by agencies concerned. Accordingly, feasibility studies on water balance shall be carried out in the respective river basin where new development plans are made.

Irrigation development of abandoned schemes

As described in the section 5.1.1, there are some abandoned paddy fields within the irrigation schemes in the Study area. These areas were developed originally as parts of the irrigation schemes, but have been abandoned due to reasons such as deterioration of facilities, scarcity of water, etc. According to the inventory survey, (Table 5.2-3), 1,166 ha under minor schemes and 5,657 ha under major/medium schemes are proposed for reclamation by Irrigation Department and other agencies concerned.

Among these, only one-third (1/3) of the schemes have been studied for development. Development of this area has a bigger potential than development of a completely new area from the view point of construction costs and time. Furthermore, such development will help the farmers, to whom the land has already been allocated, to get into sustainable agricultural production.

Irrigation for upland crops

In the agro-ecological regions classified as WM and WU, large scale production of upland crops is commonly practiced. Some of these annually cropped areas are irrigated. However, the major part of cultivation is carried out under rainfed conditions. If means of providing effective irrigation is applied to these areas, the production could be increased substantially and stabilized.

Since the extent under upland crops is smaller than that under paddy cultivation, the affect on the water balance in the basin as a result of irrigating the uplands may be quite small. The area has many small streams which could be harnessed to provide irrigation water for upland cultivation. As for the suitability for provision of irrigation facilities, however, detailed examination of respective scheme is required.

5.3. Agricultural Infrastructure Improvement Plan

5.3.1 General

The proposed water resources development under the Master Plan is envisaged through effective usage of the limited water resources. In the existing schemes in the Study area, the average holding size per farm family is smaller than national average. In order to increase the production within the limited area, it is necessary to increase the cropping intensities and the sown to harvest ratios. A reliable water supply will help to increase agricultural productivity. However, many exiting irrigation schemes in the Study area are in poor condition where proper water management is not possible. Therefore, rehabilitation of the schemes and strengthening of operation and maintenance activities are crucial to improve agriculture productivity and farmer's incomes and thereby raise the living standard. Furthermore, reconstruction of the abandoned schemes has a large potential. It is expected that the extent under irrigated paddy in the Study area would increase by about 9 % through reconstruction works.

The Government policy on the irrigation sector is focused on (a) the orientation of investment towards rehabilitation, management, and improved operation and maintenance of existing schemes rather than venturing on new ones, and (b) the adoption of participatory management of irrigation systems as a principle, developing farmer organizations for the purpose.

Accordingly, the concept of the Master Plan and the target for agricultural infrastructure improvement is can be set up as follows:

(i) Rehabilitation of major/medium and minor irrigation schemes in the Study area will be carried out in its entirety.
(ii) Reconstruction of abandoned schemes where studies are made will be carried out.

According to the NIRP appraisal report, it is expected that increases in cropped area would range between 0 % and 20 %, and increases in paddy yields between 5 % and 10 %. As seen in the results of Village Irrigation Rehabilitation Project Performance Evaluation Study (summarized below), the rehabilitation impact under this Master Plan could be expected to be same as that of NIRP.

Zone	Season	Paddy Cultivated Area Increased	Average Yield Increased
Dry	Maha	4.5 %	7.2 %
	Yala	-7.7 %	18.6 %
Intermediate	Maha	19.7 %	17.8 %
	Yala	14.1 %	7.8 %
Wet	Maha	5.5 %	14.6 %
	Yala	1.8 %	13.3 %

5.3.2 Rehabilitation of Irrigation Scheme

(1) Condition of the Irrigation Schemes in the Study Area

There are 73 major/medium schemes covering about 25,633 ha and 6,935 minor schemes covering about 51,773 ha in the Study area. According to the inventory survey, there are a large number of schemes that face the necessity of rehabilitation as follows:

Schemes	Total Extent (ha)	Poor Condition (ha)	%
Major/Medium	25,633 ha	18,624 ha	72 %
Minor			
- Over 30 ha	10,958	2,874	26 %
- 5 to 30 ha	29,855	12,807	43 %
- below 5 ha	10,960	7,187	66 %
sub-total	51,773 ha	22,868 ha	44 %

As for major and medium schemes, 18,624 ha in 69 schemes are required to be rehabilitated. As for minor schemes, those in the condition category C, D and E consisting of 4,192 schemes commanding 22,868 ha need to be rehabilitated.

(2) On-going Rehabilitation Project

There are two on-going projects in the Study area, namely, NIRP (National Irrigation Rehabilitation Project) and IRDP (Integrated Rural Development Projects). In Moneragala district, rehabilitation of eight (8) major/medium schemes are being executed or planned with EEC funds. According to the NIRP implementation programme and results of IRDP programme, the following areas will be rehabilitated or are expected to be rehabilitated.

Scheme	NIRP *1 (ha)	EEC, others (ha)	IRDP *2 (ha)	Total Area (ha)
Major/ Medium Scheme				
	7,104	4,272	0	11,376
Minor Scheme				
Over 30 ha	1,684	0	0	1,684
5 to 30 ha	6,020	0	2,110	8,130
Below 5 ha	0	0	2,140	2,140
Sub-total	7,704	0	4,250	11,954

Note : *1 from implementation programme
*2 Estimation

It is noted that some discrepancies exist between the NIRP appraisal report and the inventory survey with regard to the identification of major/minor schemes. It is assumed that subsequent review of identified schemes has been made and results of the inventory survey through Department of Irrigation will be used for this Master Plan Study.

(3) Master Plan Formation

The Master Plan for the rehabilitation works in the irrigation schemes will be made considering the on-going programmes of the NIRP, IRDP and EEC financed rehabilitation programmes. Since these programmes do not cover the total rehabilitation works envisaged, the balance works will be picked up under the Master Plan. Extents covered and the targeted completion years for respective programmes are shown in the table below.

Scheme	Project	Rehabilitation Area (ha)	Completion Year	Rate
Major/Medium				
	NIRP	7,104	1996	38 %
	EEC, others	4,272	1995	23 %
	New Project	7,248	1996	39 %
	Sub-total	18,624		100 %
Minor				
	NIRP	7,704	1996	34 %
	IRDP	4,250	2003	19 %
	New Project	10,914	2003	47 %
	Sub-total	22,868		100 %
Total	NIRP	14,808		36 %
	EEC, others	4,272		10 %
	IRDP	4,250		10 %
	New Project	18,162		44 %
	Grand Total	41,492		100 %

(4) Operation and Maintenance

According to the Government policy on operation and maintenance of irrigation schemes, farmers organization shall have the responsibility of operation and maintenance of all minor schemes, and of distributory and field channel in medium/major schemes, after completion of rehabilitation. Prior to the execution of the rehabilitation works, the following items shall be set up or confirmed:

- a farmer organization would be established and registered in accordance with the Agrarian Services Act of 1979, as amended in 1991.
- for minor schemes, the farmer organisation would bear the full cost of Operation and Maintenance after completion of the works, and
- for medium/major schemes, the farmer organization would bear the full cost of Operation and Maintenance of distributory and field channels after the completion of the works.

