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The Impact of Water Management Practices on Paddy Productivity in the Dry Zone of Sri Lanka

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ABSTRACT
Water is becoming a scare resource in Sri Lanka as all other parts of the world due to increased use for irrigation, industry and domestic purposes. In Sri Lanka, rice account for 25 percent of total cultivable land, and more than two million are engaged in farming as their main occupation. Highly water intensive rice cultivation consumes more than 70 percent pf the total water allocated for food production in the country. The aim of this study is to examine percent practices of irrigation water management by famers and tank on paddy productivity and livelihood implication of rural farming community. The study based on *Rajanganaya reservoir* and the survey consisted of 120 farmers which had been randomly chosen from the project site. Data was collected to the survey through a structured questionnaire and the analysis was conducted using four multiple linear regression models. The results partied that, when farmer water management efficiency index increases by one unit, the paddy productivity increased by 30.13kg in wet season (*Maha*) and 27.90 kgs in dry season (*Yala*). However, at tank level water management efficiency index increased by one unit, the paddy productivity increased by 7.8kg in wet season (*Maha*) and 12.9 kg in dry (*Yala*) season respectively. At farmer level water management practices have been shown a significant influence on paddy productivity rather than tank level management practices. Therefore, policy makers should give more priority for plot level water management practices and need more awareness programme among famer organization in the dry zone of sri lanka.

Keywords: Irrigation, Water Management, Farmer Water Management, Paddy Productivity and Rajanganaya.

INTRODUCTION

Today, the world's population has exceeded 7,000 million (United States Census, 2020), increasing by 25% by the year 2030. As a result of the growing population, there is a significant demand for additional food also. At the same time, the demand for irrigation water will rise in both developed and developing countries. By 2030, the world will face a 40% deficit between the predicted water requirement and the existing water supply (Food and Agriculture Organization, 2002; World Bank, 2017). Especially, a developing country like Sri Lanka has to bear this condition somehow. As a developing country, it can be identified that it is an excellent challenge for the Sri Lankan economy to manage this situation. This scarcity of water has a significant impact on the irrigated areas of the dry zone of Sri Lanka, where paddy is cultivated using irrigation water. This study primarily focuses on examining the impact of irrigation water management on the productivity of paddy cultivation in those areas.

Paddy is the most important crop cultivated 34% (0.77 million hectares) out of the total cultivated land area of Sri Lanka. In general, paddy is cultivated 560 000 hectares in *Maha* season and 310 000 hectares in *Yala* season. Typically, paddy is cultivated in an average area of 870, 000 hectares annually. About 1.8 million farming families are engaged in paddy cultivation island-wide. At present, Sri Lanka annually produces 2.7 million tons of coarse rice, which fulfills about 95% of the domestic demand. Rice provides 45% of the total calories and 40% of a typical Sri Lankan protein requirement. The per capita rice consumption fluctuates around 100 kilograms per year depending on the price of rice, bread and wheat flour (Agriculture Department, 2020). People have set up some organizations to protect water resources which are the most crucial factor needed for paddy cultivation and the 'Irrigation

Department' is the sole authority for water resources management. The dry zone receives 75% of the annual rainfall of 1200 mm to 1500 mm from the North East Monsoon (October-December), for irrigation activities. There are 65 and 698 Main and Central Irrigation Schemes, respectively and 2038 active Minor Irrigation Schemes (Kirshanth & Sivakumar, 2018a). The Irrigation Department has facilities for 350,000 hectares of cultivable lands and has provided irrigation water for 254,000 hectares and 192,850 hectares during 2017/18 (*Maha* Season) and 2018 (*Yala* season) respectively. The cultivation performance of the primary irrigation schemes under the Irrigation Department was 85% during the 2017/18 Maha season and 71% in Central Irrigation Schemes. The total allocation received for capital and recurrent expenditure in 2018 was Rs. 14,590.87 million and the capital and recurrent expenditure in 2018 was Rs. 11,094.56 (Irrigation Department, 2018).

