



Development Strategy for the Irrigation Sector of Sri Lanka 2006 -2016

Prepared for the National Planning Department
by the
International Water Management Institute

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1. Introduction

Sri Lanka had a flourishing irrigation sector in historical times. The role of the irrigation sector is now more important than ever before, because of the increasing population and the high proportion (80%) of people living in rural areas and the large number of the people dependent on agriculture for their livelihoods. Rapid growth in agricultural productivity is fundamental to reducing poverty in Sri Lanka, as nearly 90% of the poor are dependent on the rural agricultural economy. Productivity improvement through irrigation can contribute substantially to the growth of agricultural productivity in Sri Lanka, as over two thirds of the land used for annual food and other crop production is irrigated. Thus, irrigated agriculture plays a crucial role in reducing poverty.

The irrigation sector faces numerous challenges that need to be addressed. The sector is faced with stagnant or low growth in productivity, inadequate water availability, inequitable distribution and inefficient use of water, poor profitability of crops grown, inadequate operation and maintenance as well as lack of participation in the management of irrigation systems. In addition the need for allocating water for multiple uses and sustainable use of water through river basin management have now become important issues with the rising demand of water for non agricultural purposes. This strategy document attempts to address the key issues identified.

The policies and strategies for the irrigation sector outlined in the Mahinda Chintanaya such as multipurpose irrigation systems, small tank development, and trans-basin diversion of water to link existing rivers and irrigation systems to use water more productively, have been taken into account in the policy and strategy recommendations of this report. The report is arranged in nine sections as follows; an introduction followed by an overview of the irrigation sector, and a third section that discusses current policies and policy gaps and a fourth covering the key issues in the sector. Section five describes the vision for the sector and lists the objectives and targets to achieve the vision, while section six discusses the strategies and policies needed to achieve the objectives. Section seven outlines the financial plan and funding arrangements, while section eight describes how we can monitor the plan and finally section nine describes the supporting environment needed to implement the strategies.

2. Overview of the Irrigation Sector

Irrigation is widespread in the drier areas of Sri Lanka, where the rainfall pattern requires water storage for successful irrigated cropping. When the policy of restoring abandoned irrigation systems was implemented, the priority was given to schemes in the Dry zone, with the dual purpose of resettling people from the land scarce south to the drier north and eastern regions. The irrigated area in the Dry Zone expanded to the

current level between 1850 and the year 2000. Several large schemes were restored with financial contribution by the then government and to some extent the farmers. The Gal Oya scheme constructed in 1957 was the first multipurpose scheme launched, to be completed entirely with local manpower and financial resources. This was followed in the 1970s by Mahaweli, the largest multipurpose scheme. These multipurpose projects were aimed not only at irrigation development and settlement but also at hydropower generation. The Mahaweli project, which is by far the largest government project in the country, envisaged the development of more than 300 000 ha of new irrigated land and the generation of 800 MW of hydropower at the completion of the project

The area under irrigation is presently estimated at about 600,000 ha, with over 80% of the irrigated area falling within the dry zone. A district-wise distribution of irrigated areas is provided in Annex 1. The largest areas (above 30,000 ha) under irrigation are in the districts of Kurunegala, Anuradhapura, Polonnaruwa, Batticaloa and Ampara. Over 80% of the irrigated farming area is cultivated with paddy and the balance in other food and field crops. In major irrigation areas, the cropping intensity is about 150%, whereas in minor irrigation areas it is about 100% or generally one crop a year. Irrigated crop yields range between 3-5 metric tons per hectare of paddy and much more in the case of other crops.

Contribution to the economy

Irrigation contributes substantially to the economy, by way of rice and other food crop production and has been largely instrumental in reaching self sufficiency in rice and in meeting a substantial proportion of the demand of other food crops. The contribution to GDP of paddy production is estimated at 3%, and with over 80% of rice production and about 25% of other food production obtained from irrigated areas, the contribution of irrigation per se to GDP may be only slightly less than this figure. Irrigation is also vertically and horizontally linked to the input and output servicing sectors such as fertilizer, chemicals, credit and water supply, marketing, export, retail and wholesale trade, storage and processing. Hence irrigation's overall contribution is probably much higher. Average net income from irrigated paddy and other crop production is estimated at about Rs 5000 per month per family (current prices) in the Mahaweli area and less than this amount in other areas. Thus in terms of providing livelihoods and income to a large mass of the population, it is a vital sector and a substantial contributor to the overall economy as well as food security of the country.

Key institutions involved in the irrigation sector

Of the total irrigated area, about 400,000 ha are under major schemes, of which about 100,000 ha is under the administration of the Mahaweli Authority (Table 1). The balance 300,000 ha is managed by the Irrigation Department, while a further 200,000 hectares of irrigated land under minor schemes (below 80 ha) is administered by the Department of Agrarian Services. The Irrigation Department is responsible for the management of Schemes irrigating over 80 hectares, which is estimated to number over 300 (Table 2). Although reliable statistics are not available as to the number of minor schemes operating in the country, it is estimated that minor schemes may number over 15,000, of which only half are operational. There are several minor

schemes that have been abandoned, while new ones are always being constructed or abandoned ones rebuilt.

Table 1. Mahaweli Economic Agency Irrigation Systems

Mahaweli System	Net Irrigable Area
System “B”	24,713
System “C”	24,995
System “G”	5,900
System “H”	33,600
Uda Walawe	17,400
System “L”	3,664
Total	112,272

Source : Mahaweli Statistical Handbook 2004, Mahaweli Authority

Table 2. Irrigation systems under the Irrigation Department

Size of systems (ha)	Number of systems	Total area (ha)
80 to 600	223	41,480
600 to 1,000	27	19,160
1,000 to 1,200	29	40,320
1,200 to 4,000	23	61,680
Over 4000	13	132,000
Total	315	294,640

Source : Land and Water Sector Development by Henry Gamage (Deputy Director Agriculture) 1992

Currently several agencies are involved in the construction or management of irrigation systems. The main government agencies involved in the irrigation sector and their responsibilities are provided in Table 3.

Table 3. Institutions in Irrigation Sector and Responsibilities

Institution	Main responsibilities
Irrigation Department (ID)	Implementation of Irrigation Ordinance. Design of irrigation and drainage schemes, hydrological investigations, O&M and water allocation within schemes
Irrigation Management Division (IMD)	Promotion and management of Farmer Organizations, rehabilitation and O&M, agricultural management, including crop diversification and promotion of income improvement activities in designated schemes
Mahaweli Authority (MA)	All aspects of the development of Mahaweli and other designated areas, including water supply, sanitation, human settlement, and irrigation construction and management.
Department of Agrarian Services (DAS)	Provision of wide ranging services to farmers in minor schemes including support for good water and soil husbandry, registration of farmer organizations and rehabilitation, the level of support varying with the needs of farmers.
Water Resources Board (WRB)	Investigations and commercial exploitation of groundwater resources and extensive advisory responsibilities, which are largely not utilized.

A Water Management Secretariat had been established to coordinate water diversions for irrigation, power generation and other purposes from major reservoirs and river systems and comprises officials representing the ID, MA, Ceylon Electricity Board (CEB) and the National Water Supply and Drainage Board (NWSDB).

The management of the major schemes above the distributary level canal including that of head works and main canals is the responsibility of the irrigation agency (ID, IMD, MA) and the system is sometimes referred to as joint management. The distribution of water and operation and maintenance below the distributary canal is the responsibility of the farmers through farmer organizations. The administrative responsibility of minor schemes, which was with the Central Department of Agrarian Services was transferred to the Provincial Governments, but due to the lack of capacity in the Provincial agencies, the Central DAS continues to provide assistance in provision of inputs, establishment of farmer organizations and also provides financial assistance for rehabilitation of these schemes.

