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Economic impact of climate change on the farmers

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Abstract
The present study was conducted with an objective of studying the economic impact of climate change on the farmers and the impact of coping mechanism adaptations on the economic income of the farmers. The study employed ex-post facto research design with quantitative data. The study was conducted in Chitradurga district of Karnataka state in 2017. In Chitradurga district, ten villages were selected from two taluks Challekere and Molakalmuru. 15 respondents were interview from each village following simple random sampling procedure, thus constituting total sample size of 150. The pertinent data was analyzed with statistical techniques like Dummy variable analysis, frequency and percentage using Software Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. It was found that there is decrease in net returns of Rs. 8,155.12 in groundnut and increase in net returns of Rs. 52,202.38 in tomato over the years in case of non adopters. Among adopter farmers the net returns had decreased by Rs. 28,693.21 in groundnut and Rs. 1,28,680.90 in tomato cultivation. A farmer without adopting any coping mechanism get net returns of Rs. 11727.65 per hectare. The additional returns due to adoption of coping mechanism was maximum in case of drip irrigation + mulching + protected cultivation model and the net returns per farm of adopters was maximum in case of drip irrigation + mulching + protected cultivation model (Rs. 203846.14).

Keywords: Economic, climate change, farmers

Introduction
Globally, climate change is the most serious environmental threat that adversely affects agricultural productivity (Enete *et al.*, 2010) [3]. According to inter-governmental panel on climate change (Anonymous, 2007) [1], climate change refers to any change in climate over time, due to natural variability or as a result of human activity. This climate change mainly caused by greenhouse gases (GHGs) accumulation in the atmosphere, which results in increased greenhouse effect. It is now a proven fact that the global climate is changing and measures for its mitigation and adaptation are essential to face the new challenges. (Prasad *et al*., 2011) [6] Climate change could have an effect on both agriculture, changing the conditions for crop and plant growth and in turn food supply, increasing the pressure on soil and water availability as well as farming methods with a reliance on fertilizers or other chemical products. The global economy is adversely being influenced very frequently due to extreme events such as droughts and floods, cold and heat waves, forest fires, landslips etc. Climate change potentially increases economic vulnerability of agriculture in a number of ways including altering the contribution of agriculture to the overall national economy, comparative advantage relative to other countries or regions, welfare distribution, and market prices (Fischer *et al*., 2002; McCarl, 2006) [4, 5]. Thus there is a need to identify and adopt coping mechanisms which combat the adverse effect of climate change, in order to attain sustainability in production under varying climatic conditions. The scientific knowledge on impacts of climate change is increasing all the time, as are practical experiences in responding to adaptation needs. This knowledge needs to be exploited. (Bhusal, 2009) [2] A common disadvantage for local coping strategies is that they are often not documented, but rather handed down through oral history and local expertise. As site-specific issues require site specific knowledge, experience has shown that identified adaptation measures do not necessarily translate into changes because there are context-specific social, financial, cultural, psychological and physiological barriers to adaptation. It is very important to clearly understand what is happening at community level, because farmers are the most climate-vulnerable group. With this background, the present study was undertaken with the objective of studying economic impact of climate change on farmers, economic impact of coping mechanism and economic efficiency of various coping mechanisms.

Material and methods
The investigation was conducted in Chitradurga district of Karnataka state. Further, Challekere

and Molakalmuru taluks were selected. The Chitradurga district was purposively selected for the investigation based on the intensity of the climate vulnerability experienced. The study was planned to involve two categories of respondent's viz., Adopter farmers and Non adopter farmers. Adopter farmers are those who have adopted the suitable coping mechanism to combat the effects of climate change and non adopter farmers are those who have not adopted any coping mechanism to mitigate the impact of climate change. One hundred and twenty adopter farmers and thirty non adopter farmers were selected from the study area by following simple random sampling procedure. Thirty non adopter farmers were selected in order to compare with the adopter farmers as a check.

The structured interview schedule was developed to elicit the response from the farmers. The interview schedule was pretested in the non sample area. The data collected from the respondents were subjected to statistical analysis including frequency, Percentage, Dummy variable analysis, using Statistical Package for the Social Sciences (SPSS) and Microsoft Excel software. The results were expressed in frequency and percentages.