The main challenge faced by -world countries like Sri Lanka is the scarcity of productive resources and the lack of techniques and technology to efficiently and effectively utilize those resources. Therefore, this research aims to identify whether the irrigation water is managed properly adequately managed for paddy cultivation and the impact of this on rice production's productivity and investigate the socio-economic factors affecting paddy cultivation in parallel. This research is conducted by selecting a particular reservoir and measure the relationship between paddy cultivation productivity and irrigation water management of the catchment area of that reservoir. Irrigation water is the decisive factor for cultivation in many parts of Sri Lanka. Since people are not consuming water economically, efficient water management is crucialcrucial for increasing food production. The process of managing and distributing irrigation water is generally carried out with the assistance of the Irrigation Department (Chemjong & Wijesekera, 2017). The problems related to irrigation water management are identified based on the Rajanganaya reservoir, administered under this.

Paddy cultivation is the main livelihood of many people who live in the dry zone of Sri Lanka. Due to the prevailing weather conditions in those areas, people frequently use irrigation water for their cultivations. Since water in the reservoirs is used for irrigation activities and industrial and domestic purposes, it has become a scant resource and it can be identified that there is a huge competition among various sectors to utilize this resource at present. Therefore, the shortage of water for cultivation is likely to become a severe crisis of the next two decades. Meanwhile, Irrigation Department (2018) has spotlighted that the quantity of rice produced in Sri Lanka should be increased by another 1.5 million metric tons by 2025 to meet the nutritional needs of the growing population. Therefore, it is problematic whether the available irrigation water in paddy cultivated areas is sufficient to fulfill the rice requirement of people. Since irrigation development is not a feasible short-term step in the current economic scenario, there is no possibility of further increasing the current volume of water in the country. Shantha and Asan Ali in a study in 2013, has pointed out that it is essential to improve the economic efficiency of irrigation water usage in the next few decades.

Meanwhile, the studies on the separation of water between the Head, the lands closer to the reservoir and the Tail, the distant lands from the reservoir, have shown that farmers at the upper level of the canal receive uneven irrigation water and sometimes they may even face water shortages (Bhattarai, Sakthivadivel & Hussain, 2002). This situation is a key factor that leads to income inequality among the farming community in those areas. Further, it can be identified that there is a mismatch between the water supply of the irrigation system and the water demand, which leads to water wastage and it reflects the low efficiency of water usage (Shantha, 2011).

In such a condition, the volume of water received for paddy cultivation in *Yala* and *Maha* seasons for irrigated areas may vary due to climatic changes. This could also affect the productivity of paddy cultivation and further. However, climatic changes, the size of reservoirs, the location of lands, etc. affect water usage. Those factors remain inalterable. When concerning this matter, it seems that it is essential to bring water management to a better condition and to identify the impact of water management on the productivity of paddy cultivation. In this context, it is evident that the research of the effects of irrigation water management on paddy cultivation in Sri Lanka are insufficient and it is a massive gap in the literature. Accordingly, this study aims at examining the research problem of how irrigation water management affects the productivity of paddy cultivation.

Major objectives of the study are to analyze the interrelationships between irrigation water management practices and the productivity of paddy cultivation and analyze the impact of socio-economic factors including labor and knowledge on water management associated with irrigation water management practices, on the productivity of paddy cultivation.

Although many studies have been conducted on irrigation water management in Sri Lanka by various government agencies such as the Irrigation Department and the Mahaweli Authority and many researchers, there is no further reduction in irrigation water wastage damage caused to irrigation water equality (Shantha, 2011a). This is the lack of data, essential variables, lack of coverage, and the fact that irrigation water is a free resource (IWMI, 2007). In this study, the researcher selects a particular reservoir in Dry zone and compares the relationship between irrigation water management and productivity of paddy cultivation separately for *Yala* and *Maha* seasons. Using the results of this study, policymakers will take better policy decisions to manage and design the limited and natural irrigation water resources. With the aid of the results, policymakers will able to identify the productivity of paddy cultivation and make policy decisions such as reducing income distribution discrepancies, increasing productivity and alleviating poverty. It may pave the way to minimize future food and water crisis.

