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Adoption Decision Making Behavior of Farmers about Contingency Plans in Datia and Parbhani Districts

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Authors Contribution

H. Chandan Gowda : Conceptualization, investigation, data collection, drafts preparation & data analysis; Rabindra Nath Padaria : Conceptualization & data curation.

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Abstract

The present study was conducted in Datia and Parbhani districts of Madhya Pradesh and Maharashtra state, respectively to analyze the adoption decision making behaviour of farmers about contingency plans. Sixty farmers from each district were personally interviewed using a pre-tested interview schedule. Pairwise comparison has been done for technological options with the criterias selected. The results revealed that the technological options 'Change of varieties', 'Agro techniques', 'Water conservation and utilization', 'Integrated pest management (IPM)' were prioritized as first, second, third and fourth, respectively. It was found that mean percentage of adoption was more in Parbhani (49.74 %) as compared to Datia (40.51 %). About one third of the Datia farmers (31.67 %) were under moderate adoption category, while one fourth of the Parbhani farmers (25.00 %) were in high adoption category, Overall, 27.50 per cent of them were under moderate adoption category of contingency plans and overall mean percentage of adoption was found to be 45.00 per cent.

Keywords : Contingency plans, Adoption, Decision making, Behaviour

India is one of the fast-growing economies of the world. It is experiencing continuous economic growth with technological advancement. In the path of development, one of the major threats is climate change. Worldwide studies have reported that climate change is affecting livelihood security, food security, agricultural incomes, including shifts in crop production zones across the world. The climate change impacts are projected to slow down economic growth, make poverty reduction more challenging, further corrode food security, and prolong existing and create new poverty traps in developing country like India. To overcome the impacts of climate change, a few measures are there, in that the best is to build up an alternate course of action to conquer the impacts posed by climate change. A contingency is to find out the alternative courses of action to be taken if a proposed plan is rendered inappropriate or unexpectedly disrupted. The contingency courses of action help in adapting to vulnerability and change. An emergency course of action is at times alluded to as "Plan B" since it can be utilized as an option for activity if the anticipated plan fails to provide outcomes or any shortcomings to appear.

Contingency plans for all the districts in the country are prepared by Central Research Institute for Dryland Agriculture (CRIDA), in a joint effort with State Agricultural Universities (SAUs)/Indian Council of Agricultural Research (ICAR) Institutes/Krishi Vigyan Kendras (KVKs). Research organizations like the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Central Arid Zone Research Institute, Indian Grassland and Fodder Research Institute, Central Soil Salinity Research Institute, Indian Council of Forestry Research and

Education and those under the Indian Council of Agriculture Research provide data on different parts of drought management.

Decisions regarding strategic adaptation measures have to be taken by the farmers. Such decisions made by farmers lead to successful climate change adaptation in the agriculture sector because they are the key investors in this sector. While predisposed by their political and social settings, the ultimate authority in decision making by concerning distinct processes are retained by the farmers (Polsky and Easterling, 2001). Adoption of technologies and measures is a process of decision-making and enabling farmers to make better choices regarding strategic adaptations requires provision for essential knowledge and information regarding appropriate technologies and better farm management practices. Adoption decision making behaviour was defined as the action of farmer towards decision making about contingency plans in the given situation. The technologies recommended by the institutions should be socially, economically, technically feasible for the farmers to adopt. With this brief background the present study was carried out to analyze the adoption decision making behaviour of the farmers.

Material and Methods

The study was conducted to find the adoption decision making behaviour of the farmers about contingency plans in Datia and Parbhani districts of Madhya Pradesh and Maharashtra state, respectively. The sample size was sixty farmers from each of the Datia and Parbhani districts thus forming a total sample of 120 farmers. To study the adoption decision-making behaviour of the farmers, Analytic Hierarchy Process (AHP) developed by Saaty (1980) was used.

AHP algorithm is composed of two steps:

1. Determination of the relative weights of the criteria
2. Determination of the relative rankings (priorities) of alternatives

Both qualitative and quantitative information were compared by using informed judgments to derive weights and priorities.

Step 1 : Identification of decision context

Step 2 : Identification of technological options to prioritize

Step 3 : Identification of criteria

Step 4 : Identification of outcome and performance of options

Step 5 : Assigning weights to each criterion

Step 6 : Examine results

Step 7 : Final priority was given for the options or technologies

1. *Identification of Decision Context* :The first step of an AHP process involves identifying the context. In the present study, the decision context was the selection of a technology for contingency plan.

2. *Identification of Technological Options to Prioritize :* The technological options were identified based on the farmer's priorities for adaptation to climate change. For the present study, the technological options identified were the change of varieties, agro-techniques, water conservation and utilization of IPM.

3. *Identification of Criteria :* Based on the review of literature and experts' opinion, criteria such as relative advantage, compatibility and feasibility were identified.

