

IMPACT OF LARGE SCALE IRRIGATION SCHMES ON POVERTY ALLEVIATION IN THE DRY-ZONE OF SRI LANKA

Aruna Shantha, A¹⁺ and Asan Ali, B.G.H.²

PhD Candidate¹

School of Economics, Collage of Business,

Northern University of Malaysia, Malaysia

aru@sab.ac.lk or arunaeconomics@yahoo.com

Professor (PhD)²

School of Economics, Collage of Business,

Northren University of Malaysia, Malaysia

ali@uum.edu.my

ABSTRACT

Agriculture playing a significant role in rural employment in Sri Lanka and it is still account for 12 percent of gross domestic product (GDP), 24 percent of total export and 33 percent of total employed labour force. The principle irrigated crop, paddy is grown on nearly 730,000ha of land, and 383,000ha of this total is grown under major irrigation system and another 170,000ha functioning under minor irrigation tanks. Balance 171,000ha which is non- irrigable paddy land sown by small scale paddy farmers under rain-fed system. The purpose of this paper was to compare the income and poverty situation among irrigated and rainfed farmers in the dry-zone of Sri Lanka. The study used primary data collected through household-level surveys conducted two times during 2011 and 2012. The 370 irrigated farmers and 327 rain-fed farmers in dry-zone were interviewed using detailed multi-topic questionnaire. In addition, the study employed a participatory poverty assessment approach to obtain qualitative information and data from the households. Poverty was measured using monitory as well as nonmonetary indicators. The study results indicate that household income and expenditure levels were higher in areas with access to irrigation infrastructure compare to rain-fed areas. The results of the study suggest that the incidence, depth, and severity of poverty were highest in rain-fed area. The poverty head count was found 29.5 percent and 14.9 percent in rain-fed and irrigated areas, respectively. The study concludes that access to irrigation in rural areas contributes to food security. Balance diet, and reduced vulnerability and poverty at the household and community level. Irrigation can reduce poverty via increased yield, cropping area and farming higher value crops. There are also stability effects because of reduced reliance on rainfall-hence irrigation lowers the variation of output, employment and yields, and helps to reduce adverse consequences of drought.

Keywords: Irrigation, Head count index, Chronic poverty, Transient poverty and rain-fed farming.

INTRODUCTION

The entry point of this research is the idea of irrigation disparity, inequality and poverty, concepts on which there are presently ongoing debates. In this context issues are raised concerning how the community is organized to manage irrigation to mitigate rural poverty. Sri Lanka is predominantly rural; of its total population of 20.7 million, an estimated 72 per cent live in rural areas (Bandara & Weerahewa, 2003). Since agriculture remains the mainstay of economic activity in rural Sri Lanka, it has a considerable influence on the lifestyle of the rural households (Henegedara, 2002). The agriculture sector plays a dominant role in the economy of Sri Lanka and account for 12 percent of gross domestic product (GDP), 24 percent of total export and 33 percent of total employed labour force (Central Bank of Sri Lanka, 2009). In 2011, of the 1.6 million hectares of cropped area, 58 per cent is under the major export crops of tea rubber and coconuts, and 42 per cent under paddy and other minor crops (Department of Agriculture in Sri Lanka, 2011).

In Sri Lanka paddy being the staple food crop account for 25 percent of total cultivable land and more than two million farmer families are engaged in farming as their main occupation. Highly water-intensive rice cultivation consumes more than 70 percent of the total water allocated for food production in the country (Henegedara, 2002). The principle irrigated crop, paddy is grown on nearly 730,000ha of land, and 243,000 of this total is grown under major irrigation system. Of the remaining 170,000ha under minor irrigation and nearly 146,000ha are under the Mahaweli development project which is the selected study area (Department of Census and Statistics abstract, 2011). Beside there are another 171,000ha which is non-irrigable paddy land sown by small scale paddy farmers under rainfed system – especially in wet zone (Henegedara, 2002).

