

**RESEARCH ARTICLE :**

Adoption regarding eco friendly technology adopted by the paddy growers to combat environmental hazards in paddy cultivation

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SUMMARY : This study was carried out in Anand district of Gujarat state with specific objectives to study the profile of paddy growers and their adoption regarding eco friendly technology in paddy cultivation. The study revealed that more than half (56.00 %) of the paddy growers belonged to middle age group, more than two-fifth (42.00 %) of the paddy growers had primary level of education, nearly half of the respondents (46.66 %) had low (up to 10 years) experience, majority (63.33 %) of the paddy growers had membership in one-organization. Nearly two-fifth (40.66 %) of the paddy growers had medium size of land holding, less than one-third of the paddy growers (30.00 %) had annual income ranging from Rs. 2,00,001 to 3,00,000 lakh, more than two-fifth (41.33 %) of the paddy growers had medium level of extension contact, slightly more than half (52.67 %) of paddy growers had medium level of mass media exposure, slightly more than half (52.00 %) of the paddy growers had medium degree of economic motivation, majority (70.67 %) of the paddy growers had medium risk orientation. More than three- fifth (62.00 %) of paddy growers had medium level of scientific orientation, more than half (53.33 %) of the paddy growers had medium level of knowledge pertaining to eco-friendly technology, great majority (70.00 %) of the paddy growers had neutral attitude towards global warming and more than half (53.33 %) of the respondents had medium level of adoption of eco friendly technology in paddy cultivation.

KEY WORDS :

Profile of paddy growers, Adoption of eco friendly technology

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BACKGROUND AND OBJECTIVES

Rice is a water loving cereal crop. The hot and humid climate is necessary for rice crop and the crop is heavily infested with numerous insect-pests and diseases. The loss caused by insect-pest and diseases is very high in paddy. Technologically, chemical control is still the most effective method of

controlling most of the insect pests, diseases and weeds, despite intensive researches into alternative methods and it still remains the powerful tools for pest management in spite of recent population pressure to control and limit their use and chemical fertilizers had also important role to hasten productivity. On the other hand, farmers are using excessive amount of pesticides and nitrogenous fertilizer

in rice in a wrong manner with disproportionate dosage, which leads to a higher cost of cultivation as well as ecological imbalance. Hence, reducing the environmental hazards arising due to pesticides, chemicals and fertilizers needs immediate action to be taken by the environmentalists and all other concerned to mitigate the greenhouse gas emission, fertilizer pollution and health hazards to the enormous human population. Recent escalation in fertilizer and pesticides prices is a matter of concern and invites the attention of scientists and extension functionaries to analyze the situation and plan suitable strategies with judicious use of such inputs for substantiality of agriculture in future. One way by which extension scientists can contribute to find out better ways and means of promoting eco-friendly measures among the group of clientele to check environment hazards. The “adoption process” is the mental process through which an individual passes from first hearing of an innovation to its final adoption, while adoption is a decision to continue the full use of an innovation. Generally, the farmers do not adopt eco friendly practices fully. There is only a partial adoption by them. As a result, the gap always appears between the eco friendly technology and their use at farmer’s field. With a view to find out the overall adoption of eco friendly technology the respondents were asked to give information about eco friendly technology, adopted by them. With this view an attempt has been made to determine item wise adoption and overall adoption level of paddy growers pertaining to eco friendly technology to combat environmental hazards. Keeping all the above facts in mind, the present research study was carried out with following objectives.

- To study the profile of paddy growers.
- To find out the overall adoption of eco – friendly technology by the paddy growers to combat environmental hazards.
- To determine item wise adoption of eco friendly technology by the paddy growers to combat environmental hazards in paddy cultivation.

RESOURCES AND METHODS

The present study was conducted in Anand district of Gujarat state. Ten villages from two talukas of Anand district with higher potentiality of paddy cultivation were selected for the study. Fifteen respondents from each selected villages were selected randomly and thus total 150 farmers were selected as respondent.

Suitable and appropriate scales developed by past researchers were used for the measurement independent variables and dependent variable in light of the derived objective. The data were collected through personal interview and then after compiled, tabulated and analyzed to get proper answer for the specific objectives of the study with the help of various appropriate statistical tools like mean, frequency, percentage and co-efficient of correlation to test the hypotheses under study.

