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ADOPTION OF RAINGUN TECHNOLOGY: A STUDY IN ANANTAPUR DISTRICT OF ANDHRA PRADESH

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ABSTRACT
Adoption of raingun, a supplementary water saving technology is very low and potential exists to increase its adoption in the State. The study was conducted in Anantapur district of Andhra Pradesh to determine the aspects persuading in farmers adoption and to draw conclusions that will help in developing policy and institutional interventions to encourage the adoption of raingun technology. A total of 60 farmers were selected and were interviewed with the help of well-structured interview schedule. The results indicated that extent of adoption was low and were not statistically significant *i.e.,* the independent variables put together contribute 38.9 percent of the total variation in the adoption of raingun technology by the farmers. The main factors responsible for lower adoption were lack of technical information, availability and approachability of the technologies through institutional support systems. This information will help to prioritize the factors that affect adoption decisions and provide insights for improving the crop and water productivity.

KEY WORDS: Approachability, Adoption, Institutional Interventions, Policy making and Water saving technology

INTRODUCTION
Over the last decade, concern over impending water paucity has increased as it has become apparent that the water resources are becoming alarmingly scarce in India. Agriculture is found to be the largest water consumer (84%) in India; where more prudent use of water in agriculture needs to be the first priority (NITI Aayog, 2015). Water use per unit irrigated area has to be reduced in response to limitations in water availability and other associated environmental and societal problems (Surendran *et al.,* 2014). The future of water resources will impact both rural welfare and food security as irrigation status has a positive impact on both yields and cropping revenue (Huang *et al.,* 2002). Despite substantial investment in the development of water saving technologies and the potential impact of widespread adoption, there is little evidence that farmers have adopted water saving technologies (Lohmar *et al.,* 2003). The efficacy of current water saving technology extension programs is a matter of debate (Deng *et al.,* 2004). An unpredictable monsoon coupled with an increasing demand for food has induced an imperative need for irrigation options other than those that are either extremely laborious and time consuming or simply too expensive for the small and marginal farmer. While the rich farmer banks on costly systems such as electric and diesel pumps to extract groundwater for irrigating their large acres of land, the small and marginal farmer has no option other than using the tedious traditional water lifting devices to irrigate their smallholdings. Drought is a recurrent phenomenon in India. Over 68% of India, spread over several administrative districts in many states, is affected by drought. Anantapur is one such district of Andhra Pradesh where drought conditions are prevailing consistently over many years causing severe stress to the economy especially agriculture. An analysis of rainfall data for the past 10 decades reveals that, in every decade almost 7 years are prone to drought (Reddy *et al.,* 2015). The average rainfall in the district is found to be 544 mm. In this district, raingun technology has been introduced under water conserving technologies component for mitigating the prevailing drought conditions and thereby overcoming food security, enhanced profitability, improved environmental quality and sustainability. Considering all these facts, a study has been conducted to find the extent of adoption of raingun technology among the farmers of the district.

MATERIALS & METHODS
The present investigation was conducted in Anantapur district of Andhra Pradesh during 2016-17. Out of 63 mandals, two mandals were selected and from each mandal, five villages were selected based on simple random sampling procedure. From each selected village, 6 farmers were selected randomly thus making a sample of 60 respondents. An ex-post-facto research design was used for the study. Data were collected through well-structured interview schedule. The collected data were coded, classified and tabulated. Finally the statistical tests like frequency, percentage, Standard Deviation, Mean, Correlation, Regression were used to obtain meaningful findings and for drawing conclusions.

RESULTS AND DISCUSSION

Extent of adoption of rain gun technology

TABLE 1: Extent of adoption of rain gun technology (n=60)

S.No	Adoption categories	Frequency	Percentage
1	Low (Score up to 16.45)	25	41.66
2	Medium (Score from 16.46 to 20.90)	18	30.00
3	High (Score above 20.97)	17	28.33
	Mean = 18.68, S.D = 2.23	60	100

It was clear from the Table 1, that majority (41.66%) of the raingun technology using farmers had low extent of adoption followed by 30.00 percent medium and 28.33 percent high level of the extent of the rain gun technology. The plausible reason might be due to the fact that the farmers were unaware, not educated and exposed enough about the advanced water saving technologies. High initial investment and lack of ease accessibility was also found to be the factor for low level of adoption. The results were in agreement with the findings of Ghintala (2013).