5.3.3 Reconstruction of Abandoned Schemes

According to the inventory survey, there are 33 minor schemes covering 1,166 ha and 25 major/medium schemes covering 5,657 ha proposed for reconstruction. The Master plan for development of abandoned schemes is set up where studies for development has been made. Among these abandoned schemes, 11 minor schemes extending 511 ha and 13 major/medium schemes extending 3,389 ha have been studied by Irrigation Department and other agencies.

The targeted completion year for the reconstruction works will be set from 1999 to 2003, considering the financial arrangement for irrigation development. As for operation and maintenance, the farmer's organizations shall be organized on the same lines as that under rehabilitation schemes.

5.3.4 Implementation Programme

(1) Selection of Priority Projects

As described in the section 5.3.2 and 5.3.3, all exiting irrigation schemes extending 41,492 ha will be rehabilitated, and 11 abandoned minor and 13 abandoned major/medium schemes will be reconstructed. Among these rehabilitation programme, 18,162 ha of schemes will be rehabilitated under the new project comprising 7,248 ha in major/medium schemes and 10,914 ha in minor schemes. Annual implementation quantity and the criteria for implementation priority under the new project for rehabilitation and reconstruction are as follows:

Rehabilitation of Major/Medium Schemes

Major/medium schemes to be rehabilitated under new project shall be selected for execution considering the implementation of NIRP and EEC financed programmes as well as other rehabilitation programmes. The rehabilitation under the new project will commence in 1994 and completed in 1996. The annual execution area is 20 % in 1994, 40 % each in 1995 and 1996.

The selection criteria for establishment of priorities are as follows:

(i) Condition of the schemes shall be assessed in terms of cost to area ratio based on the inventory survey. Larger the ratio, poorer will be the condition of the scheme. Thus, the highest priority for rehabilitation will be given to scheme having largest cost-area ratio. The priority level will decline as the ratio diminishes.

(ii) Land holding size in respective schemes shall be considered in the selection for rehabilitation. Priority will be given to the scheme with smallest unit holding size. The priority level will decline as the individual holding size in the scheme increases.

Considering the selection standard, the priority for development of major/medium schemes is shown in Table 5.3-1.

Rehabilitation of Minor Schemes

Minor schemes to be rehabilitated under new project shall be selected for execution taking into account the implementation programmes of NIRP and IRDP. Rehabilitation under the new project will commence in 1994 and completed in 2003. The annual execution area is 5 % from 1994 to 1996, 12 % from 1997 to 2002, and 14 % in 2003.

Selection criteria for establishing the priorities are as follows:

(i) Present condition of the scheme shall be considered in the selection for rehabilitation. Those in the poorest of condition will receive the highest priority. According to the inventory survey result, schemes condition classified as E are the poorest. The priority level will decline as the condition category level moves from E, D, C, and B in that order.
(ii) Land holding size in respective schemes shall be considered in the selection for rehabilitation. Priority will be given to the scheme with smallest unit holding size. The priority level will decline as the individual holding size in the scheme increases.

Since selection of minor schemes for rehabilitation under NIRP and IRDP are made on an annual basis, it is not possible to identify the schemes prior to execution of the new project. Accordingly, for selection of priority project under new project as well as NIRP and IRDP shall be made using the data base constructed by the Study team in order to avoid possible duplication.

Reconstruction of Abandoned Schemes

The reconstruction of abandoned schemes under the new project consisting of 511 ha under minor schemes and 3,389 ha under major/minor schemes will commence from 1999 and completed in 2003 after completion of NIRP. The annual execution area is 20 % from 1999 to 2003.

The selection criteria for establishment of priorities are as follows:

(i) The scheme that will yield highest economic returns shall be executed first. Based on inventory survey results, the scheme having the smallest cost to area ratio shall be given first priority from the economic view point. .
(ii) Land holding size in respective schemes shall be considered in the selection for rehabilitation. Priority will be given to the scheme with smallest unit holding size. The priority level will decline as the individual holding size in the scheme increases.

Considering the selection standard, the priority for development of abandoned major/medium and minor schemes is shown in Table 5.3-2.

5.3.5 Implementation Cost

The implementation cost for the Master Plan including on-going projects or scheduled projects is computed in the following manner:

(1) Rehabilitation cost of major/medium schemes are applied as per inventory results.
(2) Rehabilitation cost of minor schemes are applied at US$ 750 (equivalent Rs. 35,000, as of may 1993) per hectare which is the same as of NIRP.
(3) Reconstruction cost of major/medium and minor schemes are applied as per inventory results.

The annual implementation cost for (1) rehabilitation of major/medium schemes, (2) rehabilitation of minor schemes, and (3) reconstruction of abandoned schemes are shown in Tables 5.3-3 to 5.3.-5, respectively, and summarized as below. These computed cost shown in the tables are pure civil cost excluding engineering and administration cost, and physical and price contingencies.

Item	Cost (Rs. 1,000)
1. Rehabilitation of Major/Medium Scheme	
New Project	220,750
On-going Project	465,252
sub-total	686,002
2. Rehabilitation of Minor Scheme	
New Project	382,025
On-going Project	418,390
sub-total	800,415
3. Reconstruction of Abandoned Scheme	
Major/Medium Scheme	404,220
Minor Scheme	32,050
sub-total	436,270
Total	1,922,687

As components project cost, the following estimates will be considered:

(1)	Engineering and administration cost	12 % of the civil cost
(2)	Physical contingency	5 % of the civil cost
(3)	Price contingency	10 % of the civil cost

Accordingly, the above cost for new schemes will as follows:

Item	Cost (Rs. 1,000)
1. Civil Cost	
Rehabilitation of Major/Medium Scheme	220,750
Rehabilitation of Minor Scheme	382,025
Reconstruction of Abandoned Scheme	436,270
sub-total	1,039,045
2. Engineering and Administration	124,685
3. Physical Contingency	51,952
4. Price contingency	103,905
Total	1,319,587

It is aimed that above rehabilitation will be achieved by 2003.

5.4 Rural Infrastructure Development Plan

5.4.1 Rural Roads

(1) Basic Scheme

The Master Plan is set up on the rehabilitation of Class C, D and E roads. These roads play an essential role in the distribution of agricultural produce as well as in the transportation of inputs. Further, these roads are also used extensively, on a daily basis, by the villagers.