LITERATURE REVIEW

The Concept of Public Property Resources

Gurung (2005) and Encyclopedia of Population (2020) noted that the assets around the world are divided into two categories; private and public property, they all belong to public property. This term refers to a group of institutions that regulate the right of accessing assets and controlling rights. Using one unit of public property will reduce the amount available to others. There are many examples of public property assets. Natural resources such as irrigation systems, fishing grounds, grasslands, forests, water and the atmosphere are some of them.

The Tragedy of Public Property Resources

Hardin (2009), after writing his famous article, the concept of the "Public Property Disaster" has become well-known in Economics (Ostrom, 2008). Public property refers to the absence of monopoly or what is known as an open access administration. Under such an administration, which allows anyone the right to consume resources, inefficiency inevitably arises from the over-exploitation of resources, which means the over-utilization of variable inputs. Open-access leads to reduce efficiency because what is used in the deployment of resources is the average product, not its marginal output. The information will become inefficient when the access is free and the number of exploiters is large.

Irrigation Water Management

Irrigation water management can be defined as the timely regulation of irrigation water to meet the water requirement of the crops without wasting water, energy and plant nutrients or destroying soil resources (Klausmeyer, 2012). This includes watering of crops as per the requirements of crops focusing on soil retention quantities and soil consumption characteristics. Here, Irrigation water volume, frequency and application rate are determined and controlled in a well-planned and efficient manner (Shantha & Ali 2013).

Irrigation Water Efficiency

According to Dhehibi et al. (2007), irrigation water is becoming a scant resource for agriculture in many parts of the world. With the increase in demand for agricultural products, the development of adequate irrigation infrastructure to ensure the supply of irrigation water was limited to past policies. However, the consumption of free irrigation water in large amounts has resulted in a shortage of resources (Shantha et al., (2012). Water scarcity has become an increasing social and economic concern for policymakers and those who need to use resources. Policymakers in particular, have begun to point out that irrigation water efficiency as the core of the water problem in agriculture (Shantha et al., (2012).

Pricing of Irrigation Water

According to Johansson (2000), assisting in allocating residual resources between competitive usage and users is the primary role of the prices. Accurate pricing of the consumption is one of the procedures that can be used to achieve efficient water allocation. Based on the natural and economic conditions, several methods have emerged related to the pricing of water. These methods include volumetric pricing, non-volumetric pricing, and market-based pricing (Shantha & Ali 2014).

During the study carried out by Bandara & Weerahewa (2003), three methods have been employed to evaluate irrigation water. The three types are residual approach, functional production approach, and with-without comparison approach. Here, the residual approach and with-without comparison approach estimate water value per unit while the product functional approach estimates the change in product value per unit of water by using a production function. As per Gunaratne & Thiruchelvam (2002), the study's data have been gathered from a survey conducted in *Rajanganaya* scheme and *Elayapaththuw*a Agrarian Services Division in Anuradhapura district in December 2001. For data collection, a systematic random sampling method has been followed and in the first stage, paddy was cultivated in the head end and the tail end of the catchment area. From the 18 questionnaires of the *Rajangana* scheme, 48 farmers were randomly selected from leaflets no. 1, 2, 3, and 4 of the main channel of the right bank. 49 farmers were randomly selected from three tanks in the *Elayapaththuwa* division: Vihara Kalanchiya, Vihara Bulankulama, and Maha Elayapaththuwa. Even though productivity and efficiency were used differently,, are not precisely the same. Through productivity measures, each company exhibits optimal behaviour and the observed output, input, and price data are assumed to be the result of such behaviour. The development in productivity can be obtained either from the improvement of technical progress or efficiency. Here, to measure productivity, a stochastic frontier production function has been used.

Based on irrigation water, Shantha & Asan Ali (2013) have evaluated the income discrepancy of the farmers. According to them, the income of the farmers mainly depends on agriculture and related activities, especially on cultivation. Accordingly, 13,761 families of the residents in *Rajanganaya* and *Huruluwewa* irrigation scheme were the whole sample population. Stratified random sampling methods were utilized for select the sample,. At the first stage, farmers had located the sources of water-based on head, middle, and tail near the irrigation because for the farmers who lived far away from the water sources had a minimum safe water supply while the farmers who lived closer to the water sources received an excessive amount of water. To develop each scheme's head, middle, and tail areas, irrigation engineers and technical officers are involved.
Consequently, samples of 370 and 354 have been chosen for *Rajanganaya* tank and *Huruluwewa* tank, respectively. In the second stage, the number of the sample has been decided under the Morgan approach. Here, based on the Gini coefficient, income discrepancy has been analyzed relative to median income.

