Impact of Samanala Wewa Dam on the Regional Economy of Sri Lanka: A Study of the Kaltota Scheme

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I. Introduction

Water is an essential and irreplaceable resource, not only for human existence and agricultural development, but also for modernisation and industrialisation of any given economy. These considerations have influenced people's attitudes towards water irrespective of their development stage. In traditional society, water was seen as a **non-economic good**, because it was available in more than adequate supply in relation to the limited demand of traditional societies. However, gradual population growth, the expansion of irrigated agriculture, and industrialisation, on the demand side and the decline of available water supplies and the environmental pollution in the last half century on the supply side have gradually made water a scarce resource, and an **expensive economic good**. The conditions affecting water deteriorated further due to the following: the over utilisation of water for industrialisation and urbanization, deforestation and environmental destruction. People's traditional attitudes towards water, however, did not change with the above changes in demand and supply conditions pertaining to water and its declining availability, particularly in most developing countries. For example, even today, most people in Sri Lanka, particularly in the rural sector consider water to be a non-economic good

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1 In this study, when a product is treated as 'non-commoditised', it principally

or a non-commodity[1] despite the reality that it is a high cost good. The adverse outcome of this unchanged traditional attitude has been that the pattern of water management in most villages, specifically its inefficient use, has made water a severe constraint affecting rural life not only in respect of agriculture but also of the satisfaction of daily needs.

The other major factor in water utilisation in Sri Lanka is that the supply of power has been largely dependent on hydro-electric power, whose extent is determined by the availability of water[2]. There are two groups holding different views about the extent to which the country should depend on hydro-electricity. One group argues that Sri Lanka has still unutilized capacity to generate electricity from hydro power as the opposition from environmentalists and political opportunists prevent the utilization of this available capacity. The international donor community has already offered financial and technological backing to develop the country's hydropower generation capacity. The other group believes that private companies could supply power to the national grid by operating small and medium-scale thermal generators. Those who present this argument often exert pressure against further development of hydro-power in Sri Lanka.

The other interesting point is that according to some scholars, the agricultural sector has been sacrificed to satisfy the country's power hunger. Arguing against this viewpoint, another group argues that the cost of agriculture, especially that of paddy farming, and the related irrigation system has been extremely high. This group believed that the comparative advantage the country has in paddy-farming is very low.

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means that either it is a product not exchanged in a market and cannot be reproduced or it is a product which is produced by villagers with no concern about the market (Ratnayake: 1992: 149-150).

2 At present, approximately 40 percent of the total power supply of Sri Lanka depends on hydroelectricity and the balance on thermal power.

Weerasinghe and Somathilaka (2002: 53-55), for example, find that the water released from the Samanala Wewa[3] dam for irrigation has a very high 'opportunity cost'. According to their findings, in 1999, a water release in the order of Rs. 97 million produced a paddy harvest of only Rs. 31.4 million resulting in a net profit of only Rs. 13.08 million. But, the release caused the nation to import Rs. 53 million of fuel to make up the energy lost as a result. These findings in the Samanala Wewa area appear to indicate that the production of paddy has a lower comparative advantage than using the water from the dam to produce electricity. The implied view is that using the water from the Samanala Wewa dam to generate electricity would produce more profit than using it for paddy cultivation. Such profit can be used not only to import rice at lower prices to meet local demand, but also to increase the consumption of rice. This argument based on purely economic reasoning however, is difficult to justify, since people's living conditions, the socioeconomic structures and cultural relationships of the rural economy of Sri Lanka are closely related to paddy farming. This reveals the limitations of using monetary factors alone as the major determinant of resource allocation, especially when it comes to the question of allocation of a resource like water between the traditional agriculture sector and the industrial/ urban sector.

The main aim of this study is to examine how the controversy surrounding water allocation arose in the Kaltota scheme after the construction of the Samanala Wewa dam in 1991. In addition, it expects to investigate the positive and negative impacts of the Samanala Wewa dam on socioeconomic activities in the study locale. Keeping these major objectives as the basis of the analysis, I will attempt a discussion of people's attitudes towards the dam construction and utilisation of water

3 This is a large irrigation tank in the south of Sri Lanka. See the next section for details.

and towards the use of irrigated water for paddy cultivation. I will also discuss people's responsibility and the role of farmer organisations, government officials and Samanala Wewa dam officials in the water management activities at the village level.

The data used in the analysis were collected from three types of sources viz. (i) the primary source (field survey), (ii) interviews of selected government officials, certain veteran farmers and leaders of community organisations, especially farmers' associations in the study villages and (iii) a household survey under a structured questionnaire carried out in the Kaltota Scheme consisting of three villages, i.e. Kaltota Puranagama, Welipothayaya and Madabadda. These villages are located in the Ratnapura District and the household survey was conducted from July to August 2004 and in December 2005.

II. Samanala Wewa Dam and Kaltota Scheme: An Overview of the Conflict of Interests

The origin of the Kaltota irrigation system is unknown but it is believed that most of its basic structure was built in the era of king Gajaba (112 to 134 AD)[4]. During this period, the irrigation-fed paddy lands in this region were important to the kingdom of Magama (in the South and South-East of Sri Lanka) (Wanigaratne, 1984: 91). According to a newspaper reporter who reported on that in 1622 this area became the paddy storage (Gabada Gama) of King Senerath (Sena Kapuge, *Divayina,* 05. 08. 1997). The evidence also reveals how it helped develop

4 The original channel, as ancient chronicles put it, was made by a giant named Nila Maha Yodaya, who had selected the barren district of Kaltota for a vast irrigation system. Choosing two rocks near the present anicut, he cut sockets in them, which can still be seen, and affixed therein huge beams to form a dam across the Walawe, known as the Yodaya Bemma (R.H. Basset, 1929, see Abeyaratne Malcolm, *Ratnapura as Seen by Government Agents*: 40-41 for more details).

irrigation based paddy cultivation in the area, which apparently was a rich agricultural region, specifically noted for paddy farming based on advanced irrigation technologies. This ancient irrigation structure was repaired several times during the British colonial period (1815-1948) and later after political independence. The present project (Kaltota Scheme) had its origin in a government sponsored resettlement scheme in this village in 1956 and 1964. The scheme is an 'anicut-based' channel irrigation project with two anicuts (wing dams) across the Walawe Ganga[5] (the third largest river in Sri Lanka) feeding a **Right and a Left Bank** channel system (See Wanigaratne, 1984: 89-95 for further details). The irrigation channels are about 11.5 miles long altogether, with the right and left bank channels extending to 7.5 and 4 miles respectively. The right bank consists of two villages namely Kaltota *Puranagama* (Traditional Village) and Welipothayaya colony established in 1963; the left bank comprises Madabadda colony established in 1958 (hereafter Madabadda village, See Figure 1, Map 1 and 2 for location). The left and right bank channels[6] supply sufficient irrigation water for about 2,260 acres, of which 1497 acres are in Kaltota Puranagama and Welipothayaya (right bank) with the remaining 763 acres in Madabadda village (left bank). Two of the villages (Welipothayaya and Madabadda) can be defined as extended villages of the Kaltota Puranagama based on the ancient irrigation structure.

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5 Ganga in Sinhala language means the river.

6 "The layout of the Kaltota irrigation scheme is quite simple. The 12.7 km right bank main canal follows the foot of the Kaltota escarpment and delivers water to a strip of land located along the right bank of the river. There are 39 direct off takes to lateral canals, 26 in the upper part (Puranagama) and 13 in the lower part (Welipothayaya). There are also three gates to control the water level in the main canal. The left bank main canal follows the central and higher part of the tract of land located between the Walawe and Weli Oya rivers. It serves approximately 300 hectares" (Molle *et al*, 2005: 5).

This irrigation scheme lies on the toe of the Balangoda escarpment. In other words, it is situated along the upper reaches of the Walawe Ganga on a flood plain at the confluence of the Walawe and its tributary, the Weli Oya (Map 1, 2, 3). It consists of a gently rolling alluvial plain with elevation at the causeway across Walawe Ganga about 450 feet m. s.l., and shows numerous rock outcrops. It is bordered on the West and North by steep mountains, which rise to about 7,000 feet above sea level (Silva, 2003: 89; Wanigaratne, 1984: 89). The scheme was situated in the southeastern part of the Ratnapura District, bordering the Monaragala and Badulla Districts. The nearest major city is Balangoda, about 25 miles away from the scheme.

Under the above noted physiographical conditions, the scheme falls within the lowland dry region of the country that receives approximately 75 inches of rain per annum, with peak rainfall from the northeast monsoons. As rainwater is insufficient, its agricultural activities, particularly in paddy cultivation, are dependent on irrigation water, supplied from the right and left bank anicuts of the Walawe Ganga. As in other irrigation schemes in the country, this scheme also has two major cultivation seasons, namely *Yala* (the minor season) and *Maha* (the major season)[7]. Cultivation in both seasons depends on the availability of water in the Walawe Ganga and monsoon rains. Water availability in the Walawe Ganga has become the principal factor in the meeting of people's basic needs. Currently, there are about 1,500 farming families (both legally and illegally settled) whose sole livelihood is agriculture, specifically paddy farming, which is dependent on the irrigation facilities. These facilities are based on the water level of the Walawe Ganga. The total extent of paddy land in the scheme has been estimated at 2,260

