



Short Communication

Determining factors for the adoption of sprinkler irrigation system in Navithanveli Divisional Secretariat areas of Ampara district, Sri Lanka

Nagendran V.¹, Sugirtharan M.^{2*} and Amuthenie S.³

¹Extension and Training (Inter Province), Department of Agriculture, Ampara, Sri Lanka

²Department of Agric. Engineering, Faculty of Agriculture, Eastern University, Sri Lanka

³Faculty of Agriculture, Eastern University, Sri Lanka
sugirtharan818@yahoo.com

Available online at: www.isca.in

Received 5th February 2018, revised 31st March 2018, accepted 7th April 2018

Abstract

Micro irrigation System (MIS) is promoted by the Government of Sri Lanka and NGOs in several vegetable cultivation areas of the Ampara district in order to increase the efficient usage of water. However, adoption of MIS especially sprinkler irrigation system (SIS) in these areas is very low and there is a potential to increase its adoption in these areas. In this view, this study was conducted in Navithanveli DS division areas of Ampara district to find out the factors influencing on the adoption of sprinkler irrigation for vegetable cultivation as an important tool to increase the adoption percentage of SIS. A field survey was conducted among randomly selected 126 vegetable farmers using structured questionnaires, direct observation and personal interviews. The study revealed that, the most important determinants of sprinkler irrigation adoption in the study area are level of education, age, profession, land holding size, availability of resources such as water, technology and capital, economic status of the farmer and level of awareness on MIS etc. These findings will help to prioritize the factors that affect MIS adoption decisions for improving the crop and water productivity in the study areas.

Keywords: Micro irrigation system, sprinkler irrigation, water use efficiency, vegetable cultivation.

Introduction

Micro irrigation technology, which is one of the improved irrigation technologies used in many parts of the world¹. The sprinkler irrigation is a type of micro irrigation system, where water is applied to the crop in the form of spray which is developed by the flow under pressure through the small orifices or nozzles². Application of sprinkler irrigation technology for the vegetable cultivation is very effective in reducing the cost of cultivation through lower usage of energy, fertilizer, labour force and other inputs³. At the same time, sprinkler irrigation can have a significant effect on quality and quantity of yield, pest control and harvesting time⁴. Therefore, a reliable and suitable irrigation water supply can result in vast improvements in agricultural production and assure the economic vitality of a region⁵. In this view, the Government of Sri Lanka introduced Micro Irrigation System (MIS) under a subsidy scheme during the late 1990s, however, majority of the farmers had discontinued or never used the technology provided⁶. Aheeyar *et al.*⁷ reported that, clogging of nozzles due to the poor quality water, lack of technology and awareness on the importance of using MIS, high cost for installation and expecting high profit within an year, reluctance to shift from traditional irrigation methods, not practicing MIS for high value cash crops and the lack of after-sales services and spare parts were the reasons for the discontinuation of this MIS in several places. Although there are several failures in the adoption of MIS in Sri Lanka, areas

like Kalpitiya and Puttalam are example for the success in using MIS within last 17 years period (2000–2017) without any serious outsource promotions, this adoption occurred due to self motivation and mobilization and their local knowledge⁸.

Navithanveli Divisional Secretariat (DS) division is one of the key areas in Ampara district which contribute a lot in vegetable and paddy production. About 4895 ha of land area utilized for both paddy and vegetable cultivation during both *Maha* and *Yala* season. Consequences of climate changes and its effect on agriculture, water scarcity will be the foremost problem in agriculture sector in future. This became an issue and evident in the ongoing *yala* season 2017 because water allocation for paddy cultivation was only to 50-60% of total available land in Ampara district. Therefore, effective water use techniques have to be considered for vegetable cultivation in these areas. Therefore, this study was conducted to identify determinants for adopting and continuing sprinkler irrigation systems (SIS) in Navithanveli DS division as a step to improve the efficient use of water through MIS.

Methodology

Description of the study area: Agro ecological zone of Navithanveli DS division fall under the category of DL 2b, soil type is Non Calcic Brown, a mean annual rainfall is less than 1,750 mm, mostly through the North-East monsoons, which

extends from October to January and a dry season from May to September. Navithanveli DS division is divided into 20 GN divisions, but the level of vegetable cultivation is not similar among all the GN divisions. Some are highly intensive while some are not been involving in vegetable cultivation due lack of cultivable land.

Data collection: Total of 126 vegetable farmers who are practicing and not practicing sprinkler irrigation system for their vegetable cultivation at 20 GN divisions were randomly selected for questionnaire survey during the period between May and August 2017. The data collected from the questionnaire survey and personal interviews were analyzed for descriptive statistics using Microsoft excel.