The MA has completed most of the development work connected with the accelerated program, but a few major developments that were in the original plan such as the Moragahakanda reservoir, the North Central Canal were not taken up and need to be developed. Other downstream development of system B (LB), system L, upgrading of system C, Huruluwewa feeder canal, Uda walawe LB Extension and Maduru Oya (RB) are under implementation or are expected to be taken up soon.

Irrigation management and planning in the ID, which took a “top-down” approach has changed slowly towards a participatory approach in recent times. The establishment of the IMD to manage major irrigation systems, has been accepted by the ID, which is now adopting a similar approach in 170 major and medium schemes.

3. Current policies and policy gaps

Currently policies in the irrigation sector can be categorized into the following areas.

- Institutional policy – Currently several government agencies are involved in the construction, operation and management of irrigation systems. This includes the ID, the IMD, the MA and the DAS. At the provincial level too there are provincial irrigation agencies for irrigation development and management and agrarian services. The Department of Agriculture (DA) also has central provincial agencies for agricultural development. There are many agencies responsible for irrigation that is causing duplication and inefficient use of manpower and institutional resources, this is a policy gap that needs to be addressed.
- Irrigation system management policies – Irrigation systems are jointly managed in major schemes with the management responsibility given to the farmer below the distributary level. In the minor schemes the management responsibility is entirely with the farmers. The current systems of management have been partly successful and therefore a good assessment should be made and the shortcomings or gaps addressed.
- Operation and Maintenance policies – O&M in minor schemes is the responsibility of the farmers while in major schemes the agency responsible

for management is responsible for O&M above the distributary canal, while the farmers are responsible for O&M below this canal. O&M is still being largely financed by the government, although farmer contribution in the form of labour is forthcoming. Allocation for O&M by the government is declining and therefore level and quality of O&M is on the decline. Unless this situation is reversed, and the policy gap addressed, many systems will require extensive rehabilitation within a short period.

- Water allocation policy – currently there is no policy on water allocation from major water courses or water bodies for various purposes. The government through the Cabinet of Ministers decide on water allocation for various purposes on a situation by situation basis or when an issue arises with respect to water allocation. The lack of a suitable mechanism or institution to address the problem of bulk water allocation is a gap that needs to be addressed before the situation becomes critical. \
- Irrigation financing policies – Currently, the government is responsible for financing of all new major irrigation development schemes. In minor schemes, the farmer makes a meaningful contribution in the form of labour, with the major proportion of the finances being provided by the government or other agencies such as NGOs, community organizations, well wishers or beneficiaries. Thus policy measures are needed to provide incentives and attract private sector participation in irrigation investments.

The policy statement set out in the “Vision 2010” document indicates that currently over 80% of the water withdrawals is by the irrigation sector, and the policy and strategies must be focused towards reducing the level of withdrawals for irrigation to 65%, to allow greater use of water by other sectors such as power generation, industry, domestic water supply and environmental use.

4. Key issues in the irrigation sector

The performance of the irrigation sector has been mixed, with improved yields and cropping intensity being achieved under major schemes, while performance in minor schemes have not improved with the yields and cropping intensity remaining stagnant. Farmers in minor schemes still remain at subsistence levels but the potential for achieving high increases in yield by providing water at critical times for an otherwise rainfed crop is very high in minor schemes.

Overall the performance of irrigation systems both in minor as well as major schemes have not reached the potential and the economic returns from investments in irrigation have been far below the returns in other sectors including water use for other purposes such as power generation, industrial or other uses. The key issues to be addressed in improving the performance of this sector and in achieving its full potential are identified as follows;

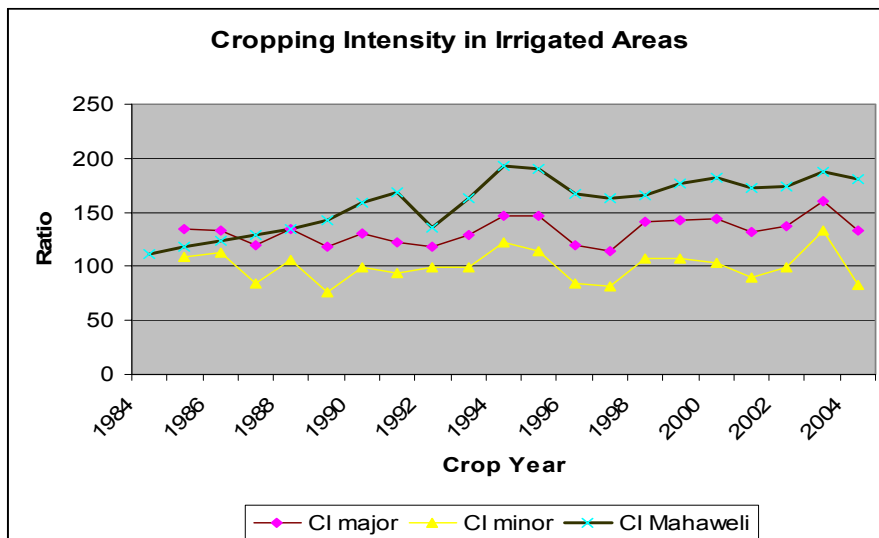
- Low productivity in terms of yields, cropping intensity and water use efficiency.
- Poor or inefficient management of water for agricultural production
- Inadequate or inefficient maintenance systems
- Lack of modernization of irrigation technology
- Inadequate investment policies in the sector

- Uncoordinated development of regional surface and groundwater resources
- Institutional multiplicity and lack of coordination between related agencies
- Low profitability and inadequate market systems reducing income of irrigated agriculture
- Inadequate protection of irrigation watersheds
- Inadequate water allocation system.

(i) Low productivity and water use efficiency

One of the major issues is the inefficient use of water and the resulting low productivity of water in irrigation. Furthermore, the bulk (over 80%) of the irrigation water is used for paddy production, which is one of the highest users of water with one of the lowest net income margins.

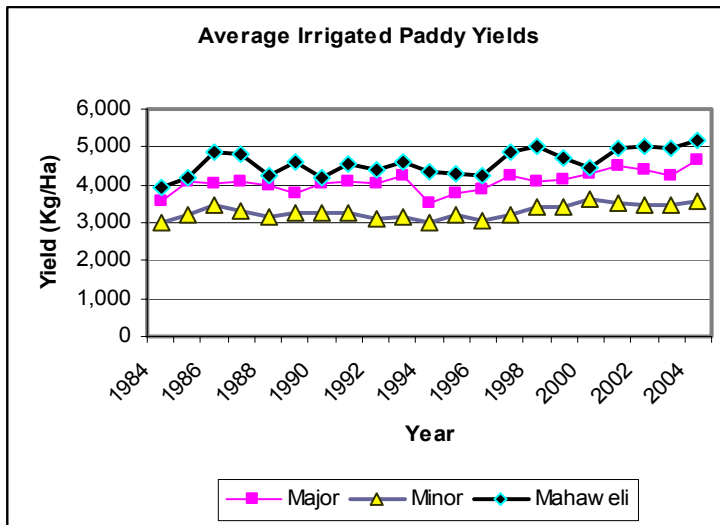
Figure 1. Cropping Intensity in Irrigated Areas



Sources: Census and Statistics Department and Mahaweli Authority

However, the economic value of water may be high because of its high food security value and the large number of persons dependent on paddy for their livelihood. The productivity of water in the Mahaweli system, which is more efficient than those outside, varies between 0.2 kg per Cu M to 0.3 kg per Cu M of water, with 80% of output coming from paddy. Average cropping intensity over the last 20 years was about 160% in Mahaweli schemes, 130% in Major schemes and 100% in minor schemes. As Figure 1 shows, the trend is increasing in all types of irrigation systems.