Quantifying the road rehabilitation works under the Master Plan will be based on the rehabilitation requirements, described in Section 4.6.1, taking into account the IRDP and Public Investment (1992-1996) programmes.

The concept of the Master Plan is to correct regional differences as far as possible, and is set up as follows:

1) Concerning Class C and D roads, rehabilitation will be carried out where the ratio of the total length needing rehabilitation to the total length of roads within a division exceeds 40%. The goal is to achieve a ratio that will be less than 40% in all divisions by the year 2003.

2) Concerning Class E road, rehabilitation will be carried out in its entirety by year 2003.

(2) Required Rehabilitation Length

Based on the inventory survey and the relevant information from the Provincial road development sections and Local Authorities, the total rehabilitation length of the Class C, D and E roads are shown in the following table

	Total Length(km)			Required Rehabilitation Length(km)		
	Class C	Class D	Class E	Class C	Class D	Class E
Kandy	808.3	632.6	1,640.0	548.8	293.4	219.9
Nuwara Eliya	380.9	225.2	304.6	194.4	145.6	70.5
Matale	339.0	237.0	1,080.2	176.7	197.3	145.9
Ratnapra	494.8	378.7	1,579.0	232.8	198.1	282.5
Kegalle	377.2	349.6	757.2	42.7	119.3	268.6
Badulla	570.1	480.1	834.0	291.8	247.5	200.0
Moneragala	395.2	459.3	1,115.6	70.5	98.1	219.2
Total	3,365.5	2,762.5	7,350.6	1,557.7	1,299.1	1,406.6

(3) Public Investment to Rural Road Sector

The total amount of public investment to the Study area is estimated at Rs. 75,652 million for the 10 year period from 1994 to 2003.

Since the public investment to the rural roads contributes only 1% (Rs. 7.5 million), rehabilitation would be possible only in 500 km of Class C and D roads by year

2003, based on an estimated per km cost of Rs. 1.5 million. Accordingly, rehabilitation length under this Master Plan from 1994 to 2003 will be 500 km (50 km/year).

(4) Estimated Rehabilitation Length by IRDP up to 2003

Rehabilitation, mainly of Class E roads, is being implemented under IRDP. Judging from the past activities on road rehabilitation, further implementation is estimated at 86 km per year as shown in Table 5.4-1.

Accordingly, the total length of Class E roads to be rehabilitated during the 11 year period from 1993 to 2003 could be expected as follows:

Kandy	Nuwara Eliya	Kegalle	Badulla	Moneragala	Total
198 km	154 km	264 km	198 km	132 km	946 km

(5) Computation of Required Rehabilitation Length

The required rehabilitation length computed in accordance with the basic concept is shown in Table 5.4-2. The district wise rehabilitation lengths of roads are summarized below.

(Unit: km)

	Class C	Class D	Class E	Total
Kandy	250	120	220	590
Nuwara Eliya	80	60	70	210
Matale	70	110	150	330
Ratnapura	90	80	290	460
Kegalle	10	50	270	330
Badulla	130	110	200	440
Moneragala	20	50	220	290
Total	650	580	1,420	2,650

(6) Master Plan Quantity and Implementation Programme

The Master Plan quantity is obtained by deducting the rehabilitated volume implemented in 1993 from the necessary rehabilitation volume in the table above. In order to achieve the Master Plan rehabilitation volume in 10 years from 1994 to 2003, the following conditions have been established:

1) Class E roads to be rehabilitated by IRDP.
2) As regards the annual rehabilitation length of 50 km expected through public investment to the study area, further investment will be made to Class C and D roads for an additional length of 25 km per year.
3) Required rehabilitation out of above will be made as a new project.

Rehabilitation volume and the implementation programme under the Master Plan are shown in Table 5.4-3.

(7) Implementation Cost

The implementation cost is computed subject to the following conditions:

1) Cost for Class C roads paved with asphalt is assumed to be Rs. 1.5 million/km.

2) Class D roads will be paved with laterite and asphalt. Asphalt pavement will be made on 50% of the total length. The cost is assumed to be Rs. 1.2 million/km.
3) Class E roads will be paved with laterite and asphalt. Asphalt pavement will be made on 30% of the total length. The cost is assumed to be Rs. 1.0 million/km.

The implementation cost for the period from 1994 to 2003 is shown in Table 5.4-4.

5.4.2 Rural Water Supply

(1) Basic Concept

The development programmes aiming for 100% rural water-supply in all the districts, except for Nuwara Eliya, have already been made. The progress made in these programmes are shown in the table below.

	Funding Agency	100% Target Year	Remarks
Kandy	FINNIDA	2000	On-going
Matale	DANIDA	1991	Completed (75%)
Nuwara Eliya	Not Available		
Ratnapura	UNDP	2001	Scheduled to commence in 1993.
Kegalle	ADB	2010	Planning has been made
Badulla	UNDP	2001	Scheduled to commence in 1993.
Moneragala	ADB	2010	Planning has been made

As shown above, future water supply projects will be implemented in line with the development programmes set up for each of the 5 districts, except in Matale district, where 100% water-supply has not been attained even though the programme had been completed, and in Nuwara Eliya district, where no development programme has been made.

As for Kandy district, 75% of supply has been made in phase II programme. However, the future implementation programme on the remaining 25% has not yet been made.

Accordingly, it is not reliable to catch up the programmes made for Kandy and Matale districts as well as Nuwara Eliya district into the Master Plan. Therefore, inventory survey results for these districts would be incorporated in the Master Plan.

As for Kandy and Matale districts, the target for100% water supply is set in year 2003, as targeted by NWB&DB. As for Nuwara Eliya district, supply target is set at 70 %, which is the present national level. Availability of many water resources which are easy to access has resulted in a low supply rate in the area, and the future requirement of water supply is considered to remain low.

(2) Master Plan Quantity

Water supply under the Master Plan is set up at a diffusion rate of 70% for the Nuwara Eliya district and 100% for the Kandy and Matale districts based on the following conditions.

1) the inventory survey results will be applied;

2) the numbers of families in 2003 are estimated from the forecasted population in 2003;
3) the water supply facilities shall be of 3 types: piped, tube wells with hand pumps and dug wells;
4) beneficiary familiy number for each type will be computed according to the present ratios of respective types;
5) number of beneficiary families per water-supply scheme is assumed to be as follows; and
   - Piped scheme: same as present average number of beneficiary families,
   - Tube wells with hand pump: same as present average number of beneficiary families, and
   - Dug wells: 15 families
6) 50% of the beneficiary families under dug wells will be considered for development, since about 50% of the private dug wells are not protected.

