anthrax and Black Quarter are all endemic in many parts of the Dry Zone and the Intermediate Zone. Rinderpest which is a deadlier disease than the others was eradicated from the country three decades ago. Under the Contagious Diseases (Animals) Ordinance No. 25 of 1909, as amended, the above diseases are required to be notified to the Director, Animal Production and Health, who on being satisfied of such fact, or, of his own motion, is empowered to proclaim an area as an infected one and prohibit the movement of livestock in, and out of, such areas. He may subsequently declare such areas to be free from disease and not an infected area.

The recorded cases of infectious diseases during the last few years for the veterinary ranges where the study locations fall are shown in Table 3.9.5.

The above statistics of disease outbreaks, although they do not give an exact picture of the disease incidence in the study area, yet throw considerable light on the likelihood and nature of disease incidence in the project area.

Interviews had with the respective veterinary surgeons and the information obtained from farmers through informal interviews confirm the premise that Foot and Mouth Disease

Table 3.9.4 DISTRIBUTION OF GOATS, PIGS AND POULTRY BY AGE GROUPES
(WITH REFERENCE TO NUMBER OF HOLDINGS KEEPING EACH SPECIES)

- (1) (a) Number of Holdings keeping Poultry and Pigs
(b) Number of Goats and Pigs by age group

	Total No.	HOLDINGS		NUMBER OF GOATS & PIGS			
		Holding keeping Goats	Holding keeping Pigs	Goats		Pigs	
				<1 yr.	>1 yr.	<1 yr.	>1 yr.
<u>MINIPE SCHEME</u>							
(a) Stages I & II Minipe A.G.A.'s Div. (Kandy Dist)	6383	82	1	132	236	-	4
(b) Stages III & IV Wil- gamuwa A.G.A.'s Div.(Matale Dist)	3814	10	-	18	41	-	-
MINIPE (ALL STAGES)	10197	92	1	150	277	-	4

- II (a) Number of Holdings keeping Poultry
(b) Number of Poultry by type

	HOLDINGS		TYPE OF POULTRY			
	Total No.	Keeping Poultry	Chicks < 6 months	Hens	Cock Birds	Ducks
<u>MINIPE SCHEME</u>						
(a) Stages I & II Minipe A.G.A.'s Div.(Kandy Dist)	6383	641	1523	4944	1365	1
(b) Stages III & IV Wilgamuwa A.G.A.'s Div. (Matale Dist.)	3814	157	295	813	521	22
MINIPE(ALL STAGES)	10197	798	1817	5757	1886	23

Table 3.9.5 NUMBER OF CASES REPORTED

	Disease	1980	1981	1982	1983	1984
Minipe I & II III & IV	FMD	10	-	-	-	-
- do -	HS	114	-	-	-	-
Minipe I & II and Nagadeepa	HS	-	412	-	-	-
Minipe I & II	HS	-	-	890	-	-
Minipe III & IV	HS	-	-	67	-	-
Minipe III & IV	FMD	-	-	-	193	-
					Not reported for FMD & HS	

(FMD) and Haemorrhagic Septicemia (HS) are the two most important endemic diseases in the area. Other disorders such as parasitism and infertility though observed are not so important.

3.9.5 Activities of Animal Production and Health Department (Under Ministry of Rural Industrial Development)

Until 1978 the functions of animal production and health fell within the purview of the Department of Agriculture, to which these functions had been assigned in 1936 in order to achieve better co-ordination between crop husbandry and animal husbandry. In 1978, however, the division concerned was made a separate department, the Department of Animal Production and Health (DAPH), and was brought under the administrative control of the Ministry of Rural Industrial Development which was concurrently established.

DAPH is responsible for all aspects of livestock development including breeding, animal nutrition, the

provision of veterinary health care services, and all related aspects of research and training.

The Division of Animal Health and Extension headed by a Deputy Director based in Peradeniya is responsible for:

- (a) Provision of an Animal Health Service (both preventive and curative) islandwide; and
- (b) Provision of a livestock extension service in the country for the establishment and proper management of livestock units by farmers.

There are seven Assistant Directors (A.DD) at the regional level reporting to the Deputy Director (Animal Health and Extension). Range Veterinary Surgeons function under the respective Assistant Directors in overall charge of the regions.

The animal health and extension field staff comprises the following officers in the respective project areas viz:

Minipe: Stages I & II (Kandy District)
- Under A.D./Kandy

The Veterinary Dispensary/V.S.'s Office, Hasalaka, should normally be manned by a Veterinary Surgeon and two village level technicians. But the Veterinary Dispensary at Hasalaka has been closed since January 1985 because of the shortage of man-power. The Veterinary Surgeon, Mahiyangana overlooks the Hasalaka range and conducts two dispensary days on Tuesdays and Thursdays at Hasalaka.

Minipe: Stages III & IV (Matele District)
- Under A.D./Anuradhapura

The Veterinary Dispensary/V.S.'s Office at Hettipola, manned by a Veterinary Surgeon and two technicians is open from Monday to Saturday.