Figure 2. Average Paddy Yields by Irrigation Type



Sources: Census and Statistics Department and Mahaweli Authority

Average yield of irrigated paddy was about 5 mt/ha in the Mahaweli area and about 4.5 mt/ha in other major schemes and about 3.2 mt/ha in minor schemes, in 2004. Figure 2 shows that average yield is increasing in all types of irrigation systems but the value is higher in the Major and Mahaweli schemes. Although the productivity of minor tanks is less than that of major tanks, the social benefits of small tanks are higher because these tanks are used for other purposes such as bathing, washing, livestock watering and cleaning, fishing and also serves as an easily accessible source of water in the village. Thus one of the key areas that must be addressed for the future is how to improve efficiency of water use, give more value to water used in agriculture and improve incomes of the population dependent on paddy and other food crops.

(ii) Poor or inefficient management of water for agricultural production

The bureaucracy was responsible for managing water in major systems earlier. The practice then was to release water according to a time table and the farmers were expected to follow the time table and use the allocated water efficiently at the field level. The farmers or farmer leaders were responsible for diverting water from field canals, while the agency was responsible for bringing the water to the field level. The agency staff was responsible for water control up to the field level. This system had many draw backs, with farmers not adhering to the schedule, and water being tapped illegally, water not flowing in some canals due to poor maintenance etc. Since productivity was low and the water was not being managed efficiently, policy makers turned to a joint management system with greater powers of water distribution given to farmers and the agency taking responsibility for water allocation up to the distributary canal only. The farmers were also given responsibility for maintenance of the system below the distributary canal with a proportion of the maintenance cost met by the agency. Currently this system is in place in almost all major schemes including the Mahaweli.

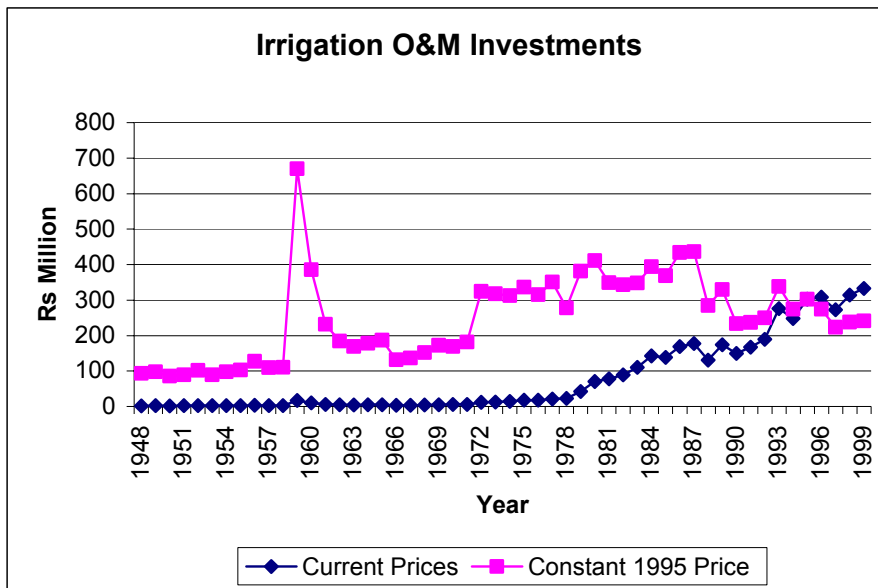
Institutional Developments such as farmer organizations for managing irrigation water, or joint management with the bureaucracy managing the main system and the farmers managing field water distribution and operation and maintenance at the field level, were established. This system has been operating for some time with partial success. Farmer organizations with good leadership have been more effective in improving water use efficiency. Farmer Organizations (FO) with political affiliations tended to show mixed results. The capacity of the FO in terms of human and financial resources has proved to be critical for their performance. In the case of minor schemes the responsibility for management of water is fully turned over to the farmer. Low productivity combined with a high population dependent on the land and declining returns from paddy have made management of these schemes more difficult.

In systems where the bureaucracy has been willing to share power, the joint management systems have worked well. Still, in a large number of schemes, substantial improvements in water management and in efficient use of water are needed to increase both water and land productivity.

(iii) Inadequate or inefficient Operation and Maintenance Systems.

Another major problem in improving the performance of irrigation systems is the poor or inadequate O&M systems currently in force. Lack of funding for O&M has been a major cause for the deterioration of the irrigation systems. Government funding for O&M is drying up and rice farming is still not profitable enough for the farmers to contribute adequately for maintenance, except in the form of voluntary or involuntary labour input. Inadequate O&M tends to reduce irrigation efficiency and shorten the effective life of the project.

Figure 3. Irrigation O&M Investments



Source: M. Kikuchi, R. Barker, P. Weligamage and M. Samad 2002: Irrigation Sector in Sri Lanka Recent Investment Trends and the Development Path Ahead Research report No 62 IWMI, Colombo

Figure 3 shows a declining trend in irrigation O&M in constant prices. Inadequate O&M results in faster deterioration of the schemes, requiring rehabilitation investments to be made sooner than necessary. Large capital investments in new irrigation systems will be wasted if the issue of adequate O&M is not resolved. Greater farmer participation in management tends to reduce this deterioration. Thus the problem of inadequate O&M is another major issue that has to be addressed by policy maker to improve the overall productivity of the sector.

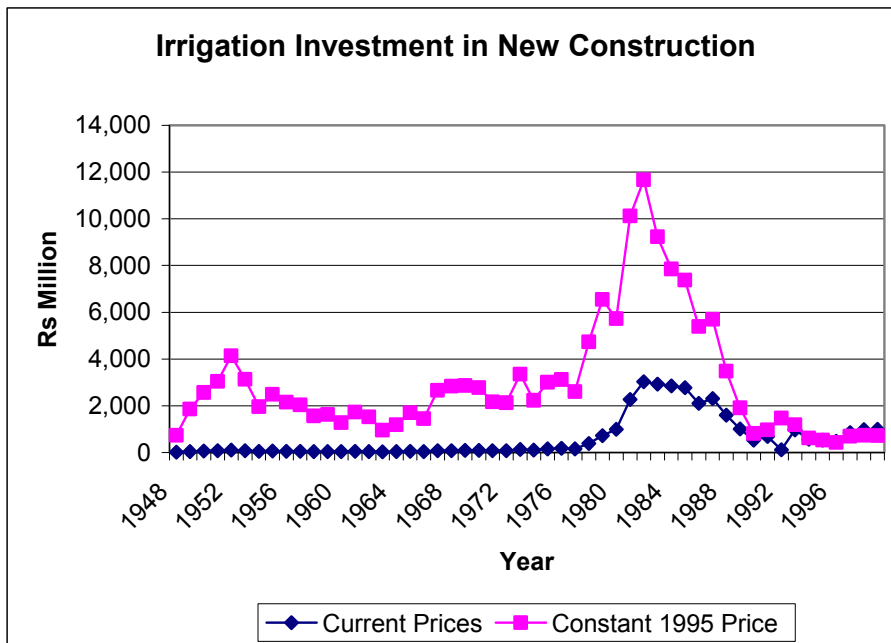
(iv) Lack of modernization or transfer of efficient irrigation technology

The pace of modernization and transfer of new irrigation technology has been slow. There is a lack of incentives for the private sector to participate in a large way in the introduction and operation of new technology. Modern technology such as, sprinkler irrigation, micro irrigation, drip irrigation, although introduced in a small way to farmers, has not been adopted on a big scale for various reasons. The lack of knowledge, the cost of the techniques and sometimes misconceptions that techniques using small quantities of water is not adequate for vigorous crop growth and would reduce yields, have prevented the greater spread of such techniques. Lack of training and awareness has also contributed to the poor adoption of these techniques.

