Volume- 6
Issue- I
June-2021

Rajarata University Journal

ISSN: 2362-0080
www.ruj.ac.lk/journals/

Category: Research Article

Performance Assessment of *Iranamadu* Irrigated Agricultural System in Sri Lanka

[*1]Thusyanthini R [1]Pathmarajah S & [2]Suthakaran N

[1] *Department of Agricultural Engineering, Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka*

[2] *Department of Irrigation, Northern Province, Kilinochchi, Sri Lanka*

ARTICLE DETAILS

Article History
Published Online: 30 June, 2021

Keywords
Iranamadu tank, Other Field Crops, Paddy, Performance Indicators, PRA.

[*]**Corresponding Author**
rthusi07@gmail.com

ABSTRACT

Prime portion of the agricultural sector in Kilinochchi depends on the Iranaimadu tank. Which was rehabilitated in 2017 to increase the capacity, land and water productivity and strengthen farmer organisations (FOs) . The objectives of this study were to assess the performance of Iranamadu irrigation system in terms of service delivery, land and water productivity, analyse the performance gaps between pre and post rehabilitation of the scheme and find out the crop preference of farmers who were neither major nor minor irrigation scheme. (completely depend on rain fed cultivation and agro well) Primary and secondary data were collected. Priramantharanu GN division also was selected purposively for focus group discussion (FGDs) using participatory rural appraisal (PRA). There were 21 farmer organizations (FOs), and performance of 50% FOs was below average. However, there were 30% women in the FOs. Cultivated extent of paddy increased by 20%. Cropping intensity improved 142% to 165%. Paddy productivity increased 4200kg/ha to 5100kg/ha and 5200kg/ha to 5700 kg/ha in Maha and Yala seasons respectively. Productivities of newly introduced OFCs were, cowpea, green gram**,** black gram, maize and groundnut were 1,000 kg/ha, 1,200 kg/ha, 1,000 kg/ha, 4,000 kg/ha, 2,000 kg/ha respectively. During Maha season, irrigation duty to the field dropped 16,775 m^3/ha to 15,850 m^3 /ha while, declined 22,510 m^3/ha to 14,803 m^3/ha during Yala season. Cost sharing of operation and maintenance went up from Rs.500/ha/yr to Rs.750/ha/yr. Essentially, there is a potential to increase the overall performance of the scheme. Farmers preferred neither minor nor major irrigation scheme to cultivate (ranked1) paddy but water was a major crisis for zero cultivation during Yala season.

1. Introduction

Water resource is the prime natural resource in Northern Sri Lanka, the significant factor which contributes to the province's economic development from bygone time. Water scarcity can be defined as the non-availability of a required amount of water of useable quality at the required time and location, for human and environmental use [1]. In Kilinochchi district, majority of farmers mainly depended on rainwater for paddy cultivation, but with years they are facing many constraints due to the drought [2]. Approximately 21,000ha of paddy land have been uncultivated, and at the same time, the water levels in tanks have also declined while the farmers have always depended on tank water to cultivate their fields [3]. Irrigation is an important component in an agricultural developing countries and which enables greater agricultural production than is achieved with rain fed agriculture. The additional food production obtained with irrigation is essential for food security on a global level [4], and on a national level for some countries like Sri Lanka.

Sri Lanka has 103 distinct river basins, twenty-one river basins are covered within Northern Province and none of them are perennial river type while all of them are seasonal rivers. The Kanagarayan river basin has been predominantly made with the agriculture based system. Its upper basin supplies water to 3 major irrigation schemes (including Iranamadu irrigation scheme) and 64 minor farmer managed irrigation schemes comprising about 12,100 hectares of agricultural land [5].

