Original Research Article

Constraints for Adoption of CSA Technologies and the Suggested Measures

Abstract

The adverse effects of climate change can be mitigated through apt interventions like Climate Smart Agriculture (CSA). The adoption of CSA technologies by the farmers is muddled because of the constraints faced by them in different contexts. The motive of the study was to identify the key constraints that inhibit the adoption of CSA technologies by farmers. Suggestions proposed by the farmers for increasing the adoption rates of the CSA technologies were also highlighted in the study. Four blocks with less average rainfall from the climate vulnerable district of Andhra Pradesh were chosen for the study. Two villages from each block were selected based on the highest number of farmers. Multi-stage proportionate random sampling was adopted for the study. Data was collected through open ended questions by personal interview methos. The responses were categorised and subjected to frequency and percentage analysis. The results demonstrated that lack of storage facilities was the major constraint faced by majority (85.71%) of the farmers followed by the uncertain returns and results of the CSA technologies (79.50%) as perceived by the farmers. Government and policy interventions, use of extension approaches in right time might help in overcoming the constraints. Providing trainings on CSA (83.23%) was the most suggested measure as it helps the farmers to increase their knowledge and clear their doubts on the outcomes of CSA. Demonstration of CSA technologies to the farmer improves their knowledge and skill.

Keywords: *Adoption; Climate Smart Agriculture (CSA); Constraints; Suggestions; Technologies.*

Introduction

Our mother earth is subjected to many changes since its' formation and it is a gradual and natural phenomenon. In the same way climate change is also a natural process. But in the recent years, the effect of climate change is visible in terms of increased temperatures, climate shift, reduced water availability and also reduced overall productivity of crops (Khan et al., 2009). It is one among the biggest challenges that are being faced at local, national and also at global level (Mmapatla, 2017).

Agriculture's vulnerability is growing over time, as climate change has a negative impact on agriculture due to unpredictability in the quality and quantity of natural resources (Norton et al., 2014). Many consequences of climate change are related to water, therefore considering how water is managed, particularly in rural and farming sectors, will be critical for the efforts for adaptation to climate change (Hardelin & Lankoski, 2015).

Encouragingly, emerging evidence from research conducted in developing nations where diverse CSA methods have been advocated shows that CSA activities have positive implications on performance indicators of biodiversity and livelihood, including poverty alleviation (Hansen et al., 2018). Both the developed and developing nations must take all necessary nations to limit emission of greenhouse gases into the atmosphere (Swamy, 2016). Constraints are universal all aspects and need to be overcome so as to use the resources or technologies fully.

Unawareness of government welfare and relief programmes is one of the major informational constraint faced by the farmers in adoption of CSA technologies (Singh et al., 2019). According to Blankenship et al., (2020) obstacles such as the limited power generation capacity of utility companies, corruption, geographical remoteness, and the poor economic condition of residents are a few of the barriers preventing the rural parts of India from having reliable electricity. Credit constraints are significant in adoption of CSA technologies as only 15.00 per cent of the farmers have access to credit according to the findings of Ifeoma et al., (2022). In these different contexts, there is a need to identify the hurdles faced by the farmers of the study area to improve the adoption rate of better practices for betterment of livelihoods. The current study was conducted on CSA technologies namely water-smart, energy-smart, nutrient-smart, carbon-smart, weather-smart and knowledge-smart technologies. The objective of the study was to elicit the constraints and enlist suggestions from the farmers point of view as they are the prime stakeholders of any technology or innovation interventions.

Methodology

The study area Ananthapuramu was the largest district in Andhra Pradesh and the seventh largest in India. There were wide variations in rainfall among the existing 63 blocks of the district. The study was carried out in the four blocks with least average annual rainfall. The blocks selected for the study were Chennekothapalle, Kudair, Garladinne and Kambadur with 397.16mm, 436.15mm, 438.02mm and 461.448mm of average annual rainfall respectively. Two villages from each block were selected based on the highest number of farmers available. From Chennekothapalle block, Kanumukkala and Nyamaddela with 1650

and 1621 farmers were chosen for the study. From Kuderu block, Ipperu and Kuderu villages were selected with 2353 and 1944 farmers respectively. In the block of Garladinne, Yerraguntla and Marthadu were selected for the study with 1526 and 1346 farmers respectively. In Kambadur block, Kambadur and Palluru villages with 3275 and 2356 farmers were selected. The sampling procedure of blocks and villages was purposive based on the average annual rainfall and highest number of farmers respectively. Multi-stage Proportionate Random Sampling was used to select one per cent of the population as sample from the selected villages. Accordingly, the sample size was finalised as 161. The farmers were asked about the constraints faced during the adoption of CSA technologies and suggestions for improving the reach and adoption of CSA technologies. The responses regarding the constraints were categorized into five components. The categories included institutional, situational, personal, technical and economic constraints. The suggestions were grouped and percentage analysis was used for analysing the data.