Results and discussion

Adoption of Sprinkler irrigation method in the study area:
 The Figure-2 shows, only 9% of the selected farmers adopted

the sprinkler irrigation system for vegetable cultivation and 91% did not adopt that system. It was the overview of the current trend regarding the adoption pattern of SIS in Navithanveli DS division. Among the farmers who adopted sprinkler irrigation system, one farmer has installed the system on his own interest. Another 3 farmers have installed the system under the 50% subsidy from the Department of Provincial Agriculture and 8 farmers were supported by NGOs as free of charge.

Factors determining the adoption of sprinkler irrigation in study area: The Table-1 shows that 56% of the farmers are engaged in paddy and vegetable farming as a full time job. Rest of the farmers in the study area have alternative income source, as they work in Government or private sectors. As far as the education level of the farmers is concerned most of the farmers (70%) studied up to G.C.E ordinary level.

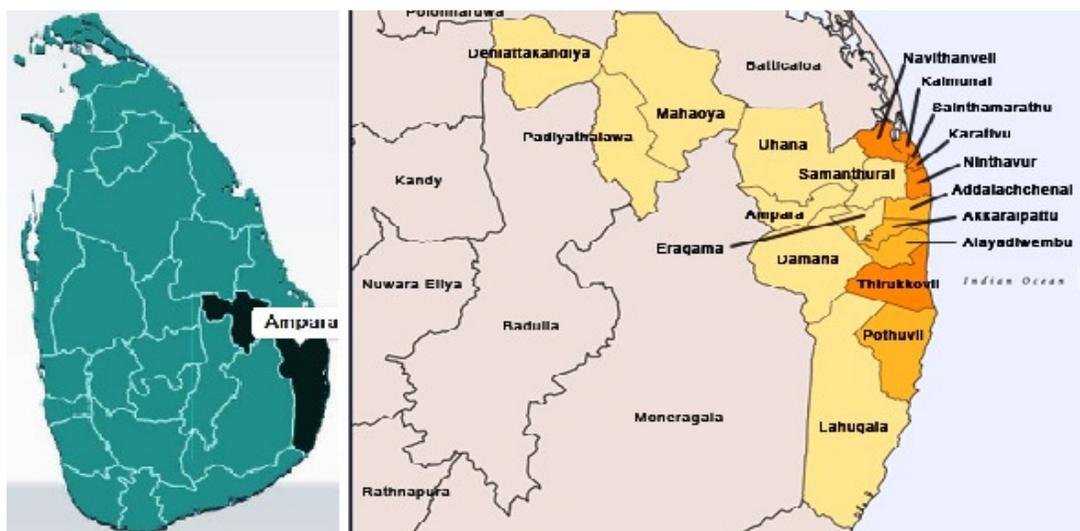


Figure-1: Map of the Ampara district.

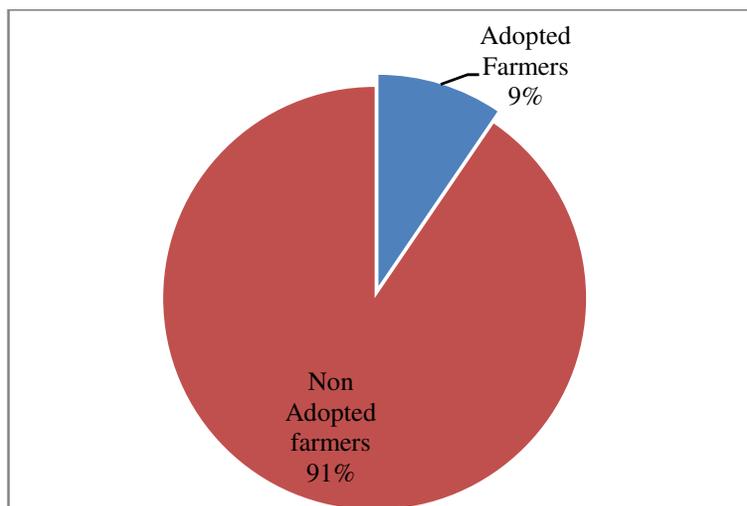


Figure-2: Percentage of Sprinkler Adoption in study area.

Gender and Age of the farmer: None of the women farmers are practicing SIS for their vegetable cultivation. Difficulties in operation and management were the reason reported by the women farmers for the non-adoption of SIS. Promotion initiatives to adopt the sprinkler irrigation system have to be concerned more on the gender.

As far as the age is concerned, age group was found to be influenced on the adoption of sprinkler irrigation in the study area. Among the SIS adopters, farmers less than 46 years of age (young farmers) were found to be better adopters than the elder farmers. Elder farmers (98%) are unwilling to shift from the traditional method of irrigation as they feel risk to adopt new

technology and lack of awareness on the water saving and other importance of SIS.