Correlation analysis of selected profile characteristics of respondents and Extent of adoption of the respondents

TABLE 2: Correlation analysis of selected profile characteristics of respondents and of the extent of adoption respondents of the respondents (n=60)

S. No.	Independent Variable	Correlation co-efficient 'r' value
X_1	Age	0.0087^{NS}
X_2	Education	0.434^{**}
X_3	Farm size	0.65^{NS}
X_4	Farming experience	-0.342^{**}
X_5	Extension contact	0.367^{**}
X_6	Mass media exposure	0.445^{**}
X_7	Innovativeness	0.543^{**}
X_8	Social participation	0.535^{**}
X_9	Scientific orientation	0.357^{**}
X_{10}	Risk orientation	0.334^{**}

**Significant at 0.05 level   **Significant at 0.01 level ^{NS}Non-significant*

Age

From the Table 2, it was clear that the age of the farmers had positive and non-significant relationship with extent of adoption on rain gun technology. This inferred that the farmers of different age groups had similar adoption level regarding the advanced water saving technologies. Lack of training programmes was also the reason for the members in not adopting the technology.

Education

The results from the Table 2 indicated that the education of the farmers had positive and highly significant relationship with extent of adoption on rain gun technology. Thus, it can be concluded that adoption is independent of education. The probable reason for highly significant association may be education improves the knowledge and knowledge shows a way to maximum extent possible adoption rate.

Farm size

Perusal of the Table 2 revealed that there was positive but non-significant relationship between farm size and extent of adoption on rain gun technology. The reason might be due to the participation of responds irrespective of different farm size was mainly based on subsidy and free of cost provided by the government. Hence, it didn't improve the knowledge levels of the respondents on rain gun technology. The finding was in conformity with the findings of Mahesh *et al.* (2017).

Farming Experience

It was evident from the Table 2, that the farming experience had negative but significant relationship with extent of adoption of respondents on rain gun technology. It means experience in farming did not make significant difference in adoption of rain gun technology by the farmers. The results seemed to be quite logical due to the fact that the raingun technology requires skills in application throughout the operation. Similar findings were reported by Kumar and Jitarwal (2012).

Extension contact

It could be seen from the Table 2 clearly mention that there was positive and significant relationship between extension contacts with the extent of adoption on rain gun technology. The probable reason may be due to interaction between extensions personnel and APMIP personnel with the farmers. Also the farmers were in regular contact with the department officials and used to attend the programmes conducted by the institutes. This finding was in concurrence with that of Mahesh *et al.* (2017).

Mass media exposure

The results furnished in the Table 2 indicated that there was positive and significant relationship between mass media exposure with the extent of adoption of respondents on rain gun technology. The probable reason may be due to increase in the telecast of agricultural programs through different channels and number of news papers publishing a full column on Micro Irrigation Systems, implementation, maintenance and chemical treatment measures regularly. Respondents with good mass media exposure are in a position to pick up right technologies at right time and implement them, so better management of respondents can be seen. The finding was in conformity with the findings of Mahesh *et al.* (2017).

Innovativeness

It can be seen from the Table 2 that there was positive and significant relationship between innovativeness with the extent of adoption of respondents on rain gun technology. The probable reason might be that innovativeness was associated with the individual's earliness in use of new practices. An innovative farmer always reaped windfall profits from new technologies. Respondents with this trait had better impact.

Social participation

Table 2 explains that there was positive and significant relationship between social participation with the extent of adoption of respondents on rain gun technology. The possible reason for significant relationship social participation is a common feature that farmers who actively participate in social activities through social organizations come across different types of people, exchange one's views and experiences, and seek solutions for their troubles and problems. Thus, they gain more new knowledge about recommended practices and try to adopt them in their farm production. Hence, the above trend was observed. The result derived support from the finding of Kolgane *et al.* (2009).