To collect 10 years' data, Chemjong & Wijesekara (2017) have made corporate visits and field visits to the project area. Especially, 5 years (from 2008/09 to 2012/13) were chosen for the study. For instance, crop cultivation, water releasing data, hourly pumping data, crop yield, and fertilizer data were gathered within the water year period of October-September. All data were modulated as a weekly resolution and later, adequate assumptions have been included for data inspection and calculation. Though both gravitational flow and elevator irrigation have been nurtured in a canal of this *Rajangana* irrigation system, to make calculations based on the guidelines of the Irrigational Department, only the gravitational flow system has been considered for the study. A detailed literature review was done in order to understand what is available before calculating data.

Hypothesis

the followings are the hypothesis that was identified under the regression.

H_1: Tank management positively affects for the productivity of paddy cultivation in the catchment area.

H_2: Farmer water management positively affects for the productivity of paddy cultivation in the catchment area.

H_3: The expenditure on labor positively affects for the productivity of paddy cultivation in the catchment area.

H_4: The knowledge on water management positively affects for the productivity of paddy cultivation in the catchment area.

The relationship between social factors and the productivity of paddy cultivation is considered under this research. According to that, it considers the education level of the farmers who cultivates paddy in the vicinity of the reservoir and the number of years of experience of the form, affecting the productivity of paddy cultivation.

H_5: There is a connection between the productivity of paddy cultivation and the education level of farmers.

H_6: There is a connection between the productivity of paddy cultivation and number of the years of experience in the form.

METHODOLOGY

Study Area

The *Rajanganaya* scheme is an irrigation scheme built across the *Kala Oya* bordering the north-central and northwestern Sri Lanka provinces. Its main concrete dam is approximately 360 meters. It has a catchment area of 76,863.36 hectares and a total storage capacity of 100.73 million cubic meters. This is considered as a low-risk reservoir. At present, about 9500 families are lived under this lake. The distribution network consists of 58km of main canals 70km of distribution canals and 316km of field canals. Each farmer was provided with 1.2 hectares of irrigated land and 0.4 hectares when setting in the project farmers cultivate 1500 acres during the wet and dry seasons (Movement for Land and Agriculture Reform, 2018).

Population and sampling

The total population of the study was 9500 families. In this case, the researcher selects farmers who cultivate paddy in the catchment area of the *Rajanganaya* reservoir. One hundred twenty farmers in the catchment area of *Rajangana*ya reservoir will be as the sample for this research subject to the ground stage scheme (stratified random sampling methods). It is presented in Table No 1 below. A questionnaire is used to obtain study-related data.

Table 1: Sample Framework

Tank Name	Right Bank		Left Bank		Total
	Head (track no 01)	20	Head (track no 01)	20	
Rajanganaya	Middle (track no 09)	20	Middle (track no 04)	20	
	Tail (track no 18)	20	Tail(track no 07)	20	
Total		**60**		**60**	**120**

Source: Survey findings, 2020

Data Analysis Model

Here, a production function approach is used to assess the value of the relationship between irrigation water management and paddy production. A linear multiple regression model describes it. In addition, Chi Square test is conducted to identify the link between socioeconomic factors and the productivity of paddy cultivation. SPSS 22 computer software was used to encode and analyze the data. Subsequently, conclusions were reached based on the results of water management and productivity of paddy cultivation in relation to the reservoir. The equation for the regression model is given below.

$$\mathbf{Y = \beta_0 + \Sigma\beta_{X1} + \Sigma\beta_{X2} + \Sigma\beta_{X3} + \Sigma\beta_{X4} + U}$$

Variable Measurement

(Y) Productivity of Paddy Cultivation

The dependent variable identified the productivity of paddy cultivation and used it to measure the yield (Bushel per acre) of the two *Yala* season and *Maha* season in the *Rajanganaya* watershed.