Results and discussion

1. Economic impact of climate change

The data presented in Table 1 signifies that in case of non adopter farmers, there was decrease in net returns of Rs. 8,155.12 in groundnut and increase in net returns of Rs. 52,202.38 in tomato over the years. The average land holding had increased from 0.77 ha to 0.84 ha in groundnut and from 0.58 ha to 0.72 ha in tomato. Whereas, among adopter farmers the net returns had decreased by Rs. 28,693.21 in groundnut and Rs. 1,28,680.90 in tomato cultivation. There is decrease in net returns of Rs. 8,155.12 in groundnut since there is reduction in yield of groundnut due to failure in the monsoon. Increase in net returns of Rs. 52,202.38 in tomato over the years may be attributed to the increased area of production and also due to improved cultivation practices. Whereas, among adopter farmers the net returns had decreased by Rs. 28,693.21 in groundnut since there is drastic reduction in cultivated area along with reduced yield due to monsoon failure. The net returns had decreased by Rs. 1,28,680.90 in tomato cultivation since there was a price crash and farmers have not obtained the appropriate market price for their produce.

Table 1: Economic impact of climate change

No.	Crop		Average Land Holding (In acre)	Average Total Cost (In Rs.)	Average Gross Returns (In Rs.)	Average Net Returns (In Rs.)
Non adopters (n=30)						
1	Groundnut	Before	0.77	11743.83	32696.86	20953.36
		After	0.84	6052.8	18851.04	12798.24
		Deviation	0.07	-5691.03	-13845.82	-8155.12
2	Tomato	Before	0.58	114018.64	30285.40	43443.80
		After	0.72	96416.67	44214.29	52202.38
		Deviation	0.15	-17601.97	13928.89	8758.58
Adopters (n=120)						
1	Groundnut	Before	3.07	46066.38	136803.18	90736.81
		After	2.47	32036.40	94080.00	62043.60
		Deviation	-0.60	-14029.98	-42723.18	-28693.21
2	Tomato	Before	0.44	65880.00	162000.00	96120.00
		After	1.19	180560.90	148000.00	-32560.90
		Deviation	0.75	114680.90	-14000.00	-128680.90

Economic impact of coping mechanism

The result of the economic impact of coping mechanisms was indicated in the Table 2. The constant indicated the net returns a farmer gets without adopting any coping mechanism which was Rs. 11727.65 per hectare. The additional returns due to adoption of coping mechanisms was more in case of drip irrigation + mulching + protected cultivation model (Rs.182384.51) followed by drip irrigation + change in cropping pattern + protected cultivation (Rs. 164948.16) and drip Irrigation + mulching + protected cultivation + farm pond (Rs77733.90). It was noted that the combination of coping mechanisms that had protected cultivation as a component fetched more additional returns. This is because cultivation of crops under protected cultivation fetches good yield. The quality of the produce was also superior that fetches more returns to the farmers. Change in cropping pattern had increased the net returns since the farmers have shifted to perennial and horticultural/ commercial crops which give more returns than that of field crops.

3. Economic efficiency of various coping mechanisms

It was evident from the Table 3 that net returns per hectare due to cultivation of crops irrespective of coping mechanisms was maximum in case of drip irrigation + mulching + protected cultivation model (Rs. 203846.14) followed by drip irrigation + change in cropping pattern + protected cultivation (Rs. 186409.78) and drip irrigation + mulching + protected cultivation + farm pond (Rs.99195.54). Similarly, net returns per hectare due to coping mechanism was maximum in case of the combination of drip irrigation + mulching + protected cultivation model (Rs.184769.15) followed by drip irrigation + change in cropping pattern + protected cultivation (Rs. 166744.12) and drip irrigation + mulching + protected cultivation + farm pond (Rs. 79993.03). The additional returns to the farmers were maximum in these combinations of coping mechanisms. These coping mechanisms have compatibility with the existing condition, which made them to adopt with less risk. Along with this, governmental support and other support from the local area had reduced the burden on farmers to some extend and returns from all these activities were comparatively higher might be the reason for higher economic efficiency.

Table 2: Economic impact of coping mechanism (n = 150)

No.	Model	Unstandardised co-efficient (B)
1	Constant	11727.65*
2	Drip Irrigation + Intercropping	33136.74*
3	Drip Irrigation + Change in cropping pattern	26575.23 NS
4	Drip Irrigation + Farm pond	15718.50 NS
5	Drip Irrigation + mulching	46006.69*
6	Drip Irrigation + Intercropping + Protected cultivation	28876.89 NS
7	Drip Irrigation + Mulching + Protected cultivation	182384.51*
8	Drip Irrigation + Intercropping + Mulching	18504.88 NS
9	Drip Irrigation + Change in cropping pattern + Intercropping	25704.40*
10	Drip Irrigation + Change in cropping pattern + Protected Cultivation	164948.16*
11	Drip Irrigation + Change in cropping pattern + Farm pond	45226.87*
12	Drip Irrigation + Change in cropping pattern + Mulching	31375.57 NS
13	Drip Irrigation + Mulching + Protected cultivation + Intercropping	57298.91 NS
14	Drip Irrigation + Mulching + Protected cultivation + Farm pond	77733.90*
15	Drip Irrigation + Change in cropping pattern + Mulching + Farm pond	28715.43 NS
16	Drip Irrigation + Change in cropping pattern + Mulching + Protected Cultivation	24754.54 NS
17	Drip Irrigation + Change in cropping pattern + Mulching +Intercropping	46610.62 NS
18	Drip Irrigation + Change in cropping pattern+ Farm pond + Protected cultivation	42770.83 NS
19	Drip Irrigation + Change in cropping pattern + Farm pond + Intercropping	26427.24 NS
20	Drip Irrigation + Change in cropping pattern + Protected Cultivation + Intercropping	74555.41 NS
21	Drip irrigation + Mulching + protected cultivation + Change in cropping pattern + Intercropping	56038.96*