3.10 ROAD SYSTEM

(1) Road Network in the Area

The Minipe Scheme covers a long and narrow strip of land which has been developed along the Minipe main canal, 74.2 km long, and is located on the left bank of the Mahaweli River. The left bank of the main canal is a mountainous area through which only two existing roads connect the Scheme with (a) Kandy at Hasalaka in Stage I and (b) Matale at Hettipola in Stage III.

The right bank boundary is the Mahaweli Ganga over which there are two bridges, both in Stage I. The first is a submerged bridge, 300 m downstream of the Trans-basin Canal Anicut while the other is the Weragantota Bridge. In the downstream Stages there are no bridges across the Mahaweli River.

The road stops downstream at the end of Stage IV which is the boundary of the sanctuary area of the Wasgamuwa National Park Project. The upstream end of Minipe is connected with the construction site of the Randenigala Reservoir where the road ends at present. Further extension, however, will be made on the completion of the reservoir.

The road network is shown in Fig. 3.10.1. There are few road links with the outside world. The minor roads are intercepted by the many rivers crossing the area. There are no bridges in Stage II. In Stages III and IV, two bridges exist at Hettipola Oya and Nikane Ela. Two bridges are to be constructed at Aliyawala Oya and Gamburu Oya in the Maraka - Madakanda road construction project which is being implemented by the Highways Department under the Integrated Rural Development Project (IRDP).