(X_1) Tank Management

To measure this, the divisional irrigation engineer's office on the amount of water released at each stage and whether the water was released on schedule. In this case, the volume of water issued by one farmer can be calculated, according to the ratio of water given by the department to the relevant land area.
The following equations show how that ratio is calculated.

$$\text{Water Use Rate} = \frac{\text{volume of water released}}{\text{Cultivation area}} \qquad \text{Ex: Water Use Rate} = \frac{2400\ (\text{ac. ft.})}{2020\ (\text{acres})} = 1.2$$

*Water Use Rate is the ratio between the amount of water released per season and the cultivation area.

The amount of water released per farmer = Water Use Rate × cultivated acres
Ex: Amount of water released per farmer = (1.2 × 2 acres) = 2.4 acre feet (2960.35 cubic m.)

(X_2) Farmer Water Management
a questionnaire was obtained using systematic data on land preparation, Bandi harvest time, how water was administered at the time of sowing, proper cultivation at the time of water release, proper water disposal and whether the seeds were used properly.

(X_3) Labour
The Labour factor is significant when considering the cost of cultivation. There are two types of Labour: family Labour and hired Labour. Here considers the value of the rupee to the total amount spent by one farmer in relation to the Labour amount is taken into one season.

(X_4) Knowledge of Water Management
It examines the water management knowledge of farmers in the productivity of paddy farming of the study and how it affects their knowledge and the farmer's water management knowledge, water management training, and the average water use per season to measure these variables.

RESULT AND DISCUSSION

Descriptive Analysis

Table 2 shows the descriptive analysis of the age, education level, experience, number of family members and family income of the farmer's sample who live in *Rajanganaya* reservoir. Accordingly, the median age of farmers about this reservoir is 48.2 and the median value of the members of those families is 4.57. This reservoir has an average value of experience related to paddy cultivation (1.98) and a level of education (2.40). The average family income is Rs.167,333.33 but the minimum average family income is Rs 40,000 associated with the reservoir area. Therefore, in this study identified that the variance of the family income is 19 in the *Rajanganaya* reservoir area. The high variance impact of average family income level highly affects their main occupation of paddy cultivation. When considering the knowledge of farmers' water management is well aware (3 categories) of water management knowledge of farmers in the *Rajanganaya* reservoir area.

Table 2: Descriptive analysis with mean values

	Rajanganaya	
Variable	**Mean**	**Std. Deviation**
Farmer's age (years)	48.22	11.12
No. of family members	4.57	1.49
Education level	2.4	1.11
Farming experience (years)	1.98	1.27
Family Income (Rs. Per season)	167,333.34	139,419.10

Source: Survey findings, 2020

Analysis of Linear Multiple Regression

Maha Season in Rajanganaya

Table 3: Results of regression: Rajanganaya Maha Season

Variable	Beta (B)	Std. Error	Sig value
Tank management	7.829	1.027	.000
Farmer water management	30.132	9.579	.003
Labour	8.159	7.864	.304
Knowledge of water management	25.923	7.716	.001
Source: Survey findings, 2020			

Based on the above results, the equation can be illustrated as follows:

Y = 27.62 + 7.829 Tank Management + 30.132 Farmer Water Management + 8.159 Labour + 25.923 Knowledge of water management

H_1: There is a positive effect on the productivity of paddy cultivation on Tank Management in the Rajanganaya reservoir area
According to the results of the regression analysis of this research conducted on the productivity of paddy cultivation in the *Maha* season in the Rajanganaya reservoir area represented the amount of estimated water supplying by the Irrigation Department of Sri Lanka (Divisional Irrigation Engineer's Office) and Reservoir Management increase by one unit then productivity of paddy cultivation increases by 7.829 units. There is a positive relationship between reservoir management and the productivity of paddy cultivation. Accordingly, the above assumption is acceptable and it is at 99% confidence level. That is 0.000 significant value. Therefore, this study identified that reservoir management has a positive effect on paddy cultivation productivity in the Rajanganaya reservoir area.