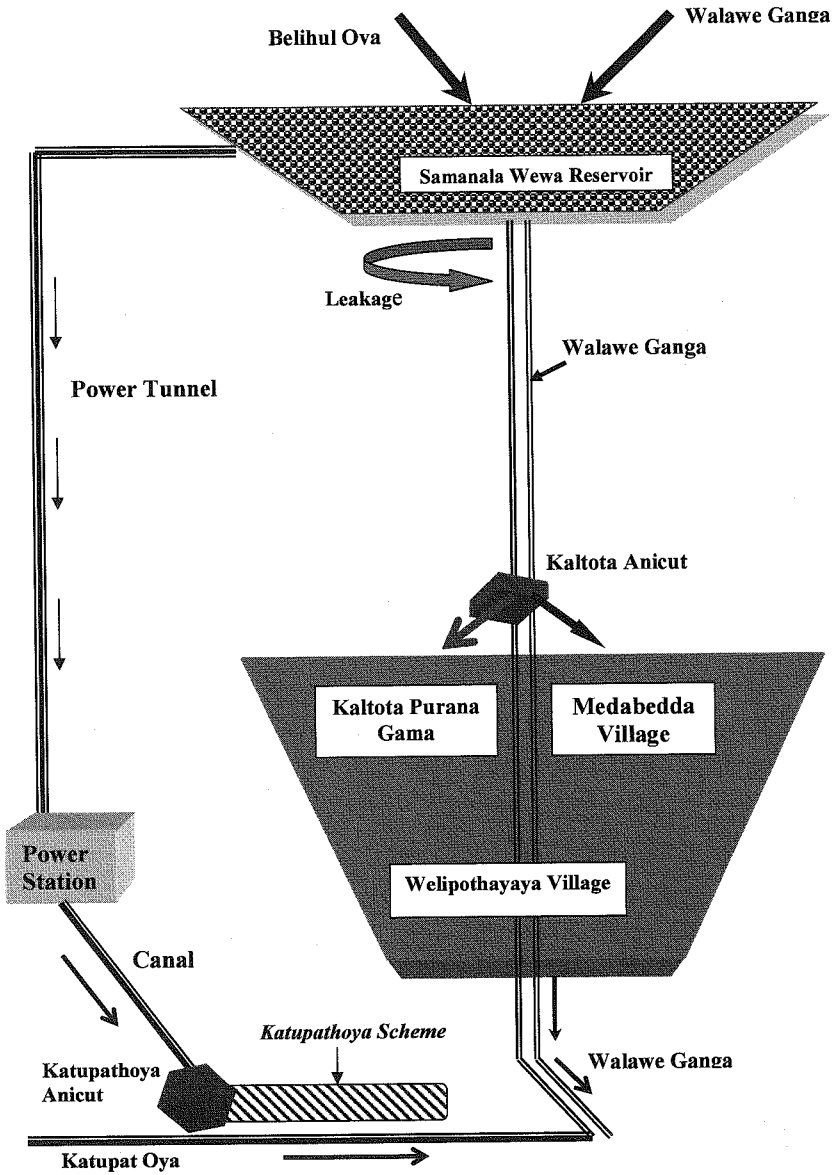
7 Paddy farming in Sri Lanka takes place in two distinct seasons: Maha (October-March) and Yala (May-September). In the dry zone, where irrigation facilities are not available, only the Maha crop is possible.

acres – 633 in Puranagama, 864 in Welipothayaya and 763 in Madabadda.

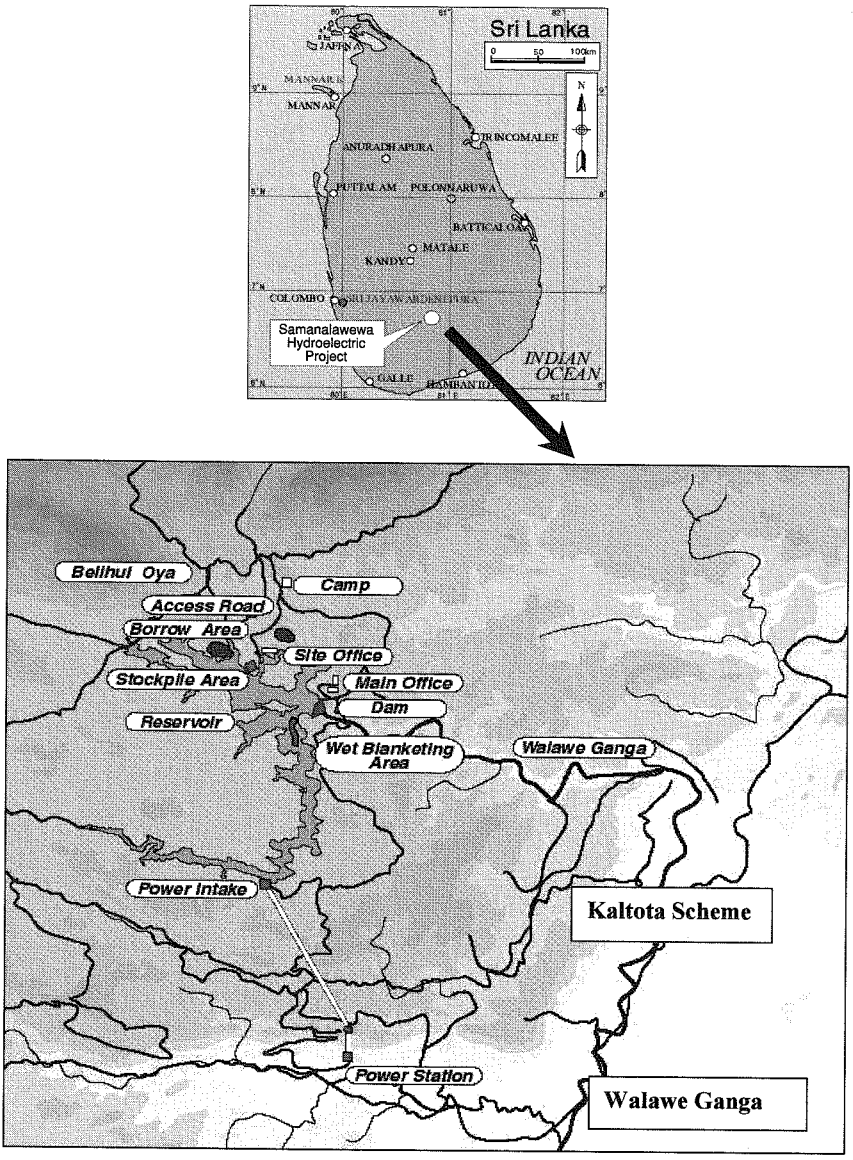
The Samanala Wewa Dam[8], a 100 metre high rock fill dam with a clay core built across the Walawe Ganga at its confluence with Belihul Oya, stores water to supply the 120 megawatt power station at Kapugala. It was completed in 1992. The dam is located in the upper stream of the Walawe Ganga, which is about 26 km away from the Kaltota scheme. The water in the dam is taken initially along a 5.5 km long underground tunnel and finally along a surface penstock to the 120 MW Power Station at Kapugala. After power is generated, the Power Station discharge is released along the Tail Race canal into a stream called Katupath Oya. It was planned to reuse the water discharged from the power station in the Kapugala for another agricultural project, the Katupathoya scheme before the water finally flows to Walawe Ganga through Katupathoya (See Map 1).

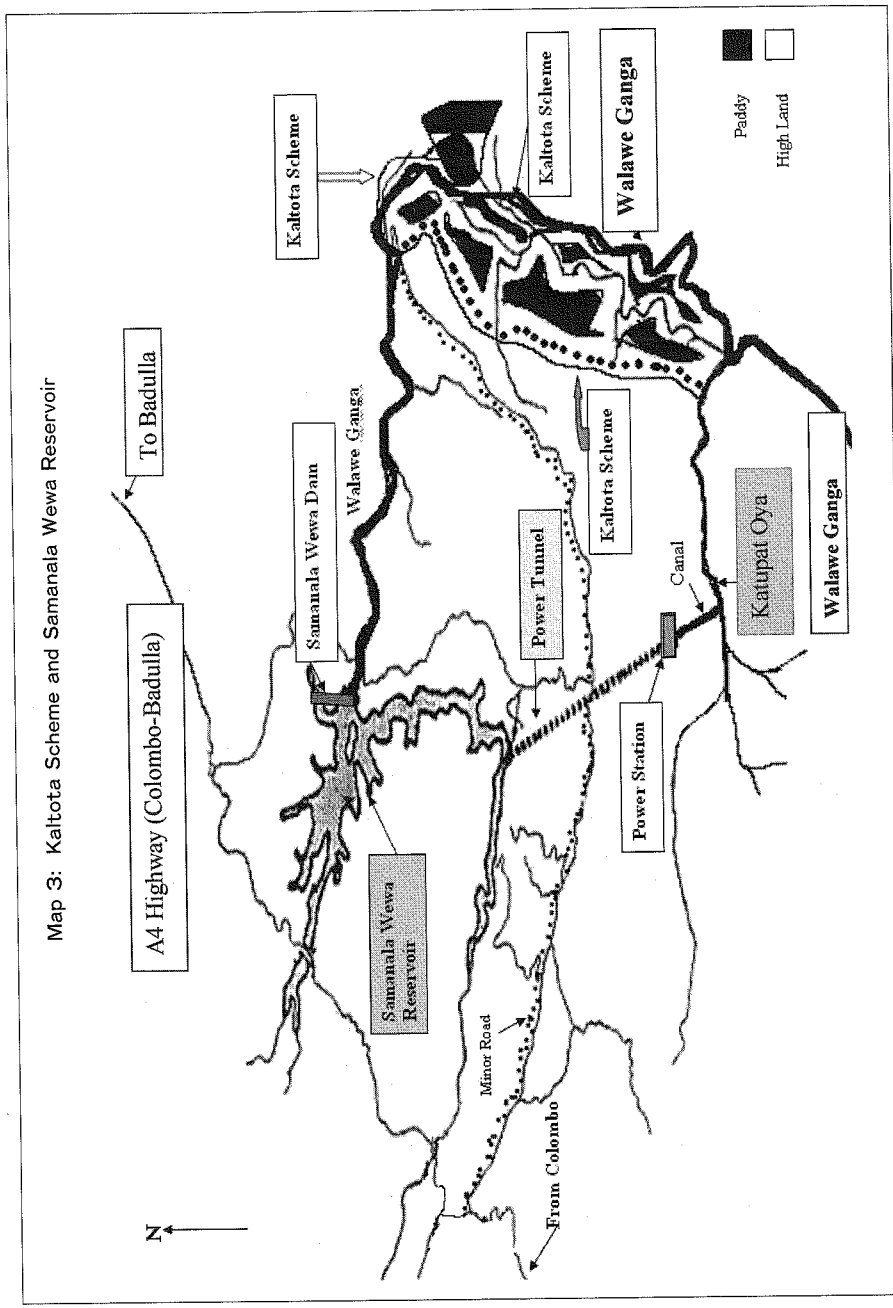
8 The Samanala Wewa reservoir extends over 897 ha at normal high water level, its catchment covers an area of 341.7 km^2 and its storage capacity is 218 million cubic meters. The full storage level is 460 million cubic meters (CEB, 1990; quoted from Udaya Kumara and Wijeratne, 2004: 46).