(v) Inadequate investment policies in the sector

During the last 60 years, irrigation and land development have absorbed the largest share of the total public investment. A steep rise in investment levels can be observed between 1980 and 1992, when the Mahaweli scheme was under implementation, as shown in Figure 4. The level of investment has declined substantially since 1992

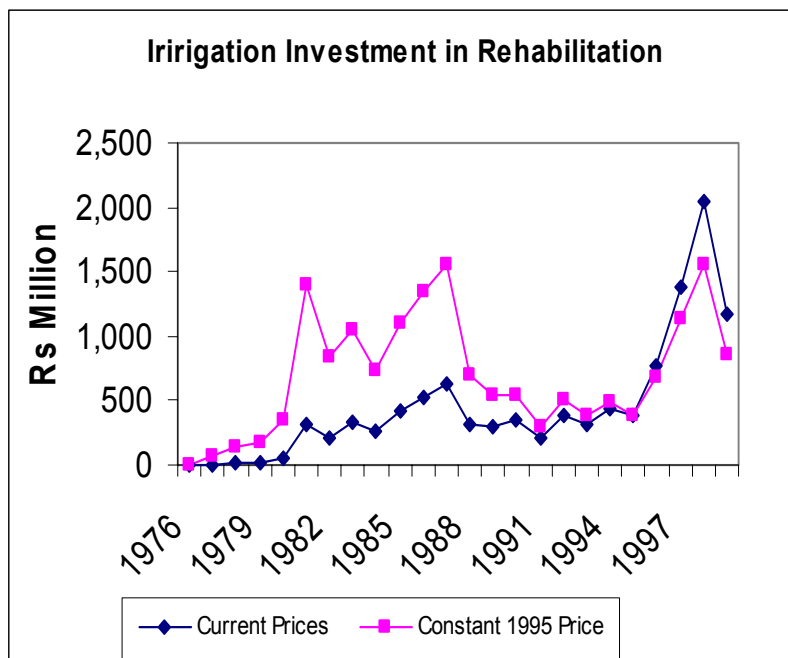
Figure 4. Irrigation Investment in New Construction



Source: M. Kikuchi, R. Barker, P. Weligamage and M. Samad :2002, Irrigation Sector in Sri Lanka Recent Investment Trends and the Development Path Ahead Research report No 62 IWMI, Colombo

This suggests that the state is reviewing the viability of new irrigation systems as against rehabilitation for increasing productivity of existing systems. The Mahaweli was a multi purpose scheme, which did not solely depend on agricultural production for its viability. Current performance shows that gross returns from agriculture are more or less equal to the value of power generation. The fact that the Mahaweli system has also been able to divert water from various river sources to irrigation systems outside the Mahaweli river basin has helped to improve the productivity of several water short systems. These benefits appear to have given credence to the fact that the Mahaweli project will achieve its objective of long- term sustainability and economic viability. Thus it may be worthy of replication in the future if similar projects can be drawn up.

Figure 5. Irrigation Investment in Rehabilitation



Source: M. Kikuchi, R. Barker, P. Weligamage and M. Samad :2002, Irrigation Sector in Sri Lanka Recent Investment Trends and the Development Path Ahead Research report No 62 IWMI, Colombo

Figure 5 shows the level of investments in rehabilitation. Investments appear to have picked up during the Mahaweli construction phase, and increased substantially in the recent past. It now appears to be on the decline again. Although, relatively the investment in rehabilitation is lower, in the long run the returns may not be as high as for a new scheme, because the benefits can come only from productivity increases rather than from new production.

Table 4. Capital Expenditure in Minor Schemes Irrigation Pumps and Wells

Period	Minor Scheme (Rs. million)	Period	Pumps and Wells (Rs. Million)
1950 – 1954	16.4	1965 – 1969	2.0
1955 – 1959	11	1970 – 1974	43.7
1960 – 1964	6.4	1975 – 1979	109.0
1965 – 1969	23.3	1980 – 1984	190.7
1970 – 1974	70.4	1985-1989	584.3
1975 – 1979	196	1990-1994	1496.0
1980 – 1982	285	1995-2000	2712.4

Source: M. Kikuchi, R. Barker, P. Weligamage and M. Samad :2002, Irrigation Sector in Sri Lanka Recent Investment Trends and the Development Path Ahead Research report No 62 IWMI, Colombo and Land and Water Sector Development by Henry Gamage (Deputy Director Agriculture)

Investment in minor schemes has been modest. Table 4 shows investment in minor irrigation schemes and in agro-wells and pumps by farmers. The latter has shown rapid increases in recent times, suggesting that farmers are willing to invest in irrigation, possibly because of high returns from agriculture. Thus private investment in irrigation has a role to play in future development of the sector. There has been no clear cut policy or direction in the past on irrigation investments. State has been the main investor in this sector and priorities in investments have been changing over time, depending on the political agenda of the party in power. Construction of large systems has been followed by emphasis on rehabilitation or minor irrigation development. If the private sector, particularly the corporate sector is to invest in this sector, a coherent and stable policy with adequate incentives is needed. Similarly reforms of land ownership laws are needed to attract greater investment by the farmer.

(vi) Uncoordinated development of regional surface and ground water resources

With the establishment of provincial administration and provincial agencies of development, uncoordinated development of water resources, both surface and ground water, has been increasing. This can have detrimental impacts on water resources in other regions or on the country as a whole. Currently there is a system of coordination between central and provincial authorities when development plans are drawn up. In addition, there is also considerable private extraction of ground water resources for agriculture and other activities. There is no authority to keep track or control extraction of both surface and ground water resources and determine optimal extraction rates for the different regions. The WRB is only an advisory body and does not have powers to regulate such development. This may become a serious problem in the near future if uncontrolled development is allowed to continue.

(vii) Institutional multiplicity and lack of coordination between related agencies

Many agencies are involved in managing irrigation systems in Sri Lanka. The available manpower is thinly spread among these agencies. Further, there is duplication of functions and responsibilities impeding a coordinated approach to development. The human resources could be managed and made more productive, if

the functions and responsibilities are clearly defined and the capacity of the institutions developed to suit their roles. Specialization in one or other field in the sector would improve the motivation and technical capacity to undertake the specialized activity more efficiently. Thus a rationalization of the functions and resource use of the multiple agencies involved in the construction and management in the irrigation sector would go a long way in increasing the productivity of the organization as well as the output and benefits from the irrigation sector.

(viii) Low profitability and marketability of irrigated crops

Using irrigation water for growing high income crops has been limited by the lack of market for such crops and the very dramatic price fluctuations experienced due to the sensitive nature of demand for most of these products. The local market can absorb only a limited quantity of such output depending on the local demand for the product. Unlike rice, which is more price inelastic because it is a staple grain, Other Food Crops (OFCs) tend to be more price elastic and demand declines when prices rise. Even in Mahaweli area, where conditions are most conducive for growing OFCs, less than 20% of the total irrigated area is devoted for the production of OFCs, and producing about 25% of the total crop output. Wherever, output has been tied to a market source, for example, for export, for further processing or for absorption within a stable local market demand, the farmers have shown success in growing non rice food crops. Producing for the local market has also been complicated by import policies. Imports of non rice crops to reduce the burden on the consumer, when prices of these crops rise in the local market, increases the risk of losses to farmers growing these crops. This is an important issue in terms of the objective of poverty alleviation through irrigation investments.