It is important to emphasize that more than 76 percent of cultivated paddy land are under irrigation and more than 70 percent of paddy farmers belong to the “small farmer category” which own less than one hectare of land (Shantha Aruna, 2011). More than 90 percent of irrigated paddy lands are locating in the dry zone including the irrigated land under Mahaweli development project (Department of Agriculture, 2011).

Most agricultural research and development institution in developing world have been discussed the linkages between irrigation and poverty eradication among rural community (Hussain, Giordano, & Munir, 2005). Within last four decades Sri Lankan policy makers and various governments have been focused, the traditional target of attaining self-sufficiency through irrigation (Hussain & Hanjra, 2004). The total public investment on irrigation was Rs.45, 000 million within last three decades (1980-2010) and, on average it is 8 percent of annual public investment in the same period (SBSL 2010). Irrigation has been the most

important strategic factor in the development in the rural sector in Sri Lanka and irrigation has played a central role in poverty reduction in the past. Thus, it is necessary to study the impact of such investment on poverty reduction in the rural area. The study applied with and without approach of irrigation condition for paddy farming (irrigation versus rainfed) to measure the impact of irrigation investment on poverty alleviation in the dry-zone of Sri Lanka.

Objectives

The main objective of this study was to compare the income and poverty level between irrigated and rainfed farmers in the dry-zone and to examine the impact of major irrigation schemes on poverty alleviation in Sri Lanka.

MATERIALS AND METHODS

Research Area

The *Mahaweli* Development Project is the largest multipurpose national development programme ever launched in Sri Lanka. It was based on water resources on *Mahaweli* River and allied six river basins (MASL, 2011). The project is covered more than 50% of the dry zone land and 39% of the island land (Wellappili, 2009). The project is providing irrigation facilities for 136,133ha in the dry zone among 115,000 settler families and these families have been settled in six major systems (System B, System C, System G System L System H and Udawalawa),based on different tanks for administrative purpose (MASL, 2010). Among those six system, researcher purposively selected system B for this study. Because, in system B, there were both irrigated and rainfed paddy farmers under similar climate and soil condition. The total area of system B is 135,000 ha. Out of this 33,875 ha is irrigated and there are 20,000 farmer families are being actively involved with irrigation farming in both wet and dry seasons per year (MASL, 2010). The supply of water to these lands is by *Maduruoya* reservoirs. However, in system B there are around 2000 second generation households were living without irrigable plots and they cultivated paddy in homeland and reservation areas only in wet season under rainfed (MASL, 2011).

There are eight irrigation blocks in system B. Out of eight blocks, 4 were randomly selected for the study. There were 10,208 irrigated farmer families and 2066 non-irrigated (rainfed) farmer families in the selected four blocks. Based on Morgan's sampling techniques (1970), 370 irrigated farmers and 327 rainfed farmer were randomly selected from four irrigation blocks in system B. Population size and sample size in selected irrigation blocks were summarized as in table no 1. Methods used for gathering data and information included key informant interviews and focus group discussion in the field. Interview will be conducted with staff from the Mahaweli Authority of Sri Lanka as well as other public officers

Sampling Techniques and Data Gathering Tools

Table 1: Selected Blocks and sample Size for the Study

Selected Irrigation Blocks	Irrigated Households		Rainfed Households	
	Total households	Sample Size	Total households	Sample Size
Allewewa	2,835	103	546	86
Dimbulagala	2,455	89	453	72
Wijayabapura	2,358	85	512	81
Damminna	2,560	93	555	88
Total	10,208	370	2,066	327

In the field farmers will interview through questionnaire individually as well as in group. Focus group discussion will be organized with the help of Block Managers and Farmer organizations. A questionnaire survey was carried out in 2011 dry and 2010/2011 wet season. Following information were used for analysis based on difference sources.