OBSERVATIONS AND ANALYSIS

Thirteen independent variables and adoption of eco – friendly technology by the paddy growers to combat environmental hazards were measured and the result is presented in Table 1.

Age:

It is apparent from the data presented in Table 1 that, more than half (56.00 %) of the paddy growers belonged to middle age group, followed by young age (29.33 %) and old age (14.67 %) groups, respectively.

Education:

It is apparent from the data presented in Table 1 that, more than two-fifth (42.00 %) of the paddy growers had primary level of education, followed by secondary level of education (30.00 %) and illiterate (18.00%). While, 8.00 per cent of the paddy growers had higher secondary level of education, 2.00 per cent had graduation and no one had postgraduate and above level of education.

Farming experience:

The data presented in Table 1 shows that, nearly half of the respondents (46.66 %) had very low (up to 10 years) experience, followed by medium (40.00 %) experience and high (above 20 years) experience 13.34 per cent.

Social participation:

The data displayed in Table 1 indicated that, majority (63.33 %) of the paddy growers had membership in one-organization, followed by 28.67 per cent, 5.33 per cent and 2.67 per cent had no-membership in any organization, membership in more than one organization and position holder, respectively.

Land holding:

Table 1 shows that, nearly two-fifth (40.66 %) of

Table 1 : Profile of Paddy growers and their adoption of eco – friendly technology by the paddy growers to combat environmental hazards (n=150)

Sr. No.	Components	Categories	Frequency (No.)	Percentage (%)
1.	Age	Young age (Up to 35 year)	44	29.33
		Middle age (36 to 50 year)	84	56.00
		Old age (Above 50 year)	22	14.67
		Total	150	100
2.	Education	Illiterate	27	18.00
		Primary education	63	42.00
		Secondary education	45	30.00
		Higher secondary	12	08.00
		Graduate	03	02.00
		Postgraduate and above	00	00.00
		Total	150	100
3.	Farming experience	Low experience (Up to 10 years)	70	46.66
		Medium experience(11 to 20 years)	60	40.00.
		High experience (Above 20 years)	20	13.34
		Total	150	100
4.	Social participation	No membership	43	28.67
		Membership in one organization	95	63.33
		Membership in more than one organization	08	05.33
		Membership in more than two organization	00	00.00
		Membership along with position holder in any organization	04	02.67
		Total	150	100
5.	Land holding	Marginal (Up to 1.0 ha)	25	16.67
		Small(1.0 to 2.0 ha)	52	34.67
		Medium (2.01 to 4.0 ha)	61	40.66
		Large (Above 4.0 ha)	12	08.00
		Total	150	100
6.	Annual income	Up to Rs. 1 lakh	19	12.67
		Rs. 1,00,001 to 2,00,000 lakh	39	26.00
		Rs. 2,00,001 to 3,00,000 lakh	45	30.00
		Rs. 3,00,001 to 4,00,000 lakh	30	20.00
		Above Rs. 4 lakh	17	11.33
		Total	150	100
7.	Extension contact	Very low (0 to 3.6 score)	35	23.33
		Low (3.7 to 7.2 score)	49	32.67
		Medium (7.3 to 10.8 score)	62	41.33
		High (10.9 to 14.4score)	04	02.67
		Very high (14.5 to 18 score)	00	00.00
		Total	150	100
8.	Mass media exposure	Very low (0 to 1.6 score)	02	01.34
		Low (1.7 to 3.2 score)	37	24.66
		Medium (3.3 to 4.8 score)	79	52.67
		High (4.9 to 6.4 score)	29	19.33
		Very high (6.5 to 8.0 score)	03	02.00
		Total	150	100

Table 1 contd....