Map 1: Location Diagram of Samanala Wewa Reservoir, Power Station, Kaltota Anicut and Study Villages



Map 2: Location of the Kaltota Scheme and Samanala Wewa Dam




Map 3: Kaltota Scheme and Samanala Wewa Reservoir
To Badulla
A4 Highway (Colombo-Badulla)
Kaltota Scheme
Samanala Wewa Dam
Walawe Ganga
Kaltota Scheme
Walawe Ganga
Paddy
High Land
Power Tunnel
Kaltota Scheme
Canal
Katupat Oya
Walawe Ganga
Power Station
Samanala Wewa Reservoir
Minor Road
From Colombo
N

But although the water released from the Power Station is redirected back to the Walawe Ganga, it cannot be used for the Kaltota scheme because the water from the power station is redirected back several kilometers downstream of the right and left bank anicuts of the project (see Map 1). In other words, the Kaltota irrigation scheme lies between the points where the water is initially tapped and the point where water is finally released after generating power (Weerasinghe and Somathilaka, 2002: 52).

As a result, the conflicting needs of the people in the Kaltota scheme and the officials of the Samanala Wewa Dam for water distribution provide the backdrop for a serious socioeconomic problem for the Kaltota scheme. At present the only water discharged downstream results from the leak in the right bank flank, which is estimated to be 2 m^3/s (ASD, 21. 06. 1996) and release of water on the request of villagers. Although the water leak[9] from the dam and occasional compensation payments by the dam authority to effected villagers have given temporary relief, the villagers' protests against the reservoir have continued, causing serious socioeconomic problems, particularly during dry seasons and cultivation

9 The first trial reservoir impounding took place in June 1991. The reservoir, barely rising up to one third of its designed height, started to leak at a point 320 m downstream of the dam proving the permeable nature of the right bank ridge. The second trial impounding occurred in March 1992 after the completion of the massive right bank cutoff 1300 m × 100 m grout curtain, where 13,500 tons of cement were injected into 53,000 m of grout holes. This cut-off measure which represented half the total cost of the dam and spillway, failed to create a hydraulic gradient across it. The right bank groundwater table even with the massive grout curtain in place continued to rise with the reservoir level. The October 1992 burst, with a steady leakage around 2 cumecs (for reservoir levels from 426 m to 433 m) has kept the ground water level at almost 10 m below the reservoir level thus improving the stability of the right bank area. The natural drainage did get blocked at one time reducing leakage and it could get blocked again. Blowouts could reoccur causing even more leakage and erosion (Pereira, unpublished research report, 1992: 41).

times, mainly in the *Yala* season. They often complain that since the construction of the dam, there has been a scarcity of water, which interferes with their agricultural activities, particularly paddy cultivation. However, the dam officials believe that they provide people in the Kaltota scheme with adequate water resources, periodically releasing water from the reservoir in addition to the regular leakage. The officials further state that farmers in the scheme could resolve their water problems if they changed their traditional attitudes towards water and used it, like other economic goods, more efficiently, thus minimizing wastage. However, it is a challenge to change the long-standing attitude of the village people not only in this scheme, but also in most other villages because historically water has been seen as a non-economic commodity, a view that has continued through the government's welfare-oriented water management policy of subsidised irrigation facilities for agriculture.

Socioeconomic Background of Villages Surveyed: An Overview

As noted previously, the present study conducted a sample survey, employing a structured questionnaire, to collect information on the socioeconomic impact of the Samanala Wewa Dam on the Kaltota scheme. The Kaltota scheme consists of three villages, Kaltota Puranagama, Welipothayaya and Madabadda. The survey was conducted in these three villages from July to August 2004 and in December 2005. The survey was conducted using 256 households, randomly chosen from among the farming households of the Kaltota scheme: 52, 83 and 121 households respectively from Puranagama, Welipothayaya and Madabadda. The basic information relating to the socioeconomic background of the people like demographic structure and labour force, production and income level of the villagers learnt in the survey is presented below briefly to provide a basis for the major discussion of the paper.

Demographic Structure of Households and Labour Force

A household means all those who pool their resources and act as a single economic unit (Jennings, 1951: 8). These economic units may include single-member as well as multi-member households[10]. Table 1 presents data on the household size in each village of the Kaltota scheme based on our sample survey. The average size of a household was found to be 4 persons, with 4-5 member households accounting for about 57 percent of the total. Three-member and six-member households constituted 27 and 16 percent respectively. Village-wise, the average size of a household for all three villages remained at around four persons. However, it is interesting to note that the newly established Madabadda village has a greater concentration of large families than the other two villages.

Table 1: Size of Households and Pattern of Age Distribution of Family Members (%)

Family Size (No in the Family)	Puranagama	Welipothayaya	Madabadda	Kaltota Scheme
1-3	23.3	27.7	28.9	26.6
4-5	63.3	60.3	47.9	57.2
6 and over	13.4	12.0	23.2	16.2
Total	100.0	100.0	100.0	100.0
Age Group (Years)				
0-15	21.5	21.5	19.9	21.0
15-65	70.4	69.4	73.9	71.2
65 and over	8.1	9.1	6.2	7.8
Dependency Ratio [(a)]	42.0	44.1	35.3	40.5
Labour Force [(b)]	70.4	69.4	73.9	71.2

Note: (a) Dependency Ratio $= \frac{\text{(Age Group over 0-15 + Age Group 66 and over)}}{\text{Age Group 15-65}} \times 100$

(b) Labour force[11]=Percentage of total population within the age group 15-65

10 According to the Census of Agriculture in Sri Lanka, a household could be (i) single-person or (ii) multi-person. A single-person household is one where a person lives by himself and makes separate provision for his food (either cooking it himself or purchasing it) (Sri Lanka Census of Agriculture, General Report, 1982: 113).

11 "The labour force was the sum of all employed and unemployed persons. All

In regard to age distribution of the population, there is not much difference between the three villages, though the dependency ratio and the ratio of aged population (over 65 years old) are slightly lower for the Madabadda village than for the other two, and the ratio of the labour force is somewhat higher. It can be noted that the ratio of labour force in this scheme is somewhat higher compared to the national average given in the recent national survey. However, the dependency ratio of the study villages was lower than the national average in 2003[12]. The structure of the labour force that is gainfully employed in each village is shown in Table 2.

Table 2: Employment Structure of the Kaltota Scheme (%)

Type of Occupation	Puranagama	Welipothayaya	Madabadda	Kaltota Scheme
Full-Time Farming	67.9	65.1	68.3	67.1
Part-Time Farming	22.2	16.3	16.7	18.4
Public Sector	8.6	4.7	1.7	5.0
Private Sector	1.23	0.0	1.6	0.9
Other	22.2	16.3	8.4	15.6

The most significant aspect revealed from the data is that farming, both full and part-time, is the dominant form of employment or source of livelihood in all three villages. In Puranagama and Madabadda, 90 and 85 percent respectively are engaged in agricultural activity and in Welipothayaya about 81 percent. Another important feature is that about 9 percent in Puranagama and 5 percent in Welipothayaya are engaged in

persons neither employed nor unemployed were defined as not in labour force. This included persons who were students, engaged in their own housework, unable to work because of disabilities, retired or voluntarily idle" CBSL, 2005: 11). But in this study, working age population is considered as labour force for convenient of the analysis.

12 According to the Annual Report of Central Bank of Sri Lanka in 2003, total labour force (15-64) of the country was about 67 percent of population. The dependency ratio works out on this basis to 49 percent.

government sector employment, while the corresponding figure for Madabadda is negligible. The major factor behind the differences in the employment structure in these three villages is, most probably, the difference that exists in the levels of education of working age population in these villages. The people in Puranagama may have received the opportunity for government employment with the development of their education system, which has a long history as opposed to the other two newly developed villages.

The Pattern of Land Distribution and Utilisation

Landed property is one of the most important resources for the rural folk reflecting their socioeconomic status and identity in the village community. Almost all socioeconomic and cultural activities in the village revolve round landed property. Land in the three target villages can be classified broadly into (a) paddy land and (b) high land. The high land in this study includes mainly homesteads and *chena* land, comprising small blocks of land with mixed crops, sometimes cultivated with perennial crops (coconut, jak fruit, bread fruit, arecanut etc.), sometimes with annual crops (vegetables, root crops, betel leaves, coffee, pepper, cashew nuts, pineapple, banana, ginger etc.). As noted in the previous analysis, the paddy lands are cultivated twice a year (*yala* and *maha* seasons) using monsoon rains and irrigation water. The general pattern of distribution of these production units in the three villages is presented in Tables 3 and 4 in terms of the above-mentioned categories.

A significant characteristic, which can be gleaned from the data in Table 3 is that approximately 60 percent of the total landed property in the Kaltota scheme consists of paddy lands; the principal source of the livelihood of the village community. The other interesting feature of the distribution pattern of landed property by size class is that more than 66 percent of paddy lands in the Puranagama are more than two acres, this

proportion was about 26 percent in Welipothayaya and 41 percent in Madabadda (Table 4). However, the smallest land units of less than 0.5 acre are at a comparatively higher level in Puranagama than in the other two villages.

Table 3: Ownership Pattern of Landed Property of the Kaltota Scheme (%)

Type of Land	Puranagama	Welipothayaya	Madabadda	Kaltota Scheme
Paddy Land	57.9	58.0	60.7	58.9
High land[(a)]	42.1	42.0	39.3	41.2

(a) Including all types of land other than paddy lands, i.e. homesteads, chena etc.