1.1 Iranamadu irrigation scheme

Iranamdu irrigation Scheme is located in Northern Sri Lanka (Kilinochchi district). The total land area of Kilinochchi district is 123,711 ha (14% of the Northern Province) and the area comes under Iranamadu system is 20,607 ha which is 17% of the district area and is located under the Kanagarayan river basin within the Northern Province [6]. The water management activities of many irrigation projects in Kilinochchi district indicate that the water supply does not meet the demands of the farmers in terms of adequacy, reliability and timeliness. There is considerable potential to increase paddy yield through improved irrigation water management, especially by efficient irrigation scheduling [5]. At present, in effective water distribution system under practice is a vague plan for irrigation scheduling. Hence, the farmers used to obtain water without any control. The D canal Farmer Organisations (FOs) implement rotational water issues during water scarcity period, but it is ad hoc and not effective from irrigation efficiency point of view. Resultant, the irrigation duty exceeds 22,510 m^3/ha (7.3 ac.ft) in Yala season and overall water productivity was significantly low [5].

1.2 Performance indicators

The benchmarking indicators are to assess the performance of irrigation scheme like performance of service delivery, financial, productive efficiency and environment. Service delivery; the indicators of this category reflect the adequacy with which the organization manages the operation of the irrigation delivery system to satisfy the water requirement by users. Financial Performance, which group of indicators is concerned with the efficiency with which the organization uses resources to provide this service. Productive efficiency indicators measure the efficiency of irrigated agriculture uses in the production of crops and water while Environmental performance indicators measure the impacts of irrigated agriculture on land and water resources [5]. Hence this study was focused on to analyse the performance of service delivery, finance and productivity of the Iranamadu irrigated agricultural system, assess the performance gaps between pre and post implementation of the development scheme and find out the crop preference of farmers during Yala season.

2 Methodology

There are four zones under the Iranamadu irrigation scheme, namely zone 1, zone 2, zone 3, zone 4. To assess the overall performance of the Iranamadu irrigation scheme [5], primary and secondary data were collected. Primary data were informal discussion with farmers, distributary canal and field canal officers, field observation, key informant discussion with Irrigation engineers, prominent farmers and agricultural officers. Secondary data were Iranamadu enhancement study volume 1,2, Project completion report, Profile of beneficiaries, Operation and maintenance manual, Soil suitability study, provincial irrigation department water duty report, cultivation report and other relevant research studies. In addition to Iranamadu irrigation scheme, to find out the crop preference of farmers, the target group was selected from neither minor or major irrigation scheme (they were completely depending on rain fed (Maha season) and own agro well (Yala season). Accordingly, Piramanthanaru GN division was purposively selected for focus group discussion with application of participatory rural appraisal where matrices were applied for data collection.

3 Results and Discussion

Iranamadu irrigation scheme has four zones, namely Kilinochchi, Uruthirapuram and Ramanathapuram. Total number of farmer organizations was 21 where total number of beneficiaries were around 6,500 [5].

3.1 Agricultural production

Table 01: Crop details and extents

Activity	Maha (ha)	Yala Crop 1 (ha)	Yala Crop 2 (ha)	Yala Total (ha)
Crop	135 days paddy	105 days paddy	Maize green gram cowpea, black gram, and groundnut	
Cultivation Extent (ha)	8467	4233	403	4637

Source: [6]

The Table 1 illustrates the crops which were cultivated in Yala and Maha seasons. During Maha season only paddy was cultivated which was stood exactly at 8467 ha, while paddy (105days), maize and green gram were cultivated in Yala season at 4233ha and 403 ha respectively.

The bar chart (Figure 1) illustrates the cropping intensity during pre and post rehabilitation project. Pre Iranamadu irrigation development project, cropping intensity was 142% which increased to 165% at post project, due to irrigation rehabilitation and proper system management (by 23%).

