"A STUDY ON ADOPTION AND FACTORS DETERMINING THE ADOPTION OF RECOMMENDED CLIMATE SMART AGRICULTURE (CSA) PRACTICES BY THE FARMERS OF TELANGANA STATE"

Abstract

A research study was conducted to identify the extent of adoption of various CSA practices and factors influencing the determining the adoption of recommended climate smart agriculture CSA practices. Exposit facto research design was followed and selected 300 respondents by random sampling method. Indicated that, majority of the farmers comes under the category of medium (59.7%) extent of adoption of various CSA practices followed by high (30.7%) and low (9.7%). The factors determining the adoption of CSA practices and these factors were grouped under seven categories namely Personal, Social, Economic, Environmental, Technological factor, Marketing and Transfer of technology. The factors under each category were ranked based on frequency and percentage.

Majority of the farmers have size of land holding is very small, followed by the constraint of lack of awareness about adaption strategies (viz., adjusting sowing dates, water saving technologies etc.), was major constraint faced by the farmers. Then Non availability of the recommended inputs in the market and sometimes due to shortage of the availability of quality inputs, traders sell the inputs at high cost resulting in non-adoption of input intensive CSA technologies. Poor availability and accessibility to short duration drought tolerant crop varieties was observed as a hindrance factors in the adoption of CSA technologies

Keywords: Climate Smart Agriculture (CSA) practices, Weather Based Agro Advisory Services (WBAAS), Natural Resource Management (NRM), Managerial ability of farmers and random sampling method.

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Introduction

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Importance of earth is self-evident, from its unique characterization as the only known planet that is habitable for human beings. Climate of the blue planet is a rare quality it possesses to sustain every living organism. Life is possible on earth because it has an atmosphere that safeguards life forms by screening out different ultraviolet solar radiation, maintaining moderate temperature, transporting water vapour, and providing useful gases.

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. 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) [1] and 13 kg/ha in cotton (Raksha., 2014) [2] 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) [3]. 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) [4]. Various other factors viz., poor availability of irrigation water, irregularities in the onset of monsoon, heat wave, cold wave, 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 water for irrigation, 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 climates 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).

MATERIAL AND METHODS

The present study confined to an *Ex-post-facto* research design. The state of Telangana was selected purposively, erstwhile Adilabad, Khamam, Mehaboobnagar districts of Telangana state was selected purposively because they come 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.

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Two mandals from each district will be selected, constituting a total of six mandals for the study. The Indervelly, Ichoda mandals of the Adilabad district, Wyra, Enkaoor mandals of the Khamam district, Hanwada, Jadcharla mandals of the Mehaboobnagar district was selected.

Two villages from each mandal will be 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 Mehaboobnagar district were selected.

RESULTS AND DISCUSSION

Extent of adoption and factors determining the adoption of recommended Climate Smart Agriculture (CSA) practices by the respondents

The data presented in the table 1 and figure 1 indicates that, majority of the farmers fell under the category of medium (59.7%) extent of adoption of various CSA practices followed by high (30.7%) and low (9.7%).

Table 1. Distribution of farmers according to their extent of adoption of various CSA practices n=300

S.No.	Category	Class Interval	Frequency	percentage
1.	Low extent of adoption	<7	29	9.7%
2.	Medium extent of adoption	8-23	179	59.7%
3.	High extent of adoption	>24	92	30.7%
Total			300	100.00

The medium followed by high adoption of CSA practices 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. Government is offering cent per cent subsidy to take up various NRM activities under watersheds like drip irrigation etc. This finding is in conformity with those of Reddy, K.M. (2009) [5].

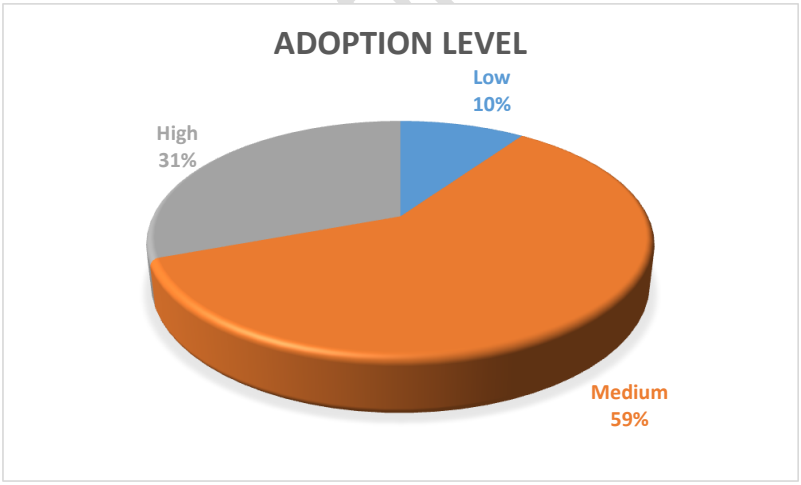

Figure 1: Distribution of farmers according to their extent of adoption of various CSA practices n=300