The present condition of rural water supply and numbers of beneficiary families under Master Plan for respective supply types are shown in Table 5.4-5.

As for the other districts, the programmed quantities by the funding agencies are applied.

(3) Implementation Programme and Cost

The implementation cost for respective types of water supply facilities were computed based on available data as shown below:

1) Piped scheme: Rs. 10,000/family
2) Tube wells with hand pump: Rs. 72,000/facility
3) Dug wells: Rs. 15,000/facility

As for Ratnapura, Kegalle, Badulla and Moneragala districts, the implementation cost of the existing development programmes are incorporated into the cost estimate.

The numbers and the implementation costs are shown in Table 5.4-6.

According to the Public Investment (1992 - 1996), the investment to the rural water supply sector in the Study area could be estimated at Rs. 1,513 million during the Master Plan period. The estimated implementation cost of Rs. 1,668 million is nearly same amount as the public investment and considered to be reliable.

5.4.3 Rural Electrification

Promotion of rural electrification represents an important national policy from the view point of economic growth, reducing fuel imports and promoting employment. The ADB Master Plan on Rural Electrification concludes that the national average electrification rate can be raised to 70% by year 2000. However, since the cost of external wiring will have to be borne by the beneficiaries, all houses with access to the power supply would not be electrified. The actual electrification rate thus will be lower than 70%. Presently, the ratio of households with electricity to the number of houses where electrification is possible is estimated at about 50%.

(1) Computation of ADB Master Plan Quantity

In the ADB's master plan, awareness of inhabitants towards electrification measured by converting the following social and economic parameters into points:

-population level,
-numbers of contracting households,
-numbers of programmed housing,
-length of Class A and B roads,
-numbers of post offices,
-numbers of banks
-rate of houses with toilet,
-rate of non-registrants for food stamps, and
-cultivation area.

The master plan formulates the ratio of the numbers of contracting households to the number of houses where electrification is possible, and the targeted electrification rate when the national average electrification rate of 70% is attained. The electrification rates in the Study area according to the master plan are as follows:

	Kandy	Nuwara Eliya	Matale	Ratnapura	Kegalle	Badulla	Moneragala
Electrified Rate	0.565	0.535	0.449	0.509	0.481	0.535	0.399
Electrification goal(%)	72.5	66.5	59.8	59.0	59.4	64.5	52.4

The ADB master plan computed the numbers of households to be electrified based on the above figures for the respective districts, and estimates that 200 households can be electrified by a single rural electrification scheme (RESS).

The numbers of RESS schemes scheduled for implementation in the Study area by 2000 are as follows:

Kandy	Nuwara Eliya	Matale	Ratnapura	Kegalle	Badulla	Moneragala
424	194	129	373	267	274	103

(2) Computation of the Master Plan Quantity

The rate of electrified households and the electrification goal, as computed in the ADB master plan, are applied to the Master Plan subject to the following conditions and procedures.

1) the inventory survey result will be applied,
2) number of households are substituted by the number of families,
3) the total number of families in 2003 is estimated from the population increase rate,
4) number of families having no electricity in 2003 is to be calculated based on the rate of electrified families in ADB report where the electrification programme is not implemented.
5) number of RESS schemes is calculated to achieve the targeted electrification rate in ADB report, and
6) the required low voltage line length per RESS scheme is computed from the average line obtained from the inventory survey.

The quantities for the respective districts are shown in Table 5.4-7.

(3) Implementation Programme and Cost

Implementation cost per RESS is estimated Rs. 2.4 million based on ADB master plan report and other references. The implementation quantities and costs are summarized as follows;

	Nos of RESS Schemes up to 2000	Low-Voltage Line (km)	Implementation Cost(Rs.)
Kandy	273	1,104	568.8
Nuwara Eliya	307	623	736.8
Matale	114	452	273.6
Ratnapura	228	1,093	547.2
Kegalle	244	1,244	585.6
Badulla	146	584	350.4
Moneragala	118	525	283.2
Total	1,394	5,625	3,345.6

5.5 Agricultural Promotion and Supporting Plan

5.5.1 Agricultural Promotion and Supporting Plan

The constraints for agricultural development in the Study area can be broadly categorised into two groups: one relating to production and the other relating to institutional support. The Agricultural Promotion and Supporting Plan is designed with the objective of alleviating the major constraints confronting the total production system. It is intended to improve the income level of the agrarian sector and thereby increase the contribution of agriculture sector to the regional and national GDP.

(1) Agricultural production plan

Agriculture continues to play an important role in the economy of the Study area accounting for about 30% of the Gross Regional Domestic Product(GRDP) and about 70% of employment in 1990. Average per capita GRDP in the Study area, however, is estimated at US$ 312, or about 34% lower than that for the country of US$475. In order to rise farm incomes and standards of living of small farmers, who comprise majority of the inhabitants, agricultural promotion is essential.

The agriculture in the area has many constraints and technical problems that have to be elucidated. Though provision levels of rural infrastructure in the area are relatively well developed, this investment has been directed toward an estate economy and has left behind the rural development. Agricultural facilities such as for post harvest activities are inadequate to accommodate growing production of highland crops cultivated by small farmers. Possibility for further expansion of the agricultural area is extremely limited and the cultivated area has already been extended too far into marginal lands. Furthermore, there remains a wide gap between farmers' crop productive capacity and the production potential identified through research.

On the other hand, there are some possibilities for achieving agricultural development. The prospects for development are summarised in foregoing Chapter 4.3.9-(2).

The agricultural development plan will comprise of a number of elements including technology improvement, agricultural infrastructure development, and

marketing improvement, etc. However, the main element on which the others will depend is the intensification of production, which can achieve through the following means:

a) Increasing agricultural productivity
b) Increasing cropping intensity;

1) Improving yields of existing crops:

Under the Land Use Plan, the crop production plan will be summarised as follows (Table 5.5.1):

Crop	Varieties	Agro-region	Potential Yield	Actual Yield	Possible Yield
addy	BG-400,etc.	All zone	6.8	3.3	5.0
Potato	Arka, etc.	WU,IW,DL	15-20	11.5	15.0
Onion	Pusa Red,etc.	DL	20-30	11.9	18.0
	Jaffna Lo. etc.	DL	15-20	11.5	13.0
Tomato	T-62, etc.	WL,IL,DL	20-30	10.6	16.0
Carrot	Top Weight etc	WU, IU	35-40	12.3	20.0
	Cape Market	WN,IM	15-20	8.0	14.0
Cabbage	K-Y Cross,etc	All Zone	40-60	22.0	30.0
Soybean	PB-1, etc	DL,IL,WL,IM	3.5-4.5	0.83	2.5-2.8

It is proposed to adopt following measures to improve the present crop yields;

- Provision of irrigation facilities to presently unirrigated and partially irrigated land,
- Adoption of recommended production technologies for efficient crop management, and
- Selection of crops on their adaptability to particular agro-ecological region.