Table 2: Sources of Information

Type of data/informations used	Source of Data/information
Farm and non farm income	Field Survey (Questionnaire survey)
Yield, cost of production and net returns	Field Survey (Questionnaire survey)
Assesst and wealth differences information	Field Survey (PRA tools)
Poverty related information	Field Survey/Group Discussion
Existing and proposed poverty aliviation policies	Department of policy planning.
Public Investment on Irrigation	International Water management Institute(IWMI)

Measurement Tools

Sen (1976) suggested that along with measuring headcounts of persons in poverty a more comprehensive measure of poverty should incorporate the average level of income of those persons in poverty and how far this level is below the poverty threshold. It is measure the income inequality of the poor and it could be expressed as:

$$P = H \{1 + (1 - I) G\}$$

Where, H is the head count of the poor, I is poverty or income gap ratio (average income short fall of the poor) and G is Gini Coefficient of the distribution of income among the poor. In order to calculate Gini-coefficient, Morduch and Sicular (2002) explained that where incomes are ordered so that $Y_1 \leq Y_2 \leq Y_3 \leq Y_4 \leq \dots \leq Y_n$, the Gini-coefficient can be computed as:

$$I_{gini}(Y) = \frac{\sum_{r=1}^n (a_i(r)) Y_i}{n^2 \mu} = \frac{\sum_{r=1}^n (r - \frac{n+1}{2}) Y_i}{n^2 \mu}$$

Where n is the number of observation, μ is the mean of the distribution, Y_i is the income of *i*th household and r is the corresponding rank of income.

RESULTS AND DISCUSSION

Descriptive Statistics

The results of this study shows that the inequalities of the economic condition among irrigate and rainfed farmers seemed mainly due to divergence of paddy income among two groups. Table 1 and 2 show the descriptive statistics of some important variable among irrigated and rainfed farmers. Average total annual net income obtained by a irrigated farmer was Rs.129,117 with variability index of 9.6 percent. The rainfed farmer's average annual income was Rs. 107,774 with 19.8 percent variability index. It is apparent that the irrigated farmers' annual earning capacity is 19.8 percent greater than rainfed farmers. More than 50 percent of annual income in irrigated farmers were depends on paddy cultivation, while this figure in rainfed farmers was just 27.1 percent. It reflects greater involvement of paddy industry by irrigated farmers than the rainfed farmers. Farther, irrigated farmer's average annual net income from paddy farming was 109 percent greater than the rainfed farmers due to law productivity as well as low extent cultivated mainly in the dry-season. Rainfed farmers average extent cultivated area is 58% lesser than the irrigated farmers in the wet season. Because, rainfed farmers are mainly cultivating paddy in their limited homestead land and state owned reservation areas in the wet season. However, in the dry season rainfed farmers were not cultivated paddy due to lack of water. A drastic yield differences was observed between the irrigated farmers and rainfed farmers in the wet season. The highest yield in irrigated farmer was (6548 kg/ha.) and lowest was (3198 kg/ha.) While in rainfed farmers highest yield was (4189 kg/ha.) and lowest was (956 kg/ha.).It is essential to emphasize that, irrigated farmers average returns to labour (Rs/day) form agriculture was 59 per cent greater than compare to rainfed farmers. However rainfed farmers returns to labour (Rs/day) on non-agricultural activities was 23 per cent greater than the irrigated farmers. Although both groups getting slimmer profit margin with agribusiness, they were getting more net returns per day from agriculture compare to net returns from non- agriculture. Both groups, on average, more than 50 per cent of their farm produced consumed by themselves, thus even though their cash income at low level from agriculture, the returns to man day from agriculture was at significantly higher level compare to non-agriculture.