Table 4: Distribution Pattern of Landed Property by Size Class of Holdings (%)

Size Class (Acres)	Puranagama		Welipothayaya		Madabadda		Kaltota Scheme	
	Paddy	High land	Paddy	High land	Paddy	High land	Paddy	High land
< 0.5	7.9	14.6	0.8	29.0	6.5	15.3	5.1	19.6
0.5-1	5.4	11.4	24.8	6.4	19.9	65.8	16.7	27.9
1-2	20.2	14.6	48.0	20.0	32.4	16.5	33.5	17.0
Over 2	66.4	59.5	26.4	44.6	41.2	2.3	44.7	35.5

It is worth noting that about one-fourth of the paddy land ownership in Welipothayaya and Madabadda is in units of 0.5-1.0 acres. Moreover, nearly half of the paddy land ownership in Welipothayaya is of units between 1 and 2 acres. The share of holdings of this size class is, however, quite small in the other two villages, particularly in Puranagama. The significant differences of land distribution by size among the people in each study village reflect partly the influence of the government's land distribution policy and partly, that of traditional land inheritance system that prevail among the village folk concerned. Welipothayaya and Madabadda were established under a government colonisation scheme of the 1960s. Under the colonisation policy, the people in Madabadda received three acres of paddy land with one acre of high land. The corresponding figures for Welipothayaya settlers were two acres of paddy and 0.5 of an acre of high land. This land allocation system under

colonization schemes was one of the major reasons behind above-noted differences in land distribution by size class of holdings. The other major reason is that most of the villagers divide their land among their children when they form separate families after marriage — regardless of whether they live separately or with their parents. This conventional practice of land inheritance, leading to land fragmentation has resulted in the present generations having economically unviable landholdings. The numbers who could be described as near landless marginal farmers are also significant in the study villages.

Finally, in spite of disadvantages of agriculture in general and paddy farming in particular, people in study villages are compelled by lack of alternative occupations to be dependent on agriculture, particularly on the paddy farming. Hence the importance of water discharges from the Samanala Wewa reservoir for people's economic activities and their living conditions. This reservoir exercises a significant influence on people's lives and on the survival of the village economy.

III. Socioeconomic Impacts of the Samanala Wewa Reservoir on the Kaltota Scheme

As a result of the rapid increase in population, industrial expansion, increased urbanization, and inefficient patterns of land utilisation in both traditional rural economy and the modern urban sector the availability of water has become a major factor in socioeconomic development of Sri Lanka, particularly in its rural sector. The construction of dams across waterways to construct small to large reservoirs was undertaken to meet the intense demand for water mainly under foreign assistance. Although seen as the solution to the acute water shortage, most studies have argued that these artificially contructed reservoirs provided only a short-term solution, while creating other socioeconomic difficulties for people whose

sole livelihood is agriculture. Regarding the Samanala Wewa Project, it is important to note that although it has had an unexpected impact on the traditional livelihood of people in the Kaltota scheme, it must also be noted that this project has also had some positive effects on the region in general and on the national economy in particular.

Negative Impacts of the Samanala Wewa Reservoir

The Samanala Wewa Project (hereafter SWP) was designed to provide hydroelectric energy to meet the needs of the modern sector while ensuring the provision of sufficient water to people in the Kaltota scheme. The survey revealed the acute socioeconomic impacts of the SWP on the people in the Kaltota scheme, often seriously affecting people's livelihoods. In particular, the deterioration of the traditional agricultural base (paddy farming), the decline of agricultural income, the decline in food consumption, the increasing scarcity of agricultural labour, the rural urban migration, the erosion of community cohesion, the deteriorating environment and the threat to the future of the village (survival of the village's social & economic conditions) are recognized as major impacts of the SWP on the people, the society and the environment of the scheme. The lack of water was the leading cause of all these problems after the implementation of the SWP.

(1) Scarcity of Water

Until 1991, the farmers in this scheme were able to use water from the Walawe Ganga, as there were no major upstream developments to direct water from the normal course of the water along the river. The construction of the Samanala Wewa Dam upstream as the storage facility for the 120 MW hydroelectric power station affected the flow of water at the diversion point as the discharge after power generation is at a point below the water uptake to the scheme (Namara, Weligamage, and

Barker, 2003: 8). Since this intervention, people in the Kaltota scheme began to complain that they were facing a water shortage, making it difficult to survive through agriculture.

The Ceylon Electricity Board (CEB), the sole authority of the SWP, agreed to protect the traditional rights the people in Kaltota to adequate water use at the outset of the implementation of the project. Namara *et al* (2003: 8) noted that farmers in this scheme are eligible for a special irrigation release calculated on the basis of historical water use. Meanwhile, as noted earlier, the leak from the reservoir also increases the amount of water available at the diversion. As a result, CEB faces the problem of minimizing the amount of water released for nonelectricity generation purposes, as such releases reduce the amount of water available for electricity generation and hence to revenue losses.

Table 5: People's Negative Attitudes about the SWP and its Compensation Policy (%)

Opinions	Puranagama	Welipothayaya	Madabadda
Not Satisfied with the Compensation	98.0	88.0	91.7
Increased Uncertainty of the Village Future	21.6	39.8	52.9
Increased Dependency of the Village on Government	3.9	19.3	19.0
Declined Self-Sufficiency Rate	13.7	25.3	31.4
Expect other Employment opportunity instead of Compensation	41.2	97.6	85.1

Although CEB attempted to minimize these losses through various incentives to affected as well as non-affected farmers. These incentives included compensation payments, funding of rehabilitation work on irrigation facilities, introduction of new water-saving cultivation

13 The System of Rice Intensification (SRI), first developed in Madagascar, is now being tested in many countries. This is an on-farm water productivity enhancing approach. The system is based largely on organic farming principles and imposes additional requirements in respect of timing of transplanting and spacing of seedlings, and irrigation scheduling (Namara, Parakrama and Weligamage, 2003: V).

methods[13], provision of knowledge about more efficient water management systems, and supplying tractors to farmers' organizations. Most of these measures failed to achieve their objectives not only because of inaccurate methods followed by the CEB in distributing its compensation payments and other incentives, but also because of the unavailability of acceptable non-agricultural activities in the scheme itself. Namara *et al* (2003: 8) also found that CEB's attempts failed to achieve their goal of encouraging farmers to reduce their demand for water as: "... payments were made to landowners and thus income sources of tenant cultivators and off-farm income to farm families ceased. There were also serious threats to household food security as payments were made as a lump sum and many recipients used them for non-food expenses and then had no other source of income to buy food".

The present study also found similar outcomes as shown in Table 5. The data in the Table reveal that nearly all people in Puranagama, 88 percent in Welipothayaya and 92 percent in Madabadda were not satisfied with the CEB's compensation policy as a solution to minimise the SWP's impact on the people in the Kaltota scheme. The most significant finding of the survey is that people in the scheme were more interested in earning through the use of their labour rather than receiving compensation from CEB or any other government institution. Although this attitude is held by only a small percentage in Puranagama (41 percent), it was nearly unanimous in Welipothayaya and held by 85 percent of people in Madabadda. The other interesting attitude is that as a result of the SWP the people feel uncertain about the future of their village: the number holding this opinion in Madabadda and Welipothayaya are 40 and 53 percent respectively. However, the people in Puranagama do not feel insecurity about the future of their village. The main factor for this is that the people in this "*purana*" village do not face as serious a water problem as the other two villages. The people in these two colonization

villages also felt that their dependency on the government has increased rapidly while their self-sufficiency in food crops has declined. The study reveals how other factors were responsible for the unpopularity of paddy-farming, in addition to the problem of water scarcity. These other factors also have come into operation mainly as a consequence of the Samanala Wewa reservoir project.

Table 6: Impact of Samanala Wewa Dam on Income Level and Indebtedness of the People (%)

Response	Puranagama	Welipothayaya	Madabadda
Income Level of the People			
Increased	4.7	14.7	16.0
Not Changed	91.3	72.9	71.2
Declined	4.0	12.4	8.0
Increase of Indebtedness			
Yes	–	10.8	9.1
No	–	89.2	90.9
Major Problems			
Lack of Irrigation Water	–	66.7	90.9
Scarcity of Wage Labour	–	11.1	–
Decline of Agriculture	–	22.2	9.1

According to mass media, Samanala Wewa dam impacted not only on the 1,500 families in the left bank channel, but also on the landless people working as wage labourers in the effected paddy fields, who suffered the loss of job opportunities (Diwaina, 05. 08. 1997). Even today, the scarcity of water is a serious problem for the people in the scheme, specifically in Welipothayaya and Madabadda. The main reason for this is that both villages are situated at the lower part of the irrigation channels and the soil in these two villages has a high sand content, which means it requires a large volume of water, making the water shortage even more serious. More than two-thirds of the people in Welipothayaya, and 91 percent of the people in Madabadda complained that they have faced water shortages in paddy farming activities since implementation

of the SWP. The data in Table 6 further indicates that the lack of water is a major factor in the decline of income and the increase of debt in these two villages. The other notable survey finding is that people in Puranagama did not face the same difficulty in securing water for agriculture and were therefore not experiencing the same decline in paddy farming. The main reason for this is that Puranagama is located near the *amuna* (anicut) or upper part of the right bank channel. As a result, the water released reaches Puranagama before reaching Welipothayaya (Map 2). Puranagama, established in ancient times, in accordance with available irrigation facilities using water from Walawe Ganga.

Table 7: Impact of the SWP on Decline of Agriculture and Paddy Farming (%)

Category	Puranagama	Welipothayaya	Madabadda
Decline of Overall Agriculture	3.9	22.9	24.0
Decline of Paddy Land Area	3.9	15.7	12.4
Decline of Paddy Production	3.9	14.5	18.2

The household survey also examined how the Samanala Wewa Project had impacted negatively on people's livelihood, particularly on paddy farming (Table 7). The study reveals only a minor negative effect on paddy farming in Puranagama, while such impacts in the other two villages have been substantially higher. Nearly one-fourth of the people in the two villages noted that their agricultural activities overall declined as a result of the SWP. In particular, approximately one-fourth of the people in the two villages said that this dam project had negatively affected their paddy land and production. The other survey, conducted in 2003 (Kumara and Wijeratne, 2004: 45) estimated that 12 percent (36, 944 bushels, worth Rs. 10.5 million) of the paddy yield has been lost per year as a result of the water scarcity. The survey further revealed that since the construction of the Samanala Wewa Dam 25 percent of the land lies uncultivated (404 acres or Rs. 11.7 million) every year, mainly due to lack of water.

However, it is not reasonable to conclude that the decline of agriculture, particularly paddy farming has occurred solely as a consequence of the SWP because in general, paddy-farming tends to be unpopular in other paddy farming villages in Sri Lanka as well. The present study investigated the major factors, which gradually caused a decline in paddy farming in the Kaltota scheme. The results of the survey are presented in the Table 8.