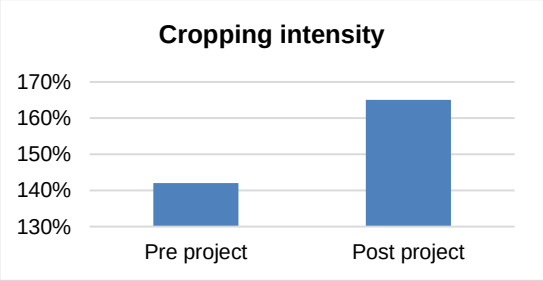

Figure- 1: Cropping intensity

The Table 2 shows the improvement of paddy yield (mt/ha) during both Yala and Maha seasons before and after Iranamadu irrigation development project. It was obviously clear that which contributed to increase of crop yield by 0.9 mt/ha in Maha, which was from 4.2mt/ha to 5.1 mt/ha. During Yala, it has gone up by 0.5 mt/ha. Overall, development project positively contributed to improve the paddy yield in both season by total of 1.4 mt/ha (5). Further, the distribution of required water quantity and use of fertilizers and other inputs as directed by the DOA also were the factors for raising up crop yield. Other than that, during the development project, project team introduced and trained farmers to involve good agriculture practices (GAP), including use of good seed varieties to enhance productivity, improved agronomic practices.

Table- 2: Improvement of paddy productivity after Iranamadu irrigation development project

	Before Project		After Project		Increase		
Season	Maha	Yala	Maha	Yala	Maha	Yala	Total
Yield (mt/ha)	4.2	5.2	5.1	5.7	0.9	0.5	1.4

Source: [5,7,8].

The tendency for Other Field Crops (OFCs) or Non-paddy crops cultivation has also been rapidly increased. In 2014, the OFC cultivated area was 150 ha. But it has gone up to 403 ha after implementation of IIDP. At present productivity of OFCs likely, cowpea, green gram**,** black gram, maize and groundnut is 1,000 kg/ha, 1,200 kg/ha, 1,000 kg/ha, 4,000 kg/ha, 2,000 kg/ha respectively through GAPs (5).

3.2 Service delivery

The irrigation requirements of Yala and Maha season based on total cultivated areas of paddy and other field crops are as follows. In Maha, season farmers cultivate 130 days' paddy varieties in 8467 ha land which requires 53,571 ac. ft. of water. In Yala season, both paddy and other field crops are being cultivated while age of the paddy varieties is less (105 days), In terms of irrigation requirements, 46,001 ac. ft. is needed for paddy cultivation while the requirement for OFC is 2852 ac. ft. [5].

Before the rehabilitation, the tank capacity during Maha season was 131Million cubic meters (MCM) and after rehabilitation tank capacity is 148 MCM. It is increased by 17 MCM. Meanwhile, the area under paddy was 7965 ha and water duty 5.44 ac. ft. After the rehabilitation, it is 5.14 ac. ft, which showed Irrigation water duty reduced in Maha by 5%. In other word, requirement of irrigation water has been declined by 5% while Yala season increased by 35%, from 7.3 ac, ft. to 4.8 ac. ft. [5,7]. Participatory irrigation water management is necessary for the empowerment of farmers for their active involvement in water management. Based on that, NGO (Nation Builders Association, Kilinochchi) organized social mobilization and training program, where the 31% of female participated while others were male. Training program was conducted by the department of agriculture to make aware on adoption of good agricultural practices (GAPs), crops such as green gram, cowpea, sesame, maize, passion fruit, and gherkin. Resultant, Farmers gradually showed their willingness to cultivate non-paddy crops and the extents of cultivation also has improved dramatically [6].

3.3 Financial Performance

The baseline report of the Iranamadu irrigation development project (IIDP) showed in the year 2013, the Head Count Ratio (HCR) was 40%, (percentage of families earned less than Rs. 17,150 per month). In the year 2017, The impact study revealed that, the HCR in the project area was 20.8% [5,9]. Hence, the number of families below the poverty line has significantly reduced by about 50%, mainly due to positive impact of the rehabilitation project. The information about net income per family was compared with pre project and post project. [9,10,11]. In order to that, project had positively impacted on farmers' income generation. Mean cultivation extent of a small land holding farmer was 2 ha in Maha and 1 ha in Yala. The department of Agriculture (DOA) data referred, the cost of production of paddy, including family labour was Rs. 15 per kg in both seasons [4]. The average selling price of paddy was Rs. 39 per kg. Then the net income from paddy was Rs. 24 per kg. And average monthly income was Rs. 31,800, while after rehabilitation it improved to Rs. 55,200/month. On the other hand, the land values in IIDP area have considerably increased. Particularly, some farmers tended to lease out their paddy land at a rate of Rs. 30,000/ ha/season.