Scientific orientation

It is clear from the Table 2, that there was positive and significant relationship between social participation with the extent of adoption of respondents on rain gun technology. The probable reason might be that farmers with high scientific orientation will prefer to cultivate the crops as per the production recommendations given by the scientists and extension personnel. This will give ample scope for respondents to think logically and scientifically. Respondents having good scientific orientation will naturally prefer to know advanced technologies in agriculture. Therefore, they are interested in knowing about latest agricultural practices. In this process, they might have acquired more knowledge. The result was in line with the findings of Joshi (2004).

Risk orientation

It was stated from Table 2, that there was positive and significant relationship between social participation with the extent of adoption of respondents on rain gun technology. The probable reason may be due to the fact that adoption of any innovation involves risk. The farmers who are risk oriented are likely to adopt the innovation to a greater extent without any hesitation. Hence, positively significant relationship was observed. Similar finding was also reported by Kumar and Jitarwal (2012).

Multiple Linear Regressions of selected profile characteristics of respondents and Knowledge levels of the respondents

TABLE 3: Multiple Linear Regression of selected profile characteristics of respondents and Knowledge levels of the respondents on rain gun technology (n=60)

S. No.	Independent Variable	Regression coefficient (b_i's)	Standard error	't' value
X_1	Age	0.125	.530	0.541*
X_2	Education	-.011	.009	-1.510*
X_3	Farm size	1.678	.444	2.777**
X_4	Farming experience	1.239	.985	0.656^{NS}
X_5	Extension contact	.328	.333	2.423*
X_6	Mass media exposure	.231	.519	$.985^{NS}$
X_7	Innovativeness	.218	.345	$.765^{NS}$
X_8	Social participation	-.200	.212	$-.555^{NS}$
X_9	Scientific orientation	.503	.190	2.312**
X_{10}	Risk orientation	1.963	.756	2.675**

R^2 = 0.389 F= 18.34 a = 16.45

** Significant at 0.05 level of probability, NS - Non-significant, ** Significant at 0.01 level of probability*

It was observed from the Table 3, that the ten independent variables with the adoption of the raingun technology taken on multiple linear regression analysis gave R^2 (Coefficient of multiple determination) value of 0.389. Hence, it could be inferred that independent variables put together contributed 38.9 percent of the total variance in the adoption of the raingun technology, leaving the rest to extraneous effects.

CONCLUSION

The "adoption behavior" is the mental process through which an individual passes from first hearing of an innovation to its final adoption, while adoption is a decision to continue the full use of an innovation. Generally, the farmers do not adopt technology practices fully. The results of this study clearly indicated the low level of adoption of the raingun technology. As a result, the gap always appears between the recommended technology and their use at farmer's field, hence; need is required to enhance the level of adoption of raingun technology by the farmers in study area. Therefore, there is a need to find out the ways and means to convince the farmers about the economic and social feasibility in adoption of the advanced technologies. Since it involves relatively higher amount of fixed investment, farmers often asks the questions mainly because of poor exposure about the social and economic advantages of raingun technology. Thus, efforts are needed to convince the farmers through quality extension network. The poor adoption can be attributed to number of factors such as high cost, complexity of the technology and other socio-economic issues such as a lack of access to credit facilities, fragmented landholdings, localized crop pattern, *etc*. Reducing the capital cost and increasing technical know-how will help the spread of the raingun technology in a bigger way. Keeping this in mind, experts, companies and farmers should identify the ways and means of reducing the cost. Providing the technical support, encouraging through capacity building activities on the advance technologies and training for unemployed village youths to reduce the time lag in installation and for entrepreneurship development is also important. Creating appropriate institutions for extension, designing water and electricity pricing policies apart from building proper power supply infrastructure will play a crucial role in facilitating large-scale adoption.

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