Table 8: The Major Factors behind the Decline in Paddy Farming (%)

Major Factors	Puranagama	Welipothayaya	Madabadda
Lack of Irrigation Water	3.9	21.7	23.1
Decline in rainfall & Water from other sources	2.0	16.9	23.1
Increase of Employment in the Dam	–	3.6	0.8
Increase of Employment Outside	2.0	9.6	3.3
Unavailability of Wage Labour	–	10.8	1.7
Poor Price of Paddy	–	14.5	18.2
Unstable Market	3.9	12.0	10.7
Decline of Government Subsidy	–	12.0	8.3

Table 8 presents the lack of water from both irrigation and rains as a principal factor in the decline in paddy farming in Welipothayaya and Madabadda. It should be noted, however, that other factors such as poor prices, market instability and deficiencies of the government subsidy on paddy are also material factors. This was confirmed when we examined the major reasons for the unpopularity of paddy farming among the people of the villages studied. We found 61 percent of the people in Puranagama and 51 and 54 percent of people in Welipothayaya and Madabadda respectively noted the lack of cultivable land, the low social status for farming, high production costs and the lack of funds as major factors that deter them from paddy farming. Among these, the scarcity of cultivable land was a dominant factor, noted as important by about 33 percent in Puranagama and 20 percent in the other two villages.

Since the decline in water supply following the construction of the Samanala Wewa reservoir, water distribution system changed from the equitable method practiced throughout the cultivation season, into a 'rotation system' (*mura kramaya* in Sinhala language). Although this was developed, under the leadership of irrigation officials of the Kaltota scheme, as a strategy to resolve the water problem, the deterioration of community cohesion, the increasing disunity, and the spread of water-related disputes and quarrels among villagers began to emerge as added problems in the complicated village society. The following statement of a veteran farmer shows how serious problems have become during the water rotation period. "In the first six weeks after the beginning of the cultivation season we get water regularly. Thereafter we receive water once every three days under a rotation system[14] regardless of whether the season is Yala or Maha. Thanks to monsoon rains, we do not face any water shortage during the Maha season. However, we need more water than is estimated by irrigation officials because most of the paddy land in the Welipothayaya and Madabadda is infertile. The soil is sandy and absorbs a lot of water. Because of these factors, the two colonization villages produce a higher demand for water than Puranagama. The rotation system was intended to provide sufficient water for paddy fields including those located downstream. But many upstream farmers tend to 'steal' water without any consideration for the

14 "The rotation schedule in Kaltota scheme has two 3-day turns. During the first turn of 3 days, water is provided to CPO1 to CPO11 as well as to D3, D4 and Pahathbima. The second 3-day turn supplies water to CPO12 and CPO25, and D1 and D2. However, this theoretical management rule is not strictly enforced. More water is provided to canals, which have a water problem. Long lateral canals (like D2) and sandy areas tend to receive a continuous flow. Personal relationships between the farmers and members of the field staff are important in obtaining ad hoc adjustments of the supply in case of need" (Molle *et al*, 2005: 14). Note: Since this is a quotation, please check carefully the sentence where I have made two changes.

community accepted rules and regulations laid down by our own organizations. During the water rotation period, we have to guard the channels all night. Many of our fellow farmers do not respect the rules and regulations enacted by the government officials who are responsible for the equal distribution of water among the farmers. In addition, some economically stronger farmers, who also have a close relationship with government officials and political leaders of the area, receive sufficient water for their paddy fields regardless of the rotation system." This implies that farmers' contribution and their cooperation under the rotation system is at a very low level. What is worse is that there is a distinct lack of trust and confidence in this system.

The CEB had paid a sum of Rs. 11.2 million as compensation to 450 families who were unable to cultivate about 800 acres of paddy fields due to the lack of water (Diwaina, 27. 08. 1997). Most farmers, especially tenant farmers, said that they did not receive any compensation from the CEB. They further said that this compensation went to landlords but not to the landless or near landless families in the scheme. The survey also found that most of the affected farmers did not receive compensation on an equal basis due to the improper distribution methods employed at the village level by CEB officials. As stated previously (Table 5), most farmers, especially in Welipothayaya and Madabadda, noted that what they wanted was water rather than compensation money because they realize that getting money without making an economic contribution is not a sustainable solution to their economic problems. The following statement of a villager is quite revealing in this regard: "Today our families survive thanks to the leakage[15] of the Samanala Wewa Dam to

15 At present, the only water discharge downstream results from the leak in the right bank flank, which is estimated to be 2 m^3/s. The river flows for approximately 26 km through of gallery forest before it reaches the Kaltota irrigation scheme which covers an area of over 1,100 hectares (ASD, 21 June 1996)

some extent, which we believe to be a gift from Mangara God[16] who offers this to protect our village and our lives. We need water to survive and improve our economic independence, not compensation. Compensation money will not bring a lasting solution to our socioeconomic problems. After the implementation of the SWP, many of our landless or near landless villagers who were dependent on chena cultivation and paid labour have lost the means of supporting themselves. Many of them have already left the village".

The farmer's simple words reveal the inadequacy of the CEB's approach and their lack of appreciation of farmers' attitudes towards their own economy. The villagers have realized that the CEB's and government officials' actions bring them only a short-term relief to their economic problems, but their long term economic security depends on their own efforts rather than on CEB compensation.

The conflict between government regulations and poor relationship between government officials and villagers: The survey also revealed how contradictory regulations of the CEB and the Irrigation Department have exacerbated the water problem in the Kaltota scheme. The officials of the CEB have made enormous efforts to minimize the Board's revenue losses, employing strategies to minimize water release for non-electricity purposes and encouraging farmers to use water efficiently and sparingly in the Kaltota scheme. These measures have not, however, provided the expected results because of the farmers' and irrigation officials' lack of cooperation. The following statement made by

16 Most people in the Kaltota scheme believe that Mangara God has protected them and their society since ancient time. The villagers said that when they faced water problems before the SWP, they requested help from Mangara god arranging a special event for the god called 'kanavendum amuna'. At present people organize another puja for the same god at the village temple called 'kirimaduwa' to request water for their paddy field. However, some villagers say that Mangara God was a 'cattle thief' and not a god.

a CEB official shows the conflict between these two groups of officials towards the water shortage problem:

"We have already promised and provided a large sum of money to repair the main channels of the left and right banks to minimize the wastage of water. We believe this will help us to save a large volume of water, which can be used for electricity generation. However, the irrigation officials will not allow us to do this because they say repair of the irrigation facilities is their responsibility. Farmers also told us several times that the problem is not only the lack of water released from the Samanala Wewa Dam, but also the poor channel system which needs urgent repair if there is to be efficient water distribution. We have already promised villagers that we can do this work at CEB's expense if the irrigation officials allow us to and the farmers promise us that they will save water after completion of the repairs". The urgent need to repair the irrigation system to save water for electricity generation and efficient water management has also been emphasized by Molle *et al* (2005: 14). It is not possible to manage water in this scheme effectively because many of the canal gates are in a dilapidated condition. Members of the Irrigation Department field staff try to close the off-takes with straw, weeds and debris, but these materials are often removed by farmers[17].

The irrigation officials, on the other hand, state that the repair of the irrigation system is under their authority and has to be done in accordance with the regulations, which specify the use of a particular technology. If CEB officials provide the Irrigation Department with the necessary funds, they can do this work on behalf of the CEB. However, according to CEB officials, the existing CEB regulations do not provide for such financial transactions with other government departments

17 See Molle *et al* (2005: 14-18) for further details about the present situation of water management in the Kaltota scheme.

without a change in the present laws and regulations. Even if irrigation officials did receive funds from CEB for the repair of the irrigation system, the farmers doubt whether such funds would be used properly. Their previous experiences with respect to such practices make them express these doubts. They also refer to misuse of funds by officials in the past. The CEB officials also state that they have released more water than they had promised before the construction of the dam. However the villagers and the irrigation officials are not aware of this. Farmers further say that the irrigation officials are not cooperating over the issue of water distribution. Many studies on water utilization patterns of irrigation systems in Sri Lanka have also found that the Kaltota scheme consumes a relatively high volume of water for paddy farming and related agricultural activities than in similar schemes in the country. The study reveals that this is due not only to the poor relationships between farmers, irrigation officials and CEB officials, but also to a lack of understanding, cooperation, and commitment on the part of relevant officials and villagers. The following description of a discussion between farmers and officials is offered as evidence of this controversy, which the author became aware of when he participated in a *Kanna* meeting (seasonal meeting)[18], which took place during the survey period. At the meeting, a government official requested the farmers to respect and adhere to the water-distribution-time-table and not to ask for additional

18 The kanna meeting is a very common event and one of the most important events in paddy farming areas of Sri Lanka. This gathering takes place before commencement of paddy farming under the leadership of the district secretary or his delegate and with the participation of farmers in the area. The main purpose of the meeting is to secure farmers' participation in decision making, particularly in the following areas: the time table in water distribution; dates of cleaning and repairing of the channel system; commencement of cultivation activities (date of land preparation, planting or broadcasting etc.); discussion and resolution of major problems and disputes of water distribution, as encountered in the last season; and agreement of a method of resolving anticipated difficulties in the present cultivation season.

water after the closure of water release. But one of the farmers pointed out at this stage that most of them did not know the exact dates of water release or closure. He further stated that the officials of the Samanala Wewa reservoir (CEB) did not inform the farmers' organisations of the date of water closure. Further, one of the farmers' organisation leaders noted that although the irrigation and CEB officials have a responsibility to inform farmers (through village level irrigation officials and farmers' organizations) of decisions on water distribution, this has not happened as regularly as expected. However, CEB officials emphasized that they do not have an obligation to inform farmers of their decisions on this matter. This discussion in the *kanna* meeting reflects the communication gap as well as the lack of cooperation among the government officials, the CEB officials and the farmers in the study villages.

The study also showed that the unavailability of irrigation officials in the village, particularly during the period of water distribution under the rotation system, was a major problem for the farmers. As a farmer explained: "the main problem we all face today is the lack of an irrigation official living in the village. There is an irrigation manager appointed by the department of irrigation for our scheme, but he lives outside the village and visits us only 1 or 2 days a week. He doesn't like staying at the irrigation quarters because of poor facilities there. If we had an irrigation officer living in the village as part of the community, the rotation system could have been operated for proper water distribution without any problem".

