JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

"EFFECTIVENESS OF RECOMMENDED CLIMATE SMART AGRICULTURE (CSA) PRACTICES IN TELANGANA STATE"

DR.C.YUVARAJ* AND N.SAILAJA **
*Assistant Professor Agricultural Extension Education and
**Assistant Professor Soil science
School of Agricultural, Loyola Academy, Degree & P.G. College, Alwal,
Secunderabad 500010, Telangana State

ABSTRACT

Climate change, during the recent times, has become a global concern demanding attention and action. In a densely populated country like India, particularly the effects of climate change are more detrimental due to its highly vulnerable nature. In view of the increased importance to address the development needs of more vulnerable populations of the country, Indian Council of Agricultural Research (ICAR) has launched various projects and programmes to compete with climatic changes by disseminating the climate resilient and smart agricultural technologies.

The study was conducted to identify the effectiveness of various recommended Climate Smart Agriculture (CSA) practices to understand the extent to which these technologies are perceived as effective and their capability of decreasing the vulnerability of agriculture and subsequent beneficial nature in the long run as perceived by the farmers.

The analysis of climatic variability of the Telangana for the study period revealed that the recent decade (2008-2017) has shown the highest variation in annual rainfall (CV= 29.03%) and mean maximum temperature (CV = 2.38 %) compared to the past two decades. The recent decade (2008-2017) has seen a steady increase in the seasonal rainfall across all the months compared to the earlier two decades (1998-2007, 2008-2017). It seems there exists climatic variability and change in the state.

Ex-post facto research design were followed and selected 300 respondents by using random sampling method. The analysis of effectiveness of Climate Smart Agriculture (CSA) practices perceived by the farmers revealed that majority were found to have medium economic efficiency (44.3%) followed by high (34.3%) and low (21.3%) economic efficiency. The possible reason might be attributed due to sub division and fragmentation the farm size is decreasing there by more small and marginal land holdings. It may not be feasible to take up all the CSA practices in these holdings.

Most of the farmers are not inclined much to be in touch with the changes in environmental climate change, this trend may be due to the idiosyncratic behaviour established by the virtue of their medium to old age, less education and possessing low degree of other profile characteristics and majority of them seemed to be not

following the WBAAS regularly as they were taking up the farm activities naturally which limits effectiveness of Climate Smart Agriculture practices at critical periods of time.

Keywords: Climate Smart Agriculture (CSA), Weather Based Agro Advisory Services (WBAAS), Natural Resource Management (NRM), Climate Resilient Agriculture (CRA), National Innovations in Climate Resilient Agriculture (NICRA).

INTRODUCTION

Climate is continually changing and with projected changes in rainfall patterns and temperature range are expected to affect many biological systems including agriculture. Climate related events such as droughts, cyclones, hailstorm, snowfall, erratic rainfall and fluctuations in temperature badly contributing to world food production and overall economy. The atmosphere is one of the principal components in determining weather and climate of the earth. Today, Climate change has been recognized globally as the most pressing critical issue affecting the mankind survival in the 21st century. No one can deny it any longer. You can feel it in heat, you can see it in ice and you can observe it in storms. Climate change without doubt became the critical environmental issue of present decade.

Climatic influence on Indian agriculture

Ample evidences have shown that climate change is not a future threat but a present danger. In view of the extreme climatic uncertainties, it is obvious that Indian agriculture is highly vulnerable to climate change as climate is the direct input for production. Singh (2008) said that different estimates by environmentalists indicate location specific uncertainties in the minimum and maximum temperatures which may have adverse impact on agricultural productivity in different agro climatic regions of the country. Such calculations for trends in monthly rainfall may be more during December, January and February in case of West Rajasthan, Punjab, and Haryana. However, there may be slight decrease in October-November rainfall in several locations of the country. The analysis about trends of annual rainfall for the period 1871 to 1999 indicates that there is a shift in the surplus rainfall from western part of country to east.