Employment and Profession: The survey revealed that, different groups were involved in vegetable production in the study area. About 25% of farmers are government employees and the vegetable cultivation supporting their livelihood to manage the family expenses. Among them 6% are practicing the sprinkler irrigation. Similarly, about 19% are private sector employees who involved in vegetable cultivation as additional income source, and among them 26% are practicing the sprinkler irrigation. The study further identified that among the 56% of the full time farmers, only 6% are installed the sprinkler irrigation system for their vegetable cultivation.

Table-1: Socio Economic characteristics of the study population.

		SIS Adopted Farmers (12)	SIS Non Adopted farmers (114)	Total (126)
Gender	Male	12 (12%)	88 (88%)	100 (79%)
	Female	00 (0%)	26 (100)	26 (21%)
Age	Below 35	04 (29%)	10 (71%)	14 (11%)
	36- 45	06 (27%)	16 (73%)	22 (18%)
	Above 46	02 (2%)	88 (98%)	90 (71%)
Employment	Government job and Farming	02 (6%)	30 (94%)	32 (25%)
	Private job and Farming	06 (26%)	17 (74%)	23 (19%)
	Full time farming	04 (6%)	67 (94%)	71 (56%)
Education	Below O/L	04 (5%)	85 (95%)	89 (70%)
	O/L	06 (21%)	23 (79%)	29 (23%)
	A/L	02 (25%)	06 (75%)	08 (07%)

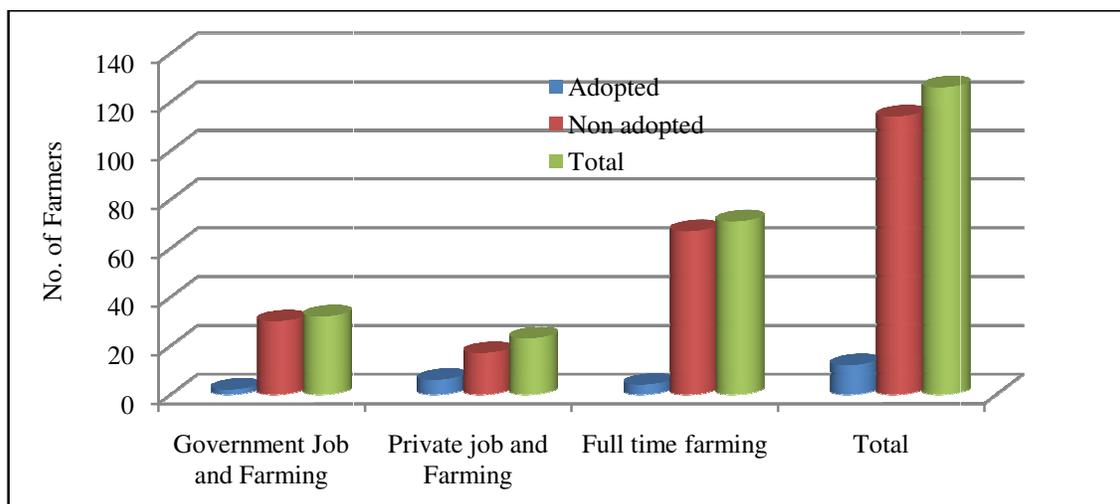


Figure-3: Number of farmers adopted Sprinkler system according to the profession.

The Figure-3 shows, adoption percentage was comparatively high among the farmers who are working at government and private sectors. Most of the farmers who are engaging agriculture as fulltime jobs reported that they are using their family members for irrigation and they don't feel the time limitation for the irrigation purpose. In contrast to that, the farmers who are working either in government or private institution hiring labour for the irrigation and need to supervise the labour during irrigation. In order to reduce the labour cost and time limitations they installed the sprinkler irrigation at their farm with the partial support from the Government and NGOs. However, they were not known about the water use efficiency of the sprinkler system they adopted.

Education level: The present study revealed that only 9% of farmers are adopted the sprinkler irrigation system (Figure-2). The education level of the most farmers (70%) in the studied population is below G.C.E. Ordinary level (Table-1). This might be a reason for the lower acceptance of the sprinkler system in the study area. The education level will determine the acceptance and implementation of new technologies for the production activities. However, there is a potential to increase adoption of sprinkler irrigation through awareness about the MIS and their significance in the study area.

Availability of Resources: The micro irrigation technology is a complex technique for the farmers particularly for the illiterate farmers who live in the remote areas where, number of resources such as technical person, capital and physical resources are required to execute micro irrigation.

