

IRRIGATION DEVELOPMENT AND FOOD SECURITY IN SRI LANKA

By

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For the past several decades irrigation development coupled with new agricultural technologies especially for rice has provided the engine of growth for the food crop sector and food security for the nation. Now the era of construction of major irrigation schemes and expansion of irrigated area has come to an end, and output growth in the food crop sector has stagnated. There is uncertainty about the future directions for agriculture and irrigation development, an uncertainty intensified by the growing scarcity and competition for water. The issue is not one faced by Sri Lanka alone but by many other Asian countries who experienced rapid agricultural growth from the mid 1960s to the mid 1980s.

Our specific objective in this article is to examine the role played by irrigation in food security and agricultural development and the prospects for further development of irrigated agriculture. What have been the policy objectives? What have been the benefits and costs? What are the implications for the future development of irrigated agriculture and for food security?

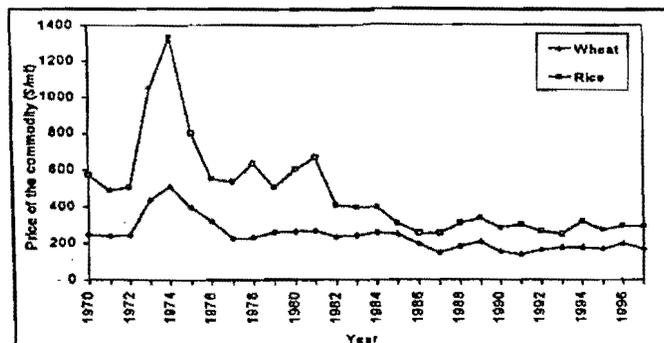
Global Food Security

Food security can be examined from a global, national and household perspective. National food security policy must take into account the global and household level situation. Global food security was a matter of strategic importance in the developed and developing countries during the cold war years. Asia was the region of greatest concern. The population explosion after World War II led to a fairly rapid transition from land to labor surplus. By the 1960s, ways were being sought to increase the productivity of land and avoid a pending food crisis. The development and release of modern fertilizer-responsive varieties of rice and wheat offered

the potential for achieving rapid yield increases. But it was obvious that major investments in irrigation and supporting infrastructure and institutions would be needed if this potential were to be realized. Crop failures in the Indian sub continent in the mid 1960s, and a world wide shortfall in grain production in the early 1970s led to sharply higher grain prices (Figure 1) providing the inducement for major investments in agriculture and irrigation. The World Bank and other international lending agencies helped to finance the construction of large public irrigation schemes. Throughout Asia, investments to increase irrigated rice production accounted for a major portion of foreign and domestic investments in agriculture. Over the three decades from 1960 to 1990 the irrigated area grew by 1.7 percent annually reaching about 143 million hectares or about 64 percent of the world's net irrigated area. Approximately one third of the cropland in Asia is irrigated.

As a consequence of the investments in irrigation and new cereal grain technologies, the world prices of rice and

Figure 1: Real world prices of wheat and rice 1970-1997 (in 1990 dollars)



wheat have fallen to about half of their levels in the early 1960s (Figure 1). The intensification of production in irrigated agriculture played an important role in achieving and maintaining global security

in the past and must continue to do so in the future. But the lack of opportunities for further expansion of irrigated area and growing scarcity of water for agricultural and non-agricultural uses add a new element to the food security problem. The article by Seckler et. al. addresses some of the concerns related to global food security and the future development of water resources.

Domestic Food Security

In Sri Lanka, just as in much of the rest of Asia, successive governments have been concerned about the country's ability to meet the demand for food for its rapidly growing population. Although the term *food security* has not been clearly defined, official documentation and pronouncements by policy makers have associated food security with self-sufficiency in rice. The report of the national policy framework for agriculture, land and forestry (Ministry of Agriculture, Lands & Forestry 1995) notes that:

"Paddy is the staple carbohydrate of the Sri Lankan's and its importance to the nation's economy via saving of

foreign exchange through import substitution and employment of a large segment of the rural population cannot be over emphasized. About 1.8 million farmers or 10 percent of the total population are engaged in paddy cultivation. Rice accounts for 45 percent and 40 percent of per capita calories and proteins respectively in the Sri Lankan diet. Hence food security, by pursuing a policy towards achieving self-sufficiency in the major staple, rice should be a major policy goal".