The official's part of this story is that he does not have the transport facilities to visit all the paddy fields in the scheme. The scheme is very large and irrigates about 856 hectares of paddy land along two major channels. Inspecting all the paddy fields without a suitable transport facility is difficult. The officer admits that a vehicle was allocated for him by the Irrigation Department but complains that the limited approved

fuel allowance rules out regular field visits. Limited funds from the central government thus lead to inefficiency of rural level field officers.

(2) Impact on Environment

It is well known that large-scale reservoirs constructed for irrigation and hydropower development have not only thrown traditional agriculture into disarray but have also caused lasting environmental damage, altering weather patterns as well. In particular, such projects divert waterways, remove hundreds of hectares of land from the landscape, cause loss of forest cover, lead to extensive agricultural expansion on erosive land, cause land salinisation, lead to loss of the ancient tank systems and loss of habitats. The large-scale dam projects in Sri Lanka over the last 2-3 decades have already had a negative impact on the surrounding regions. For example, a World Bank study shows that the environmental impact of the Mahaweli Irrigation Project[19] has been devastating (Withanage, 1996: 22). There are many studies of how such large scale reservoir projects impact negatively on the environment, particularly on tropical forests; the main source of biodiversity in developing countries. Despite such evidence, many developing countries continue to depend on such large scale dam projects to achieve important objectives like the prevention of flooding, the provision of cheap and clean energy to meet the growing demand from industrial development and to

19 The Mahaweli is the longest river in Sri Lanka (335 km). The MAHAWELI GANGA development project, the largest multipurpose river basin development project ever undertaken by Sri Lanka, involves the production of 508 MW of power and the development of 364,000 hectares of land for irrigated agriculture and human settlement. The area covers over 364,372 hectares of land. This project was launched in 1982 under loan and grant assistance of Rs.520 billion provided by the World Bank. By 1992 the project had displaced about 111,400 families or 700,000 people. See http://www.ywat.org/knowledgebase/riverbasins/as-mahaweli.html and Withanage (1996: 22-25) for further details.

provide irrigation water for agriculture (Withanage, 1996: 22). The available evidence of negative impacts of large-scale dams are often deliberately ignored by many developing countries because they do not have alternative sources of energy and water. Such projects are often implemented in spite of strong opposition from environmentalists, on grounds that these are necessary for modernisation of the country, which is of greater significance than environmental conservation and sustainability.

The Samanala Wewa Reservoir is no exception to this. It was launched at a cost of US$ 440 million, without any environmental impact assessment, and resulted in adverse environmental and social impacts including loss of valuable forests and destruction of indigenous fish species. This has displaced many small farmers who still have not received alternative plots of cultivable land. Some of the displaced villagers no longer have access roads as old roads have been submerged (Withanage, 1996: 23). A study of this project in 1992 conducted by Herath, Gunatillake and Karunarathne (extracted from Withanage, 1996: 23) found that this project affected people's traditional livelihoods, particularly paddy farming and subsistence agriculture, which were dependent on a regular water flow from the Walawe Ganga. A summary of their findings is given below:

> Failure to provide agricultural support services has already resulted in detrimental land use practices adversely affecting sustainability; water allocation and connected land use practices have become a major issue for farmers in the project area, particularly after dewatering of their lands by leaks on the dam side; mineral deposits (gem stones) have been inundated; the quarrying activities for the dam had an adverse impact on the houses and property of residents and the destruction of crops due to dewatering of the hillside by leaks in the tunnel and later from the dam side. The importance of

subsistence farming and its relationship with resettlement issues were ignored in evacuating 428 people with little or no socioeconomic planning and in violation of the CEB's own guidelines contained in the Electricity Master Plan and one of the major effects is that former land-owning farmers have now become landless labourers[20].

The present survey also found that the collapse of traditional means of livelihood has led to an increase in illegal activities like the cultivation of marijuana, timber cuttings and gem mining in state forests, hunting, burning of bush land in hilly areas and illegal settlements. All these led to even greater deterioration of the environment in the area surrounding the scheme. In particular, gem mining, timber cutting, and burning of bush in hill areas have directly caused a change in the weather pattern and an increase in the mosquito population, being dangerous disease carriers. Such processes are common to any society when people's principal livelihood has been destroyed. The affected people of the Kaltota scheme have engaged in activities they could find, regardless of their legality, because people will do whatever is needed for the survival of family.

In addition, villagers in the scheme complain that their water problems after SWP extended not only to agriculture, but also to their daily needs like drinking and washing. The water level in most of the wells, specifically in Welipothayaya and Madabadda declined since the regular flow of water in the Walawe Ganga stopped after construction of the dam and the 5.5 km-long underground tunnel. Although this effect was negligible in Puranagama, 17 percent of the people in Welipothayaya and 23 percent of the people in Madabadda noted that other water sources declined along with the construction of the Samanala Wewa dam (Table 8). There are many environmental studies which found that the

20 See Priyadarshani (1992) for a detailed analysis on the environmental impact of the Samanala Wewa dam.

construction of the Samanala Wewa dam and its underground tunnel adversely affected the water table so that not only man-made wells, but also water springs dried up. Many villagers noted that the streams that flow from the surrounding hilly areas dried up along with the construction of the Samanala Wewa reservoir. Some veteran farmers believe that even annual rainfall in this region has declined significantly over the last 10-15 years as a result of the SWP.

The study also learned that the decline of the regular water flow from the Walawe Ganga has resulted in pollution of the limited stagnant water in the river. This has had a negative impact on the natural environment and led to an increase in the number of mosquitoes and many other disease carrying insects. At the same time problems arose with wild animals, due to lack of water and food for them after the construction of the Samanala Wewa dam. This was especially so with elephants, who began to invade villages, destroying agricultural crops and even threatening people's lives. However, some people argue that there is no direct relationship between SWP and the elephant problem. According to them, this occurred as a result of the decline in forest area along with the rapid increase of population through the creation of new land settlement schemes, *chena* (slash and burn) cultivation and the increase of illegal settlements on state-owned land — and not as a direct result of the construction of the Samanala Wewa dam.

According to the present survey, respectively 43 and 39 percent of people in Puranagama and Madabadda feel that their village environment deteriorated after the creation of the Samanala Wewa reservoir (Table 9). The proportion of people in the Welipothayaya who feels that way, however. Is smaller. Although it is difficult to pinpoint the reason for this discrepancy in the villages, the distance of each village from the main anicut may provide a clue to it. Puranagama is is located nearer the anicut, and may be, it is facing garbage and other environment problems

Table 9: Some other Negative Impacts of the Dam on the Village Economy (%)

Type of Negative Impact	Puranagama			Welipothayaya			Madabadda		
	DC.	NC	IC	DC.	NC	IC	DC.	NC	IC
Food Consumption	43.0	57.0	0.0	28.0	72.0	0.0	33.9	61.2	5.0
Migration	—	70.0	30.0	—	76.8	23.2	1.7	76.0	22.3
Wage Labour	13.3	56.7	30.0	13.3	57.8	27.7	7.4	47.9	44.6
Exchange Labour	6.7	60.0	33.3	12.2	64.6	23.2	15.7	53.7	30.6
Community Cohesion	30.0	60.0	10.0	28.0	63.4	8.5	28.9	54.5	16.5
Environment Pollution	6.7	50.0	43.3	4.9	70.7	24.4	5.8	55.4	38.8

Note: **DC:** Declined; **NC:** Not Changed; **IC:** Increased

as a result of larger numbers of outside visitors to the anicut area. According to a Buddhist monk from the village temple, many tourists stop at this point to rest (eating, bathing etc.) and to use the toilets. This may have been the reason for the largest proportion in Puranagama, out of the three villages, claiming environmental damage after the construction of the reservoir. The stoppage of the regular river flow after the construction of the dam caused damage in spheres closely related to people's livelihoods: the decline of forest cover along the river bed, the drying up of springs and wells, the increase of mosquitoes in areas with stagnant waters, the decline of natural food crops in the hills, forest and around the river areas, and the disappearance of fish in the river. The impact of these factors on different villages was different and these differential impacts may have coloured people's opinion of the environmental impact of the Samanala Wewa project. However, it should be noted that some of the above-mentioned developments have had no direct relationship with the Samanala Wewa project.

(3) The other negative impacts

The survey was also designed to ascertain whether the implementation of the SWP has had any other negative impacts on specific socioeconomic spheres such as food consumption, migration,

wage labour, exchange labour and community cohesion. The results of the survey on these matters are presented in Table 9. The most significant effect revealed in the Table is the decline of food consumption since the implementation of the scheme; this is substantially high in Puranagama compared to the other two villages. The increase in out-migration is another negative consequence of the SWP according to opinions of the people who were interviewed in study villages. Nearly one-third of the people in Puranagama and about one-fifth of those in the other two villages noted that migration from their villages increased with the SWP. This cannot, however, be identified as a direct consequence of the SWP because such migration from rural areas was commonly observed in most villages in the country. They were moving out in search of jobs in the country's Free Trade Zones (FTZ), in Middle Eastern countries[21] or in the Sri Lanka army. Units of land becoming increasingly uneconomic as a result of the process of fragmentation and the lack of non-farm employment opportunities in the village itself are the principal push factors behind such migration from rural areas. The villages in the SWP were no exception [see also Molle *et al* (2005: 4)]. As Molle *et el.* (2005) noted the village economy of Sri Lanka has become dependent on four major sources of employment/ livelihood: first, migration, particularly of female workers to the Middle East; second, the Export Processing Zones; again mostly for female workers; third, the security

21 More than 1.2 million Sri Lankans work in the Gulf countries, many as domestic and construction workers. Further, there are about 300,000 who have migrated there unofficially. More than three quarters of these workers are rural unskilled women who work as housemaids under severe conditions for low wages. The remittance of these workers in 1998 was about Rs. 65 billion. Earnings from the garment export industry, (one of the highest export goods) is Rs. 82 billion, but half of this is the cost of importing the raw materials for the garment industry. So the income from migrant workers is a significant part of the Sri Lankan economy. See www.imadr.org/project/srilanka/srihome.html, and IPS, World News, January 4, 1999 for further information.

forces which increased in number due to Tamil separatist movement; and fourth, the Sri Lankan government's poverty alleviation programme. The contribution of these other factors to migration from rural areas was significant and that of the Samanala Wewa project in respect of villages examined in this study was a mere supplementary factor in this regard.