The result reveals that most of the farmers who engaged in vegetable cultivation reluctant to invest for the SIS because of their low income status. Economic status of the farmers was highly influenced on the adoption of SIS in this area. Further about 90% and 88% of the farmers mentioned that difficulties in getting spare parts at local area markets and lack of financial support for the development of irrigation technology at their farm. Therefore, it is apparent that intervention of government as subsidy programme is necessary to encourage the farmers for the adoption of SIS in the study sites.

The success of the adoption also depends on availability of technical knowledge. That is true in the study area because, the farmers who are not practicing the sprinkler irrigation were responded that they were lacking in technical skills to operate and maintain the system. Therefore, intense extension activities like field demonstration in small groups should be executed in this area to solve this problem. More than 65% of the farmers also emphasized the importance of having a training to assemble SIS.

Anticipation of External supports: In Sri Lanka more than 70 % of the community make livelihood directly or indirectly from agriculture sector. Most of the agricultural sectors are seasonal thus; their income is seasonal and low standard⁹.

Therefore, to invest on new technology they are expecting financial support from external sources. The study revealed that, most of the farmers are with low income level and require some support to improve their technical knowledge on SIS.

Extent of land holding and water availability: The direct observation during field visits found that, farmers with larger area of cultivation adopted the SIS. The farmers with the small extent of land are commonly practicing the surface irrigation methods using hose pipes. Smallholder farmers are not keen or do not have the capacity to make large investments in unfamiliar new technologies, due to the uncertainty of the return on investment and the risk involved in such investments. Therefore, land holding size may have influenced on the adoption of SIS in the study area to some extent. Palanisami *et al.*¹⁰ also reported that larger area of the field, lower will be the capital cost since the components like head unit, filter, tank, pump set will be common for 0.25 and 2 ha area.

Most of the farmers from both SIS adopters and non adopters were reported that there is sufficient amount of water from Iguniyagala tank canals for their vegetable cultivation. This situation in this area may be the reason for not thinking about the efficient water application systems for their cultivation.

Conclusion

Adoption of sprinkler irrigation system for the vegetable cultivation is very low in Navithanveli DS areas of Ampara district. Education, age, gender, economic status, lack of awareness on SIS, land holding size, profession, availability of water, other available resources for the development of modern technology at farm are some of the determining factors for the adoption of sprinkler irrigation. Shortage of labour force and higher labour cost were also influenced on the adoption of SIS. However, there are potentials to encourage the farmers to adopt the SIS in this area through proper extension services, trainings and financial support. It is also essential to introduce and promote SIS that can be easily assembled and are user-friendly at low cost.

References

1. Ekanayake E.M.T, Gunaratne L.H.P. and Gunawardena E.R.N. (2015). Technical and socio economic assessment of micro irrigation systems in the small scale farming sector of Sri Lanka. *Tropical Agricultural Research*, 18.
2. Keller J. (1976). Energy economics in pipe selection. Proc. Ann Tech Cont. Sprinkler Irri. Assoc, 134-145.
3. Verma S., Tsephal S. and Jose T. (2004). Pepsee systems; Grass root innovations underground stress. *Water Policy*, 6(4), 303-318.
4. Dorota Z., Hainan Forrest and Izuno T. (1989). Principles of micro irrigation. Cooperative extension service, Institute of food and agriculture science. University of Florida.

5. Paul N. (1997). Irrigation technology transfer in support of food security proceeding of a sub regional workshop. April 14-17; Harare, Zimbabwe: water report 14.
6. Aheeyar M.M.M., Sharmini K.K. and Samarasinha G.G. (2005). The application of micro irrigation technologies in the small farming sector in Sri Lanka: Potential and constraints. (dl.nsf.ac.lk/ohs/harti/22748.pdf).
7. Aheeyar M.M.M., Bandara M.A.C.S. and Padmajani M.T. (2012). Assessment of Solar Powered Drip Irrigation Project Implemented by Ministry of Agriculture Phase-1. Research Report No: 148, Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo, 27-49.
8. Aheeyar M.M.M., Manthirithilake H. and Pathmarajah S. (2016). Drivers of the Adoption of Farmer-innovated Sprinkler Irrigation Systems: Evidence from Kalpitiya, Sri Lanka. *International Perspective on Water Resources and the Environment, Colombo, Sri Lanka*, January 4-6, 1-14.
9. Central Bank of Sri Lanka (2005). Recent Economic Developments: Highlights of 2005 and Prospects for 2006.
10. Kuppannan P., Raman S. and Mohan K. (2012). Micro-irrigation economics and outreach. Macmillan publishers, New Delhi, 45-49.