CONSTRAINTS ON WATER AVAILABILITY FOR AGRICULTURAL PRODUCTION IN THE DRY ZONE OF SRI LANKA AND THE POSSIBLE ADAPTATION MEASURES- A CASE STUDY IN RAJAGANA-ANURADHAPURA DISTRICT

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INTRODUCTION

Groundwater is the main source of rural water supplies in many developing countries and good quality ground water is a prime factor for sustenance of rural life. However, it has become a major problem today as this water is used for drinking and agriculture by more than half of the nation's population. The groundwater is the main water source for agriculture and domestic purposes in the dry zone of Sri Lanka. It is a well-established fact since thousands of years that the Dry and the Intermediate Zones of Sri Lanka is characterized by moisture stress when practicing agriculture. The large scale Mahaweli Diversion Irrigation Project could help this situation only partially. Though there were around 20,000 minor village tanks in these regions, only about 50% are in good operational conditions experiencing a gradual decrease of the capacity further (Udawattage, 1985, Kendaragama, 2000). There are also constraints such as decline of catchment forests, ineffective use of rainfall, improper water management, intensive cropping, increase of rural population, high tank evaporation losses etc. in using minor village tanks demanding supplementary water sources for comfortable existence. According to De Silva (2002), the major irrigation schemes could only supply water for about half of the crop lands. The water shortages are specifically experienced during *Yala* season as well as during some periods of *Maha* season where life-saving irrigation is required without which the smooth and uninterrupted cropping be hampered. It is therefore thought that extraction of shallow groundwater by means of constructing large diameter Agro-wells would be able to supplement water irrespective of naturally occurring moisture depletions within a range of a low maintenance cost even though the initial capital investment would be comparatively high for an average farmer. Thus, this paper aims to analyses the view of farmers on the constraints on water availability for agricultural activities and to recommend possible adaptation measures.

METHODOLOGY

This study was based on a primary questionnaire survey conducted in Rajangana area of the Anuradhapura district with a total sample size of 30 farmers. The area which comes under tail end of the Mahaweli scheme was only considered for this study where on 300 farm families were involved in agricultural activities. The main variables measured included demographic variables of the respondents such as age, education, and income, and the information related to climate change, knowledge on climate change adaptation, the effects on cultivation, and the observation on the field about the agro wells, irrigation system, types of crops grown, water source and water lifting techniques. Primary data were collected through interview schedules by conducting a social survey.

RESULTS AND DISCUSSION

Demographic Characteristics of the Respondents

All the respondents were involved with vegetable cultivation, 83.3% of them were heads of the households and 16.6% were spouses of the household head. There were 40% household heads involved in fulltime paddy cultivation. The mean age of the respondents was 41 years.

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There were 80% respondents aged 31-50 year range. Majority of the population involved in agricultural activities are middle age group who could easily adapt the new technologies and ideas. Their main livelihood is agriculture and they like to improve their agricultural production by using new methods.

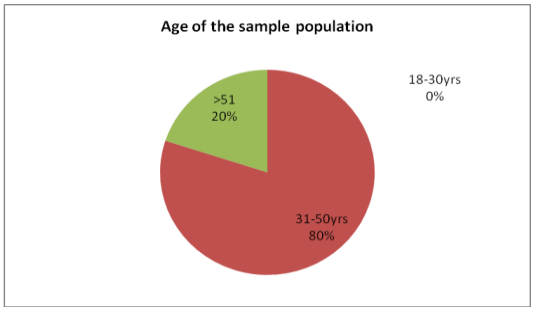

Figure 1. Age group of the sample population in Anuradhapura

Agricultural activities

An examination of the perception of the farmers and adjustment of their farm management practices, in the dry zone of Sri Lanka has revealed that during the last few decades, the pattern of rainfall has significantly changed and the farmers have observed the changes in the climate affecting their livelihood. The increase in average temperature combined with decreased rainfall has forced them to change their traditional paddy cultivation to shifting vegetable cultivation. Most of the farmers are involved in agricultural crop production. Farmers cultivate Banana, Brinjal, Bandakka, onion, capsicum, cowpea and several other vegetables fruit and cash crops. Since Rajangana comes under Mahaweli scheme, they cultivate paddy when they receive irrigation water and other field crops using the other sources such as agro well and village tanks.