Table 1: Descriptive Statistics of Some Variables – Irrigated farmers

Variables	Mean	Standard Deviation
Household size	5.32	1.944
Age (years)	53.16	5.32
Total income (Agri+Non Agri.)*	129,117	12,345
Total Net Income from Agribusiness*	68,318	14,546
Total income from Non Agriculture*	60,799	24,356
Net Returns to Labour from Agri.(Rs/day)	1,205.7	234.5
Net Returns to labour from Non Ag.(Rs/day)	512.25	452.5
Per capita income	23,665	2,654
Employment income*	31,890	6,545
Net Income from paddy*	61,177	6,543
Net Income from other field crop*	2,821	1,234
Net Income from perennial crops*	1,100	657
Net Income from livestock	3,220	2,311
Nonfarm businesses*	1,622	2,678
Other sources- (Rs/Year)	27,287	3,456
Average Paddy yield (M.T/Ha/Maha)	4.55	0.83
Average Paddy yield (M.T/Ha/Yala)	4.32	1.87
Formal credit for paddy*	42,540	5,467
Informal credit for paddy*	64,356	23,456
Value of total removable assets ** (Rs/HH)	323,458	56,789
Value of last year assets accumulation (Rs/HH)	5636	2345

Source: Authors computation, * Rs/HH/Year, ** excluding fixed assets, 1\$ = Rs 120

Absolute Poverty and Sen Poverty Index

With regard head count index which is official poverty line in 2012, there were 29.5 percent households below the poverty line in rainfed farming while this figure in irrigated farmers were is 14.9 percent. It means, approximately one third of the households

in rainfed farmers were below the poverty line. Beside it is heavy burden on the already precarious rural poverty in Sri Lanka. In this analysis real total food and non- food consumption expenditure per person per month which is Rs.3210 was considered as the poverty line. It was computed based on year 2004 poverty line which has been introduced by Census and Statistical Department of Sri Lanka and it has re-adjusted based on Colombo Consumer Price Index in year 2012(CCPI,2012).

Sen (1976) noted that headcount measure of poverty was lacking because it neglected other important features of poverty such as the distribution of income of those in poverty. suggested that along with measuring head count of persons in poverty a more comprehensive measure of poverty should incorporate the average level of income of those person in poverty and how far this level is below the poverty threshold if is measure income inequality of the poor. Across irrigated farmers the Sen Poverty index was 0.312 and among rainfed farmers it was 0.598 and almost double compares to irrigated farmers.

Table 4: Descriptive Statistics of Some Variables – Rainfed Farmers

Variables	Mean	Standard Deviation
Household size	4.54.	2.32
Age (years)	41.22	5.34
Total income (Agri+Non Agri.)*	107,774	21,345
Total Net Income from Agribusiness*	33,040	4,387
Total income from Non Agriculture*	74,734	35,567
Net Returns to Labour from Agri.(Rs/day)	758.54	155.45
Net Returns to labour from Non Ag.(Rs/day)	680.50	365.6
Per capita income	17,680	6,345
Employment income*	56,200	13,456
Net Income from paddy*	29,240	6,789
Net Income from other field crop*	618	345
Net Income from perennial crops*	1,312	466
Net Income from livestock	1,870	1,989
Nonfarm businesses*	3,878	3,675
Other sources- (Rs/Year)	14,656	9,800
Average Paddy yield (M.T/Ha/Wet)	3.98	1.78
Average Paddy yield (M.T/Ha/Dry)	-	-
Formal credit for paddy*	-	-
Informal credit for paddy*	36,800	16,789
Value of total removable assets ** (Rs/HH)	286,789	252,000
Value of last year assets accumulation (Rs/HH)	5,620	1,345

Source: Authors computation, * Rs/HH/Year, ** excluding fixed assets, 1\$ = Rs 120

CONCLUSIONS AND POLICY IMPLICATION

The analyses presented in this study have shown that poverty and economies of agriculture between irrigated and rainfed farmers were still very high in large scale irrigation project. Specially, difference in income drawn from irrigable land was accounted for the highest portion of poverty disparity between two groups. In generally more than 18 percent of households are absolutely poor in Mahaweli system B. It was very worst among rainfed farming, since there are more than 32 percent of rainfed farmers were absolutely poor. The absolute poverty of rainfed farmers was two times larger than that of the irrigated farmers and lack of irrigation water was the major cause of the disparity. Efforts to ensure an irrigable plot for all farmers in the project area were essential to eradicate the poverty situation among rainfed farmers. Conclusively, income inequality is detrimental to economic growth and development according to conventional economic theories. Achieving the Millennium development Goal (MDG) of reducing poverty by 2015 is nightmare in Sri Lanka without conscious efforts to minimize rural poverty by reducing irrigation inequality among large scale irrigation projects. The Sri Lankan government should therefore respond by ensuring equal irrigation facilities among settler households which are living under large scale irrigation projects.