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A recent report of the World Bank (1996) argues that Sri Lanka currently has no comparative advantage in the production of rice and other field crops in either major or minor irrigation schemes or under rainfed conditions. The study asserts that "food security in terms of 'physical self-sufficiency' was purchased at a high cost through investment in very capital intensive irrigation schemes to produce a low valued commodity" and the continued focus on rice self-sufficiency inevitably constrains the performance of the agricultural sector.

We agree on the need to broaden the concept of food security beyond the focus on rice self-sufficiency. But it is clear that Sri Lanka continues to have a comparative advantage in producing rice, particularly in the *maha* (wet season) where there are almost no suitable crop alternatives. Furthermore, the World Bank was instrumental in supporting the development of irrigation projects such

national food security. For example, wheat is gradually becoming a more important component of the Sri Lankan diet and this has been encouraged by the government through subsidies on the price of wheat and tariffs on rice imports. Between the mid 1960s and the mid 1980s paddy production grew at 4 percent per annum (Figure 2). Per capita consumption in this period ranged from 105 to 115 kg. per annum, with no apparent trend. Since 1977 imports have averaged 200 thousand metric tons per annum and ranged from 100 thousand to 300 thousand metric tons or 7 to 15 percent of consumption. Rice imports as a share of total imports is around 1 percent. Thus, rice imports have been maintained at low levels.

By contrast to rice, annual per capita wheat consumption has risen from less than 20 kgs. in the early 1960s to 50 kgs. in the mid 1990s. Annual imports have risen to steadily in the 1990s and exceeded 1000 metric tons in 1995 (Figure 2). Thus, maintaining rice production at 85 to 90 percent of domestic needs and increasing imports and per capita consumption of wheat has been an acceptable food security strategy to date. Prices for rice and wheat have remained relatively stable, and supplies of these two staples have been readily accessible to all segments of the economy.

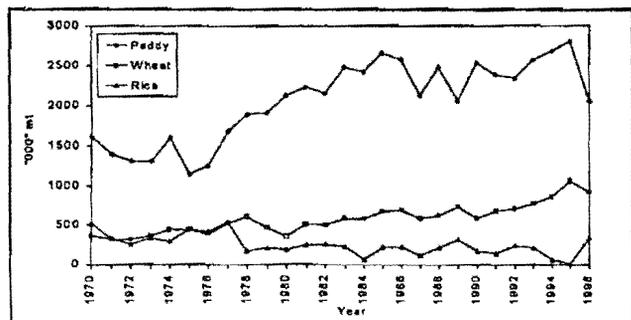
of crops other than rice continues to involve a high element of risk. Where possible, rural households look for more stable alternative sources of income, such as employment of family members in the garment factories, the army or overseas but opportunities for either farm or non-farm employment are limited. Dunham and Edwards (1997) indicate that rural economy is being kept afloat by off-farm employment, particularly remittances.

The Development of Irrigation

Against this background, let us consider the factors associated with the development of irrigation in Sri Lanka. Throughout the post independence (1948) era, until very recently new irrigation construction was viewed as one of the most important investment opportunities in the country receiving support from one political administration after another. Irrigation as a share of total public investment exceeded 30 percent in the 1950s, but ranged from 15 to 20 percent until the late 1980s (Aluwihara and Kikuchi 1991). From the early 1950s to the mid 1980s the area irrigated rose from approximately 250 to 550 thousand hectares, but has remained fairly constant since then. During that same period the area in major public irrigation schemes tripled from 100 to 300 thousand hectares. However, the major irrigation schemes have encapsulated many existing minor systems.

The change in government following the 1977 election marked an important turning point in the development of the nation's economy. The new strategy was launched in consultation with the IMF and the World Bank. The thrust of the reforms were in the direction of

Figure 2. Sri Lanka paddy production and, rice and wheat imports 1970-1996.