Table 2. Rank wise analysis of factors determining the adoption of CSA practices n=300

S. No.	Factors	Agree		Disagree		Undecided		Total Score	Mean Score	Overall Rank	Subsection Rank
A.	**Personal factor**	**F**	**%**	**F**	**%**	**F**	**%**				
1.	Low level of farmers literacy	176	58.67%	124	41.33%	0	0.00%	776	2.587	15	VI
2.	Lack of knowledge on different sources of information on advanced technologies	193	64.33%	102	34.00%	5	1.67%	788	2.627	12	IV
3	Unfavorable attitude towards the existing extension system	226	75.33%	68	22.67%	6	2.00%	820	2.733	8	III
4.	Un adopted farmers are not believing scientific method of cultivation	249	83.00%	37	12.33%	14	4.67%	835	2.783	6	I
5.	Size of land holding is very small	201	67.00%	81	27.00%	18	6.00%	783	2.610	14	V
6.	Un adopted farmers are traditional bound (follows age old technologies)	223	74.33%	77	25.67%	0	0.00%	823	2.743	7	II
7.	Past and present experiences of farmers	185	61.67%	73	24.33%	42	14.00%	743	2.477	20	VII
B.	**Economic factor**										
8.	Cost of machinery is higher to hire or purchase	261	87.00%	20	6.67%	19	6.33%	842	2.807	4	III
9.	Cost of labour wages is higher to hire	266	88.67%	33	11.00%	1	0.33%	865	2.883	1	I
10.	Less availability of required agricultural credit	254	84.67%	44	14.67%	2	0.67%	852	2.840	2	II
C.	**Social factors**										
11.	Family pattern (extended family), where family members are engaged with other economical jobs hence not interested to gain information on advanced crop production technology	242	80.67%	58	19.33%	0	0.00%	842	2.807	4	I

12.	Lower cast of the farmers are alienating from the main stream	46	15.33%	68	22.67%	186	62.00%	460	1.533	34	III
13.	Proximity from neighbors/community	39	13.00%	41	13.67%	220	73.33%	419	1.397	35	IV
14.	Poor coordination and reluctance to share ideas among the members of the community	88	29.33%	122	40.67%	90	30.00%	598	1.993	28	II
D.	**Environmental factor**										
15.	Scarce rainfall	221	73.67%	63	21.00%	16	5.33%	805	2.683	10	IV
16.	Heavy rainfall	234	78.00%	49	16.33%	17	5.67%	817	2.723	9	III
17.	Poor soil nutrient status	240	80.00%	59	19.67%	1	0.33%	839	2.797	5	II
18.	Unpredictability of climatic conditions	252	84.00%	46	15.33%	2	0.67%	850	2.833	3	I
E.	**Technological factor**										
19.	lack of proper irrigation facility	178	59.33%	88	29.33%	34	11.33%	744	2.480	19	V
20.	Poor supply of good quality seed	207	69.00%	80	26.67%	13	4.33%	794	2.647	11	II
21.	Machinery for agricultural operations is not available	174	58.00%	99	33.00%	27	9.00%	747	2.490	18	IV
22.	Less availability Post-harvest storage and processing technologies	180	60.00%	109	36.33%	11	3.67%	769	2.563	16	III
23.	Poor maintenance & unavailability of all required implements in custom hiring centers at times of high demand	218	72.67%	69	23.00%	13	4.33%	805	2.683	10	I
F.	**Marketing**										
24.	Lack of timely information	185	61.67%	114	38.00%	1	0.33%	784	2.613	13	I
25.	More involvement of middle men	165	55.00%	132	44.00%	3	1.00%	762	2.540	17	II
26.	No markets in the reachable distance	84	28.00%	160	53.33%	56	18.67%	628	2.093	26	IV

27.	Lack of market infrastructure	122	40.67%	158	52.67%	20	6.67%	702	2.340	21	III
G.	**Transfer of technology**										
28.	Insufficient number of need based trainings on CSA technologies	116	38.67%	134	44.67%	50	16.67%	666	2.220	23	II
29.	Poor contact with extension system	116	38.67%	145	48.33%	39	13.00%	677	2.257	22	I
30.	Poor transport facility	58	19.33%	123	41.00%	119	39.67%	539	1.797	31	VIII
31.	Administrative burden of extension functionaries	3	1.00%	156	52.00%	141	47.00%	462	1.540	33	XI
32.	Insufficient fund allotted to the department of agriculture to transfer the technologies	133	44.33%	89	29.67%	78	26.00%	655	2.183	24	III
33.	Extension functionaries are not interested in field work	25	8.33%	131	43.67%	144	48.00%	481	1.603	33	X
34.	Unavailability of subsidized good quality seeds, fertilizer, pesticides	79	26.33%	180	60.00%	41	13.67%	638	2.127	25	IV
35.	Not familiar with advanced electronic gadgets viz., TV/radio/internet connection to establish linkage and get information	53	17.67%	174	58.00%	73	24.33%	580	1.933	29	VI
36.	Poor cooperation from line departments	57	19.00%	142	47.33%	101	33.67%	556	1.853	30	VII
37.	Higher authorities are not effective to direct his/her subordinate for field work	45	15.00%	112	37.33%	143	47.67%	502	1.673	32	IX
38.	Less extension functionaries	75	25.00%	153	51.00%	72	24.00%	603	2.010	27	V

The Table 2. illustrated the factors determining the adoption of CSA practices and these factors were grouped under seven categories namely Personal, Social, Economic, Environmental, Technological factor, Marketing and Transfer of technology. The factors under each category were

ranked based on frequency and percentage.