4. *Identification of Outcome and Performance of Options :* After identifying criteria and options, the performance of options were compared with the criteria by pairwise matrix.

5. *Assigning Weights to Each Criterion :* Weights were given to each criterion and the consistency ratio was calculated for each comparison matrix.

6. *Examine Results :* Consistency ratio values were examined. In the present study consistency ratio for all the matrices was less than 0.1.

7. *Final Priority was given for the Options or Technologies :* Priorities were given based on the results.

Consistency ratio = Consistency index/Random index

Note : As a rule, the consistency ratio for the criteria and options should be less than 0.1

Analytical Hierarchy Process (AHP) technique was employed to analyze the adoption decision making behaviour of farmers. To begin with, the technological options were identified through review of literature and experts' opinion. A total of four technological options were identified for the study *viz.,* Change of varieties (CV), Agro techniques (AT), Water conservation and utilization (WCU) and Integrated pest management (IPM).

Evaluation Criteria

Based on the experts' opinion as well as discussion with farmers, three important evaluation criteria *viz.,* 'Relative Advantage', 'Feasibility' and 'Compatibility', were selected which played a vital role in determining the choice of technological options.

Further, extent of adoption was measured by using the formula

Extent of Adoption = Area under contingency plans (the number of acres managed with the technologies given in contingency plans) / Total potential area. The different categories has been made based on mean and standard deviation.

Results and Discussion

Analytical Hierarchy Process (AHP) technique was employed to analyze the adoption decision making behaviour of farmers. Consistency ratio in case of Datia with respect to criteria was found to be 0.093 which indicates sufficient consistency in the process of pairwise comparative judgment. Table 1 indicated that in Datia, Relative advantage (RA) was perceived as the most important followed by Feasibility (FE) and Compatibility (COM). In case of farmers of Parbhani district, the consistency ratio with respect to criteria was found to be 0.0158, which indicated sufficient consistency in the process of pairwise comparative judgment. Table 4 indicated that in Parbhani also, Relative advantage (RA) was perceived as the most important followed by Feasibility (FE) and Compatibility (COM). The results are in line with Veisi *et al*. (2016).

Paired comparison of technological options with respect to the selected three criteria was conducted among the farmers of Datia and Parbhani districts. Consistency ratio with respect to relative advantage in case of Datia was found to be 0.0784 which indicated sufficient consistency in the process of pairwise comparative judgment. Table 2 indicated that in Datia, Change of Varieties (CV) was perceived as most important followed by agro techniques, water conservation & utilization and integrated pest management. The results are on par with Sun *et al.* (2017). In case of Parbhani district, the consistency ratio with respect to relative advantage was found to be 0.0731, which indicated sufficient consistency in the process of pairwise comparative judgment. In Parbhani too, the Change of Varieties (CV) was perceived as the most important followed by agro

Table 1

Criteria with respect to goal: Prioritization of contingency plan technologies

Datia			Parbhani		
Eigen vector	Weight	Composite Eigen vector	Eigen vector	Weight	Composite Eigen vector
1.8171	0.5171	1.6072	2.2894	0.625	1.8865
1.2599	0.3586	1.1144	0.8736	0.2385	0.7198
0.4368	0.1243	0.3863	0.5	0.1365	0.412
λ max = 3.1078 Consistency Index = 0.0539 Consistency Ratio = 0.093			λ max = 3.0183 Consistency Index = 0.0091 Consistency Ratio = 0.0158		

TABLE 2

Paired comparisons of technological options with respect to relative advantage

Datia			Parbhani		
Eigen vector	Weight	Composite Eigen vector	Eigen vector	Weight	Composite Eigen vector
2.2795	0.478	2.044	2.0598	0.4502	1.9158
1.2779	0.268	1.1249	1.1892	0.2599	1.0959
0.7598	0.1593	0.6421	0.8409	0.1838	0.7511
0.4518	0.0947	0.4007	0.4855	0.1061	0.4347
λ max = 4.2117; Consistency Index = 0.0706; Consistency Ratio = 0.0784			λ max = 4.1975; Consistency Index = 0.0658; Consistency Ratio = 0.0731		

TABLE 3

Paired comparisons of technological options with respect to feasibility

Datia			Parbhani		
Eigen vector	Weight	Composite Eigen vector	Eigen vector	Weight	Composite Eigen vector
2.6321	0.522	2.1981	2.0598	0.4457	1.8238
1.1892	0.2359	0.9695	1.3161	0.2848	1.1517
0.8409	0.1668	0.7166	0.7598	0.1644	0.6655
0.3799	0.0753	0.3262	0.4855	0.1051	0.4308
λ max = 4.2103; Consistency Index = 0.0701; Consistency Ratio = 0.0779			λ max = 4.0717; Consistency Index = 0.0239; Consistency Ratio = 0.0266		

