

Role of Institutional and Policy Factors in Influencing Adaptations to Climate Change

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ABSTRACT

The purpose of the study was to understand the role of institutional and policy factors in influencing the climate change adaptations by the farmers. The study was conducted in a climate vulnerable district of Andhra Pradesh, India by covering 90 farmer households through structured interviews and Focus Group Discussions. The selected villages had the climate change related projects implemented in the past. The findings revealed that while the farmers were aware of climate change and adaptations, the adaptation decisions were largely influenced by the policy factors like minimum support price, subsidies, loans, credit, market, extension, quality inputs, weather advisory etc. There is a need for an enabling policy environment for the farmers to follow the adaptations and benefit from the same.

Keywords: Climate Change; Adaptation; Farmer; Awareness; Knowledge; Policy support; Andhra Pradesh.

INTRODUCTION

Climate Change and associated risks are of an important concern for India where more than half of the population live in rural areas and depend on climate sensitive livelihoods. The concerns are even greater for farmers situated in climate vulnerable areas practicing rainfed farming. Adapting to climate is no more an option but a necessity in the current times. Farmers are increasingly becoming aware of the changes and are following adaptations. There are examples from the dry regions of Tamil Nadu, where the farmers changed the planting dates, followed crop rotation, intercropping and mixed cropping in response to perceived variations in temperature and rainfall (Varadan and Kumar, 2014). Practices like adapting crop varieties that demand less water, high yielding and drought

resistant were also followed by the farmers in Maharashtra (Udmale et al., 2014). Farmers from Gujarat also responded to drought by late sowing and mixed cropping, selection of drought tolerant crops, increased irrigation etc. (Roy and Hirway, 2007; Jain et al., 2015). Similarly, farmers from Karnataka opted for soil and water management practices (Singh et al., 2018) while intercropping was one of the common responses of farmers from Telangana (Reddy et al., 2015). These evidences indicate that the farmers are aware of the changing climate and are capable of adapting to the same.

However, the adaptation decisions can be influenced by several factors. There are micro- level or internal factors operating at the household level such as age, education,

farming experience, family incomes availability of information, farmers perceptions, behavioral patterns etc. (Maddison, 2007; Hassan and Nhemachena, 2008; Deressa et al., 2011). Household level factors such as gender, labor availability, farming experience etc, were found to have a significant influence on the adaptations by smallholder farmers (Ahmed and Fatema 2023).

In addition to the internal factors, there are also macro level or external policy and institutional factors operating from national to state to local/ district level (Singh, et al., 2019; Deressa et al., 2011) that can influence the adaptations. These factors include access to credit, quality inputs, market fluctuations, infrastructure facilities, weather advisory services, extension support etc. The availability of financial support from formal sources plays an important role in facilitating on time adaptations as many of the adaptation practices are time sensitive and need immediate investments. The formal credit support, in general, is inadequate and inaccessible to small and marginal farmers, thus restricting the adaptations (Deressa et al., 2009; Satishkumar et al., 2013) hence the majority of farmers rely on informal credit sources that levy high interest rates. This increases the cost of adaptations which may discourage farmers. The agriculture extension system and capacity building programs are also crucial in encouraging the adaptations (Tripathi and Mishra, 2017; Satishkumar et al., 2013) however the extension reach-out in general is restricted due to limited human resources which can limit the adaptations. Given the indications that the farmers perceive the variations in climate and follow the adaptations, it is important to focus on the factors influencing the adaptations and support required to encourage the adaptations. The adaptation efforts by farmers alone will be not sufficient unless policy reforms are done to strengthen the farmer's incentives (OECD, 2015).

The aforementioned studies have captured the farmers' adaptations and highlighted the importance of contributing factors, which also shed some light on policy factors, but have not yet done a thorough examination of each of these factors. Going forward there is a need to understand in depth, the extent of influence of the policy factors, and their relative importance in contributing to the livelihood and income securities in the context of climate change. The study tried to understand the importance of these factors for the farmers practicing rainfed farming in a climate vulnerable region, Kurnool district of Andhra Pradesh, which is the second most vulnerable district in the state. Given the region's vulnerability to climate change, sustained research covering small and marginal farmers in vulnerable areas is important to inform policies and interventions.