Contd... Table 1

9.	Economic motivation	Very Low (6 to 10.80 score)	00	00.00
		Low (10.81 to 15.60 score)	02	01.33
		Medium (15.61 to 20.40 score)	78	52.00
		High (20.41 to 25.20 score)	66	44.00
		Very High (25.20 to 30.00 score)	04	02.67
		Total	150	100
10.	Risk orientation	Very low (10 to 18 score)	02	01.33
		low (19 to 26 score)	12	08.00
		Medium (27 to 34 score)	106	70.67
		High (35 to 42 score)	30	20.00
		Very High (42 to 50 score)	00	00.00
		Total	150	100
11.	Scientific orientation	Very low (8 to 18 score)	00	00.00
		Low (19 to 26 score)	24	16.00
		Medium (27 to 34 score)	93	62.00
		High (35 to 42 score)	30	20.00
		Very high (42 to 50 score)	03	02.00
		Total	150	100
12.	Knowledge	Very low (0 to 20 score)	03	02.00
		low (21 to 40 score)	51	34.00
		Medium (41 to 60 score)	80	53.33
		High (61 to 80 score)	14	09.33
		Very High (81 to 100 score)	02	01.34
		Total	150	100
13.	Attitude	Most unfavorable (12 to 21.6 score)	00	00.00
		Unfavorable (21.7 to 31.2 score)	15	10.00
		Neutral (31.3 to 40.9 score)	105	70.00
		Favourable (41 to 50.5 score)	30	20.00
		Most favourable (50.6 to 60 score)	00	00.00
		Total	150	100
14.	Overall adoption of eco friendly technology	Very low (0 to 20 score)	00	00.00
		low (21 to 40 score)	28	18.67
		Medium (41 to 60 score)	80	53.33
		High (61 to 80 score)	42	28.00
		Very High (81 to 100 score)	00	00.00
		Total	150	100

the paddy growers had medium size of land holding, followed by 34.67 per cent with small size of holding and 16.67 per cent with marginal size of land holding and rest 8.00 per cent of the paddy growers belonged to large size of land holding.

Annual income :

It is clearly mentioned from the Table 1 that less than one-third of the paddy growers (30.00 %) had annual income ranging from Rs. 2,00,001 to 3,00,000 lakh,

followed by 26.00 per cent had annual income ranging from Rs. 1,00,001 to 2,00,000 lakh, 20.00 per cent had annual income in between Rs. 3, 00,001 to 4, 00,000 lakh. 12.67 per cent had annual income up to 1.00 lakh and 11.33 per cent had above 4.00 lakh annual income.

Extension contact :

It is apparent from the data presented in Table 1 that, more than two-fifth (41.33 %) of the paddy growers had medium level of extension contact, followed by 32.67

per cent, 23.33 per cent and 2.67 per cent had low, very low and high level of extension contact, respectively.

Mass media exposure :

The data presented in Table 1 show that, slightly more than half (52.67 %) of paddy growers had medium level of mass media exposure, followed by low, high, and very high level of mass media exposure with 24.66 per cent, 19.33 per cent and 2.00 per cent, respectively.

Economic motivation :

The data displayed in Table 1 indicated that, slightly more than half (52.00 %) of the paddy growers had medium degree of economic motivation, followed by high, very high and low degree of economic motivation with 44.00 per cent, 2.67 per cent and 1.33 per cent, respectively. No paddy growers found place in the category of very low level of economic motivation (Badhe, 2012).

Risk orientation :

Table 1 shows that, majority (70.67 %) of the paddy growers had medium risk orientation, followed by 20.00 per cent, 8.00 per cent and 01.33 per cent of them had high, low and very low level of risk orientation, respectively. None of the respondents belonged to the categories of very high risk orientation (Choudhary, 2010

and Maheriya, 2013).

Scientific orientation :

It is clearly mentioned from the Table1 that More than three- fifth (62.00 %) of paddy growers had medium level of scientific orientation, followed by 20.00 per cent, 16.00 per cent and 2.00 per cent had high, low and very high level of scientific orientation, respectively. None of the paddy growers belonged to very low level of scientific orientation.

Knowledge :

The distributional analysis mentioned in Table 1 indicated that More than half (53.33 %) of the paddy growers had medium level of knowledge pertaining to eco-friendly technology, followed by 34.00 per cent, 9.33 per cent, 2.00per cent and 1.34 per cent had low, high, very low and very high level of knowledge regarding eco-friendly technology, respectively.