2) increasing cropping intensity:

Present average cropping intensity in the Study area measured in terms of the ratio of extents cultivated in the Yala season to that of Maha season are shown in Table 5.5-2. The lower cropping intensities are generally associated with the dry zone conditions experienced in some divisions that limit crop production during the dry Yala season. It is planned to improve the cropping intensities by adoption of following measures:

- Provision of irrigation infrastructure to new areas and improvements to existing irrigation schemes,
- Revision of cropping patterns, particularly in the upcountry vegetable and potato growing areas to incorporate a third crop in between the Yala and Maha; the Meda season,
- Adoption of viable and sustainable dry farming systems, particularly in the unirrigated dry zone area of Study area, and
- Inter-cropping of suitable rubber and coconut lands with appropriate fruit and export agricultural crops.

(2) Agricultural supporting plan

Intensification of agricultural production will be achieved by the effort of farmers and/or farmers' organisations themselves mainly through proper use of agricultural inputs, use of high yielding varieties, adoption of recommended cultivation technologies, etc. However, it is expected that the Government, through relevent agencies, would strongly support the development of appropriate agricultural production technologies and the improvement of agricultural institutional supporting system that are essential to encourage and motivate farmers to intensify agricultural production. The agricultural supporting plan will consist of two sections; one relating to institutional matters and the other relating to supporting facilities;

1) Strengthening of agricultural supporting system

The agricultural supporting systems in Sri Lanka have been strengthened through a number of projects supported by multilateral and bilateral donors. These projects have contributed in achieving of some degree of success. However, there still remain many areas that need further improvement. Agricultural supporting systems have been subjected to drastic changes since 1989 due to; (i) the rationalisation of public sector through the introduction of economic restructuring policy, and (ii) the devolution of authority to the Provinces under the 13th Amendment to the constitution. The administrative changes introduced sought to give the Provinces and rural communities more power for self management. However, the process of implementation has caused considerable disruption to the existing agricultural supporting systems. Presently, steps are being taken by all the government agencies concerned to restucture their organizations to fall in line with the new policies and issues. Furthermore, a medium-term investments and reforms that are required to accelerate the growth of the agricultural sector are being formulated by the Government through the Agricultural Growth and Restructuring Strategy (AgGro Strategy) which is under preparation.

It is imperative that the restructuring of the agricultural supporting system is completed within the shortest possible time, giving due consideration to the matters dicussed above. It is emphasized that the system should, firstly, respond to farmers problems and production constraints and, secondly, cost effective in terms of sustainability of operation. .

Areas for improvement in the provision of agricultural support services, based on studies made on the present condition, are examined through the Study and put together as a "Guideline for Agricultural Promotion and Support", which presents a set of recommendations on the present supporting system.

The Guidelines are summerized as follows:

a) Agricultural Research

- At present, research priority for agricultural commodities has mainly been determined in terms of the national agricultural objectives. it is vital that the regional importance of the crops are given due consideration;
- New Crops imported recently will lack of production technology support. Measures for rapid testing and demonstrating the benefits to the farmers should be undertaken;
- Development of farm level storage and post harvest technologies for agricultural produce need urgent attention;
- Adoptive research programme should be strengthened to develop area specific recommendations for increasing cropping intensities and improving farming practices.

b) Agricultural Extension

- Strengthening of village level extension services by recruiting trained agricultural extension workers. In view of the changing perspective of agricultural extension based on the farming systems approach rather than on rice based simple extension massages, it is recommended that the KVSN level is replaced by the AI level;
- Service area of the AIs should not be based on the number of farm families served as was done in the past, but on the productivity of the area;
- Re-establishment of direct functional and administrative line of command down from provincial level to village levels;
- Maintain the uniformity of institutional structure in the different provinces.

c) Agricultural Credit

- Programme should be drawn up to grant agricultural loans to the farmer organisations rather than to individual farmers;
- Programme should take into account the regional needs, particularly in post-harvest activities;
- Placement of supervisory staff who work in close co-ordination with extension agents and farmer group would greatly facilitate the credit disbursement and recovery.

d) Input Supply

- Production level of certified seeds by Seeds and Planting Material Division of DOA should be maintained until the private sector is in position to supply the requirements;
- In view of recent reduction in the use of fertilisers, revival of subsidy or alternative measures should be examined;
- Scope of extension agent should include the co-ordination function of input supplies with relevant public and private sector organisations.

e) Agricultural Marketing

- Agricultural marketing facilities such as pola, produce storage should be constructed and/or improved, and their appropriate managing system should also be taken up;
- In order to protect the vegetable farmers from collapse due to various adverse situations, it is desirable to establish a Vegetable Production and Distribution Development Fund with functions of (i) co-ordinating production and distribution of vegetables, (ii) compensating the losses caused to the farmers due to sharp decline in product prices ,and (iii) providing credit to the farmers enabling them to carry on their farm production activities;
- Establishment of an effective marketing information system is a strongly felt need.

2) Improvement of agricultural facilities

a) Improvement of Agrarian Services Centres

(i) Justification

178 Agrarian Services Centres (ASCs), established by the Department of Agrarian Services (DAS) as Government facility, operate within the Study area. Each division has been provided with one or more centres depending on the productivity of the area. Staff of ASC comprises representatives of DOA, DEA, ADA in addition to those of DAS. Bank staff too have

occationally been stationed at the Centre. It has played an important role as a front line institute for providing agricultural supporting services of the Government.

Functions of the centre has been operated through a 14 member committee that comprised eight governmental members each representing the concerned agency and six members representing farmers.

The committee examines the cultivation plan, and the requirement of seeds and planting materials, fertilizers, agro-chemicals and equipment prior to each planting season in the area of jurisdiction and coordinates procurement and distribution plan among the related agencies. Activities of the Centre with regard to supply of agricultural inputs tend to concentrate twice a year with the two planting seasons of Yala and Maha.

The main constraints faced by the Centres are the inadequacy of storage facilities to stock agricultural inputs, particularly seed paddy and fertilizers, in required quantities under good storage conditions. Timely procurement and distribution of inputs among farmers are hampered due to the lack of transportation facilities.

(ii) Improvement plan

The following measures for improvement will be carried out on the 178 Agrarian Services Centres;

- Rehabilitation and/or construction of storage;
- Provision of transportation vehicle;

(iii) Project cost

About Rs. 407.1 million. (Rs. 2.3 million per Centre)

b) Construction of produce storage

(i) Justification

One of the major constraints to marketing of SFCs is poor post-harvest handling of the produce. Smallholders producing SFCs and certain export crops are subject to the effects of gluts and are unable to take advantage of higher mid-season prices due to lack of marketing credit and storage facilities.