More than 60 per cent of the total cropped area under irrigation in India is still dependent on the vagaries of monsoon. Studies on climate change have shown that for every 1˚C rise in temperature from optimum, yield losses of about 4.6 to 9.4 per cent in rainfed rice (Kumar et al., 2014) and 13 kg/ha in cotton (Raksha., 2014) were recorded. About 11.7 million tonnes of wheat yields and 11 per cent of winter sorghum crop yields were estimated to be lost by 2050 due to climate change and variability (Srivastava et al., 2010). Climate change has projected effects on major crops viz., paddy, sugarcane and groundnut showing decrease in the yields by about 5.2 to 9.5 per cent (Palanisami et al., 2009). Various other factors viz., poor availability of irrigation water, irregularities in the onset of monsoon, heat and cold waves, decline in soil fertility, rise in sea level, saline water intrusion in coastal belts, pests and disease attack, weeds, floods, cyclone and drought tend to cause further losses in the yields. The type of crops to be cultivated would be determined by the climatic variability along with the availability of agricultural inputs like irrigation water and solar radiation etc.

Climate Smart Agriculture (CSA)

Climate Smart Agriculture concept was originally put forth in 2010 by the UN s Food and Agriculture Organization. Climate smart means agriculture that sustainably increases productivity and resilience to environmental pressures, while at the same time reduces greenhouse gas emissions or removes them from the atmosphere. It is also known as Climate Resilient Agriculture (CRA). CRA means the incorporation of adaptation, mitigation and other practices in agriculture which increases the capacity of the system to respond to various climate related disturbances by resisting damage and recovering quickly.

CSA is defined by three objectives: firstly, increasing agricultural productivity to support increased incomes, food security and development; secondly, increasing adaptive capacity at multiple levels (from farm to nation); and thirdly, decreasing greenhouse gas emissions and increasing carbon sinks (FAO).

What CSA means: - It contributes to achievement of sustainable development goals - It integrates – social, economical and environmental development to meet challenge of providing sustainable (a) livelihood to farmers (b) food security to hungry millions, and (c) eradication of poverty.

It is composed of four pillars: 1. sustainably increasing agriculture productivity and income 2. Adapting and building resilience to climate change 3. Reducing and / or removing greenhouse gas emission wherever possible 4. It uses agriculture as a major tool for mitigation of GHG and CO_2 by laying emphasis on its unique capacity to absorb CO_2 and release Oxygen through photosynthesis process. It envisages to achieve this through increased cropping, by reducing rain fed areas through integrated water and river basin management and expansion of agriculture on wasteland, wetland, degraded fallow areas and introducing urban agriculture.

- It is an approach for addressing the development efforts towards the technical, policy and investment condition related issues to achieve sustainable agricultural development for food security under climate change along with eradication of poverty. But its focus is to act at local level where there is already impact of climate. There are five important reasons why we need to act together at local level.

MATERIAL AND METHODS

The present study confined to an *Ex-post-facto* research design. The state of Telangana were selected purposively, erstwhile Adilabad, Khammam, Mahabubnagar districts of Telangana state were selected purposively as they classified under the 100 vulnerable districts selected for the NICRA project implementation and subjected to climatic vulnerability across the country. The important climatic vulnerabilities of the districts are high drought proneness, heat stress, mid and terminal dry spells, unseasonal rains etc. Also, average annual rainfall of the district ranges from 750-950 mm which describes the high vulnerability of the district towards climatic aberrations among the selected districts. Two mandals from each district constituting a total of six mandals were selected for the study. The Indervelly, Ichoda mandals of Adilabad district, Wyra, Enkaoor mandals of Khamam district, Hanwada, Jadcharla mandals of Mahabubnagar district were selected. Two villages from each mandal were selected randomly, thus constituting a total of 12 villages for the study. Two villages namely Anji, Daenapur of Indervelly mandal, Narsapur, Gear jam of Ichoda mandal of the Adilabad district, Somavaram, Thatipudi of Wyra mandal, Nacharam, Emmamnagar of Enkaoor mandal of the Khamam district, Nainonpally, Ibrahimbad of Hanwada, Kodgal, Gangapoor of Jadcharla mandals of the Mahabubnagar district were selected.