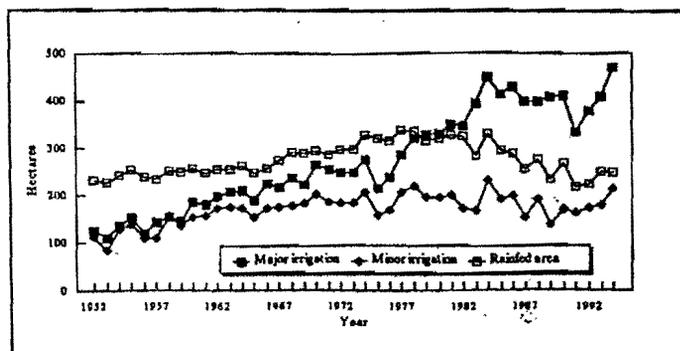


as the Mahaweli in Sri Lanka and elsewhere in Asia when food grain prices, and hence benefit-cost ratios, were considerably higher than they are today. The right question to ask is: *What would the international price of cereal grains have been if the World Bank and other donors had not financed the construction of large-scale irrigation systems such as the Mahaweli in the 1970s and 80s?* Most observers would agree that the global and domestic food security and agricultural surpluses achieved by these investments was well worth the cost. Today's low benefit-cost ratios, due in large measure to the decline in food grain prices, largely reflects the success of global and domestic food security strategies.

Changing household consumption patterns are also having an impact on

Rice production remains an important part of food security at the farm household level. Rice can be consumed in the household or easily marketed. An increasing amount of rice is being produced under irrigated conditions which provides the farmer with a higher and more stable production. However, due to poorly developed markets, high marketing costs and volatile prices, production

Figure 3. Area planted to rice by water source (1952-1994)



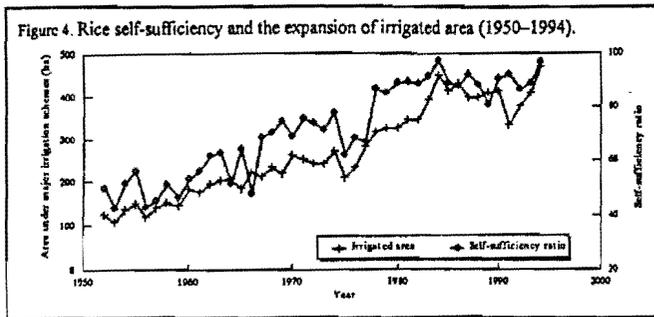
Source: ARTI Data Bank Statistical Abstracts (various years)

reducing government interventions and allowing for market forces to guide the pattern of economic activity (Rodrigo and Attanayaka 1988). However, public investment in irrigation and water resource development was given high priority. The Accelerated Mahaweli

in increasing rice production in the country and realizing a foremost national policy objective of self-sufficiency in rice. Figure 3 shows the trend in the area planted to rice during the period 1952 – 94 in the major and minor irrigation schemes and under rainfed conditions. Between 1952 and 1985 the area planted to rice under major irrigation schemes grew at an annual rate of 4 percent. The two other modes of rice production grew at a modest 2 percent and 1.5 percent respectively. As noted earlier, the major irrigation schemes encapsulated minor irrigation schemes.

Figure 5 shows the substantial yield advantage in rice production under the major irrigation schemes during the *maha* (wet) season. The yield advantage of the major schemes is even more pronounced in *yala* (dry) season, with yields for major irrigation schemes consistently about one ton higher than for minor irrigation schemes principally due to the higher level of fertilizer and other purchased inputs. It is interesting to note, however, that annual yields are at least at variable under irrigated than under the rainfed conditions. This may be due in large measure to the way in which water resources are currently managed in storage reservoirs. Panabokke, in his article elsewhere in this volume, observes that decisions regarding the release of water are “governed by subjective considerations rather than an objective reliance on a stochastic analysis of past rainfall and reservoir inflow data”.

Figure 4. Rice self-sufficiency and the expansion of irrigated area (1950-1994)



Source: ARTI Data Bank - Statistical Abstracts (various years)

Development Project (AMDP) was initiated despite concerns about the impact of the size of this project on the economy as a whole. Over the past two decades AMDP has accounted for 90 percent of total irrigation investments.