Attitude :

Table 1 shows that, great majority (70.00 %) of the paddy growers had neutral attitude towards global warming, followed by 20.00 per cent and 10.00 per cent of them had favorable and unfavorable attitude towards global warming, respectively. None of the paddy growers falls under the categories of most favorable attitude and

Table 2: Distribution of paddy growers according to their item wise adoption of eco friendly technology

(n=150)

Sr. No.	Eco friendly technology	Frequencies	Per cent	Rank
1.	Hand wedding	150	100.00	I
2.	Tolerant varieties	146	98.00	II
3.	Bio fertilizer	075	50.00	IX
4.	Deep ploughing in summer	133	88.66	IV
5.	Time of transplanting	140	95.00	III
6.	Recommended spacing	066	44.00	X
7.	Seedling root dip techniques	054	36.00	XII
8.	Clipping tips of seedling	061	40.67	XI
9.	Use of traps (pheromone and light traps)	051	34.00	XIII
10.	Use of organic manures	99	66.00	VIII
11.	Green manuring	041	27.33	XIV
12.	Use of neem oil	105	70.00	VII
13.	SRI technique	032	21.33	XV
14.	Puddling	130	86.67	V
15.	Application of fertilizers by using soil health card	022	14.67	XVII
16.	Crop rotation	120	80.00	VI
17.	Avoidance of burning of rice straw and husk in field	031	20.67	XVI
18.	Bio agent	11	7.33	XVIII

unfavourable attitude.

Overall adoption :

It is clearly mentioned from the Table 1 that Majority (53.33 %) of the respondents had medium level of adoption of eco friendly technology, followed by 28.00 per cent and 18.67 per cent of them had high and low level of adoption of eco friendly technology in paddy cultivation (Patel, 1995 and Patel, 2006).

Item wise adoption of eco-friendly technology by the paddy growers to combat environmental hazards caused through injudicious use of chemicals in paddy cultivation:

To obtain information from the paddy growers about adoption of different practices, eighteen eco friendly recommended practices were identified. Practice wise adoption of eco friendly technology in paddy cultivation followed by respondents of paddy growers in study area is presented in Table 2.

Hand weeding is an important practice done by the cent per cent paddy growers to check weed infestation to avoid competition of the crop with nutrient, water and sun light as it is traditional method of weed control.

Diseases and pest resistance varieties of paddy were evolved by SAUS of Gujarat for assuring higher production. The data in Table 2 illustrated that diseases and pest resistant varieties, achieved the first rank amongst all the eighteen adoption practices as overwhelming majority of paddy growers (98.00 %) had adopted tolerant varieties like Gujarat-11 and Gurjari variety as both the varieties had higher yield attributes and required less consumptions of pesticides.

Timely transplanting of paddy seedling is important determinants to avoid pest and diseases as well as water requirements. Transplanting time in paddy cultivation was generally during the period of second week of July to first week of August. Data in Table 2 revealed that overwhelming majority (95.00 %) of the respondents had transplanted their paddy at right time and this type of result may be due to timely occurrence of monsoon during last five consecutive year and majority of the farmers had potential irrigation facilities in research area. Deep ploughing in summer is a major activity through which weed is destructed and also helpful in improving the efficiency of soil. The data depicted in Table 2 revealed that overwhelming majority (88.66 %) of the respondents

had adopted deep ploughing in their paddy field. The paddy growers were functionally literate and known the advantage of deep poughing in summer so that weed, pest and diseases infestation can be check up and require less consumption of weedicide, pesticides and fungicide.

Puddling is also important activity done by paddy growers to prevent weed attack and for pulverizing of soil for better aeration and healthy growth of the crop. It also helps to reduce use of weedicides in paddy. Vast majority (86.67 %) of the respondents had adopted puddling to check weed infestation in the field. The probable reason might be good knowledge and experience of the respondents toward puddling.

Crop rotation which is an important practices to maintain soil fertility as well as to break life cycles of pest and various diseases causal organisms. The goals of crop rotation are to manage soil fertility and to avoid or reduce problems with soil borne diseases and some soil-dwelling insects, and hence crop rotations are at the heart of eco friendly farming, and help to protect our environment and realizing its importance great majority (80.00 %) of the paddy growers had adopted crop rotation.

Neem oil is working as a repellents for the pest and antiseptic for bacteria and use of neem oil might have great impact to check occurrence of pest and will ultimately help the farmer for reducing the use of pesticides in paddy cultivation. The Table 2 revealed that majority (70.00 %) of the respondents had adopted neem oil to control pest population because of its easy and cheaper availability at village level.

Organic manures generally compost and FYM which increase soil fertility by supplying nutrient in environment friendly manners in paddy cultivation. The data presented in Table 2 showed that exactly two-third (66.00 %) of the paddy growers had adopted organic manures as they were caution about soil and environmental health even though the availability of FYM is scare.