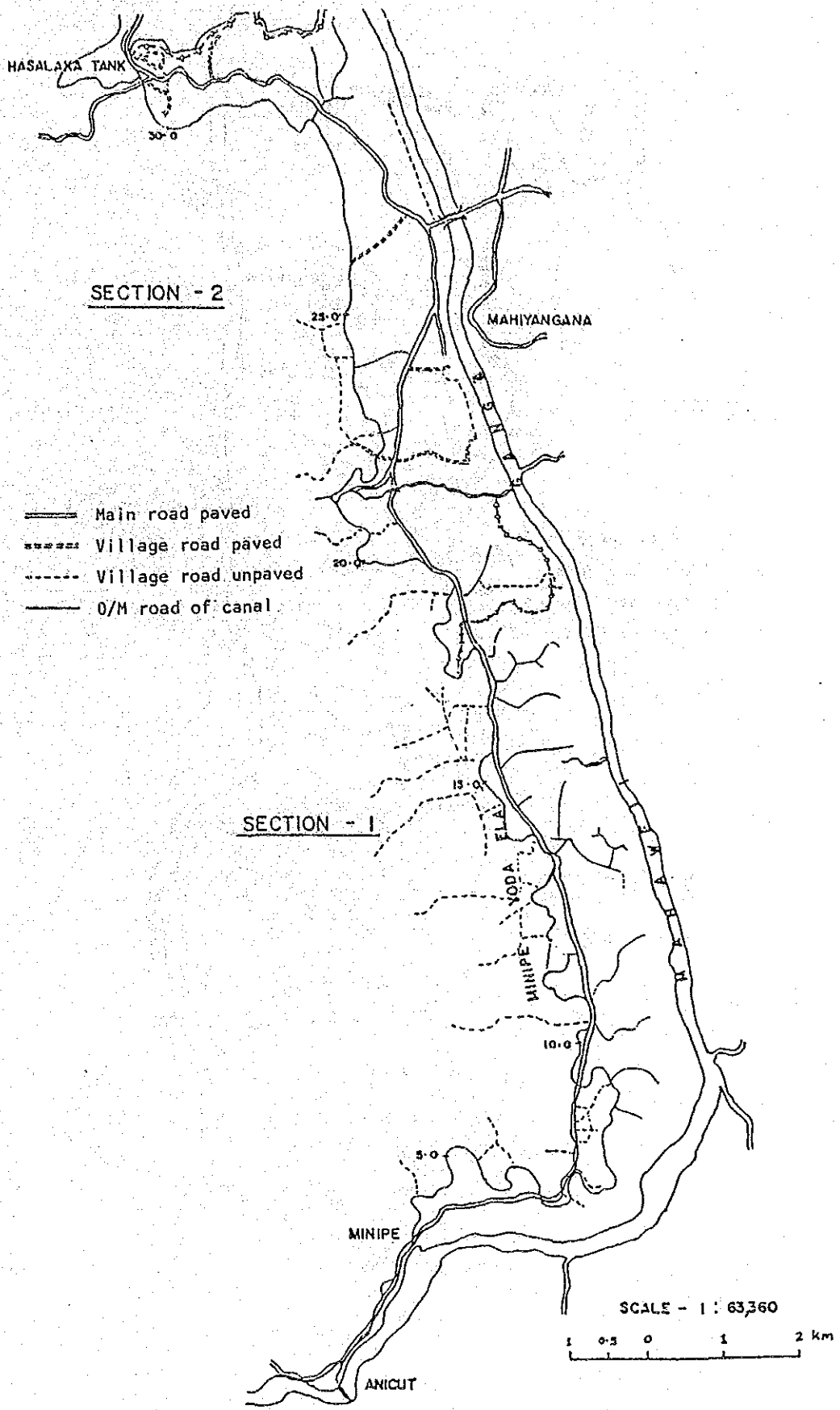


Fig. 3.10.1a ROAD NETWORK IN MINIPE STAGE I

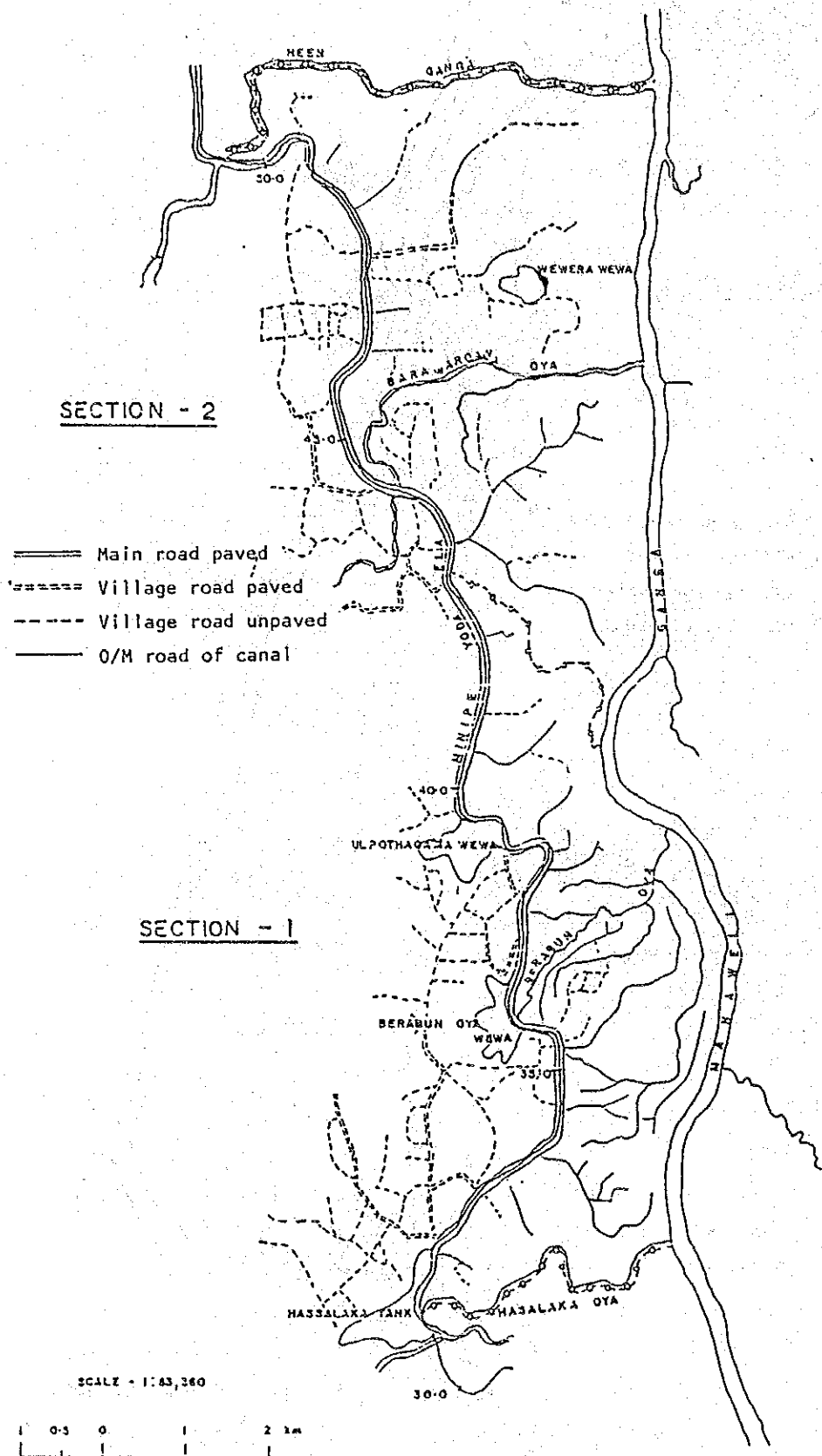


Fig. 3.10.1b ROAD NETWORK IN MINIPE STAGE II

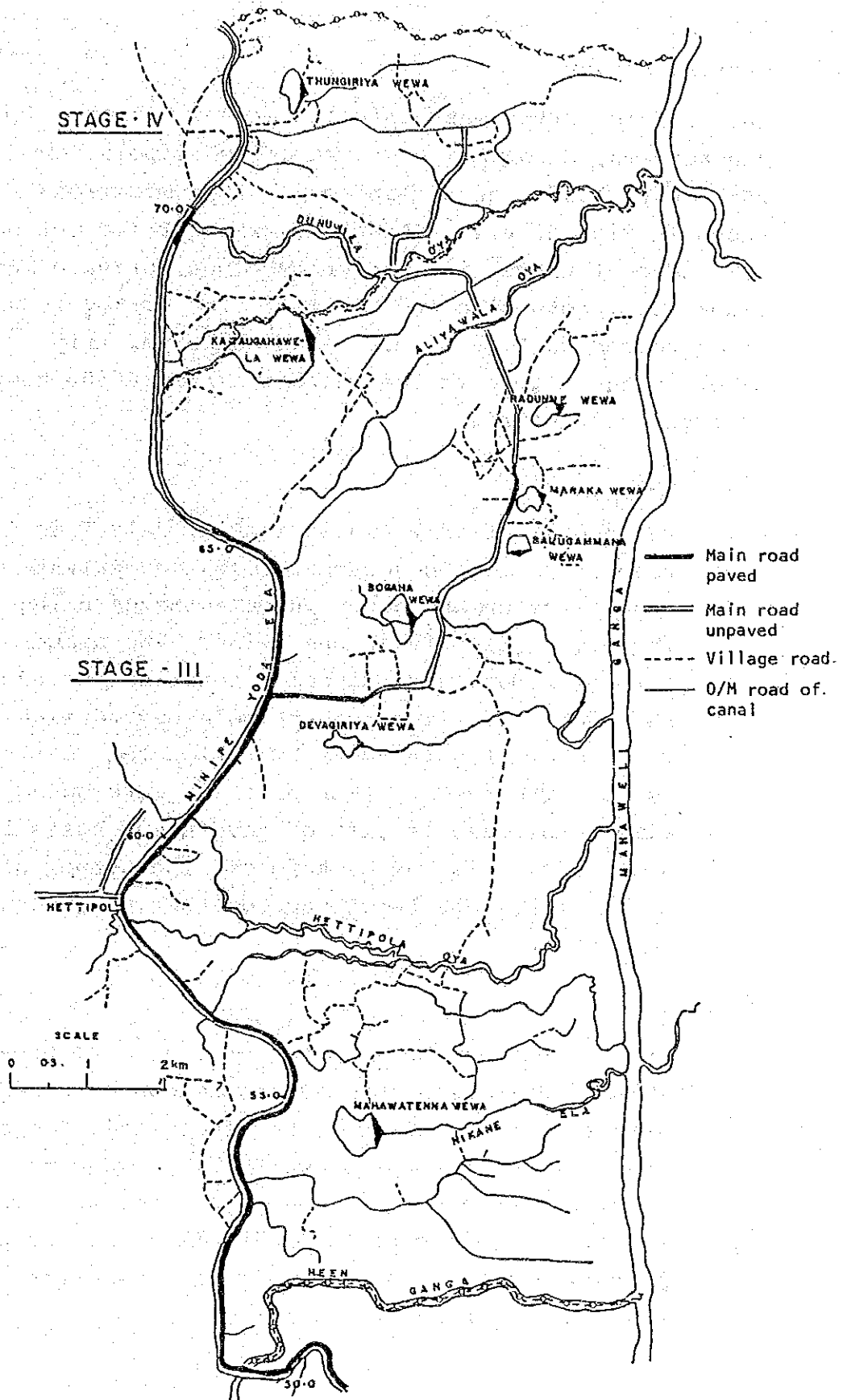


Fig. 3.10.1c ROAD NETWORK IN MINIPE STAGE III & IV

(2) Traffic Survey

The traffic survey was conducted at 4 locations, i.e. Handaganawa, Weragama, Hasalaka and Hettipola, on 25th July, 1985. An outline map of the locations is shown in Fig. 3.10.2. The survey was carried out on six modes of travel i.e. government bus, private bus, truck, car, motorbike and bicycle. The survey results are recorded in Fig. 3.10.2. The number of trips given in the figure is the aggregate from 06:00 hours through 19:00 hours.

(i) Bus

The number of trips shown in Fig. 3.10.2 is in respect of both government buses and private buses, the number given in parentheses being the number of private bus trips. The number of trips for Matale-Hettipola T junction includes the number of trips to Hettipola bus terminal. The number of government bus trips for Matale is 12. The number of trips of private buses is almost the same as that of government buses in Hettipola. Elsewhere, however, the number of trips of private buses exceeds that of government buses.

(ii) Truck

At Handaganawa the number of trips is 74 because this road is used for transportation of construction materials for the Randenigala Project. The traffic of truck shows that Mahiyangana functions as a centre of economic activity for the area. In the Hettipola region, the transportation link with Matale is more important than that with Hasalaka.

(iii) Passenger Car

The number of trips of cars at the Weragama T junction, is less than half that of buses. Jeeps, which are used by government officials have been included in this category. It is estimated that the number of jeep trips constituted approximately half the number of car trips.