From each selected village, 25 farmers were selected randomly to comprise a total sample size of 300 for the present study.

Taking into consideration the scope and objectives of the study, a well-structured interview schedule was prepared. It was developed with the help of extensive review of literature and consultation with the experts in the fields of Agricultural Extension, Agronomy, and Statistics. Before interviewing the respondent, the purpose of the study was explained in detail. Observation of respondent's background, behaviour, emotions, feelings, ideas, aspirations and surroundings were also made use of during interview.

RESULTS AND DISCUSSION

Effectiveness of Climate Smart Agriculture practices.

The results pertaining to the effectiveness of Climate Smart Agriculture (CSA) practices as perceived by the farmers are presented. Considering various dimensions viz., economic efficiency, environmental efficiency, and social efficiency of CSA technologies as perceived by the farmers.

I. Economic efficiency of Climate Smart Agriculture (CSA) practices as perceived by the farmers

The results in Table 2 and Figure 2 indicate that, **Economic efficiency of** Climate Smart Agriculture (CSA) practices perceived by the farmers **revealed that majority were found to have** medium economic efficiency (44.3%) followed by high (34.3%) and low (21.3%) economic efficiency. The farmers stated that they were able to enhance their incomes, employment opportunities throughout the year (viz., growing diversified crops, dairy farming, IFS and off farm activities like etc..), diversified farming systems and minimize the aberrations caused due to climate change and variability.

The possible reason might be attributed due to sub division and fragmentation the farm size is decreasing there by more small and marginal land holdings. It may not be feasible to take up all the CSA practices in these holdings. The degree of innovativeness and risk taking also may be minimum for these farmers possessing such kind of holdings, which limits effectiveness of Climate Smart Agriculture practices at critical periods of time.

Table 1. Distribution of respondents according to the Economic efficiency of CSA practices as perceived by farmers (n=300)

S.No.	Category	Class Interval	Frequency	Percentage
1.	Low economic efficiency	<5	64	21.3
2.	Medium economic efficiency	6-7	133	44.3
3.	High economic efficiency	>8	103	34.3
Total			300	100.00