Findings and discussion

Constraints faced by farmers during adoption of CSA technologies

Constraints are the obstacles which are ubiquitous and impede the farmer's attempts in implementation of CSA technologies. The current study attempted to identify the barriers encountered by farmers of Ananthapuramu district for implementing CSA technologies. Perception of farmers regarding the constraints faced was collected, analysed, categorized and commented under the following sub-heads.

The Table 01 shows the results of the study on different constraints faced by the farmers.

Table 01 Constraints in adoption of CSA technologies (n=161)

S. No.	Items	Number	Per cent
Institutional constraints			
1.	Non availability of inputs	80	49.69
2.	Lack of extension activities about Climate Smart Agricultural Technologies	76	47.20
3.	Lack of improved communication facilities	64	39.75
4.	Low organizational membership	96	59.63
5.	Lack of trainings	106	65.84
Situational constraints			
6.	High dependence on monsoon	102	63.35
7.	Migration of youth	86	53.41

8.	Difficulties in shifting to different cropping patterns in short period of time	113	70.19
9.	Lack of access to forecasting technologies on weather and poor reliability	109	67.70
10.	Lack of storage facilities	138	85.71
Personal constraints			
11.	Low literacy level	79	49.07
12.	Small and fragmented land holdings	105	65.22
13.	Lack of knowledge and skills about CSA technologies	95	59.00
14.	Traditional belief /practice on the concomitant of farming practices	73	45.34
Technical constraints			
15.	Lack of technical guidance	68	42.24
16.	Difficulty in technology adoption	60	37.27
17.	Recommended technologies do not fit into the situation	79	49.07
18.	Uncertain returns and results	128	79.50
19.	Poor implementation of IPM technologies	115	71.43
Economic constraints			
20.	High cost of farm inputs	117	72.67
21.	Longer gestation period	99	61.49
22.	Poor financial assistance	103	63.98

It could be inferred from the Table 01 that nearly two-thirds (65.84%) of the respondents reported that lack of trainings (65.84%) was the most important institutional constraint faced during adoption of CSA technologies followed by low organizational membership (59.63%) of the farmers and non-availability of inputs and lack of extension activities about CSA technologies with 49.69 and 47.20 per cents respectively. Lack of improved communication facilities was the least perceived institutional constraint as reported by nearly two-fifths (39.75%) of the respondents.

Creating awareness is not only the prime function of extension workers but making the farmers adopt the suitable technologies play a better role in enhancing their livelihoods. Lack of capacity building programmes and trainings for improving their skills towards CSA might have contributed to the results. Farmers were less orientated towards participation in the organizations in the study area. The findings were in line with Kumar et al., (2016a).

In the context of situational constraints, lack of storage facilities was reported to be the major constraint by majority (85.71%) of the farmers followed by difficulties in shifting to different cropping patterns in short period of time (70.19%), lack of access to forecasting technologies on weather and poor reliability (67.70%), high dependence on monsoon (63.35%) and migration of youth (53.41%).

Lack of storage facilities like godowns, cold storages etc., and the difficulty in comprehending the technologies at field level might have hindered the farmers in adopting the CSA technologies. There were many information sources existing and the farmers were not sure about on which they should rely for credible information. Majority of the crops grown in the study area are rainfed which might have showed a negative impact on CSA adoption. Even though many efforts are being made by the governments, NGOs and SAUs for the betterment of agriculture sector and the farmers, the retainment of youth in agriculture is not being possible to a visible extent. They are being attracted towards more profitable and standardized occupations which might be a reason for the migration of youth to cities and towns. The results were in accordance with Patidar (2015).

Personal constraints included small and fragmented landholdings by nearly two-thirds (65.22%) of the respondents followed by lack of knowledge and skills about CSA technologies (59.00%), low literacy level (49.07%) and traditional belief on the concomitant farming practices (45.34%).

The land fragmentation is ancestral and a common phenomenon among the farmers of the country which had become a barrier for adoption of CSA technologies. Nearly three-fifths of the respondents from the study area were small and marginal which had contributed to the stated results. Lack of skill development programmes and the traditional beliefs that “it is better to follow conventional farming today and let tomorrow take care of itself” might have been a possible reason for the outcome. The findings derive support from the study of Howlader and Akanda (2016).