Construction of produce storage facility in the immediate vicinity of ASCs is planned to over come the present deficiency.

(ii) Improvement plan

Produce storage facilities will be constructed on the yard of ASCs in the following divisions, which are the main producing areas of SFCs and vegetables. The storage facility will be the property of ASC, but its management will be entrusted to a farmer's organisation under a contract between the Centre and the Organisation.

District	Division	No. of Centres	Main Crops
Matale	Dambulla	2	Onion,Chili, Vege.
	Galewella	3	do
	Naula	2	do
Kandy	Uda Dumbara	3	do
	Mada dumbara	5	do
	Peta Hewaheta	3	do
Nu. Eliya	Uda Hewaheta	7	Potato, Vege.(high)
	Nuwara Eliya	3	do
Badulla	Uba Paranagama	6	do
	Hekiela	3	do
	Welimada	4	do
Ratnapura	Welegepola	2	Onion, Chili,Vege.
	Embilipitiya	3	do
	Kolonna	1	do
Total		53	

(iii) Project cost

About Rs. 471.1 million. (Rs.8.9 million per facility)

(c) Development of rural marketing facilities (Pola)

(i) Justification

The weekly Pola is an important market outlet of agricultural produce in the flow of commodities. The Pola, which existed for generations, served as assembly points for rural producers and rural marketing centres, where the facilities are used on approved days for sale and purchase of produce by vendors, wholesale dealers and consumers.

Beside agricultural products, these rural marketing centres also serve the small scale and cottage industrialists for local consumption.

Furthermore, the Pola has a vast potential for generation of additional employment for youths such as providing transporting, parking, packaging, etc. Generally, these rural marketing centres locate in convenient places for majority of the villagers. These places could also be developed as rural service centres by providing some basic service facilities such as postal, rural banks, co-operative retail outlets, etc.

The rural marketing centres will develop more as a centre of rural community. At present, there exist about 110 polas in the area. However, existing polas are generally too small and superannuated as most were constructed long years ago and there had hardly been any measures of rehabilitation since then. In addition, some of them lack fundamental facilities such as water supply, shelter, toilets, access road, etc. It is proposed to provide assistance for construction of new pola complexes and also to upgrade the existing ones

(ii) Improvement plan

Of the 110 existing polas, half of number (55) will be improved on the basis of the results of a survey conducted by MUPR. Improvement plan will be as follows:

- Duration of implementation is from 1994 to 1998.
- Project is to construct/rehabilitate permanent stalls and basic facilities as well as access roads, etc.

(iii) Project cost

About Rs.330 million (Rs. 6 million per pola)

(d) Improvement of agricultural training facilities

(i) Justification

There are 3 In-Service Training Institutes(ISTIs) and 7 District Agricultural Training Centres (DATCs) in the Study area. The former is the institute where in-service training programmes are conducted for officers of DOA and other agricultural organisations. The DATC is the district level facility where vocational training in agriculture conducted for youth, farmers and farm women. The locations of the facilities in the Study area are shown below. Sabaragamuwa province has no ISTI or Regional Agricultural Research Station (RARS).

Province	Location	
	ISTI	DATC
Central	Gannoruwa (Kandy)	Galpalama (N'eliya) Nalanda (Matale) Katagastota (Kandy)
Uva	Bindunuwewa (Bandarawela)	Bindunuwewa (B'wela) Bibile (Moneragala)
Sabaragamuwa		Wagolla (Kegalle) Karapincha (Ratnapura)

Training programmes in the DATC are conducted under three courses of one day, one week and one month duration. Under these courses, group training is provided to participants, the number variying from 5-90 persons per group. On the average, 1,100 - 1,500 person in 30-40 groups undergo training annually.

The management and administration of the field services of the DATC and ISTI of the DOA that were formerly under the DOA has been devolved to respective Provinces except the ISTI.of Gannoruwa

The constraints on the ISTI and DATC include:

- No ISTI in Sabarabamuwa Province;

- Facilities of existing ISTI as well as DATC are inadequate; ISTI and DATC need to be refurbished, re-equipped, provided with transport and in some instances expanded.

(ii) Improvement plan

- construction of one ISTI in Sabaragamuwa Province;
- Refurbishing 7 existing DATC;
- Provision of equipment for training, particularly visual training equipment.

(iii) Project cost

About Rs. 50 million.

In addition to the above, the following recommendations should be made effective as early as possible:

- To carry out a feasibility study on central market and principle local markets for improvement of agricultural marketing.

  The Pettah market, sited in the centre of Colombo, has two functions; collecting and redistributing agricultural produce from all over the country, and providing for both wholesale and retail sales. The market suffers from heavy congestion and lack of basic facilities within the market area. The conditions are well below the minimum level that could be considered acceptable. Recommendations have been made on several occasions in the past to undertake the study, though no progress has been made in this rgard to date. Principle markets located in the Provincial Capitals too are in a similar state.

- To establish a Vegetable Production and Distribution Development Fund with functions of (i) co-ordinating production and distribution of vegetables, (ii) compensating the losses caused to the farmers due to sharp decline in product prices ,and (iii) providing credit to the farmers enabling them to carry on their farm production activities.

5.5.2 Animal Husbandry Promotion and Supporting Plan

Ambitious targets have been established for livestock production as part of Government's effort to improve consumption patterns and increase milk production. As stated before, consistent with government's priorities, specific attention is given to expansion of the dairy industry. Government's aim is to reach a level of self sufficiency rate of 30 per cent by the year 2002. An optimistic livestock products production will be emphasized in the national plan but the per capita livestock products and other animal protein consumption tend to increase only slightly due to rapid population growth.

On the demand side it is clear that animal production holds the key to increasing the food protein level of the country's growing population, and so should be the profitability of such enterprise. Profitability in livestock and poultry production should attract even greater investment from the private sector and accelerate the growth of Sri Lank's animal husbandry.

However, in view of the limited land and feed resources, policy objectives should move from those on expanding animal numbers to those on increasing the output of animal products per unit of land area. Introduction of improved livestock can result in a major improvement of product without a significant increase in numbers. Achievement of targets will depend heavily on use of animals with higher genetic potential, better production and management systems, improved veterinary services and the availability of larger supplies of good quality animal feeds such as grass, feed grain and protein supplements.

From the above analysis of the present situation and national policies, number of possible projects have been identified and prioritized accordingly. The top ranking projects, include;

(1) Strengthening of Central Artificial Insemination Centre.
Introduction and development of appropriate technology for genetic improvement.