(ix) Inadequate protection of irrigation watersheds

Another emerging problem in the irrigation sector is the inadequate conservation of irrigation watersheds. While watersheds of major irrigation systems are further upstream, the watersheds of smaller systems are closer to the irrigation systems and could be managed by the irrigation users and the agencies concerned. Upstream watersheds are also threatened by deforestation, cultivation and other uses and the irrigation systems including Mahaweli systems are experiencing considerable siltation of canals and reservoirs. Similarly smaller watersheds are also being denuded of forests and being used for various purposes, including cattle grazing, chena farming, etc. The threat of reduction of water flows is much greater in smaller systems which are more dependent on surrounding watersheds than larger systems which are more dependent on perennial rivers. Thus action is required to stem the destruction of valuable watershed areas.

(x) Inadequate water allocation system

Another related issue is the competition for water for other users or the principle of multiple use of water. With growing urban population and rising incomes, the demand for potable water is rising rapidly, and irrigation water resources are being increasingly tapped for water supply schemes, and also for industry. Environment is no longer the residual water user but needs an allocation. The revenue from using water for power production or water supply is higher than in agricultural production.

Thus the demand for using water for these purposes is likely to take precedence if water use is determined purely on an economic basis. Thus any future development scenario should incorporate the need for sharing of water resources by various users. River basin level management of water will become an important tool or strategy in the more efficient use of water. Thus, with a limited supply of fresh water resources, including ground water extraction, the need for judicious control and management of river basin level water resources should become an integral part of any future policy or strategy in this sector.

Although there are several other issues of lesser importance that also need to be addressed, the major shortcomings that needs to be addressed urgently are discussed above. The strategy in the following chapters is developed based on these issues.

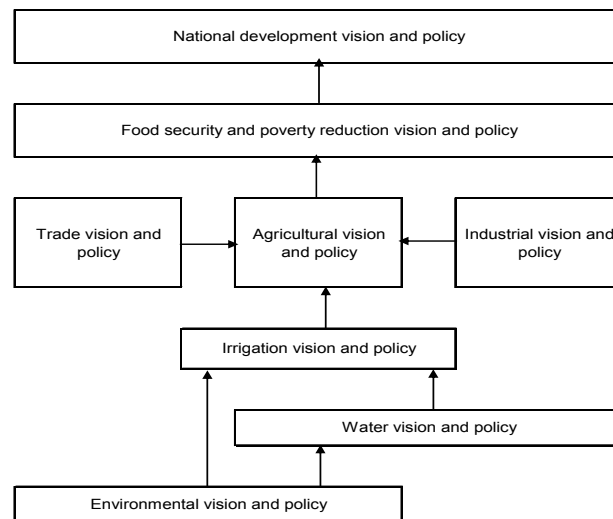
5. Vision, Objectives and Targets

Vision Statement

“By the year 2016, irrigated agriculture will be transformed into a commercially viable and technologically advanced sector producing for local consumption and processing as well as for export, using modern irrigation techniques that optimise water use and maximise production by increasing the productivity of irrigation systems. A more productive minor irrigation sector developed through participatory approaches will contribute to poverty reduction as well as fulfil the socio economic needs of the poorer farmer. New water resources developed, through trans-basin diversions and other means will lead to increased supply for irrigation and other uses.”

The vision of the irrigation sector is invariably linked to many other sector visions and contributes to the fulfilment of the national vision and policy through the intermediary vision of food security and poverty reduction as illustrated in the chart below. Obviously the vision of the irrigation sector must be inline with the vision of other related sectors to be a realistic and achievable one.

Figure 6. Irrigation Sector Vision and its Linkages



Objectives of the sector

- i. Increase productivity of unit of water through improved cropping and irrigation techniques in existing as well as new schemes.
- ii. Diversify and link output of irrigation systems with stable and established markets to stabilise income and productivity of irrigation systems.
- iii. Improve the management of existing major schemes, through successfully implementing participatory management systems in these schemes.
- iv. Improve the existing systems of operation and maintenance, through participatory approaches and establishment of viable funding mechanisms
- v. Improve management of minor or small schemes, through awareness, education and a farmer funding mechanism to support operation and maintenance and increase productivity. Assist in farmer financing of pumps or wells to enhance productivity from minor schemes.
- vi. Encourage and help to spread new technology for reducing water use and improve productivity of small and medium schemes, through such systems as micro or drip irrigation or other systems.
- vii. Improve the watersheds of small, medium and large systems through participatory approaches.
- viii. Rehabilitate, abandoned or poorly maintained but operational schemes, with farmer ownership including funding or labour inputs, with technical assistance from government irrigation agencies, including a study of surface and groundwater availability for such rehabilitation.
- ix. Establish a system of trans-basin linkages between major rivers or river basins to divert water to water short schemes and for multiple uses of water and develop other new systems if feasible.
- x. Establish river basin management authorities for all major river basins, to share water for various purposes and improve the distribution and productivity of of both surface and groundwater.
- xi. Improve the capacity of institutions to better manage irrigation systems including groundwater resources.

Targets for the sector

- i. Water productivity to be increased by 20% in major schemes and by 10% in minor schemes by the end of five years
- ii. Policies for improved or more effective O&M be put in place and implemented within the next five year period.
- iii. Modern methods of irrigation to be practiced by 25% of farmers in irrigated areas
- iv. Cropping patterns of 30% farmers to be diversified within five years
- v. Management turn-over of 50% of the major schemes completed within five years.
- vi. Establish systems to strengthen Farmer Organisations, particularly in minor schemes.
- vii. Establish financially viable farmer companies for water management and input/output marketing in 25% of the major irrigation systems within five years.
- viii. Encourage public private partnerships resulting in at least 20% of new investments by the private sector over the next 10 years.

- ix. 1000 minor tanks to be restored every year.
- x. Water shed improvement plans to be formulated for 25% of the most critically affected minor and major irrigation systems
- xi. Complete regional study on ground and surface water availability by third year
- xii. River basin management authorities to be established within the next five years at the rate of one every year.
- xiii. Work on feasibility study of trans-basin diversion of Kaluganga, Nilwala or other wet zone rivers to the south east and northern areas.
- xiv. Continuation of implementation of projects in the master plan of the Mahaweli development program, starting with Moragahakanda and the North Central canal.
- xv. Develop new irrigation systems for which feasibility studies have been completed and have been found viable.
- xvi. Examine the feasibility of linking water short schemes with other schemes or river basins.

6. Strategies and interventions to achieve vision

Strategies, policies or interventions needed to achieve objectives and targets, may comprise of changes to existing policies or strategies or drawing up new policies and strategies. Sometimes it may useful to weigh the pros and cons of the best option and second best solutions in strategies, particularly keeping in mind the socio-economic realities of the country.