The other major finding of the survey is that 45 per cent of the people in Madabadda and approximately 30 percent of the people in the other two villages feel that wage labour has increased as a result of the SWP. The high proportion in Madabadda reflects the adverse effect SWP has had on paddy farming, and how it has forced people to become wage labourers. As discussed previously, this village was badly affected by lack of water due to its unfavourable location and soil conditions. However, it is interesting to note that approximately one-third of the people in Puranagama and Madabadda said that the use of exchange labour increased after SWP. This is quite an unusual change in Sri Lankan village economy because most of such reciprocal labour practices gradually declined with the development of the market economy. However, the reappearance of this traditional labour utilisation pattern may have been due to the difficulty of using wage labour due to economic constraints or the unavailability of such labour in the village as a consequence of the SWP.

The erosion of community cohesion in the scheme was another indirect effect found in the study locales. For example, approximately 30 percent (Table 9) of the people in the three villages stated that their community cohesion deteriorated after the construction of the Samanala Wewa reservoir. As noted previously, implementation of the water rotation system to offset the scarcity of water destroyed the traditional concept of working together towards a common goal in the village community. This can also be seen as an indirect consequence of the Samanala Wewa project, as the tendency away from community

participatory work has been a common feature of the recent period of liberalisation.

Positive Impact of the Samanala Wewa Reservoir

Most studies of large-scale dams have focused largely on their negative impacts on the national and the regional economy. This applies to existing studies of the Samanala Wewa project also. However, in the present study we have made an attempt examine its positive effects as well on the national and regional economy. The opinion in the survey villages consider the project as having generated the following favourable consequences: the improvement of the pattern of water utilisation and security of the water supply, an increase in income levels, the expansion of employment opportunities, the improvement of the economic infrastructure, the integration of the socioeconomic activities of the village economy with the national economy, the access to outside information and its contribution to the socioeconomic development of the village economy, the emergence of market-oriented agricultural products, an increase in the consumption of durable consumer goods and the emergence of non-economic activities along with the provision of electricity. These consequences of the project are examined further under two headings: the contribution to national economy and repercussions on the regional economy, particularly on the Kaltota scheme.

(1) Direct and Indirect contribution to national economy

As previously discussed, the Samanala Wewa reservoir is one of the principal sources of Sri Lanka's electricity supply. Most people appear to consider it a national treasure. Although its annual contribution to the country's power generation is relatively insignificant, it has already produced Rs. 16,095 million worth of energy (accumulated value) between 1993 and 2004. Figure 1 demonstrates how the annual power generation

of this project has increased since its operation began in 1993. This increase has been stable and continuously upward, although there were occasional year-to-year declines.

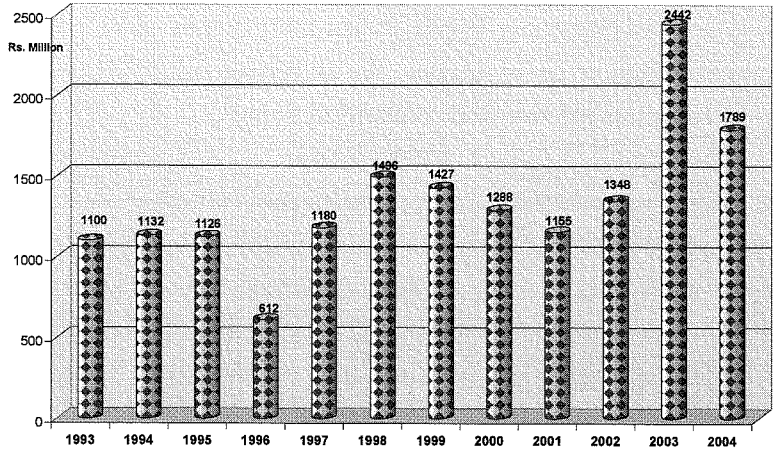
The establishment of Sabaragamuwa University[22] is recognized as an indirect contribution of the SWP to the national economy and the Ratnapura District. This new university was established in 1995, using the housing complex and other buildings, which had been constructed to provide residential and administrative facilities for the foreign and local staff during the construction of the Samanala Wewa reservoir. These facilities were estimated by the CEB to be worth about Rs. 100 million, and have already created nearly 1,000 permanent jobs while indirectly creating a high level of employment in the surrounding area.

In addition to undergraduate and post graduate training offered by this University and its contribution to the country's human capital formation, it has become a source of growth stimuli for the surrounding area of its location which once was a lonely rural area, inhabited by simple rural folk. The area now appears to be a teeming modern township and a busy education centre crowded with educated and fashionable young people. (*http://www. pvpubs.com/read-article.asp?*). These Sabaragamuwa University related developments in the regional economy could never have been achieved without the basic infrastructure facilities provided by the SWP.

Another indirect contribution of SWP is that it allowed the development of another irrigation scheme named the Katupathoya

22 Belihuloya, where the Sabaragamuwa University is located, is well known for its pristine beauty and salubrious climate. It is in a rural setting about 160 km from Colombo on a highway leading to tourist centres in the hill country and nestles below a range of hills that rise up to some 2000 meters above sea level. It has the potential of developing into a beautiful campus with facilities and opportunities attractive to all those who seek higher education.
(http://www.pvpubs.com/read_article.asp?ID=26&article_id=141).

Figure 1: The Trend of Annual Energy Supply of the Samanalawewa Power Station



Source: H.S. Somatilake, "Samanalawewa Power Station", Presentation.

Scheme. This uses water, released after power generation at the Kapugala Power Station. Under this scheme, the CEB has provided irrigation water for about 400 hectares, whose cost has been estimated at Rs. 66 million, of which 23 percent (i.e. Rs. 15 million) was provided by the CEB. This newly developed irrigation system has provided a secure water supply not only for the newly developed paddy lands, but also for old paddy fields which were cultivated using only rain water until the establishment of this project. According to our survey, more than 500 farm families, comprising about 4,000 people, live in three villages, namely Diyavinnagama, Kalupedigama and Kongahamankada, that depend on this new irrigation scheme, established after SWP. A veteran farmer who is also a leader of the village community in the area expressed his feeling as follows: "Thanks to Samanala Wewa project, today, we can cultivate our paddy lands twice a year. Before this project, we could cultivate paddy once every 2-3 years. Today we can survive without depending on outside assistance because of this new irrigation project, which emerged as a result of the Samanala Wewa project. In particular, we can get more water in the dry season for cultivation not

only of paddy, but also of market-oriented cash crops like vegetables. This is because Samanala Wewa Power station uses more water for power generation in the dry season. We all believe that SWP has helped us to increase our incomes and standard of living".

(2) Direct and indirect contributions to the Kaltota scheme

The study finds that the water management / utilization system has changed not only as a result of water scarcities brought about by the SWP, but also through the efforts of CEB officials to introduce various new water management strategies and water-saving technologies. Among these, the rotational schedule, water management at the lateral canal level, plot-to-plot water management and the SRI system are strategies introduced by CEB to improve water management in the Kaltota scheme[23]. These have also marked the beginning of a gradual change in traditional attitudes toward water, from viewing it as a non-economic good to an economic good. The employment of new ways of water distribution like the rotation system may have influenced people to reconsider their traditional pattern of water utilization. The following statement by a farmer is revealing in this regard: "Unless we use water very carefully, our families will not survive. Our livelihood is absolutely dependent on the availability of water. This has influenced us all to find an alternative strategy for using this limited resource for our requirements. These attitudinal changes have contributed to improving the water management of this scheme. Although some conflicts have emerged among villagers relating to water distribution, we all have learnt a lesson and have used the opportunity to rethink on the efficient utilisation of a scarce resource like water". This simple statement

23 See Molle *et al*, 2005: 14-18 for detailed information on these water management strategies introduced by the CEB after the construction of the Samanala Wewa dam.

reveals that the shortage of water produced by the discontinuation of the regular flow from the Walawe Ganga has caused farmers to reconsider their attitudes towards water utilisation. Table 10 shows how villagers were committed to alleviating the water problem individually as well as cooperatively.

Table 10: Villagers' Efforts to Minimize the Water Problem after Construction of the Samanala Wewa Dam (%)

Type of Efforts	Puranagama	Welipothayaya	Madabadda
Community Efforts			
Make Wells	5.9	10.8	1.7
Make a Small Dam	2.0	1.2	0.8
Repair Cannels	7.8	13.3	6.6
Compelled to Well Manage Irrigation Facilities	37.3	67.5	69.4
Decided to Distribute Water According to Rotation System	51.0	85.5	83.5
Selected a Person in Charge to Manage Water Distribution	49.0	83.1	72.7
Individual Efforts			
Make Wells	11.8	18.1	9.9
Make a Small Dam	0.0	1.2	0.8
Repair Cannels	3.9	0.0	5.0
Compelled to Well Manage Irrigation Facilities	13.7	44.6	33.1
Participated to Select a Representative for Water Distribution	35.3	48.2	47.1

Table 10 shows that as a community, more than two-thirds of the households in Welipothayaya and Madabadda were powerfully committed to distributing the limited water equitably in the face of unlimited water-related needs. The water problem was not as serious in Puranagama. It has become very serious in the other two villages due to factors of geographical location. However, as a community, nearly half of the people in Puranagama were also obliged to support the newly

introduced water management efforts like the rotation system and to appoint a veteran farmer for water management.

The study also found that **security of the water supply** has improved with the construction of the Samanala Wewa reservoir. The water availability from the Walawe Ganga depends on the rainfall in the upper reaches of the river, particularly in the mountainous areas. It is well known that water was limited during the dry season for the people in the study villages even before the implementation of this project. However, now water is held at the reservoir all year round and can be released in accordance with the needs of the people, especially during the dry season when the monsoon rains are not available. Many villagers noted that they could now get irrigation water throughout the year thanks to the reservoir. They further feel that they can now cultivate in two seasons (*Yala* and *Maha*) without much fear of water scarcity in the yala season when monsoon rains are not available. Water supply stability has also provided economic security to people in the scheme. According to them, the regular provision of water allows them to continue their economic activities throughout the year. The provision of compensation by the CEB for foregone crops due to non-cultivation provided further protection of the people's economic position. Table 11 indicates people's attitudes towards the CEB's compensation policy and their future economic security.