TABLE 4

Paired comparisons of technological options with respect to compatibility

Datia			Parbhani		
Eigen vector	Weight	Composite Eigen vector	Eigen vector	Weight	Composite Eigen vector
2.4495	0.4944	2.1024	2.2134	0.4624	1.9274
1.4142	0.2854	1.2397	1.4142	0.2955	1.1997
0.6389	0.129	0.5475	0.7071	0.1477	0.5998
0.4518	0.0912	0.3744	0.4518	0.0944	0.3963
λ max = 4.264; Consistency Index = 0.088; Consistency Ratio = 0.0978			λ max = 4.1232; Consistency Index = 0.0411; Consistency Ratio = 0.0456		

techniques, water conservation & utilization and integrated pest management. The results are in conformity with the results of Giri and Nejadashemi (2014).

Table 3 indicated that in Datia, Change of Varieties (CV) was perceived as the most important followed by agro techniques, water conservation & utilization and integrated pest management with respect to

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feasibility. Consistency ratio with respect to feasibility was found to be 0.0779 which indicated sufficient consistency in the process of pairwise comparative judgment. The results are in line with Mawapanga and Debertin (1996). In case of Parbhani district, the consistency ratio with respect to feasibility was found to be 0.0266 which indicated sufficient consistency in the process of pairwise comparative judgment.

Table 4 indicated that in Datia, Change of Varieties (CV) was perceived as the most important followed by agro techniques, water conservation & utilization and integrated pest management with respect to compatibility. Consistency ratio with respect to compatibility was found to be 0.0978 which indicated sufficient consistency in the process of pairwise comparative judgment. Similar kind of results are obtained by Romejin *et al.* (2016). In Parbhani, Change of Varieties (CV) was perceived as the most important followed by agro techniques, water conservation & utilization and integrated pest management with respect to compatibility. Consistency ratio with respect to compatibility was found to be 0.0456 which indicated sufficient consistency in the process of pairwise comparative judgment. The results are in conformity with the results of Giri and Nejadashemi (2014).

Table 5 presents final priority of technological options for both the district. It was found that the technological options 'Change of varieties', 'Agro techniques', 'Water conservation and utilization', 'IPM' were prioritized as first, second, third and fourth, respectively. The results are in conformity with the results of Giri and Nejadashemi (2014). In Parbhani too, the Change of Varieties (CV) was perceived as the most important followed by agro techniques, water conservation & utilization and integrated pest management with respect to feasibility.

TABLE 5

Final priority of technological options

Final priority	Final priority		Priority
	Datia	Parbhani	
Change of varieties	0.4958	0.4508	I
Agro techniques	0.2586	0.2707	II
Water conservation and utilization	0.1582	0.1742	III
IPM	0.0873	0.1043	IV

It was found that mean percentage of adoption was more in Parbhani (49.74 %) as compared to Datia (40.51 %). About one third of the Datia farmers (31.67 %) were under moderate adoption category, while one fourth of the Parbhani farmers (25.00 %) were in high adoption category, Overall, 27.5 per cent of them were under moderate adoption category of contingency plans and overall mean percentage of adoption was found to be 45 per cent (Table 6). Policy incentives were found to correlate positively with adoption decision-making. The availability of funding programs (Zhai and Williams, 2012) and government support and policies (Luthra *et al.,* 2016) were important in tackling barriers and driving adoption of technologies. Similar results were found by Montes De Oca Munguia *et al.,* 2021.

TABLE 6

Extent of adoption of contingency plans by farmers

Extent of adoption	Datia (n = 60) f %	Parbhani (n = 60) f %	Total (n = 120) f %
Very low (0 - 20 %)	12 (20.0)	10 (16.67)	22 (18.33)
Low (>20 - 40 %)	14 (23.33)	12 (20.0)	26 (21.67)
Moderate (>40 - 60%)	19 (31.67)	14 (23.33)	33 (27.5)
High (>60 - 80%)	8 (13.33)	15 (25.0)	23 (19.16)
Very high (>80 - 100%)	7 (11.67)	9 (15.0)	16 (13.33)
Mean (%)	40.51	49.74	45.12
Standard Deviation	30.20	33.45	31.82

The study was conducted to find the Adoption decision making behavior of farmers about contingency plans in Datia and Parbhani districts of Madhya Pradesh and Maharashtra state, respectively. It was found that mean percentage of adoption was more in Parbhani

(49.74 %) as compared to Datia (40.51 %). Overall, 27.50 per cent of them were under moderate adoption category of contingency plans and overall mean percentage of adoption was found to be 45.00 per cent. It was found that the technological options 'Change of varieties', 'Agro techniques', 'Water conservation and utilization', 'IPM' were prioritized as first, second, third and fourth, respectively. The results of the study may be used by the scientists of ICAR institutes to provide the contingency advisories based on farmer's priorities and help them making better decisions for climate change adaptation.

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