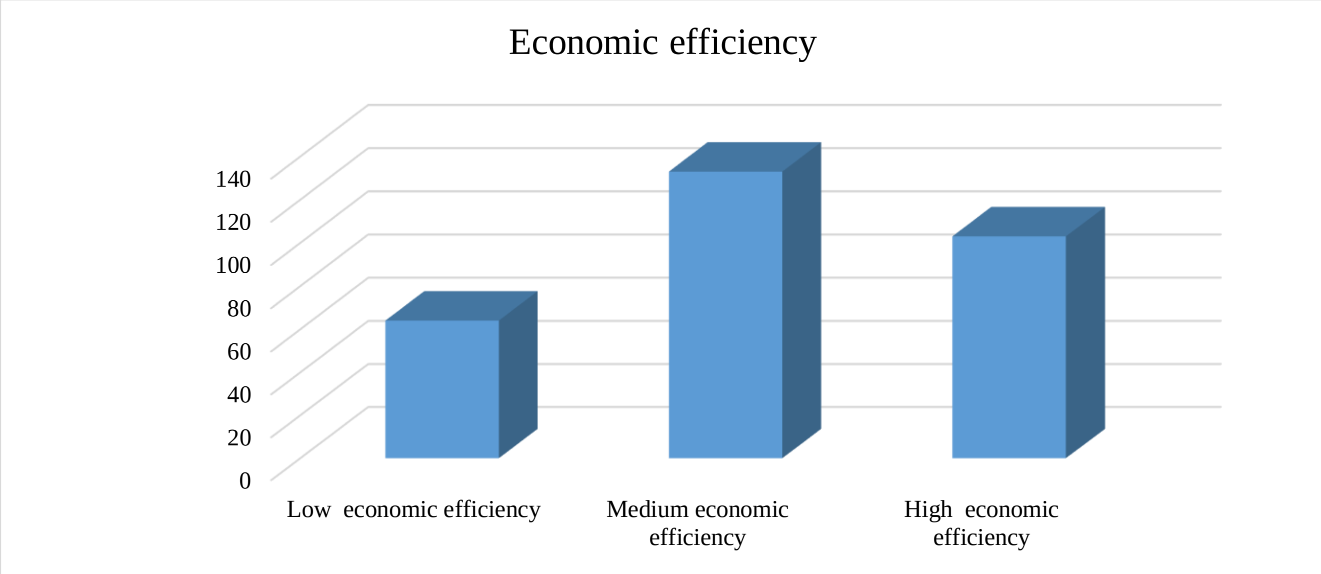

Figure 1. Distribution of farmers according to environmental efficiency of Climate Smart Agriculture

II. Environmental efficiency of Climate Smart Agriculture (CSA) practices as perceived by the farmers

The results in Table 2 and Figure 2 revealed that, majority CSA practices as perceived by farmers were found to have medium environmental efficiency (42.3%) followed by low (41%) and high (16.7%) environmental efficiency. The possible reason might be attributed due to that farmers are not inclined much to be in touch with the changes in environmental climate change and CSA practices, this trend may be due to the idiosyncratic behaviour established by the virtue of their medium to old age, less education and possessing low degree of other profile characteristics.

The probable reason for the medium to low followed by high levels of perceived environmental effectiveness of CSA technologies by the farmers may be due to the satisfying results produced by the technologies could be attributed to the reason that the farmers are slowly realising both short and long lasting effects of these practices, in addition to this the government is giving financial support to take up various NRM activities under watershed. This finding is in conformity with Reddy (2009).

Table 2. Distribution of respondents according to the Environmental efficiency of CSA practices as perceived by farmers (n=300)

S.No.	Category	Class Interval	Frequency	Percentage
1.	Low environmental efficiency	<6	123	41
2.	Medium environmental efficiency	7	127	42.3
3.	High environmental efficiency	>8	50	16.7
Total			300	100.00