Unlike in Puranagama, more than three fourths of the households in Welipothayaya and Madabadda admit that they had received compensation for foregone crops due to non-cultivation. Here too the difficulty of water supply was the main reason for receiving compensation in these two villages. Another important factor coming out of the data is that the majority of the people in these two villages feel that the extent of their economic security had improved as a result of the implementation of SWP. They also seem to think that they could get

mofre closely integrated with the national economy as a consequence of the project, although they express some dissatisfaction with the compensation policy.

Table 11: People's Attitudes toward Compensation Policy and Economic Security (%)

Attitudes	Puranagama	Welipothayaya	Madabadda
Receive Compensations	25.5	74.7	77.7
Satisfied with the Compensation Policy	2.0	12.0	8.3
Created conditions of Economic Security & a New Hope for the Future	23.5	43.4	43.8
Provided a Base for Modernization of the Village	27.5	59.0	39.7
Helped to Integrate the Village Economy with National Economy	25.5	60.2	43.0

The improvements to **economic infrastructure**, specifically irrigation channels, road facilities, electricity and public transport are identified by our respondents as important contributions of SWP to the Kaltota scheme (Table 12). No direct involvement of the CEB officials was permitted by existing administrative regulations in the repair of irrigation facilities. The CEB has, however, provided Rs 5 million directly to the Department of Irrigation to carry out some urgent repairs to the channel system. About one-fifth of the people in Welipothayaya and Madabadda admit that the conditions of irrigation channels had improved due to the CEB's assistance. The CEB officials attempted to reduce wastage of the water issued and to minimize the amount of water released for non-electricity generating uses by assisting with the repair of the irrigation facilities. The CEB officials maintain that the cost of repair of the irrigation system in the Kaltota scheme will eventually be offset by savings effected in the use of water, which can then be used for generating electricity. However, they strongly emphasize that this depends on farmers' cooperation.

Furthermore, more than one-third of the people in Welipothayaya

and half of the people in Madabadda believe that construction of the Samanala Wewa dam expedited the supply of electricity to their villages. The CEB officials said that they have spent a large sum of money to supply electricity to Madabadda and to more than 10 other electricity projects in the region since 2002. According to the villagers, this has contributed to the emergence of several small-scale industries like rice mils and an increase in the consumption of durable consumer goods like televisions and radios. SWP has indirectly helped through these mechanisms to integrate the village economy with the macro economy through information transfer from outside the village economy.

The construction of the Kapugala road (27 km) the repair of the Kumbalgama road (8 km) and the Kapugala-Weligepola road (12 km) in 1990 are some of the other important contributions of the SWP to improve economic conditions in the Kaltota scheme and its surroundings. The CEB has spent millions of rupees on the infrastructure between 1990 and 2000. In this respect, many people stressed that these new roads helped to integrate their villages with the nearest large commercial centre of Balangoda and thereby to other major cities of Ratnapura and even Colombo. These newly constructed roads also helped villagers to transport their agricultural produce to markets and obtain better prices.

In addition, the provision of six tractors and a number of water pumps and small machines to agricultural organizations in the scheme by the CEB was another attempt to save water through minimizing the land preparation period. Although it was practical, the utilization of the tractors, water pumps and other machines had failed to become popular among the villagers due to the improper methods of distribution of these machines among farm households. This assistance did not increase cultivation of more than a few farmers in the targeted villages.

Introduction of new technologies, specifically water-saving technologies, organic farming and organic fertilizer, was also attempted

Table 12: People's Attitudes about Infrastructure Facilities Provided by the Samanala Wewa Project (%)

Type of Infrastructure Facilities Improved after the SWP	Puranagama	Welipothayaya	Madabadda
Road	5.9	33.7	12.4
Electricity Facilities	19.6	67.5	56.2
Telephone	0.0	9.6	2.5
School Facilities	2.0	9.6	0.8
Health Facilities	3.9	4.8	0.8
Irrigation Channels	7.8	21.7	19.6
Transport (Public)	13.7	37.3	8.3

SWP=Samanala Wewa Project

under the SWP. Namara *et al* (2003: 8) found that, SRI (System of Rice Intensification) appeared to be a potential water saver so CEB took steps to promote SRI among farmers in this scheme. The CEB spent a large sum of money to introduce and encourage the use of these technologies among farmers in the study villages. However, the survey revealed that CEB's efforts, particularly the diffusion of SRI failed to become popular among farmers since it involved a high labour input. According to Namara *et al* (2003) (as cited in Molle *et al,* 2005: 22), an average increase in yields by 40 percent is expected when technology was shifted from conventional rice farming to SRI, but labour requirements of the latter technology are around three times those of the conventional method. It has also been further noted that the SRI system is more attractive to farmers with a large family labour force. However, the survey showed that the utilisation of organic fertilizer, which is also a requirement of the water-saving technology, has gained popularity among many farmers in the study villages. This new development is expected to bring about an increase of organic farm products where such products command high prices in urban markets because of the increasing demand from the newly emerging middle-class.

Table 13: The other Positive Impacts of the SWP on the Kaltota Scheme (%)

Types of Contributions Increased	Puranagama	Welipothayaya	Madabadda
Demand for Agricultural Products	13.7	33.7	9.1
Price of Agricultural Products	15.7	30.1	17.4
Market for Agricultural Products	13.7	27.7	9.1
Knowledge of New Technologies	17.6	39.8	33.9
Productivity	11.8	31.3	18.2
New Market-oriented Products	9.8	12.0	6.6
Demand for Imported Food Products	15.7	20.5	16.5
Employment Information	9.8	13.1	–
Tourists	15.7	18.1	10.7
Government Supports	3.9	18.1	9.9

Other contributions: There were positive contributions from SWP to the study villages as a result of the facilitation of information inflow from outside (Table 13).

Overall, Table 13 reveals that the SWP has produced favourable conditions for agricultural produce of the three study villages. In particular, about one-third of the people in Welipothayaya believe that there was an improvement in the market and the demand for, the prices of, production technologies and productivity in respect of agricultural produce. The corresponding figures for the other two villages ranged between 10 and 18 percent. The other interesting point brought to light in the Table is the increase of tourists and the demand for imported food products. This shows how integration of the Kaltota scheme with the outside world has resulted in an inflow of outside information to the village.

IV. Concluding Remarks

The Samanala Wewa Project (SWP) provides strong evidence of Sri Lanka's failure to utilise foreign aid for development activities. It also demonstrates the inability of recipient institutions to make constructive

decisions regarding development when they are dependent on foreign assistance or so-called foreign loans. In particular, the failure to recognize the project's tremendous negative impact on the regional society and economy, and its ongoing unreliability due to leaks, shows that Sri Lanka, a country dependent on foreign aid, was unable to produce sustainable development from that foreign aid. The findings of the study focus on significant issues such as the project's negative impact on socioeconomic activities and the environment, and the ongoing cost for continuing repairs of the leak. All the evidence suggests that this project has been one of the most unsuccessful implemented with large amounts of foreign aid and it is expected to be unstable and economically unviable in the long-term.

The results of the Kaltota scheme survey are mixed and show that the SWP has had both positive and negative impacts on people's livelihood. The principal source of income of the people is agriculture, specifically paddy farming. The survey revealed that people began to face severe water shortages after the implementation of the SWP, not only for paddy farming but also for their daily needs. However, along with the new constraint on paddy farming, people gradually started to change their traditional attitude towards water, i.e. from viewing it as a non economic good to viewing it as an economic good. As a result, water management in the scheme improved substantially. However, some researchers found that paddy farming productivity has declined considerably and large tracts of paddy lands have even been abandoned due to the scarcity of water after the implementation of SWP.

The survey also found that CEB has made an enormous effort, under various programmes, to minimize the water shortages caused since the implementation of the SWP. Although CEB implemented a compensation policy, to redress the damage caused to people's livelihood, the results were not as successful as expected, however the other strategies they

employed to solve the water problem, like water-saving technologies and efficient water management strategies, in cooperation with the farming community, produced reasonably good results. According to farmers, water management in the scheme improved greatly after water-saving technologies were introduced to minimize water use in paddy farming, like the SRI system, the rotation system and the distribution of agricultural machinery. It is also important to emphasize that many farmers in the surveyed villages said that they now had a guaranteed water supply thanks to the storage of water at the Samanala Wewa reservoir. CEB officials also stated that they intend to continue their efforts to provide an adequate water supply to farmers through greater cooperation between the farmers and the irrigation officials.

The other significant finding of the survey is that most of the farmers have confidence in their traditional livelihood and a desire for economic self-reliance and do not wish to become dependent on compensation or any other material assistance provided by the CEB or the government. Most farmers in the scheme realize that their economy is dependent not only on the availability of the water supply, but also on their commitment to use the limited supply as efficiently as possible.

The results of the Kaltota scheme survey reveal not only the negative impacts on people's livelihood and the environment, but also the positive ones such as the helpful contributions made to the Kaltota scheme as well as the surrounding areas of the project and to the national economy. These contributions were made mainly through providing electricity to the industrial sector and households, and developing infrastructure like roads and buildings, which were used in the implementation of the Samanala Wewa project. Although the power supplied by the project has shown an upward trend since its completion in 1993, the dam's continuing leaks and its endless maintenance costs have cast doubt on its long term benefit. On the other hand, the infrastructure, mainly housing and roads

which were developed for the initial requirements of the project were not designed to be used for other purposes and are not suitable to meet the demands of socioeconomic development. Most of these facilities, especially the houses, were constructed for temporary purposes only, not for the future needs of the region and country. If these facilities had been planned for multiple purposes, particularly for the development of the regional economy, the damage from the Kaltota scheme could have been minimized. This also demonstrates the failure of the recipient institutions to make sound decisions and to produce long term plans for the utilisation of foreign aid to achieve long term stable and independent economic prosperity for the country.

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