Uncertain returns and results was the major technical constraint as outlined by nearly four-fifths (79.50%) of the farmers followed by poor implementation of IPM technologies (71.43%), recommended technologies do not fit into the situation (49.07%), lack of technical guidance (42.24%) and difficulty in technology adoption (37.27%).

The low predictability of CSA technologies might have influenced them for not fully adopting the IPM practices. There existed a lack of technical guidance which might have made the farmers think that the technologies were not suitable to them or there are difficulties

involved in adoption of CSA technologies. The findings were in accordance with those of Patidar (2015).

High cost of farm inputs was the major economic constraint as reported by nearly three-fifths (72.67%) of the respondents followed by poor financial assistance and longer gestation period with 63.98 and 61.49 per cent respectively.

Any better or a new technology involves some investment to be made initially to reap better profits later. Majority of the farmers being small and marginal and with medium level of annual income, lack financial resources to afford the high cost machinery. Lack of financial assistance and longer gestation period for the visibility of results from CSA might have contributed to the result.

Suggestions for improving the adoption of CSA technologies

The suggestions were collected and recorded from the farmers for overcoming the constraints faced by them during adoption of CSA technologies and which would increase the adoption rate. The suggestions were tabulated and presented in the Table 02.

Table 02. Suggestions of farmers for greater adoption of CSA technologies

S. No.	Suggestions	Number	Per cent
1.	Involvement of local people in decision making	125	77.64
2.	Supply and availability of inputs at subsidised prices in time	107	66.46
3.	Arranging field visits	116	72.05
4.	Providing trainings on CSA	134	83.23
5.	Demonstration of CSA technologies in villages	130	80.74
6.	Distribution of literature on CSA technologies	78	48.45
7.	Timely information about weather forecasting	95	59.01
8.	Extending credit and subsidy on easy terms	82	50.93
9.	Improving the knowledge level of farmers through communication networks	63	39.13
10.	Providing incentives for adopting CSA technologies	119	73.91

The results from the Table 02 indicate that providing trainings on CSA was the most suggested measure by majority (83.23%) of the farmers followed by demonstration of CSA technologies in villages (80.74%), involvement of local people in decision making (77.64%), providing incentives for adopting CSA technologies (73.91%) and arranging field visits

(72.05%). Supply and availability of inputs at subsidised prices in time was suggested as a measure to improve adoption of CSA technologies by a little less than two-thirds (66.46%) of the farmers followed by timely information about weather forecasting (59.01%), extending credit and subsidy on easy terms (50.93%), distribution of literature on CSA technologies (48.45%) and improving the knowledge level of farmers through communication networks (39.13%).

Seeing is believing being the important principle of extension, demonstrations play a major role in making the farmers trust the outcome of CSA. Learning by doing principle of extension can be fulfilled by integrating participatory approaches which help in utilizing the farmers knowledge on their situations and develop location and need based technologies. Farmers know their problems better than anyone and if they are included in decision making, policy making can be made more efficient. The farmers were facing a constraint of uncertainty on results and returns from the CSA. Incentives for those who adopt the CSA technologies can be provided which might influence the farmers for adoption. Improving the knowledge of farmers and supplementing them with useful information through documenting and distribution of relevant literature might contribute to the adoption of CSA technologies. Giving credit access through group approach might increase the organizational participation of the farmers and will provide a better access to information at right time. Establishment of scientific storage facilities may motivate the farmers to grow more beneficial crops. Price forecasting and standardization can be made to motivate the farmers to retain in farming and might attract youth towards agriculture.

Conclusion

The increased awareness of farmers on climate change and the consequences is forcing the farmers to search for the ways through which they can secure their income and livelihoods. Upscaling the CSA technologies is facing barriers due to the heterogeneity prevailing in the landholdings, attitudes of farmers, situational and also economic factors. Farmers' participation in decision making should be encouraged in order to develop an ownness of technologies in order to adopt them. Lack of synchronization in implementing the policies from state and central governments to the farmers' level should be focused through extension interventions. Policies should be developed in order to shape the path through which the knowledge and information about the new technologies is being communicated. Diversified cropping should be encouraged by providing incentives and subsidies to supplement the investments involved in adoption of new technologies. Infrastructure facilities should be improved for providing diversified seed material and also feed for livestock under

diversification. Localized solutions would be more effective and sustainable and so as to achieve it, policy formation and implementation should consider the farmers' perspective.

Consent

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

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