H_2: The farmer water management has a positive effect on the productivity of the paddy cultivation of Rajanganaya water drainage area
According to the results of the regression analysis, the productivity of paddy cultivation increased by 30.132 units when the farm water management increased by one unit, such as how water was managed to prepare the land, how water was managed during the Bandi harvest and how water was discharged correctly at the time of release. That is, there is a relationship between farm water management and the productivity of paddy cultivation. Accordingly, the above assumption is acceptable and it is numerically regression under the level of 99% confidence. That is, here sig value is 0.003. Therefore, this research shows that farm water management has a positive effect on the productivity of paddy cultivation in the *Rajanganaya* drainage area.

H_3: The Labour cost has a positive effect on the productivity of paddy cultivation of Rajanganaya drainage area

The regression analysis results, the productivity of paddy cultivation increases by 8.159 when the labor cost increases by one unit. That is, there is a positive relationship between labour cost and the productivity of paddy cultivation. But it is not numerically regression and here sig value is 0.304. Therefore, we can't accept above assumption.

H_4: Irrigation water management knowledge positively effects the productivity of paddy cultivation of Rajanganaya drainage area
The regression analysis results, the productivity of paddy cultivation increased by 25.923 units when the knowledge of irrigation water management increases by one unit. That is, there is a positive relationship between irrigation water management and the productivity of paddy cultivation. Accordingly, the above assumption is acceptable and it is numerically regression under the confidence. Therefore, here sig value is 0.00. Accordingly, the above assumption is good and it is numerically regression under the level of 99% confidence. Thus, this research shows that irrigation water management knowledge positively affects the productivity of paddy cultivation in the *Rajanganaya* drainage area.

Yala Season in Rajanganaya

Table 4: Regression Results: Yala Season in Rajanganaya

Variable	Beta (B)	Std. Error	Sig value
Tank management	12.836	1.562	.000
Farmer water management	27.901	7.703	.001
Labour	-3.306	6.092	.589
Knowledge of water management	23.379	6.408	.001

Source: Survey findings, 2020

As per the results of the table mentioned above, the equation relevant to the regression can be demonstrated as follows.

Y = 0.274+12.836 Tank Management + 27.901 Farmer Water Management - 3.306 Labour + 23.379 Knowledge on Water Management

H_1: Tank management impacts positively on the productivity of paddy cultivation in the Rajanganaya catchment area.
According to results of the regression analysis of this research conducted on the productivity of paddy cultivation at *Maha* season in the areas of *Rajanganaya* reservoir, the productivity of paddy cultivation increases by 12.836 units when the reservoir management including the quantity of water released by the Irrigation Department of Sri Lanka (the office of *Rajanganaya* residential project managers of Irrigation Department of Sri Lanka) is increased by one unit. That is, a positive relationship exists between reservoir management and the productivity of paddy cultivation. Accordingly, the hypothesis above is accepted and it is proved statistically under a belief level of 99%. Its sig value is 0.000. Therefore, it is obvious through the present research that reservoir management positively affects for the productivity of paddy cultivation in the *Rajanganaya* catchment area.

H_2: Farmer water management impacts positively on the productivity of paddy cultivation in the Rajanganaya catchment area.

As per results of the regression analysis, the productivity of the paddy cultivation increases by 27.901 units when the farm management, including the control of water for tilling, the control of water in the primary pod bearing "Bandi Goyam" period and ripening period of paddy, engaging in cultivation properly at the very time of the release of water and the proper removal of excess water, is increased by one unit. Hence, a positive relationship exists between reservoir management and the productivity of paddy cultivation. Accordingly, the hypothesis above is accepted and it is proved statistically under a belief level of 99%. Its sig value is 0.001. Therefore, it is obvious through the present research that farm management positively affects the productivity of paddy cultivation in the Rajanganaya catchment area.

H_3: Labor cost has a positive effect on the productivity of paddy cultivation in the Rajanganaya reservoir.