There is a need to balanced supply of nutrients to the crops in an integrated fashion without over reliance on only one source of nutrients for sustainable production. In this direction, bio-fertilizer has emerged as a promising component in integrated nutrient supply system for sustaining the crop production. Bio-fertilizers are eco friendly and are environmentally safe. They form not only part of integrated nutrients but are of low cost. Data

showed in Table 2 concluded that exactly half (50.00 %) of the respondents had adopted bio fertilizers whereas remaining half of the respondents had not adopted bio fertilize.

Recommended spacing in paddy cultivation is non monitoring input to increase tillers capacity, growing ability, reduces seed rate and improve the physiological processes. The data pertains to Table 2 revealed that more than two-fifth (44.00 %) of the respondents had adopted recommended spacing and rest have not adopted as they were traditional in farming and had fear about low yield due to lower plant density might be responsible reason for this type of result,

Clipping tips of seedling is recommended practice to reduce stem borer infestation as stem borer is an important insect pest responsible for huge loss of rice production and majority of the farmers uses insecticide for the controlling of this particular pest. The data presented in Table 2 revealed that slightly more than two-fifth (40.67 %) of the paddy growers clipped tips of the seeding before transplanting and rest had not adopted because of unawareness.

Seedling root dip techniques in paddy cultivation which provide nutrient and protection to the plant. The data regarding the adoption of seedling root dip techniques revealed that more than one-third of the paddy growers (36.00 %) had adopted the seedling dip root techniques as majority of the respondents were unaware about the advantages of this practices.

Use of traps (pheromone and light traps) are the important bio logical means to control insect pest and the data depicted in Table 2 revealed that more than one third (34.00 %) of the respondents had adopted the pheromone and light traps to check insect pest population to reduce pesticides use.

Green manuring is the practice of growing a short duration, succulent and leafy legume crop and ploughing the plants in the same field before they form seeds and increase the nutrient level in the soil. The data reported in Table 2 revealed that that less than one third (27.33 %) of the paddy growers had adopted green manuring practices as it required one season and irrigation in summer when water is scare might be the reason for non adoption of green manuring.

SRI technique of paddy cultivation requires less water and its helps to reduce methane gas emanation. Data showed in Table 2 revealed that more than one

fifth (21.33 %) of the respondents had adopted SRI technique of paddy cultivation, while majority of the farmers had not adopted the SRI technique. The SRI technique is high skillful labour intensive and shortage of labour in study area might be possible explanation for low adoption rate of SRI technique.

Burning of rice straw and husk in field cause air pollution. Result in Table 2 showed that nearly one fifth (20.67 %) of the respondents had avoid burning of straw and husk in the field and majority of them burn rice straw and husk in the field due to shortage of labour.

Application of fertilizers by using soil health card is done by only 14.67 per cent of the respondents even though it is cost effective and save fertilizer and also provide all the information regarding nutrient status, minerals availability and soil properties The probable reason may be farmers are unaware about this scheme and irregular issuing of soil health card to know soil health status.

In recent years, concerns have been raised over the effects of the overuse of agricultural pesticides on the environment and human health. Bio-control can be used as an alternative to the chemicals in integrated pest management (IPM) systems to reduce usage of pesticides. This will obviously reduce exposure of the legal, environmental, and public safety hazards of pesticides but only 7.33 per cent of the paddy growers had use bio-agent as it had slow knock down effect and highly technical knowledge is required might be the possible reason for this type of result. Similar work related to the present investigation was also done by Raja and Mahalakshmi (2014); Phukon (2014); Senthivelu and Surya Prabha (2008), Bhavani and Padma (2011) and Rathika and Ramesh (2013).

Conclusion :

To epitomize the results it can be said that majority of the farmers belonged to middle age group having primary to secondary level of education with low to medium experience in paddy farming, and had membership in at least one organization with medium to small size of land holding having annual income ranging from Rs. 1 to Rs. 3 lakhs with low to medium level of extension contact and had medium level of mass media exposure, economic motivation, risk orientation, scientific orientation and knowledge regarding eco friendly technology with neutral attitude towards global warming

as far as adoption is concerned majority of paddy grower had adopted medium adoption of eco friendly technology to combat environmental hazards in paddy cultivation.

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