With this context, the study was purposed to understand the adaptations followed by the farmers and to explore the farmer's perceptions and experiences on the influence of the institutional and policy factors on their adaptation decisions. The study was conducted focusing on the following objectives:

- To understand the common adaptation practices followed by the farmers in response to climate change, nature of the adaptations and triggers.
- To understand the institutional and policy factors that can influence the farmers' adaptations to climate change.

METHODOLOGY

Study Area

The study was conducted in Mandaloor (Rudravaram *mandal* - *Mandal* is an administrative division in some parts of India, constituting a subdivision of a district, i.e., a sub-district.) and Ramakrishapuram or RK Puram (Allagadda

mandal) villages located in the Kurnool district of Andhra Pradesh state, India. The district Kurnool is the second most vulnerable district to climate change in the State of Andhra Pradesh (CRIDA, 2013). The district is under the scarce rainfall zone (VI) of Andhra Pradesh with an annual rainfall of 500 to 750 mm which is mostly erratic, insufficient, and unevenly distributed resulting in frequent droughts. The soil types in the region are red earth with loamy, red sandy, and pockets of black cotton soils. Agriculture is the major livelihood and the major crops grown in the rainy season are paddy, groundnut, cotton, and pigeon pea. In the post-rainy season, chickpea, groundnut, sorghum, and sunflower are predominantly grown. The crop choices are determined by the monsoon and available water resources. Given the scenario, the farmers in this region have the need to respond and adapt their practices to suit the climatic variations. The majority (about 70%) of the farmers in the villages are small and marginal.

The study villages experience frequent weather vagaries and follow rain fed farming to a large extent, supported by groundwater. The villages have also experienced the implementation of climate change adaptation related projects in the past by an NGO. The project 'Strategic Pilot on Adaptation to Climate Change (SPACC)' was implemented during 2009-14 in Mandaloor village which has focused on enabling farmers to understand climate change and follow adaptations. Based on the learnings, the farmers were still following the adaptations at the time of the study. In the second village, Ramakrishnapuram (RK Puram), the project 'Andhra Pradesh Farmer's Managed Ground Water Systems (APFAMGS)' was implemented during 2004-09 which has focused on collective groundwater use by involving farmers in monitoring groundwater levels and promoting sustainable use of groundwater through crop

water budgeting and collective decisions on crop selection. The farmers in the village continue to follow these practices. A Farmer Producer Organization (FPO) was also formed with 700 farmers which was active. The FPO offers support by providing information on groundwater availability, crop budgeting, crop loans, inputs like seeds, and fertilizers etc.

Sampling

The study covered 90 farming households from two villages - 40 from Mandaloor and 50 from RK Puram. The samples were purposively selected to identify farmers who were exposed to the climate change related projects implemented in the past. While purposively selecting the samples, preference was given to small farmers and marginal farmers who represent the majority of Indian farmers. The sample included 69% of small and marginal farmers. The sample comprised small farmers (48), followed by medium farmers (21), marginal farmers (14), and large farmers (7).

Data Collection and Analysis

The research design was a mixed method approach with an explanatory sequential design. The method involved is a two-phase design where the quantitative data was collected first through structured interviews followed by qualitative data collection through Focus Group Discussions (FGDs). The qualitative results are used to further explain and interpret the findings from the quantitative data.

The household farmer surveys were conducted covering 90 households that provided data on the adaptations followed by the farmers and their perceptions/experiences on the influence of policy factors on adaptations. Followed by the household surveys, The FGDs were conducted in both villages which further helped in an in-depth understanding of the

constraints faced and required policy support. The surveys were conducted in 2019.

The quantitative data was analyzed using SPSS software. The analysis was descriptive. The data was analyzed and interpreted using suitable statistical procedures (frequencies). The qualitative information was used in explaining the findings.