- Improving productivity and irrigation efficiency

Productivity and efficiency of water use go hand in hand. Productivity can be increased through optimal input use including water, more balanced distribution of water, high yielding varieties, improved systems of water management, better operation and maintenance through farmer participation, and use of modern irrigation technology. However, all this comes to naught if the product cannot be sold for a reasonable price. Thus essential to improving productivity is to stabilize and improve the marketability of the produce. This may involve upward linkages to the input market and downward linkage to the seller. Storage and processing are also down ward links that help to stabilise prices and markets. New options such as highly productive irrigated orchards may be a solution, with an increasing demand for fruits from higher income receiving urban-population where a large part of this demand is being met from imports at present. The strategies/policies that emerge are;

- Improve management of water through farmer participation
- Better O&M through funding by government and farmer
- Wider use of new irrigation technology to improve output of irrigation water.
- Foster upward and downward linkages to agricultural output, including contracted prices.
- Processing and storage as a price stabilizing instrument

- Investments in rehabilitation of existing irrigation systems

One of the strategies for improving productivity is to opt for rehabilitation of existing schemes. The return from rehabilitation is only through increased productivity from current levels to higher levels. This margin cannot be very high as average yields are reasonably good even in dilapidated schemes. In the case of new schemes the entire production is a benefit.

Furthermore, there is evidence to suggest that even in rehabilitated schemes with concrete lined canals, if the water supply is inadequate or not reliable, productivity cannot be increased. A recent study showed that in a scheme which had not been rehabilitated for a long period, yields were higher than an adjacent fully rehabilitated scheme, the main reason being there was adequate water available from drainage flows, giving yields about 20% higher than the rehabilitated scheme. A study of five rehabilitated schemes showed that there was no change in area irrigated, crop yields, profitability, crop diversification, employment, in all five schemes except for two schemes where cropping intensity improved after rehabilitation. This suggests that rehabilitation should be low key, without heavy investments, but with more emphasis on farmer participation and management and investment on essentials repairs.

What may be required is to improve water management through farmer participation and improvements considered essential for water distribution, rather than going for a full-scale rehabilitation. The system for O&M should be revamped to improve and maintain the system. The additional productivity obtained will justify the small investments made. Thus it is suggested that the strategy to adopt is to provide adequate funding for essential rehabilitation but accompanied by management improvement. A funding system should be established to contribute O&M funds equal to the contributions made by the users. This system prevailed earlier and was being successfully implemented, before it was abandoned due to political reasons. The strategies/policies that emerge are;

- Rehabilitation should be low key with essential investments
 - Improved management of water in existing schemes through participatory approaches
 - A farmer–government joint fund for O&M, and possibly public private partnerships.
- Investments in development of new irrigation systems

The cost of new schemes is high but in the long run may provide better returns than from rehabilitation. Moreover, a recent study shows that investments in irrigation infrastructure had direct impacts on poverty alleviation and other beneficial multiplier effects. Larger multipurpose schemes may be even better, as benefits may accrue from the various uses for which the water is used. Irrigation combined with power generation and perhaps use in industry and domestic water supply may provide a stable flow of benefits over time, when compared to irrigated agriculture. A further benefit is the possibility of transferring water through diversions to schemes outside the basin to irrigate

crops in chronically water short systems. In this case, the marginal benefit of applying an additional unit of water would be very high. It may even save a crop that would have otherwise been lost. Despite high costs, new multipurpose systems may be cost effective, provide a more assured supply of water and thus induce the normally risk-averse farmer to invest in inputs and technology to increase productivity.

- Develop new but feasible schemes
 - Opt for larger multipurpose schemes among feasible alternatives.
- Policy measures to make irrigation investments attractive for private sector, including private investments by farmers.

Currently the irrigation sector investments are overwhelmingly public. Farmer investment in pumps and tube wells is emerging as an area of substantial private sector input. Investment in irrigation and agriculture is an area of investment with high potential. This potential has not been exploited fully due to lack of adequate incentives or carefully targeted consistent policies. Tax and other incentives that are specifically targeted towards irrigated agriculture production are needed to induce private sector to invest in this area. Areas suitable for private investment include development and marketing of modern irrigation technologies such as micro irrigation, drip irrigation and sprinkler systems. Farmer investments should also be encouraged through tax or other incentives such as subsidies. However, it is cautioned that large scale development of wells and tube wells for drawing groundwater should be encouraged only after a good scientific study of water resource availability is completed.

The option of public-private partnership should be encouraged at two levels; one at a high level, when developing large multipurpose systems like the Mahaweli for power, irrigation water supply or industrial use, where the possibilities for cost recovery become a reality. A 20% to 30% investment level from the corporate sector in this area could be encouraged through tax incentives, or rebates and stock options for earning profits from revenues from such projects. At the lower end of the scale, private-public partnership can emerge from small scale rehabilitation of minor systems, operation and maintenance, and storage and warehousing.

Private sector participation in irrigated orchard and sugar cane cultivation would be an attractive option when developing new systems of irrigation or converting existing ones for crop diversification. Incentives for crop diversification should be accompanied by assured marketing of outputs, by the private sector for further processing, export or local sale. Super market chains have linked with the producer to obtain their outputs for sale in their outlets. This is another area that should be encouraged through incentives to the private sector. The policies/strategies that emerge are;

- Incentives such as subsidies for farmer investment in wells and pumps
- A study to determine water availability for such purposes

- Private corporate investment incentives for large multipurpose irrigation projects
 - Private-public partnership at the lower end of the scale with small farmers in minor tank rehabilitation, O&M and warehousing and storage.
 - Crop diversification incentives with private sector investment in processing, orchard development, sugar cane production and products for the supermarket chains.
- Investments in watershed development, especially in the context of minor and medium irrigation schemes

The viability of small and medium schemes is threatened due to the destruction of their water sheds. Farmer involvement in watershed improvement would be ideal if the state is to invest in such development. Farmer input in the form of labour for planting, upkeep and protection of the watersheds will induce the state to invest in this area. Private sector participation, particularly the corporate sector to invest in upkeep and maintenance could be a possibility if incentives are provided, in addition to limited use of the watershed by the private investor. The policies/ strategies that emerge are;

- Farmer – State partnership in upkeep and maintenance of watersheds
 - Private corporate-farmer partnership in upkeep and maintenance of water sheds.
- Improved water allocation system

Basin level management of water resources is becoming increasingly important in the context of sharing and multiple use of water resources. This should be facilitated with necessary institutional arrangements. Public leadership and stakeholder participation is needed to implement this. Already plans have been drawn up for establishing such authorities, but implementation needs to be accelerated. The strategies/policies emerging are;

- Establishment of institutions for basin level management
- Participation of stakeholders and the state in establishing water sharing policies

- Small tank / minor scheme rehabilitation

Small tank rehabilitation is less costly than major rehabilitation on a per hectare basis. Although benefits may be less than that obtained in major schemes, there are tangible and intangible socio-economic benefits that accrue in small tank rehabilitation. Water is used for multiple purposes, the water body provides a better aesthetic environment for the village, people need not travel long distances to get to a water source, and the added benefit is the production of crops to provide a nominal income. Under the circumstances, minor tank rehabilitation should be encouraged, particularly since one can garner the support and participation as well the physical input for the

rehabilitation. Thus, small tank or minor scheme rehabilitation is advocated, with the proviso that rehabilitation follows a scientific study of available water resources and that no other scheme dries up if a particular one is rehabilitated. The policies/ strategies emerging are;

- Rehabilitate suitable small tanks or schemes that bring in highest socio-economic benefits based on scientific approaches without adversely affecting other nearby schemes.
- Institutional reforms and capacity building

The existing irrigation institutions have to transform to meet the new challenges and policies that have to be implemented under this strategic development. As already envisaged under the restructuring plans, the Mahaweli Authority should become a specialized construction and development arm of the state to undertake the development and new constructions envisaged under the proposed strategy alternatives. The Irrigation Department should continue to specialize itself into a management agency, for improving the management of existing schemes and to take over the management of schemes developed under the Mahaweli and other developments. The Department of Agrarian Services, should gear up to implement the minor scheme rehabilitation programme in order to ensure its success. The Water Resources Board should be given legal powers to control and manage ground water resources and develop a resource map of ground water to be used for development and monitoring of ground water resources. The policies/strategies emerging are;

- The Mahaweli Authority to transform into a specialised construction and development agency
- The Irrigation Department is to specialize in management of irrigation schemes with the Mahaweli schemes also transferred to this institution
- The Agrarian Services Department should gear up to undertake a large rehabilitation program of minor schemes.
- The Water Resources Board should be made the responsible agency for the control and management of ground water resources with the necessary legal backing.