(iv) Motorbike

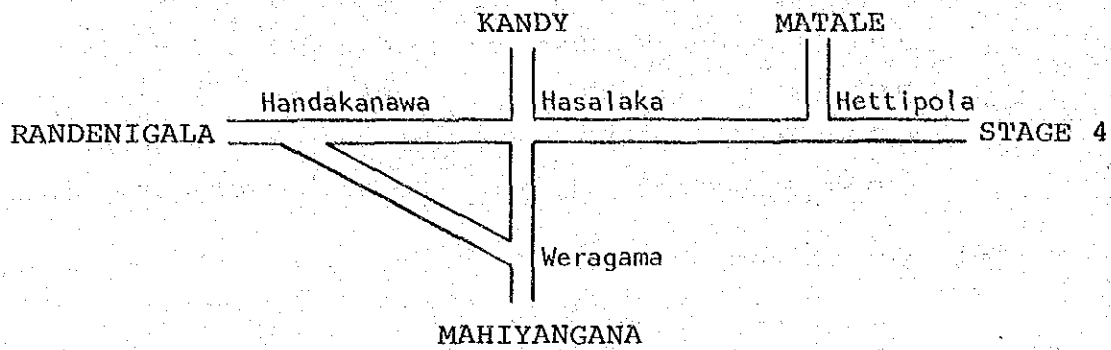
The number of motorbike trips is almost the same as that of cars except at the Weragama T junction. The number of trips on the Weragama - Handaganawa stretch is 122 but it is reduced to 35 at Handaganawa. This means that motorbikes are used for short distance runs. The number of trips from Hasalaka to Kandy is small for the same reason.

(v) Bicycle

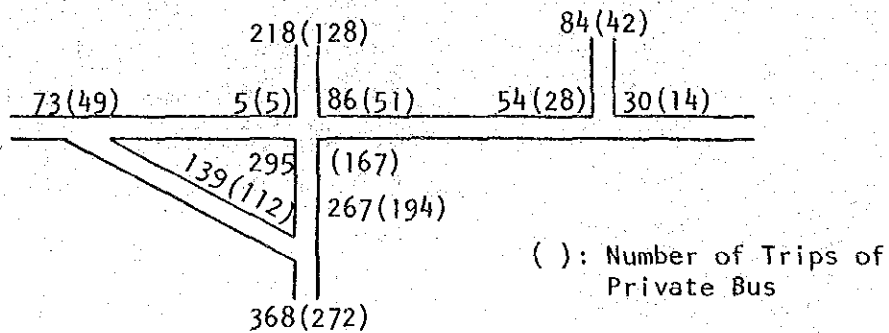
The number of bicycle trips is far in excess of those of the other modes of travel. It is estimated that only a few of these trips extend from one location to another except between Hasalaka and Weragama.

(3) Operation and Maintenance Roads for Irrigation System

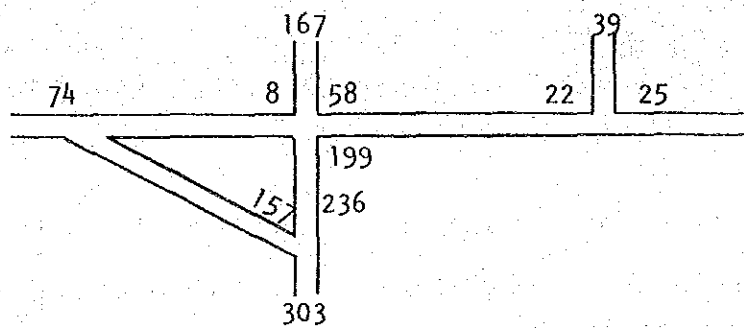
Operation and maintenance roads (O/M roads) for the irrigation system are maintained by the Irrigation Department. A part of O/M road of the main canal had been paved, and thereafter its maintenance had been handed over to the Highways Department. The length of pavement and pavement ratio for O/M road of main canal are as follows:



(a) Location of Traffic Survey

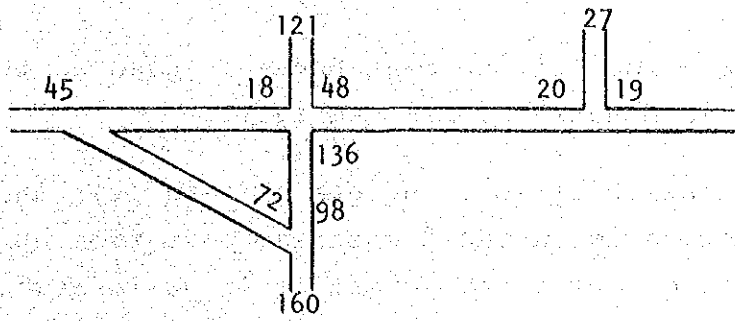


(b) Bus

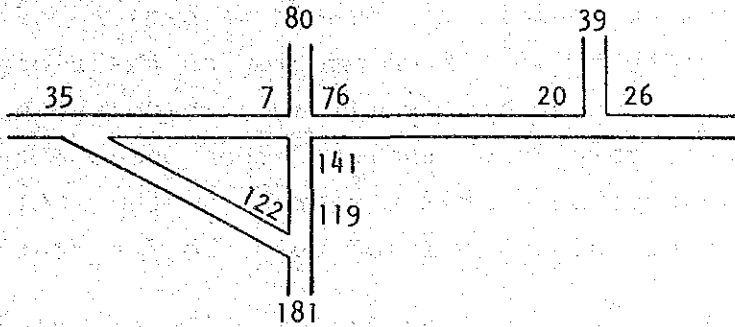


(c) Truck

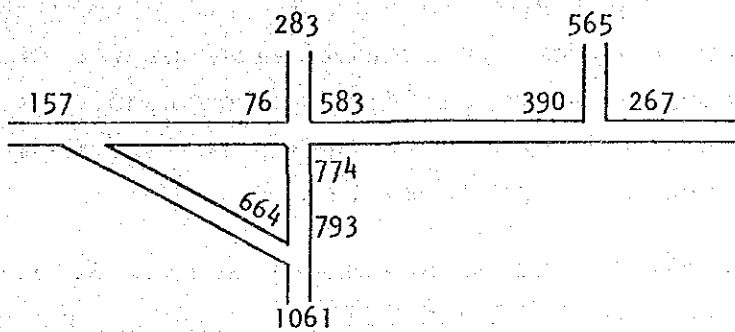
Fig.3.10.2a TRAFFIC SURVEY RESULT



(d) Passenger Car



(e) Motorbike



(f) Bicycle

Fig.3.10.2b TRAFFIC SURVEY RESULT

Stage I	6.26 km (20.1%)
Stage II	19.20 km (100.0%)
Stage III	15.19 km (89.1%)
Stage IV	0.85 km (12.5%)

The O/M road of the main canal is used as the main road in Stages II, III and IV.

In Matale District, (Stages III and IV), the O/M road is not paved in the downstream part from 50.45 km point, except on the crest of Dunuwila Wewa. In Stage I, where utilization ratio of the O/M road as main road is low, it is difficult, (if not impossible), to pass by vehicle in some parts because of the reduced road width arising from erosion on the slopes. In Stage I 19 Nos. drop spillways, which are used only in Stage I, make road gradient steep because the access road has to drop from the crest to the stilling basin. Such steep slopes are not suitable for traffic.

The width of O/M roads for distributing canals has become reduced at some points as a result of encroachments. Sometimes trenches are cut across the roads either to divert irrigation water or for drainage. In some cases, road width has got reduced as a result of canal width being increased due to erosion as in D 21 and D 25 canal of Stage I.

Motorable O/M roads are shown in Fig. 3.10.1. The O/M roads of D 34 and D 43 in Stage I, are paved, 1.28 km and 0.80 km respectively. The pavement of D 35 O/M road in Stage I is under construction. In other Stages the O/M road of the distributary canal has not been paved.

(4) Village Road

Village roads not linked to canals, which fall wholly within villages or connect them, are maintained by the

Land Commissioner. Village roads are generally gravel roads and are paved only for short distances. The conditions of roads in each Stage are as follows:

Stage I Paved roads are access roads to Government Offices, Government Hospitals, River Valleys Department Board and Paddy Marketing Board, 1.47 km long, and roads around Hasalaka town, 1.61 km long.

Stage II On the right bank of the main canal, the paved road is limited to Kolongoda area. On the bank, an access road to Udattawa village, which was developed upstream of Borawadana Oya before the Minipe Settlement Scheme, has been paved up to the mountainous area. The total length of paved road in this area is 13.5 km. Some paved roads continue outside the limits of the survey map prepared by JICA and some exist in parallel with the main canal.

Stage III In this stage, there are no paved village roads. Paved roads are limited to the main road, the Dewagiriya-Maraka road and Hettipola town. At Mukgola and Wilgamuwa on the left bank of the main canal, gravel village roads are kept in a relatively good condition.

Stage IV There are no paved village roads in this Stage.

It is learned that neither Kandy nor Matale District have any implementation plans for construction of new roads nor for rehabilitation of existing roads. It is evident that the pavement of village road has low priority in Matale District since the maintenance of the main road itself is poor.

3.11 RURAL WATER SUPPLY

(1) Sources of Domestic Water

The sources of domestic water are wells, the Minipe main canal and its distributary canals and rivers. The water from the canals is mainly used for bathing and washing. Water from wells is used for drinking. Water is collected and taken to the homestead for drinking and cooking and for washing food and utensils. But the villagers wash themselves at the source of water itself, whether it be the tank, canal or well.

The number of wells in Stage I, Stage II and Stage III & IV is 1,240, 1,100 and 514 respectively. The number of villagers per well in Stage I, Stage II and Stages III and IV is 16, 24 and 52 respectively. The number of villagers per well increases progressively downstream.

The main canal, 74.2 km in length, is joined by seven rivers, Mahana Oya, Nicaliyadda Oya, Hasalaka Oya, Barawadana Oya, Hettipola Oya, Gamburu Oya and Dunuwila Oya. All these rivers (with the exception of the Dunuwila Oya which was dry) discharge their waters into the main canal in Yala 1985. Heen Ganga is diverted to the canal by an anicut.

Pipe borne water supply schemes have been installed, these systems being fed by the Mahana Oya and Hasalaka Oya where water is diverted from the anicuts. The Mahana Oya Scheme supplies water to the Government Hospital, school and 100 local families while the Hasalaka Scheme supplies water to the quarters of the Irrigation Department staff and 30 families in the area.