FINDINGS AND DISCUSSION

Climate Change Adaptation Practices Followed by the Farmers

Adaptation is necessary for farming in climate vulnerable regions. The farmers in the study area were well aware of the adaptation practices, given their exposure to relevant projects implemented in the past. In addition, the

influence of other farmers, NGO programs and extension played a key role. The farmers perceive and adapt to the changes, however, there are variations in the selection of adaptations which is determined to some extent on the resources at their disposal as well as external triggers. The reasons or triggers behind their adaptations are climate and non-climate related as well. The most common adaptations followed by the farmers were – changing planting dates (94%), crop rotation (80%), crop diversification (80%), soil conservation measures (78%) varietal diversification (74%) and need based irrigation (71%), mixed livestock farming (53%), crop insurance (49%), livelihood diversification (34%), Shift to traditional crops (30%), farm diversification (23%), intercropping (9%), water conservation (8%), and micro irrigation (3%).

Table 1. Most Common Adaptations Followed by the Farmers

Sl. No	Type of Adaptation	Farmers Following Adaptations	Nature of Adaptation ¹ (Ease of adoption, cost)	Adaptation Triggers (Climate-driven or non-climate-driven)
1	Changing Planting Dates	94%	Simple, low cost	Climate change driven (delayed monsoon or early monsoon)
2	Crop Diversification	80%	Simple, low/medium cost	Climate change driven (monsoon, droughts, groundwater availability) and Non-Climate change driven (better market price)
3	Crop Rotation	80%	Simple, low/medium cost	Non-climate change driven (better market price, soil nutrient and pest/disease control) Climate change driven (better market price)
4	Soil Conservation measures	78%	Regular practices, involve cost	Non-climate change driven (conventional/traditional practice)

Sl. No	Type of Adaptation	Farmers Following Adaptations	Nature of Adaptation ¹ (Ease of adoption, cost)	Adaptation Triggers (Climate-driven or non-climate-driven)
5	Varietal Diversification	74%	Simple, low cost	Climate change driven (delayed monsoon or early monsoon) Non-climate change drivers (market demand)
6	Need based Irrigation	71%	Simple, low to medium cost	Climate change driven (dry spells, drought)
7	Mixed Livestock Farming	53%	Traditional practices, not simple, involve medium to high costs	Climate change driven (additional income source/risk proofing) Non-climate change driven (traditional practice, for better incomes)
8	Crop Insurance	49%	Part of bank loans, auto deduction	Climate change driven (insurance against climate risk) Non-climate change driven (part of loan package)
9	Diversification of Livelihoods	34%	Complex and often involve costs	Climate change driven (additional security in the event of crop failures) Non-climate change driven (better incomes)
10	Shift to Traditional Crops	30%	Simple, low cost, depends on market forces	Climate change driven (low risk crops) Non-climate driven (market demand and low input costs, less management required)
11	Farm Diversification	23%	Complex and often involves costs	Climate change driven (less water use, low chance of failures) Non-climate change driven (market demand, better incomes)
12	Intercropping	9%	Depends on selected crops, medium to low cost	Climate change driven (risk proofing) Non-climate change driven (extra income)

Sl. No	Type of Adaptation	Farmers Following Adaptations	Nature of Adaptation ¹ (Ease of adoption, cost)	Adaptation Triggers (Climate-driven or non-climate-driven)
13	Water Harvesting	8%	Complex, involves cost (land allocation for farm pond)	Climate change driven (to save water for life irrigations)
14	Micro Irrigation	3%	Complex, involves cost	Climate change driven (efficient and judicious use of water)

While the farmers were aware of the benefits of all adaptation practices, the adaptations that followed were often chosen based on the required investments and ease of adoption. This is evident from the findings where the most common, top 6 adaptations followed by more than 70% of the farmers are those involving less/medium costs and are simple to follow. However, these adaptations are mostly temporary or short term. The complex and high investment adaptations like water conservation and micro irrigation were followed by very few farmers, mostly the farmers with high incomes or large landholdings. This indicates that in any adaptation decision, one of the important factors to consider is economic efficiency as noted by Aryal et al. (2019).