7. Investment plan and financing

Investments of ongoing projects have been incorporated in the plan for investments in irrigation sector. Several, new proposals included in the Public Investment Program fall in line with the strategies outlined in this report and have been included in the Investment Plan for irrigation sector shown in Table 5. The emphasis has been given to new schemes and annual investments. For example, new investments for multipurpose projects and trans-basin diversions have been given the highest allocation.

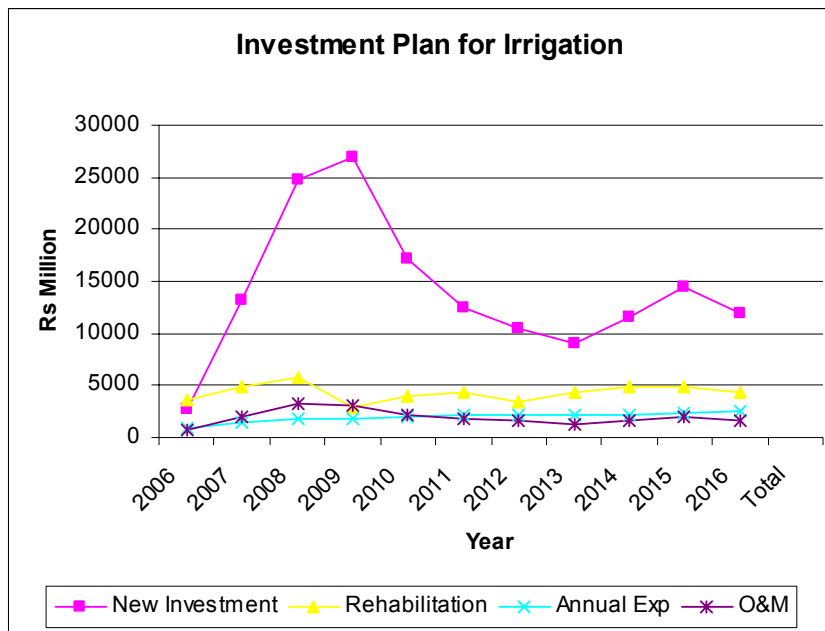
Table 5. Planned Investments in the Irrigation Sector (Rs Million)

Year	2006	2007	2008	2009	2010	2011
New Investments	2635	13159	24739	26984	17140	12500
Rehabilitation	3620	4811	5835	2810	4012	4250
Other /Annual	881	1420	1735	1845	1964	2094
O&M	740	1915	3180	3106	2245	1810
Total	7875	21305	35489	34745	25361	20654
Year	2012	2013	2014	2015	2016	Tot. 2006-16
New Investments	10500	9000	11500	14500	12000	129918
Rehabilitation	3510	4250	4900	4900	4250	41312
Other /Annual	2238	2139	2238	2343	2453	19615
O&M	1540	1325	1640	1940	1625	17886
Total	17787	16714	20278	23683	20328	208731

Sources : Based on PIP estimates

Minor tank rehabilitation, surface and ground water management, and other rehabilitation projects have been included under rehabilitation. Allocation for rehabilitation is roughly half that of new schemes. Annual expenditure includes administrative expenses for planning, designs, research, consultancy, inter-provincial transfers, and expenditure on small capital works as well transfers for investment by other agencies.

Figure 7. Investment Plan for Irrigation



Sources : Based on PIP estimates

The investment plan is shown graphically in Figure 6. Gearing up to meet the rapid peaking based on PIP is considered feasible only on the presumption that some ground work for the relevant projects have already been carried out. The high level of new investments during the period 2007 to 2011 reflects the investments proposed for several new schemes such as the Uda Walawe LB extension, Moragahakanda, Mahaweli System B (LB) and Maduru Oya balance development. In the Irrigation

Department, the Heda Oya, Uma Oya and Yan Oya development is to take place during this period. The new investment peak in 2015 reflects investment for the development of the Kelani ganga, Kalu, Nilwala and Gin ganga diversions and other new schemes identified.

Funding requirement for the entire period of 10 years is estimated at Rs. 210 billion or an average of about Rs 20 billion per annum over the next 10 years. As of now, it is understood that foreign funding is available to cover 25% or Rs 50 billion of the total investment. This proportion may rise once feasible projects are identified and foreign aid agencies show interest in financing such projects. It is also envisaged that part of the investment will be financed by the private sector, both farmers and the corporate sector. Table 6 provides details of possible funding sources for the investments proposed in the irrigation sector.

Table 6. Funding Sources for Investment

Funding Sources	Investment (Rs Billion)	Percentage of total (%)
Foreign Aid	62	30
Government Funds	84	40
Farmers	11	5
Private Sector	31	15
NGOs	11	5
Other agencies	11	5
Total	210	100

Sources : Based on PIP estimates

8. Monitoring and evaluation of plan

A monitoring system should be established to assess the impact of the policies and investments. A short term monitoring system is needed to determine the physical and financial progress and achievements of individual projects undertaken. A second medium term monitoring system is required to assess the success or failure of policies and strategies adopted by the plan. A third long-term monitoring system is required to evaluate the impact of the project or plan on the economy, the incomes and well being of stakeholder or beneficiary, government finances, and benefits accruing to others or related sectors, the impact on the environment, as well as on the socio economic aspects of poverty alleviation, education and social welfare of the target groups. The last mentioned assessment can be undertaken on completion of the project and after a considerable period of operation of the project.

- Short term monitoring system

It is suggested that for short term monitoring purposes, a system of collection of data on financial aspects and the physical progress of the project be established.

The project should be monitored on the basis of targets for a period of one year, where the financial progress is estimated on the basis of expenditure as against the allocation. Financial progress must be evaluated in relation to the

physical targets that should be achieved in making the expenditure. If this is not the case, the monitoring agency should review the project to determine whether the targets were too ambitious, or if other problems caused delays etc. Thus this tool will be useful in improving project implementation.

- Monitoring plan for assessing impacts of policies and strategies.

In order to assess the policies and strategies used in achieving the objectives a longer time frame would be required. The short term project implementation monitoring process itself will provide some idea about the success or failure of the policies and strategies being utilized for implementing the project. A basic framework for monitoring policies and strategies would also be prepared if a Log Frame approach is used in preparing the feasibility study. However a simple matrix of policies and impacts in the format given below would be sufficient to facilitate the monitoring of impacts.

Policy / Strategy Evaluation Matrix

List of Policies/ Strategies	Agency Responsible for Implementing	Impacts of policies	Indicator for evaluation of impacts	How these indicators can be measured

- Long term assessment of impact of investments and plan.