Three factors appear to have received almost equal weight in the decision to undertake the AMDP: food security, hydropower generation and employment. The short fall in food grain production in the mid 1970s had led to higher prices worldwide (Figure 1). Sri Lanka experienced declines in rice production due to drought in 1972 – 73 and again in 1975 – 76. The global energy crisis that occurred at almost this same time provided a strong incentive for developing hydropower. Finally, the continued investment in major irrigation schemes offered the opportunity to increase employment. According to census figures during the 1971 – 81 period agriculture grew at 3.4 per cent per annum largely due to the introduction of *green revolution technology* but over this same decade employment in the rice sector declined. Resettlement schemes to create job opportunities for families in the newly irrigated areas in the dry zone were part and parcel of the AMDP.

Irrigation Development and Food Production

There is clear evidence that irrigation development played a pivotal role

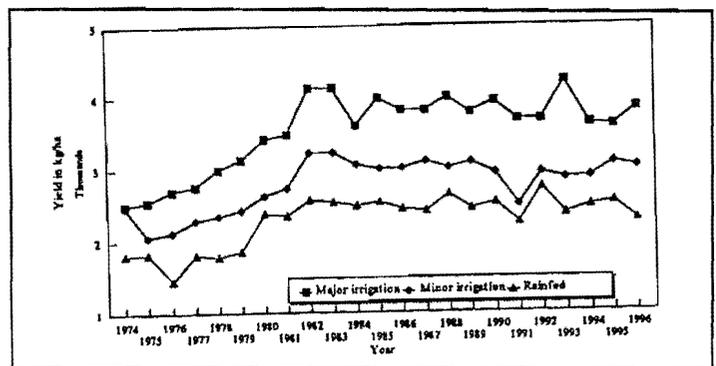
However, there has been a marked decline in area under rainfed rice since the mid 1980s. The decline is pronounced in the more urbanized wet zone

where there has been a substantial increase in the demand for housing and other urban needs. The short fall in paddy output resulting from the loss of these lands has been more than offset by intensification of paddy cultivation in irrigation schemes. Figure 4 shows that the degree of self sufficiency in rice is strongly correlated with the expansion in the area under irrigation. Without the investments in major irrigation schemes, Sri Lanka's rice self-sufficiency level would have been at 78 percent as against the 97 percent realized in 1994.

Irrigation Development and Employment Generation

Another principle objective of irrigation development has been employment generation. The development of

Figure 5: Paddy yield by mode of irrigation - (maha season)



Source: ARTI Data Bank Statistical Abstracts

Table 1: Percentage Distribution of GDP.

Country	Agriculture		Industry		Services	
	1970	1985	1970	1985	1970	1985
Sri Lanka	25	22	25	38	37	52
Bangladesh	25	10	18	31	56	52
Indonesia	25	19	18	36	57	51
Philippines	25	10	18	39	53	50
Malaysia	25	10	18	36	49	50

Source: World Bank World Development Report, 1995 & 1997

major irrigation schemes in the dry zone was accompanied by population resettlement and employment generation. Between 1946 and 1981 the population of the dry zone, which accounts for 62 percent of the country's land area, increased from 1.2 to 3.8 million or from 12 to 26 percent of the population of Sri Lanka (Dept. of Census and Statistics 1995). Many of the new settlers have been landless families from the wet zone who were resettled in the irrigation schemes and provided with employment opportunities in farming. The construction of the major irrigation works themselves also provided a good deal of additional employment.

However, resettlement has had its problems. Critics of the Mahaweli Development Project have noted: (i) the strong engineering bias in the planning and execution of the project; (ii) inadequate attention to social services; and (iii) lack of planning for the second generation of settlers which has led to social problems, fragmentation of holdings, and poverty in many of the resettlement areas (see Muller and Hettige 1995). They have also argued that investments should not simply produce small subsistence level family production units across the project area but should have resulted in a regional growth and development which prepares the ground work for agricultural diversification and industrialization. They conclude that inadequate investments in social infrastructure development in the downstream areas may well explain the significant agricultural diversification and the absence of rapid growth in the new settlements (Muller and Hettige 1995).