As per the Irrigation Act (Amended) in 1991, the responsibilities of maintenance of distributary & field canals were transferred to respective FOs in all major irrigation schemes in the country having informal discussion with distributary canal and field canal officers who suggested that however, the farmers often did not attend to required maintenance work in a satisfactory manner. To address this issue, the project formulated a mechanism to finance irrigation maintenance on 50% cost sharing between the FOs and the government. It was estimated that farmers share was Rs.300/ac/yr (Rs. 750/ha/yr). However, the O & M manuals for downstream water management and maintenance programs were rare [6].

Farmers were trained on bulk water allocation system (BWAS), operation and maintenance of field and distributary canal, good agricultural practices, planting trees and forming field canal groups. Totally, 21 FOs in the Iranamadu Tank command area, and each FOs had about 12 field canal groups. Most FOs had an independent water supply from main canal to an irrigated area of about 400 ha. Average numbers of members in each FO were about 300 where 30% was women. The FOs performance was vital for canal maintenance, cultivation, water management and marketing activities. According to an evaluation conducted, in mid-2015, the performances of 50% FOs were below average. However, this situation was improved with the social mobilization and training conducted by Non-government organization (NGO) [5, 6]. The survey conducted in early 2017 and focused group discussions at the FO level to review the current performance level of the existing FOs on organizational, functional and financial aspects to plan future activities. According to that the farmer leaders were trained on the main areas where they were weak and these FOs needed further strengthening to become self-reliant organizations. In addition to that, decision making capacity of both men and women leaders, credit and saving programs through small group formation contributed to develop the socio-economic status of the rural families for strengthening and empowering youth and women groups [5].

Additionally, agricultural employment was raised up due to production improvement, which brought an additional area of approximately 4500ha under paddy in order to that which labour requirement that generated around 327,000 man-days. This was provided about 14,000 to 15,000 employment opportunities during the cultivation season. It was an important source of additional income for those who depended on agricultural labouring [5].

Table- 03. Farmers' (Neither major nor minor irrigation scheme) crops preference to cultivate during Yala

	Paddy	Banana	Cowpea	Green gram	Black gram	Ground nut
Water availability (30)	-	-	10	10	10	-
Land requirements (30)	5	5	5	5	5	5
Soil suitability(30)	30	-	-	-	-	-
Marketing (30)	20	-	-	-	-	10
Consumer demand (30)	25	-	-	-	-	5
Crop duration (30)	5	5	5	5	5	5
Knowledge about the crop cultivation (30)	10	-	5	5	5	5
Total	95	10	25	25	25	30
Preference ranking	**1**		**3**	**3**	**3**	**2**

Source: Matrices in Piramanthanaru village,2019

In addition to Iranamadu irrigation scheme, Piramanthanaru village also was focused because this is one of the villages which belong to neither minor nor major irrigation scheme. Where farmers completely depended on rain fed cultivation (Maha season) and agro well during Yala. Hence, to find out crop preference of the farmers during yala season due to water scarcity this village was selected. For the data collection, participatory rural appraisal (PRA) particularly, focus group discussion (FGDs) was done. Accordingly, they were requested to give weight for other field crops which they preferred to cultivate in the season based on their availability of resources such as water, land, soil suitability, marketing facilities, consumer demand, crop duration and current knowledge about the crop. While considering all the factors, farmers were mostly preferred (total