The issue of water to the distributary canals is interrupted in accordance with the rotation system

which has been adopted in this Scheme. When such interruptions take place, water from wells is used for bathing and washing. Wells are also so used in areas which are far removed from the main canal. Irrigation water is supplied from 20th April through 31st August in Yala and from 15th October through 15th March in Maha. When the water supply through the main canal is interrupted, the shallow wells around the main canal dry up. When this happens the deep wells (9m and over) are used as sources of residual water. All deep wells in the Sample Areas have been constructed by the government.

(2) Consumption

There is very little difference between the several stages of the Scheme in the consumption of water collected from wells. This water is used for drinking and cooking and for washing food and utensils. Its consumption is estimated at 25 litres per capita per day (l.p.c.d). Domestic per capita consumption is estimated by extensive studies on many domestic water supply projects in Sri Lanka. It has been already established that with the development of better living standards and improved knowledge of health education, the per capita water consumption will also increase. The evaluated per capita water demand for domestic consumption varies from 140 l.p.c.d. in 1988 to 185 l.p.c.d. in 2008. Furthermore, the per capita consumption from stand posts will remain constant as only the drinking water requirement will be obtained from them. Example of rural water consumption is shown in Table 3.11.1. It is estimated that the per capita water consumption in this project will be 45 l.p.c.d. in future.

Table 3.11.1 AVERAGE PER CAPITA DOMESTIC CONSUMPTION

Unit: ltrs per capita/day

<u>Place</u>	<u>1988</u>	<u>1993</u>	<u>1998</u>	<u>2003</u>	<u>2008</u>
Hamlets	45	45	45	45	45
3 Townships	55	61	68	78	87

SOURCE: National Water Supply & Drainage Board "FEASIBILITY STUDY ON WATER SUPPLY TO NEW TOWNS & SETTLEMENT AREAS UNDER KIRINDI OYA PROJECT" July 1985

(3) Water Quality

We were informed that the International Standards for Drinking Water of WHO has been accepted as the Water Quality Standard in Sri Lanka.

1) Main Canal

Minipe main canal is joined by seven rivers which have the function of stabilizing the fluctuation of the discharge and of attenuating pollution. The temperature of water increases from 23°C to 30°C as it travels down the canal. The canal water is polluted both by humans, (e.g. for washing clothes and personal washing), and by buffalo. Thereby potential of hydrogen (pH) changes from 8.0 through 9.0, indicating alkaline character in the upstream part, and is reduced to approximately 8.0 due to dilution by the confluent rivers. Electrical conductivity (EC) and chemical oxygen demand (COD) is increased from the beginning of Stage II while Coliform bacteria starts to increase rapidly from the beginning of Stage III. Water is highly polluted in Stage III and IV. The turbidity of the water remains at the same

value, (20 - 25 units), throughout the main canal because it is high at the source i.e. the Mahaweli River.

(2) Well

The temperature of water is approximately 23 centigrade in Stages I and II while it is 25 - 29 centigrade in Stage III and IV. In the Sample Areas, groundwater seeps from the main canal in the Dry Season. Therefore the quality of well water is affected by that of the main canal.

The Chemical and physical water quality is shown in Table 3.11.2. All items fall within the maximum permissible level of the World Health Organisation (WHO) International Standard for Drinking Water, 3rd edition (1971). Almost all of them are over the highest desirable level. Groundwater, however, is normally preferable to surface water because it is purified by the filtering action of the soil through which it flows. Microbiological tests show that faecal bacteria are found in all wells.

WHO suggests the following standards for treated drinking water:

- (i) Water entering the distribution system should contain no coliform organisms;
- (ii) Water on tap should contain no coliforms in 95 percent of samples taken in any one year and it should never contain more than 10 coliforms/100 ml or any *Escherichia coli*.

Canal water is substantially polluted with significant human or animal populations, whereas groundwater sources are of better quality. It would however, be almost inconceivable that any untreated water supply

system in village in any tropical area exists in which one cannot detect faecal coliforms and other faecal bacteria. In the circumstances it might not be possible to conform to the WHO standards mentioned above when selecting new sources of domestic water.

Table 3.11.2

CHEMICAL AND PHYSICAL CHARACTERISTICS

	Stage								WHO Highest desirable level	WHO Maximum permissible level
	I - 1	I - 2	II - 1	II - 2	III	IV	III	IV		
Discolouration in unit ^a	29	38	21	35	14	3	5	50		
Turbidity in unit ^b	9	13	5	8	12	18	5	25		
pH range	6.9	6.8	6.7	6.9	6.6	6.7	7.0 to 8.5	6.5 to 9.2		
EC in micromhos/cm	218	158	161	194	155	320	-	-		
Total Hardness in mg/l CaCO ₃	158	88	69	125	138	225	100	500		
Chloride in mg/l	69	39	30	39	25	54	200	600		
Copper in mg/l	0.6	0.5	1.4	0.5	0.5	0.5	0.05	1.5		
Iron in mg/l	0.2	0.27	0.3	0.27	0.2	0.35	0.1	1.0		

^aOn the platinum-cobalt scale^bTurbidity units

4. THE PROJECT

4.1 BASIC POLICY

4.1.1 Objective

This Project aims at stabilizing and increasing agricultural production, as well as upgrading the incomes and living standards of the villagers in the Project Areas by rehabilitating the existing irrigation, drainage and road systems and by ensuring proper operations and maintenance of the systems and effective utilization of irrigation water. The study on the project is also expected to provide a plan for improving the rural water supply and for the new job opportunities for the second and third generation settlers in the area.