Characteristically, as an economy develops the share of *Gross Domestic Product* (GDP) in agriculture declines. This so-called *agricultural transformation* also leads to a decline in employment in agriculture as the opportunity cost of employment in non-farm jobs rises. Today in the United States and Japan, agriculture represents less than 3 percent of total employment and 2 percent of GDP. But the transition from an agrarian to an industrial society occurred over the period of almost a century. Their strategy in the early stages of development involved a strong commitment to investment in the rural economy. Subsequently as agriculture became a small part of the total economy, the agricultural sector was heavily subsidized.

Table I shows the change in the percentage distribution of *Gross Domestic Product* (GDP) from 1970 to 1995 for Sri Lanka and for neighboring Asian economies. The transformation has been most rapid in Indonesia and Thailand and slowest in the Philippines and Sri Lanka. While in the former two countries the rural labor force has found jobs in the domestic economy, in the latter two, the rural sector has been supported much more heavily by domestic and overseas remittances. In all four countries there have been substantial adjustment problems, and the rural sector is being left behind. In an insightful article, Dunham and Edwards (1997) document the changing nature of the Sri Lankan rural economy, the growing poverty, and the growing importance of remittances and other transfers.

One of the objectives of economic liberalization is to speed up the process of agricultural transformation. But given the current financial, and environmental (pollution) problems being faced by the fastest growing economies, and the mounting rural poverty in some regions, there is much to be said for stronger investment in the rural areas to increase the productivity of agriculture and attack poverty even if it means a somewhat slower economic growth.

The Future of Irrigated Agriculture

Irrigated agriculture provides the greatest potential for further growth and intensification of crop production. With the decline in output growth, the limited opportunities for expansion of irrigated agriculture, and rising rural poverty, the agriculture sector is at the cross roads. There is much debate in the government about future directions for agriculture and the policies and investments necessary to support agricultural development. There are those who support the World Bank thrust for liberalization and those who take a more traditional projectionist view. However, neither strategy seems particularly suited to solve the current problems of the Sri Lankan rural economy.

The experience in other countries suggested that there is a process of change that can lead to higher farm incomes and a strong role for agriculture in the early stages of economic development. There is no complete agreement on the policies and investments needed to stimulate the growth of the rural economy. But there are lessons on where to place the empha-

sis and on policies to avoid to insure that the rural sector does not become impoverished in the course of development.

Food security and employment generation will continue to be high on the policy agenda. However, domestic food security is already taking on a new dimension. There should be continuing emphasis on the need to provide all levels of society access to basic staples with the Food Stamp, Janasaviya and Samurdhi programs serving as a safety net for the poorest 30 percent of the rural economy. Staples are provided through domestic production (rice) or by imports (wheat). A gradual rise in food grain imports should not be viewed as a serious threat to food security as the import bill is a very small part of domestic imports. Caution should be exercised not to be overly protective of the rice sector. But investments in rice research and technology should be strengthened as rice will remain the backbone of irrigated agriculture and much of the rural economy for the foreseeable future.

As agriculture becomes more commercialized it tends to become more diversified. But there is much confusion about the concept of *diversification*. Diversification can occur at three levels – in consumption patterns, in the agricultural sector, and at the farm level. With the increase in trade, the diversification in consumption patterns becomes very pronounced. The agricultural sector may become more diversified but depending on the crop, farms may become more specialized to take advantage of scale economies in production and marketing. Poorly developed markets remain a major constraint to agricultural development in Sri Lanka. Further government investments will be needed in rural infrastructure – roads, electricity and communications – to facilitate the development of private marketing and rural small scale industries.

The further development of irrigation will continue to play a critical role in maintaining food security and facilitating rural development. As noted earlier, the opportunities for expansion of the irrigated area and the benefit-cost ratios for new irrigation have declined. This factor coupled with the growing competition for water among sectors makes it imperative to increase the productivity of water in agriculture.

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