According to the Rajanganaya Yala Season Regression Analysis results, when labor costs increase by one unit, the productivity of paddy cultivation decreases by 3.306 units. Then, there is a negative relationship between labor and the productivity of paddy cultivation. The main reason for this inverse relationship is that farming in the *Rajanganaya* watershed is based mainly on hired labor. According to the literature, domestic labor was more productive than hired labor, but hired labor was the most widely used form of sample labor. Therefore, there is an inverse relationship between labor and the productivity of paddy cultivation. However, it is not significant and the significance value is 0.589. Accordingly, the above hypothesis is not accepted and it does not affect.

H_4: Irrigation water management knowledge positively affects the productivity of paddy cultivation in the Rajanganaya watershed.

According to the regression analysis results, the productivity of paddy cultivation increases by 23.379 units as the knowledge of irrigation water management increases by one unit. Then, there is a positive relationship between irrigation water management knowledge and the productivity of paddy cultivation. Accordingly, the above hypothesis is acceptable and it is significant under a 99% confidence level. The significance value is 0.001. Accordingly, this research shows that the knowledge of irrigation water management has a positive effect on the productivity of paddy cultivation in the *Rajanganaya* reservoir.

The Relationship between Socio-Economics Factors and the Productivity of Paddy Cultivation

Table 5: Results of Chi – Shure Test

			Chi – Shure Value	Significance Value
Rajanganaya	Education Level of Farmers	Yala	61.009	0.017
		Maha	70.799	0.000
	Years of farm experience	Yala	63.900	0.001
		Maha	83.239	0.000

Source: Author calculation based on survey data (2020)

H_5: The level of education of farmers has an impact on the productivity of paddy cultivation.
Based on the above results, the Chi-Shure value of the education level of the farmers associated with *Rajanganaya* Reservoir is 95% confidence level and it can be identified based on its value being less than 0.05. Therefore, it can be seen that there is a link between the productivity of paddy cultivation and the level of education of the farming community.

H_6: Years of farm experience have an impact on the productivity of paddy cultivation.
The results show that the Chi-Shure value of Rajanganaya Reservoir farmers with years of farm experience is 95% confidence level and it can be identified based on a value of less than 0.05. As a result, it can be seen that there is a relationship between the productivity of paddy cultivation and the years of farm experience of those farmers.

POLICIES AND RECOMMENDATIONS

According to the findings of this research, the volume of irrigated water has a significant impact on the productivity of paddy cultivation. All farming in the dry zone is based on irrigation water, mainly due to insufficient rainwater. Although the productivity of paddy cultivation can be increased if the water capacity of the reservoirs is high, increasing the volume of water in the reservoirs is not a practical measure in the short term and it is application to formulate policies to manage the existing water.

Under this, the validity of current policies should be re-examined and the necessary policies updated. Novel reports on the extent of land cultivated, the demographics of the farming community and the changing water capacity from time to time should be maintained, as there is a need to change policies based on those factors that change from time to time. Paddy cultivation is the main livelihood of the farmers who are mainly cultivating based on irrigation water. It is crucial to impart the necessary knowledge to the farmers regarding the management of water required for paddy cultivation under the auspices of the Government. Under this, it is essential to organize the necessary activities to impart the relevant knowledge to the farming community with the help of highly knowledgeable officials regarding water management. Efforts should be made to strengthen the farmer organizations associated with the Rajanganaya Reservoir and the main responsibility of the Department of Irrigation is to monitor the role currently being played by the farmers' organizations and to provide new guidance.

It is essential to pay due attention to the rehabilitation of irrigation canals and obtain the Government's support and the assistance of the people under the offices of the Department of Irrigation. Water discharged from reservoirs should be planned by the authorized bodies of the Irrigation Department to prevent wastage. One of the main ways to do this is to manage schedules properly. It is essential to give a good idea about the schedule for the farmers. Another reason is that the educational status of the people in these areas is significantly lower and they do not understand the value of water consumption. Although they are deeply concerned about financial value, they do not know the value of preventing water wastage. Therefore, it is possible to strategically give an idea to the farmers about the amount to be paid to obtain water for cultivation. The practical problems faced by the farming community related to irrigation should be properly studied. As well as, to identify the solutions for the practical issues. It requires conducting research and assistance from higher education institutions to provide appropriate guidance to researchers.

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CONFLICT OF INTEREST

The author declare no conflict of interest

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