Availability of water sources

Water storage is major problem for agricultural activity in the dry zones of Sri Lanka. But in selected areas farmers have about 80% of the agro well, 3% domestic wells and 17% irrigation water, which receives from the Mahaweli scheme. Agro wells are being introduced supplementary irrigation. Present agro well system is used without proper guidance on hydrological properties of the aquifer. Those farmers pump water in to their farming lands from the agro wells. Most of them pump water 3or 4 hours continuously per day. Then lack of water in agro wells during middle of the dry season causes crop failure. The management of on-field water application systems constitutes a complex problem which the farmers are faced with daily. It is often an important bottleneck for efficient implementation and large scale development of advanced irrigation scheduling practices. Figure.02 shows the availability of water sourcess

(a)  (b) 

Figure 2. Types of irrigation source (a) Mahaweli water (b) Agrowell

Irrigation systems

In the study area farmers use various types of irrigation systems as they wish, without proper guidance. About 97% of the farmers use traditional way of earthen canal irrigation which leads to the water wastage and only 3% of the farmers use their own innovative sprinkler irrigation systems. To obtain sustainable water savings, it will be mandatory to require a minimum degree of technical quality for systems and to transfer to users a true mastery in managing water in on-farm irrigation systems, so enabling the water losses resulting from heterogeneities in the distribution of water to be controlled. This is due to farmers lacking the management skills to manage their irrigation systems properly. Consequences include reductions in crop yields and a waste of water resources. All these systems were not in suitable condition. Because of that they get themselves dried their well during the mid-season. For example, if they pump water for 3 hours, water level in the well goes down to the bottom and they have to wait for another day or two to do the next irrigation. This problem is aggravated due to the delayed rainfall pattern. Farmers have very poor knowledge on new agricultural technology. Sprinkler irrigation is often considered as being very effective compared to surface irrigation because it enables better control of water application.

(a) Hose pipe (b) Earthen Canal (c) Polythene (d) Sprinkler irrigation

Figure 3. Different types of irrigation used by farmers in the study area.

Some farmers use sprinkler irrigation which motivate other farmers also to use sprinkler irrigation. Total sample populations of the farmers requested further knowledge on sprinkler irrigation system to use the system successfully. The major barriers to adaptation are lack of knowledge on adaptation methods (81%), lack of funding (62 %) and absence of prior information on rainfall variability due to climate change (51 %). Limited availability and supply of location specific technologies and know how to cope with climate shocks and long term changes. Major drawbacks for sustainable agriculture production area lack of awareness of the complexities of climatic variation, limited agency support to strengthen adaptive capacity through consistent professional service delivery such as information, credit, relief, insurance, training and technology transfer.

Need for the farmers

Farmers expressed the shortage of water is the major problem. Even though they have agro wells they do not have proper efficient irrigation system. One farmer uses sprinkler irrigation made in his own and that farmer is doing a successful cultivation. Therefore 73% of the sample population requested for sprinkler irrigation system for successful cultivation by saving the water. Nearly 13% of the farmers requested agro well while 11% requested rainwater harvesting system. Only 3% of the total sample requested for pumps. Limited local collective efforts, weak local organizations, networking and their engagement with authorities and agencies responsible for assisting communities need to help cope with the effects of water losses.

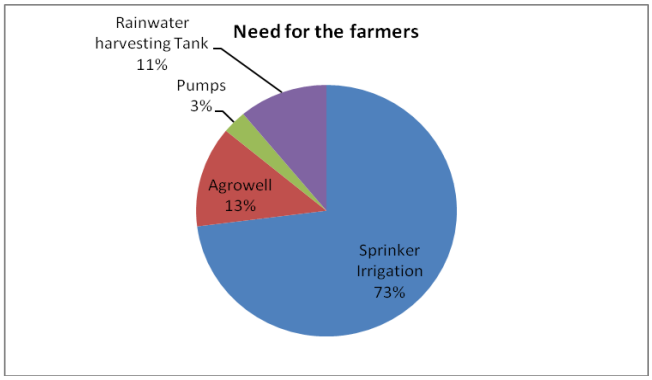

Figure 4. Need for farmers in the study area

CONCLUSIONS

The study focused on the need of the farmers in their own view point on the agricultural productivity by conducting and farmer survey in Rajagana-Anuradhapura District of the dry zone of Sri Lanka and also to recommend possible adaptation measures. Farmers expressed the shortage of water is the major problem. Even though they have agro wells they do not have proper efficient irrigation system due to financial constraints. Therefore 73% of the sample population requested sprinkler irrigation system for successful cultivation by saving the water. Nearly 13% of the farmers requested agro wells while 11% requested rainwater harvesting system. Only 3% requested pumps.

The study reveals that the community lacks guidance on new technology to improve agricultural productivity by them to improve their living standards. Limitation of water is the major problem and the farmers use irrigation methods which are not suitable for limited water sources. However, this control is dependent on a good quality level in the irrigation system design and in the selection of equipment, and also requires that the farmers develop appropriate skills for managing their irrigation system (knowledge and control of the pressures and flows that enable the system to distribute water uniformly over the field). Since the farmers are unable to invest on sprinkler irrigation system government intervention is necessary for installation and capacity building on the use of these systems along with other technology inputs to have sustainable shallow groundwater use in the Dry Zone of Sri Lanka.

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