Providing Frozen Semen Processing Equipment, Artificial Insemination Equipment, vehicles and others. The cost is estimated at Rs. 8,130,000.

(2) Strengthening of District Level Veterinary Surgeon Stations.
Animal health services (prevention, eradication, control and treatment of animal diseases, veterinary public health, etc.)

Supply basic diagnostic and treatment equipment and vehicles. 7 districts, 10,000,000 yen each station. The cost is estimated at Rs. 28,500,000.

5.6 Environment Preservation and Control Plan

5.6.1 Concept of the Plan

(1) Rationale

The Government of Sri Lanka (GOSL) recognizes that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of his environment. In this context, the Environment Preservation and Control Plan is to be established by considering the following regional characteristics of environment in the Up-country.

a) The Up-country has received high pressure on the land resources mainly due to high population density, limitation of areas with gentle slope and development of plantation estates. The exceeding pressure on lands induced various kinds of environmental issues such as deforestation, cultivation of marginal lands, encroachment of reserves and soil erosion. This has caused environmental degradation, and in turn threatens the sustainable development of the Up-country area.

b) The Up-country has contributed not only to the national economy by producing estate crops, but also to the local people by providing a fundamental socio-economic and natural base for their living. Thus, the preservation of environment is inevitable to ensure the sound living conditions both for existing and next generations.

c) With great care of the necessity of environmental conservation, the Government of Sri Lanka established the National Conservation Strategy and the Environmental Action Plan. The Up-country should contribute to promotion of the national policy in regional level. Thus, the establishment of an Environmental Preservation and Control Plan gives effective and efficient ways for actual actions of environmental protection in the Up-country area.

(2) Objectives

The principal objectives of the Environment Preservation and Control Plan are as follows;

a) to clarify a desirable figure of the environment in the Up-country area,
b) to set long and short term goals and targets,
c) to guide fundamental policy for achievement of goals and targets in the regional level, and
d) to establish basic strategies and actual actions for implementation.

A conceptual diagram of the Environmental Preservation and Control Plan in the Up-country is shown in Fig. 5.6-1.

5.6.2 Environment Preservation and Control Plan

(1) Target and Control Plan

Seven (7) major environmental issues, namely Soil erosion, Deforestation, Shifting cultivation, Encroachment of reserves, Mono-cropping of tobacco and sugar cane, Gem mining, and Landslides are found in the Study area. As shown in Fig.4.8.2-1, these environmental issues are firmly linked each other, and eventually result in the degradation of Land Resources, Forest Resources and Bio-diversity in the area. Thus, the region oriented strategy against the degradation of land resources, mineral resources, forest resources and bio-diversity should be established in accordance with the national strategy. The Environment Preservation and Control Plan is summarized in Table 5.6-1 including a target for conservation and a legal structure supporting the Plan.

(i) Land Resources

The problems of soil erosion, shifting cultivation, mono-cropping of tobacco and sugar cane and landslides are eventually resulted in the issues of land resources. Up-country is predominantly agricultural area occupying about 62 % of the total Study area of 19,000 km2. Within it, a population of 4.1 million are living in 1981. With increasing population, a land:man ratio has declined from about 2.7 ha per person to 0.4 ha per person within the last hundred years mainly due to the slow economic growth and lack of employment opportunities outside agriculture. Over exploitation of the existing agricultural lands and encroachment of the remaining state forest land has led to an accelerated rate of land degradation creating a variety of adverse ecological consequences such as soil erosion, siltation, landslide and loss of biodiversity.

The local people have been farming on slopes and tracts of land that should be reserved, and it is now very common to see steeper uplands under cultivation without any conservation measures. Lower slopes are permanently cropped with annual and perennial species, while the highest and steepest slopes show evidence of shifting cultivation during the Yala season. Agricultural practices in the marginal

lands are leading to further degradation of the soils and together with existing demographic pressure on available land resources, this results in the exploitation of marginal lands high up the mountain crests as well as encroachment of the last remaining forest areas. Other factors accelerating the process of land degradation are of a serious non-technical nature, for example i) unregulated soil conservation, ii) uncontrolled land alienation mainly through annual permits, iii) unfavorable tenancy conditions such as short term land use right, iv) weak and fragmented institutional framework related to land use, and v) lack of mobility by landless farmers, along with a pressing need to make their resettlement elsewhere a priority.

Main issues related to land resources in the Study area are as follows:

- Loss of productivity of agricultural lands by soil erosion,
- Continuing practice of shifting cultivation and mono-cropping,
- Encroachment of environmentally critical areas,
- Insecurity of land tenure and lack of incentives to develop and manage land by small holders,
- Inadequate land use planning and implementation at the national, provincial and local levels,
- Poor enforcement of the relevant legislation due to lack of political will and fragmentation of responsibilities among a multitude of state agencies,
- Increasing damage to life and property due to national disasters such as landslides and floods.

(ii) Mineral Resources (Gem Mining)

Increasing demand for minerals has led to exploitation of non-renewable resources with little attention to the management of resources and protection of the environment. Damages by illicit gem-mining and river dredging for gems are severe. On the other hand, authorized activity is largely unmonitored resulting in similar degradation of land as a resource, and often linked with other environmentally damaging consequences such as pollution of water bodies and damages to ecosystems. Furthermore, it leads to mismanagement of the resource itself having a long term effect on the quality of life as a whole. The main issues to be tackled are as follows:

- Existing legislation on mineral resources does not address environmental protection and issues adequately,
- Weak institutional structure for serving the mineral sector in assisting, monitoring and guiding mineral industry,
- No environmental assessment is done in mineral based activities, and
- Inadequate research and development in mineral based activities.

(iii) Forest Resources

The land covered by natural forest is only 27 % of the total project area in 1900. The consequence of deforestation is linked with the loss of species and genetic diversity. The importance of forest cover in the Up-country goes beyond the direct contribution to the regional economy of forestry. Forest regulate stream flows, stabilize steep land, control soil erosion, reduce flood intensities, prevent land desiccation, and protect agricultural lands and human settlements. Issues of deforestation and forest degradation caused by over exploitation of forests for timber and fuelwood, illegal felling and illicit gem-stone mining are being addressed by a number of government agencies, donors and NGOs. The following issues to be considered for reduction of deforestation problems.

- Lack of community development programs based on forestry,
- Inadequacy of institutional capacity for forest protection, and
- Inadequate capacity for timber utilization research.