score 95) to cultivate paddy. Then groundnut was as second preference (30) while cowpea, green gram and black gram were ranked thirdly (25) because of production surplus, no market linkage and less profit. Due to unavailability of water, farmers were not able to cultivate paddy though they firstly preferred and the other factors were desirable. This meant that no water for paddy because they were not under any major or minor irrigation scheme, and totally depended on rain fed cultivation. Therefore, they could be able to cultivate only in Maha (100% rain fed) and during Yala season all paddy lands (100%) under the Piramanthanaru GN division were uncultivated. On the other hand, people and livestock have no safe drinking water too in Yala season.

4. Conclusion

Under the participatory irrigation management policy, the Operation & Maintenance tasks of distributary canals (DCs) and field canals (FCs) were responsibility of FOs. In comparisons with pre training programs, FOs were strengthening and who took their responsibilities well to do weeding, de silting, earth works, and minor repairs to structures of DCs and FCs, control of gates and other structures. Land and water productivity have considerably improved resulting of, some key contributory factors likely capacity improvement of tank, proper management of irrigation system, strengthening of project management committee, distributary & field canal management of FOs, cost sharing for operation & maintenance Irrigation infrastructure rehabilitation, women's participation in water and land management. Moreover, the reduction of water duty for paddy cultivation (effective water management), significant improvement of other field crops cultivation (increase cropping intensity) also positively contributed to raise household income of the beneficiaries in Yala season. Additionally, many villages were neither minor nor major irrigation scheme in Kilinochchi district. Their crop preference was paddy but water was the major scarcity for zero cultivation of paddy in Yala season.

5. Recommendations

The farmer should prepare their own cultivation plan, including the crops, optimum extents, water allocation, the crop water requirement for each crop, which should be used as a guideline by the farmers.

Participatory Irrigation Management should be practiced at distributary and field canal level to reduce the cost sharing of government in operation and maintenance.

A strong emphasis should be placed on improving agricultural practices. Particularly, the excessive use of irrigation water, minimize the opportunity cost of cultivating paddy, especially during Yala, it can be addressed through the awareness program.

References

1. Thusyanthini R and Siyamalan S.Foremost Need of Value Driven Water Education in Sri Lankan School Curriculum: Science. International Journal of Scientific and Research Publications (IJSRP). 2021, (11)3 :388-395.

2. Thusyanthini.R, Peramunagama SSM and De Silva AGSD. Needs of the Human Right to Safe Drinking Water in terms of Rainwater Harvesting System in Dry Zone of Sri Lanka. International Journal of Scientific and Research Publications (IJSRP). 2021, (11)3: 125-131.

3. Sivam, K. Suitability assessment for selection of Maruthanagar D4 canal for the PEDMA cultivation: (unpublished dissertation). University of Jaffna Sri Lanka ;2014

4. Mukherji A, Facon T, Molden D, Chartres C. Growing more food with less water: how can revitalizing Asia\u2019s irrigation help? In International Water Management Institute Conference Papers 2010 (No. h043241).

5. Iranamadu irrigation development project: project completion report: department of irrigation northern province Sri Lanka. 2018

6. Iranamadu irrigation scheme: Operation and maintenance manual: department of irrigation northern province Sri Lanka: 2017

7. Iranamadu irrigation development project: project design report: department of irrigation northern province Sri Lanka :2010

8. Iranamadu irrigation development project: water duty report: department of irrigation northern province Sri Lanka. 2017

9. Iranamadu irrigation development project: project baseline report: department of irrigation northern province Sri Lanka:2013

10. Molden DJ, Sakthivadivel R, Perry CJ and De Fraiture C. Indicators for comparing performance of irrigated agricultural systems. IWMI; 1998.

11. Turner RK, Georgiou S, Clark R, Brouwer R and Burke JJ. Economic valuation of water resources in agriculture: From the sectoral to a functional perspective of natural resource management. Food & Agriculture Org. 2004.