4.1.2 Classification of Works

The works included in the Project can be classified into two categories as follows:

- (i) Work (I) - Works for rehabilitation and improvement of irrigation, drainage and road systems;
- (ii) Work (II) - Works under the Community Development Programme.

Work (II) should be executed as a whole country basis and encompass the following aspects:

- (a) improvement of rural water supply
- (b) development of rural industries and
- (c) improvement of the transport facilities to the neighbouring economic sphere.

As for (b) development of rural industries, livestock is recognized to be a promising sector for the future by the

result of the field investigations, but its development should be scheduled to meet several phases as follows:

- i. Demarcation of grazing lands
- ii. Upgrading of cattle and buffaloes through an intensified breeding programme
- iii. Control of infectious diseases prevalent in the area
- iv. Strengthening of vaterinary services
- v. Improved marketing of milk produced in the area.

Therefore, reclamation of pasture land is proposed as a basis for the future development on establishment of a breeding farm and execution of a mini project there.

As for (c) job opportunity for the second and the third generation settlers in the Scheme can not be secured unless the Scheme is linked with the larger economic sphere of the Mahaweli Development System C area of which is almost ten times as large as the Minipe Area. The lack of a bridge across the Mahaweli River either at Stage III or Stage IV stands in the way of such a link. The construction of a new bridge would remove this impediment.

4.1.3 Project Support Programmes

Attainment of the Project goal could be said to depend largely on the farmers' achievement in effective utilization of the rehabilitated facilities and adoption of modern technics and diversification of agriculture. Various Project Support Programmes, therefore, are proposed to proceed under the related agencies in the Project Area, regarding water management, regularisation of encroachment, development of animal husbandary, improvement to agricultural extension, monitoring and evaluation and strengthening INMAS Programme. At the same time, strengthening line agencies is proposed as building and repairing offices, quarters and warehouses.

4.2 IRRIGATION AND DRAINAGE PLANS

4.2.1 Basic Policy

The basic policy for the irrigation and drainage plans proposed under this project aims at overcoming the impediments to effective water utilization by identifying the factors causing such impediments.

The Minipe Scheme depends for its irrigation water on the Mahaweli River. It is possible, in the Minipe Scheme, to make plans to supply water except in an extraordinarily dry year. Furthermore, water supply from the river is expected to be stabilized due to the progress of the Mahaweli Development Programme. As the Minipe Scheme had been developed stage by stage from 1948 to 1968, its system has deteriorated to the degree of ineffective water utilization. In addition encroachments result in continuous water shortage especially for the tail end canal areas of the Stage III and IV.

The result of the field survey shows that a consumption mechanism of water in the project area has the following features:

- i) Water losses are largely due to defects in, and deterioration of, the existing irrigation facilities.
- ii) After settlement in the Minipe Scheme Area, extension of the irrigable area has been caused by encroachments on the part of the villagers, resulting in increasing the water requirements. 80% of the encroachment area is concentrated in the Stages I and II and there is heavy water consumption in the upstream area.
- iii) There is overuse of water in the upstream area, particularly, in Stage I and II.

- iv) The existing facilities as a whole would not be assured with the function of carrying out the efficient water management because they are acutely short and becoming more obsolescent, combined with inadequate farmers' training and unsystematic farmers' organisation, causing difficulty in creating an appropriate water management system.

Accordingly, it is a fundamental principle that the existing irrigation system as a whole would be rehabilitated at first and, in turn, the existing system is transformed into a system equipped with the effective water utilization and the rationalized water management in the end.

Because this system has a longer main canal in correspondence with the catchment area, the conveyance loss shows an extremely large value and this is regarded as an inevitable disadvantage. In order to overcome this problem, a diversion weir was built on the upstream of the Heen Ganga which forms the boundary between Stage II and Stage III and, starting from the weir, distribution of irrigation water is made through the main canal by a feeder canal system, but its proper functioning cannot be assured owing to the deterioration of the facilities as well as to its inherent defects. Consequently the rehabilitation of all these facilities, such as this diversion weir and the feeder canal, and thereby making it possible to supply adequate water is essential for the solution of the problem of water shortage in the Stages III and IV.

A continuous irrigation has been principally adopted as an irrigation method. The facilities used for the proposed water management which is described in 4.2.5 would be either rehabilitated or newly constructed with a view to bring them into full operation.

The irrigation facilities proposed under this project would play a pivotal role in supplying not only irrigation