The triggers behind the adaptations could be other than climate change. In the case of the adaptation 'crop diversification' the market demand for that particular commodity could be the actual trigger but not variation in climate. Similarly, adaptations like mixed livestock farming, intercropping and farm diversification are traditional practices while crop insurance is part of crop loans. These findings concur with previous studies which indicated that climate change is not the sole driver of adaptation, but adaptations sometime may be profit-driven instead of climate-driven and can also be changed according to season (Nhemachena and Hassan,

2007). Even if farmers adopt these practices to secure better income rather than adapt to climate change alone, these practices are important adaptation strategies in the agriculture sector and hence need to be encouraged.

Influence of Policy Factors on Adaptations

Following the adaptations and maintaining the yields despite of changing climate cannot be treated as ultimate success. The benefits of adaptations are not real until the farmers secure better incomes which largely depends external policy factors. Unless and until the policies are supportive, the farmers may not reap the actual/economic benefits of adaptations (in terms of cost recovery, and incomes) despite the good yields in unfavourable climatic conditions. As per the experiences and views of farmers, among the policy factors, support price (99%) and farm subsidies or loan waivers (98%) in the event of crop failures are the key facilitating factors for adaptations. Credit access (93%), access to markets (91%) (to sell the produce in market yards) and timely purchase and quantities that can be sold (89%), and storage infrastructure (89%) are the top 6 factors influencing the adaptations by farmers. These are followed by quality extension system (85%), awareness on climate change (81%), quality input availability (79%), weather updates (68%), and technological solutions (64%).

¹The nature of adaptations and costs are specific to the village context and based on farmers' views, and experiences.

Table 2. Policy Factors Influencing the Adaptations

Sl. No	Factors influencing Adaptations	Percentage
1	Minimum Support Price	99
2	Farm Subsidies, Loan Waivers	98
3	Credit Access	93
4	Access to Markets	91
5	Timely Purchase and Quantities purchased	89
6	Good Infrastructure (storage facilities)	89
7	Quality Extension System	85
8	Awareness on Climate Change	81
9	Quality Input Availability	79
10	Weather Updates	68
11	Technological Solutions	64

Despite following the adaptations and maintaining the crop yields, one of the key challenges farmers in the study region faced was inadequate Minimum Support Prices (MSP) or the absence of MSP (for some crops). According to farmers, the MSPs, in general, are not a match to the actual crop cultivation costs and in cases of climate variations, the costs are higher (e.g., additional costs for irrigation). In addition, farmers also experience market price fluctuations. These factors deter the farmers from making adaptation decisions like crop diversification. Farmers in the study area felt that in absence of the economic benefits they have no incentive to adapt and maintain the yields amidst unfavorable climatic conditions.

Ease in access to credits and subsidies also plays an important role in making certain adaptation decisions like crop diversification or farm diversification, creating an irrigation source, etc. While the farmers welcome the government support for input costs (Rs. 12,500

per farmer - Under the Scheme *YSR Rythu Bharosa (guaranteed support to farmers)* -PM Kisan farmers are provided with annual investment support of INR 12,500.), loan requirement remains as the support is not adequate, especially in the case of high value crops. In addition, lack of or limited subsidies deters them from adopting improved technologies like drip irrigation or farm diversification. In the case of crop loans, at times, unexpected decisions by Government on loan waivers (especially during elections) lead to confusion. The process for loan waivers during crop failures and claiming insurance is also tedious. While the process of accessing bank loans has become easier over time, the farmers face problems as they may not have land documents readily available (mortgaged somewhere else). Secondly, on time disbursements are not done forcing farmers to borrow temporarily from local lenders due to the limited window of the sowing season. With the FPO and SHGs in the villages, there is an added source of credit which is good. These findings are in concurrence with the findings of

Mulwa et al (2017) who observed that the number of adaptation practices was positively associated with access to credit. Similar observations were made by and Nhemachena and Hassan (2008) who also noted that farmers in Africa followed adaptations better when they had access to markets, new technologies, extension, and credit services.