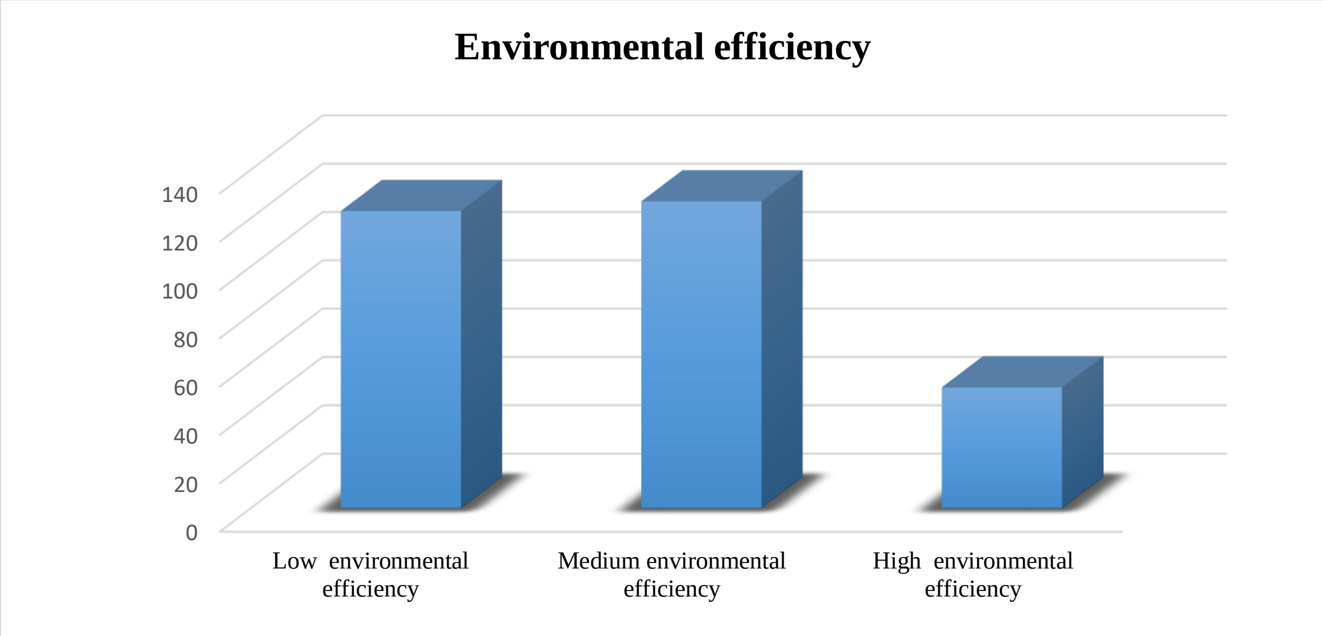

Figure 2 Distribution of respondents according to the Environmental efficiency of CSA practices as perceived by farmers

III. Social efficiency of Climate Smart Agriculture (CSA) practices as perceived by the farmers

The results in Table 3 revealed that, (39%) of the CSA practices as perceived by farmers were found to have low social efficiency followed by medium (31.7%) and high (29.3%) social efficiency. The probable reason for the low to high followed by medium levels of perceived social efficiency of CSA technologies by the farmers may be due that majority of the respondents might be attributed to the medium levels of adoption of CRA and CSA technologies followed by less information seeking behaviour, less social affiliation, environmental awareness, achievement motivation, innovativeness and medium mass media exposure.

Table 2. Distribution of respondents according to the social efficiency of CSA practices as perceived by farmers **(**n=300)

S.No.	Category	Class Interval	Frequency	Percentage
1.	Low social efficiency	<5	117	39
2.	Medium social efficiency	6	88	29.3
3.	High social efficiency	>7	95	31.7
Total			300	100.00

CONCLUSION

The study shows that majority of the respondents had revealed that majority were found to have medium economic efficiency followed by high and low economic efficiency. The farmers stated that they were able to enhance their incomes, employment opportunities throughout the year with diversified farming systems and minimize the aberrations caused due to climate change and variability. The major constraint is sub division and fragmentation the farm size is decreasing there by more small and marginal land holdings. It may not be feasible to take up all the CSA practices in these holdings. More than one-third of the respondents had perceived environmental efficiency was medium followed by low and high environmental efficiency. Its due to the satisfying results produced by the technologies could be attributed to the reason that the farmers are slowly realising both short and long lasting effects of these practices. Majority of the respondents had perceived the CSA and CRA practices found to have low social efficiency followed by medium and high social efficiency. The farmers were found to be lacking in use of WBAAS, Integrated Pest Management, Site- Specific nutrient management and crop insurance, which can be addressed by integration of mass media, information communication technology and other new applications through which the farmers can gain information regarding the weather and plan their activities. Also, farmers can make better decisions on market and adopt new technologies. As majority of the farmers belong to semi-medium and small size land holdings, the CSA and CRA technologies developed should be of low cost, user friendly and compatible to increase the rate of adoption. The high levels of achievement motivation, risk taking ability and scientific orientation of the farmers can be best utilized by encouraging them towards taking up various IFS activities, floriculture, poultry, dairy enterprises etc.

The Effectiveness of Climate Smart Agriculture practices analysis of the study provide feedback to the institutions engaged in the dissemination of the CSA and CRA technologies, which would help in preparing contingency plans specific to each month for various crops grown in the districts and provide advisory support to the farmers accordingly. Thus advising the farmers to utilize WBAAS in taking up contingency crop planning, increasing their exposure, sensitivity and adoptability towards climatic variabilities, which contributes in higher perceived effectiveness of CSA practices by the farmers. The provision of financial support to the farmers can empower them to take up new technologies, strengthen the functioning of custom hiring centre, fodder and seed banks.

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