The major factors faced by the farmers under economic factor ware cost of labour wages is higher to hire, was ranked first, which may be due to the fact that majority of people moving to the nearby towns and cities in search of work. It was followed by less availability of required agricultural credit was ranked second as majority of the subsidized rates were low compared to the actual price incurred and are mostly reserved for small and marginal farmers. High investment cost on machinery and land development of the farmers was ranked third.

The major factors faced by the farmers under personal factor are Un-adopted farmers are not believing scientific method of cultivation was ranked first, it was followed by Un-adopted farmers are traditional bound (follows age old technologies) ranked second, unfavorable attitude towards the existing extension system ranked third, lack of knowledge on different sources of information on advanced technologies ranked fourth and major factor faced by the farmers size of land holding is very small ranked five, and low level of farmers literacy ranked six.

The major factors faced by the farmers under social factors are family pattern (extended family), where family members are engaged with other economical jobs hence not interested to gain information on advanced crop production technology was ranked first, poor coordination and reluctance to share ideas among the members of the community ranked second, lower cast of the farmers are alienating from the main stream ranked third and proximity from neighbors/community ranked fourth.

The major factors faced by the farmers under environmental factor are Unpredictability of climatic conditions was ranked first, it was followed by poor soil nutrient status ranked second, heavy rainfall ranked third and scarce rainfall ranked fourth, its due to that 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, poor education and possessing low degree of other profile characteristics.

The major factors faced by the farmers under Technological factor are poor maintenance & unavailability of all required implements in custom hiring centers at times of high demand was ranked first, it was followed by poor supply of good quality seed ranked second, less availability Post-harvest storage and processing technologies ranked third and machinery for agricultural operations is not available during critical time ranked fourth, Sometimes due to shortage of the availability of quality inputs, traders sell the inputs at high cost resulting in non-adoption of input intensive CSA technologies and lack of proper irrigation facility ranked five.

The major factors faced by the farmers under Marketing factor are lack of timely information was ranked first, it is followed by more involvement of middle men ranked second, lack of market infrastructure ranked third and less markets in the reachable distance ranked fourth.

The major factors faced by the farmers under Transfer of technology are not familiar or poor contact with extension system was ranked first, it is followed by insufficient number of need based trainings on CSA technologies ranked second, insufficient fund allotted to the department of agriculture to transfer the technologies ranked third, unavailability of subsidized good quality seeds, fertilizer, pesticides ranked fourth, less extension functionaries ranked five, less familiar with advanced electronic gadgets viz., TV/radio/internet connection to establish linkage and get information ranked six, poor cooperation from line departments

ranked seven, poor transport facility ranked eight, higher authorities are not effective to direct his/her subordinate for field work ranked nine, and extension functionaries are not interested in field work ranked ten.

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Conclusion:

The study shows that Technical, Economic, Market and Environmental factors which influencing the managerial ability of farmers for the adoption of CSA practices. Major suggestions expressed by the farmers were Ensure timely availability and adequate quantity of quality inputs by the Government, fix the minimum labour charges by the government or provide Agricultural machinery on subsidy basis so that labour problem can be minimized.
Among the major factors elicited by the farmers under technical were Unpredictability and uneven rainfall, which was ranked first followed by the constraint of Poor maintenance & unavailability of all required implements in custom hiring centres at times of high demand (viz., ridge and furrow maker, bund former, tractor etc,.) Which was ranked second by the farmers. Sometimes due to shortage of the availability of quality inputs, traders sell the inputs at high cost resulting in non-adoption of input intensive CSA technologies. Poor availability and accessibility to short duration drought tolerant crop varieties was observed as a hindrance in the adoption of CSA technologies and was ranked third major factor and constraint.

Suggestions

- Government should focus on creating awareness among the farmers about climate change and resilient practices to overcome it.
- Government, NGOs and voluntary organizations' should work together for providing new farm machinery, management and operation of CHC in villages to reduce the drudgery of the farmers when there is labour scarcity for land preparation to harvesting of crop.
- Most of the farmers were found to be facing the problems of technical assistance, which is needed to be addressed through increased training programmes, field trips etc., in all the villages through different approaches like community, commodity etc,.
- The farmers were found to be lacking in the use of WBAAS, 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.
- Climate change affects the seasonal temperature and rainfall was very serious constraint. Therefore, farmers should adopt the agricultural practices, which could be capable of more adaptability to changing climatic conditions.
- Farmers have to use a local contingency plans to cover new and evolving risk scenario due to climate change.

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