Problems in accessing markets, timely purchase, and availability of storage infrastructure are other important factors influencing adaptations, and these factors are also interrelated. The farmers could not access the bigger markets due to long distances and at times the decisions on crop selection and technology adoption are also influenced by the access to markets. This is in line with the observation by Maddison (2007), Hassan and Nhemachena (2008), (Deressa, et al., 2011) and Tangonyire and Akuriba (2021). The tedious processes involved in selling their produce also discourage farmers from approaching the markets as they have to approach the Agriculture Produce Marketing Committee (APMC) market committees/authorities along with their land documents and details of crops grown and quantities of produce. Due to limited capacities/targets at markets, only parts of the products were purchased at times, forcing farmers to do distress sales. While the farmers prefer to sell directly in the market for MSP, the payments are often delayed and are transferred to bank accounts whereas the middlemen pay ready cash but below MSP. Thus, farmers make decisions based on their urgency. Limited storage facilities were also the reason behind distress sales (Kharumnuid et al., 2018). The system of buyback arrangement at standard prices becomes advantageous in such circumstances. This kind of arrangement offers security to farmers and enables adaptation decisions (the farmers in *RK Puram* avoid taking Kharif crops when rainfall is

low to save the groundwater which enables them to take up ground nut crop during Rabi, or as late Rabi crop for which they have assured market). This is in concurrence with the findings of Belay et al. (2017) who he observed that access to input and output markets can have a positive and significant effect on farmers' adaptations like crop diversification.

The farmers in the study area have gained knowledge through government involvement and non-government programs that helped them in following adaptations which agrees with the findings of Amsalu and de Graaff (2007). While the extension can play an important role in facilitating adaptations, the inadequate coverage affects the timely dissemination of crucial information. In addition to the government extension programmes, informal sources like NGOs, and neighboring farmers also influenced the adaptations which are in line with the findings of Mulwa (2017). The majority of the farmers following the adaptations in the study area is an indication of farmers' ability to respond to formal or informal extension support. This calls for a need to focus on strengthening extension services with information on the appropriate adaptation strategies.

Availability of quality and timely inputs (seeds and fertilizers) is another common issue faced by farmers in the region. One solution followed by the farmers was collective purchase, which was followed in the village *RK Puram* where 700 farmers (including neighboring villages) came together as a Farmer Producer Organization (FPO). The FPO also has plans for collective produce marketing in the future. While the FPO membership can take care of certain gaps like quality inputs, adaptation decisions, credits, etc. certain factors such as market price, and access to markets are the issue that needs to be addressed by the government.

CONCLUSION

The study explored the role of policy factors in facilitating the farmers' adaptations to climate change. Given that most of the households in the study area (above 90%) have followed at least one adaptation, the inferences are that the farmers are aware of climate change and can follow adaptations; when exposed to knowledge and awareness programs. However, their choices were based on cost and ease in adoption and the adaptation triggers could be both climate and non-climate driven. Despite of the farmers following adaptations, they may not benefit from the same if the policy environment is not favorable. The most important determinants of adaptation decisions, faced by the farmers are the gaps in the formal institutional support systems and policies such as weak pricing policy on MSP, gaps in subsidies; credit access; access to markets; infrastructure; extension support, awareness on climate change; quality input, weather updates; technology solutions etc. This emphasises the importance of addressing the policy gaps and creating an enabling environment for the small and marginal farmers. The study recommends to reconsider the support prices, keeping in view the cultivation costs and climate risks. Similarly, the agriculture marketing policies need to address the loopholes in the functioning of the current system. Timely credit availability from formal financial institutions can reduce the informal debt burdens on the farmers and encourage adaptations. The farmers can also benefit from easy to adopt, low cost technological solutions and extension support, hence more thrust is required on research and extension. The National Mission for Sustainable Agriculture under the National Action Plan on Climate Change (NAPCC), Government of India, largely focuses on promoting sustainable agriculture practices at the farmer level but lacks emphasis on policy measures to support farmers in securing their incomes. There is a need

for strengthening the policy measures for the success of the mission.

The study had tried to explain the influence and importance of the policy factors in encouraging farmers to adapt to climate change. The policy factors were picked based on a literature review and preliminary field visits/discussions with the farmers in the study area. A few important aspects the future studies can explore are – a thorough examination of government schemes/programs/action plans etc. for inclusion of necessary policy level support, and also the influence of political factors in promoting the policy support. These further explorations are likely to merit a deeper understanding of the challenges and might provide insights to policymakers and offer better strategies for promoting wider adaptations.

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