Agribusiness is seen as the spectrum of growing, harvesting, post-harvest handling, processing marketing and related commercial activities of agriculture-based cash crop. However, our study identified, yet, both irrigated and rainfed farmers were just involving only growing part of the agribusiness. Even if large number of state and non-government organization were attempt to diversified cropping patterns of dry-zone farmers, still it has not been succeed. Still they are mainly depending on paddy based agri- business with slimmer profit margin. During last three decades agricultural policy makers have been identified commercialization of agricultural sector through diversification into high value agriculture as a viable strategy for up-scaling the socio-economic status of both irrigated and rainfed farmers. According to field observation, it was impotent to highlight that, dry-zone farmers were not transfer to the commercial oriented agribusiness and still they are involving production oriented agribusiness. To exterminate the rural poverty, it may be needed to motivate rural farmers for market oriented farming rather than production oriented farming.

REFERENCES

- Bandara, H., & Weerahewa, J. (2003). Economic Value of Irrigation Water in Paddy Cultivation in Sri Lanka. *Tropical Agriculturao Research*, 10(1), 14-26.

- Department of Agriculture in Sri Lanka. (2011, February 18). *Agriculture Technologies*. Retrieved February 18, 2011, from <http://www.agridept.gov.lk>.
- Department of Census and Statistics. (2011, February 26). *Agricultural /Allsector/incex.htm*. Retrieved February 07, 2012, from www.statistics.gov.lk: <http://www.cen&sta.com>
- Henegeedara, G. (2002). Agricultural Policy Reform in the Paddy Sector in Sri Lanka: An Overview. *Sri Lanka Journal of Agrarian Studies*, 10 (1), 1-25.
- Hussain, I., & Hanjra, M. (2004). Irrigation and poverty Alleviation: Review of the Empirical Evidence. *Irrigation and Drainage*, 53, 1-15.
- Hussain, I., Giordano, M., & Munir, H. (2005). *Agricultural Water and Poverty Linkages: Case Studies in Large and Small Systems*. Colombo: International Water Management Institute (IWMI).
- MASL. (2010). *Mahaweli Statistical Handbook*. Colombo: Mahaweli Authority of Sri Lanka.
- MASL, M. (2011). *Mahaweli Statistical Handbook*. Colombo- Sri Lanka: Mahaweli Authority of Sri Lanka.
- Morduch, J., & Sicular, T. (2002). Rethinking Inequality Decomposition with Evidence from rural China. *The Economic Journal*, 14(1), 410-442.
- Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, 607-610.
- SBSL. (2011). *Annual Report*. Colombo: Central Bank of Sri Lanka.
- Shantha Aruna, A. (2011). Technical Efficiency in Stochastic Frontier Production Model: A case Study of Irrigated Paddy Farming Under Village Tanks in Sri Lanka. *Eight International Conference on Business Management* (pp. 9-26). Colombo: University of Sri Jayawardanapura.
- Shantha Aruna, A. (2011). The impact of Uneven Allocation of Irrigation Water on Dynamics of Agribusiness & Income Inequality: The Case of Mahaweli Development Project In Sri Lanka. (pp. 148-165). Colombo: University of Sri Jayawardana Pura - Sri Lanka.
- Wellappili, C. (2009). *Overview of Mahaweli Authority of Sri Lanka*. Colombo: Planning and Monitoring Unit of MASL.