* - Significant at 5% NS – Non significant

Table 3: Economic efficiency of various coping mechanisms (n = 120)

No.	Model	Net returns/ ha	Net returns due to coping mechanism/ha
1	Drip Irrigation + Intercropping	54598.36	37320.29
2	Drip Irrigation + Change in cropping pattern	48036.86	30867.56
3	Drip Irrigation + Farm pond	37180.12	18368.09
4	Drip Irrigation + mulching	67468.31	48531.61
5	Drip Irrigation + Intercropping + Protected cultivation	50338.51	31363.76
6	Drip Irrigation + Mulching + Protected cultivation	203846.14	184769.15
7	Drip Irrigation + Intercropping + Mulching	39966.50	19907.60
8	Drip Irrigation + Change in cropping pattern + Intercropping	47166.03	26698.00
9	Drip Irrigation + Change in cropping pattern + Protected Cultivation	186409.78	166744.12
10	Drip Irrigation + Change in cropping pattern + Farm pond	66688.49	47276.70
11	Drip Irrigation + Change in cropping pattern + Mulching	52837.20	33634.69
12	Drip Irrigation + Mulching + Protected cultivation + Intercropping	78760.54	59606.62
13	Drip Irrigation + Mulching + Protected cultivation + Farm pond	99195.54	79993.03
14	Drip Irrigation + Change in cropping pattern + Mulching + Farm pond	50177.06	31182.27
15	Drip Irrigation + Change in cropping pattern + Mulching + Protected Cultivation	46216.16	26662.23
16	Drip Irrigation + Change in cropping pattern + Mulching +Intercropping	68072.26	49011.27
17	Drip Irrigation + Change in cropping pattern+ Farm pond + Protected cultivation	64232.47	45018.12
18	Drip Irrigation + Change in cropping pattern + Farm pond + Intercropping	47888.87	28717.72
19	Drip Irrigation + Change in cropping pattern + Protected Cultivation + Intercropping	96017.05	76940.03
20	Drip irrigation + Mulching + protected cultivation + Change in cropping pattern + Intercropping	77500.59	56720.28

Conclusion

Climate change has been recognized globally as an ever increasing threat to our planet that is becoming impossible to ignore. Individuals with access to extension services are likely to perceive changes in the climate because extension services provide information about climate and weather. Various awareness programmes and trainings can be conducted so that the farmers can be made aware regarding various coping mechanisms. There were some local coping and adaptation strategies adopted in response to observed risks and hazards associated with climatic factors. Most of the coping activities were found to be event specific based on local knowledge and innovations. Thus, there is a need to promote a model of coping mechanism among the farmers that are economically feasible and viable so that farmers and adopt it and realize returns in a long run and also suitable institutional support is necessary in order to increase the outreach of these coping mechanisms, especially among small and marginal farmers.

References

1. Anonymous, IPCC Climate Change. The Fourth Assessment Report. Impacts, Adaptation and Vulnerability, 2007. [https://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg2_report_impacts_adaptation_and_vulnerability.htm]
2. Bhusal YR. Local Peoples' Perceptions on Climate Change, Its Impacts and Adaptation Measures in Mid-Mountain Region of Nepal (A Case study from Kaski District). *B.Sc. Thesis*, Tribhubhan University, Institute of Forestry, Pokhara, Nepal, 2009.
3. Enete AA, Amusa AT. Challenges of Agricultural Adaptation to Climate Change in Nigeria: a Synthesis from the Literature. Field Actions Science Reports, 2010.
4. Fischer G, Shah M, Van Velthuizen H, Nachtergaele FO. Global Agro- Ecological Assessment for Agriculture in

the 21st Century. International Institute for Applied Systems Analysis, 2002.
5. McCarl BA. US Agriculture in the Climate Change Squeeze: Part 1: Sectoral Sensitivity and Vulnerability. In: National Environmental Trust, 2006.
6. Prasad R, Ram Newaj, Dhyani SK. Local innovations for supporting climate resilient agriculture. Agroforestry Newsletter 2011; 23(1):3-4.