The impacts on the beneficiaries, stakeholders, or the economy of the country can be undertaken by various methods. A socio economic survey of the beneficiaries will provide basic information on the impacts. Such surveys may be conducted mid way through project implementation as well as after project completion. A fairly detailed study on a sample of beneficiaries would provide details on income, outputs, inputs and cost of production, employment and other social parameters as well as housing, sanitation, education and employment aspects. Such information can be used to construct indicators such as poverty levels, income and expenditure and other social indicators of well being. In addition other aspects such as environmental impacts, technical aspects of the project, financial and economic factors should be assessed to obtain a detailed report on the impact of the project. Such an evaluation will also provide useful feedback that can be used in preparing better projects in the future.

9. **Enabling Environment**

- What are the risks or threats and opportunities in the plan

The major risks are delays in implementation and the lack of technical manpower, and human resources needed to implement the plan. Inability to raise adequate funds is clearly another major risk. Cost overruns may reduce the viability of the project and the envisaged benefits may not be realized due to poor preparation of the project or inaccurate data used in evaluating the project. Implementation of the project will have multiplier effects with benefits accruing to other sectors as well. The plan will facilitate the spread of new technology that could be adopted in other sectors as well.

- What possible safeguards and measures are needed to reduce such threats

More preparatory work and collection of reliable data would help in preparing good projects and plans. Closer monitoring during implementation would also help to reduce delays and cost overruns.

- What possible support or cooperation is needed from bureaucrats, policy makers, politicians and other stake holder to succeed?

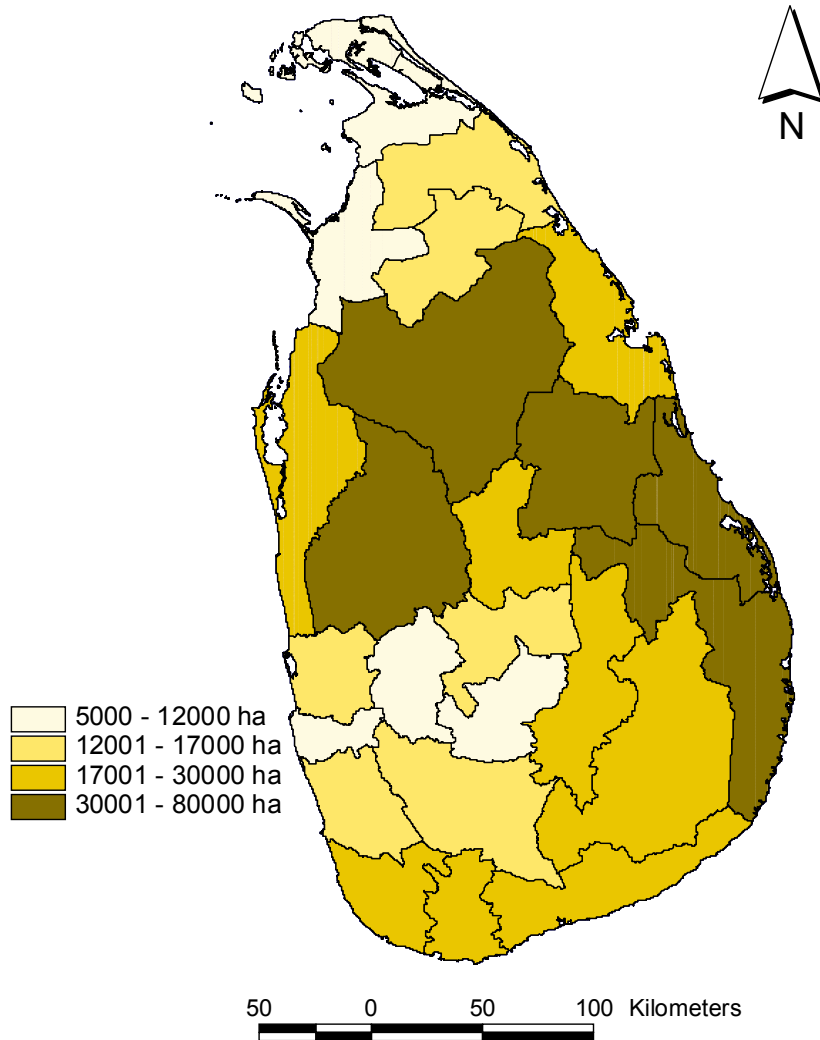
The bureaucrats, policy makers, and politicians should maintain the consistency of policies and procedures once agreed. Policies should be well thought out and evaluated prior to implementation and once policies are operational enough time should be given to such policies to determine their impact before making changes. The manpower most suited for implementing such plans and projects should be used in implementation.

- Cooperation and support needed in terms of policies and strategies from other sectors/institutions having an impact on this sector.

Other related institutions such as the Departments of Agriculture, Water Supply and Drainage Board, the Water Resources Board and Agrarian Services can play a vital role in helping to implement such plans and projects. Their cooperation particularly in the technical aspects of cultivation and contribution to increased productivity would facilitate the implementation of the plan and strategies.

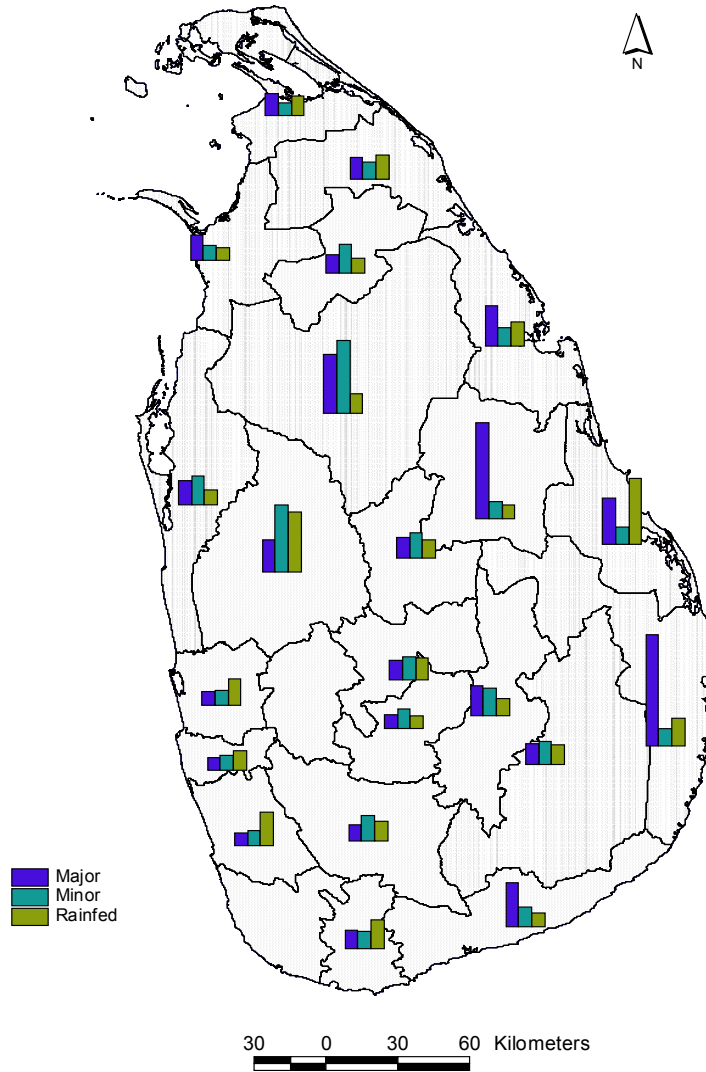
It must be ensured that all related sectoral policies are consistent with the overall national development policies and strategies, and the inter-linkages are also consistent.

Annex 1: Gross Asweddumised Extent by District, 2002/2003



Source: Based on Department of Census and Statistics Data

Annex 2: Gross Asweddumised Extent by District, as Major, Minor and Rainfed 2002/03



Source: Based on Department of Census and Statistics Data