(iv) Bio-diversity and Wildlifeç

Two factors pose serious threats to the preservation of species diversity in the Up-country, namely i) deforestation and forest degradation, and ii) selective exploitation of economically valuable species, such as elephants, certain timber species, and certain medical and ornamental plants. Over 3,300 km2 (about 17% of the total area) are designated as the national parks and protected reserves under the jurisdiction of the Department of Wildlife Conservation or Forest Department (FD). However, the following issues can be pointed out for promotion of bio-diversity and wildlife preservation in the Up-country.

- Inadequate coverage and management of existing protected areas,
- Mobilization of resources to support conservation,
- Plan for conservation and management of elephants, and
- Plan for wetland conservation.

(2) Strategy for Solution

i) Land Resources√

Prevention of productivity reduction of agricultural lands by soil erosion

The rate of soil erosion in the most Up-country area are rather high compared with other areas in Sri Ranka, though its intensity can vary according to the climate, slope and the ground cover. Estimates of soil loss from the most affected areas such as those under tobacco grown on steep slops are reported as high as 388-913 t/ha/y (TAMS, 1980). The rapid rate of soil loss is reflected in the high silt loads carried by rivers which eventually deposit them in the reservoir.

The implementation machinery of the Soil Conservation Act of 1951 which performed a useful role in identifying and declaring erodible areas and taking corrective measures has virtually ceased to function. The devolution of functions to the Provincial Councils without adequate preparation at the provincial level and had caused further deterioration of this situation. There are some current efforts to introduce new legislation, although there is no single agency to take over the implementation tasks. However, soil erosion at least in the critical watersheds cannot be mitigated without some concerted efforts and massive investments. Thus, the following strategies should be taken for conservation of land resources in the Up-country are.

- to improve deficiencies in the legislation and lack of clear institutional responsibility,
- to introduce adequate incentives to small farmers for soil conservation,
- o put high priority accorded to soil conservation, particularly by the Ministry of Agriculture Development and Research (M/AD&R), at the center as well as at the Provinces, and
- to change the policy of high market prices fetched by erosion enhancing crops such as tobacco, vegetable and potatoes.

Control of shifting cultivation

Shifting cultivation covers about 4,500 km2 of about 24 % of the total Up-country area. Although there are no available data, it is said that the extent of shifting cultivation lands have been apparently increased during the recent decades despite of governmental restrictions. The shifting cultivation is practiced largely on available state forest lands either by individuals or occasionally by more organized persons with business interests.

The detrimental ecological effects of shifting cultivation were recognized for a long time. It depletes soil fertility, causes weed infestation, soil erosion and crop yield decline. Most farmers conducting shifting cultivation come from the poorest segments of society, and many of them have no easy access to any other means of livelihood. It represents an example of that problematic link between poverty and environmental conservation. It is now clear that legislative or administrative actions can have limited success without the development of alternative strategies of gainful employment. Shifting cultivation is strenuous and provide no security of tenure and many farmers will be glad to leave it for other ways of employment and income are provided. Thus, the following strategies should be taken to prevent shifting cultivation in the Up-county.

- to delineate areas being permitted shifting cultivation as a provisional measure,
- to develop a forest rehabilitation method for degraded forests due to shifting cultivation with community participation, and
- to convert areas of currently degraded forest lands with high agricultural potential into agricultural areas.

ii) Mineral Resources (Gem Mining)

In Sri Lanka, there are around 15,000 gem pits operate legally, but it is estimated that an equal number are illegal. Although, the State Gem Corporation (SGC) was established in 1971 to supervise this industry, it has not sufficiently trained staff to enforce existing regulations. Most gemstone deposits lie within a geologically narrow area (240x64 km2) with Ratnapura district. Most gemstone mining follows the traditional, small scale pit mining with lateral tunneling.

There are many negative environmental effects of gem mining. A detailed study in Ratnapura district indicated that damages from traditional methods included soil erosion, land slides, depletion of plant cover, sedimentation of streams and rivers, effect on soil profiles, loss of fertile layer, groundwater depletion and pollution, outbreak of vector borne diseases and loss of arable lands. In addition, damages from mechanized practices including destruction of landscape and forest cover, impact on wildlife, and disturbance of groundwater table and aqueducts by extensive excavations. Thus, the following strategies should be taken to control the damages caused by gem mining.

- to strengthen the capacity of the SGC or successor organization to carry out its environmental responsibilities more effectively,
- to concentrate the location of gem mining with future land use plan,
- to introduce and encourage the financial bond deposit for deep mining projects, and
- to introduce disincentives for control of operations of illegal mines.

iii) Forest Resources

The value of the natural forests in the wet zone has been widely recognized, in association to the importance of those forests as genetic reservoirs, they also play a very crucial role in watershed protection. All the remaining areas of natural forests in the wet zone should be strictly protected and not be allowed for further degradation. Besides, illegal felling within state forests for timber and fuelwood is common in the study area. This activity has severely depleted the natural and plantation forests of its valuable timber species. Additionally large extents of state forests are encroached on for settlements and agricultural development. Efforts to combat illegal felling, encroachments have been limited in the past due to the shortage of manpower and financial resources in the Forest Department (FD). Thus, the following strategies should be taken for preservation of forest resources in the Up-country.

- to prepare programs which bring benefit to the people around the forest areas and which reduce the risk of damage to the forest resources, and
- to provide sufficient manpower and financial resources in FD.

iv) Bio-diversity and Wildlife

Because of the relatively small size and fragmented patches of the protected area in the Up-country, the conservation capacity of high bio-diversity would be limited. Although the total area under protected status has increased, there are only 2 reserves that contain 100,000 ha or more of contiguous forests - the minimum area that studies have determined is critical for conservation of biodiversity. To address this fragmentation, preparation of management plans for clusters of wildlife reserves is being proposed under Department of Wildlife Conservation's (DWLC's) 5-year investment plan.

Recent study results reviewing conservation values of wet zone forests revealed that a significant proportion, about 8 % of the wet zone, remains under forest cover and needs to be given newly protection status. While, the buffer zones of existing protected areas offer potential for restricted harvesting, e.g. collection of firewood and forest products, planting of forest plantations and perennial crops and controlled grazing, that would generate income for local communities and preserve adjacent protected areas. Thus, the following strategies should be taken for the conservation of bio-diversity and wildlife in the Up-country.

- to improve the protection system by reviewing current forest and wildlife protection networks,
- to reevaluate biological and ecological values of existing reserves,
- to redemarcate boundaries based on biological, ecological and social considerations,
- to develop conservation and management goals for each area,
- to prepare and implement the management plan of the protected areas,
- to prepare a plan to develop and test buffer zone protection models, and
- to implement several pilot programs in community based resource management.

(3) List of Projects and Programs to be Implemented

To attain the objectives of the Environmental Preservation and Control Plan, various kind of projects and programs are to be implemented in line with the strategies