RESEARCH ARTICLE

ADOPTION OF AGRICULTURAL INNOVATIONS, TECHNOLOGY AND MODERN FARM PRACTICES AND THEIR RELATIONSHIP WITH SOCIO – CULTURAL, PSYCHOLOGICAL AND COMMUNICATION CHARACTERISTICS: A STUDY IN RURAL WEST BENGAL, INDIA

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ABSTRACT

The adoption of new technologies and modern farm practices in agriculture is a continuous process maintained by the farmers. Sometimes farmers motivated by the advancement of new agricultural research as a result of its extension activities towards its adoption. On the other hand their knowledge and experience help them or rather to say compel them to adopt new practices to keep agricultural practices ongoing and to maintain their livelihood properly. It is need less to mention that, so many factors are responsible for the adoption of new technologies and modern farm practices. In this paper an attempt has been made to analyse the impact of socio-cultural, psychological and communication characteristics of farmers for the adoption of new technologies and modern practices in agriculture with the relationship between them. Results show that higher the leadership quality, who are strongly against fate, who possess higher modern value and have higher marketing orientation, higher risk preference, more the knowledge on farming, more the communication skill and mass media, cosmopolite and localite communication ability more is the adoption as highest the category show highest mean over other categories.

INTRODUCTION

The adoption of new technologies and modern practices in agriculture are indispensable one to provide adequate food to all people in our county. Adoption of improved agricultural innovations and practices has attracted the attention of research workers in extension education since long. The adoption of innovation was described by Barnett (1953) at the psychological level and conceived innovation as basis of cultural change. Of the persons who studied behavioural aspects of adoption of improved agricultural practices, mention may be made of Blanckenburg (1972), Kunnal *et al.* (1984), Mann (1989), Juliana *et al.* (1991), Nikhade and Linbika (1992), Perz (2003), Reddy (2006), Sen and Bhatia (2004), Knowler *et al.* (2007) as a few. Adoption to innovations by land holders depends on a range of personal, social, cultural (Benjamin, 2007) and economic factors' as well as characteristics of the innovations itself (Pannell *et al*, 2006).

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Awareness building, extension, education, markets and livelihood strategies of the farmers (Posthumus *et al*., 2011); mass media extension activities on awareness (Adeniji & Ega, 2006); inherent knowledge and skills and social and financial capital (Kansiime, 2012) of farmers significantly affects adoption of innovations. Conley & Udry (2010) found that farmers adjust their inputs to align with those of their information with neighbours who were surprisingly successful in previous periods.

MATERIALS AND METHODS

The present study is not related to any specific operation, practice, technology or innovation, rather it is a drive to assess the farmer's perception on modern agricultural technology, operation, schemes, practices and innovations. Therefore adoption was measured by the adoption index method developed by Bhattacharjee (1997). Following two questions were placed before the respondents to assess the degree of their adoption of innovations.

Table 1. Variables selected for the study and their measurement

Variables	Measures
Dependent Variables (Y)	
i)Adoption of Improved Varieties of Crops.	
ii)Adoption of Modern Agricultural Practices	Adoption Index Method, Bhatterjee(1997)
iii)Adoption of innovations towards Integrated Nutrient Management	
iv)Adoption of innovations towards Integrated Pest Management	
v)Adoption of Organic Farming	
vi)Adoption of Modern Agricultural Technology	
Independent Variables:	
Cultural	
i) Social Participation	Pareek and Trivedi,1964
ii) Non Fatalistic Orientation	Schedule developed
iii) Modern Value	Schedule developed
Psychological	
iv) Innovation Proneness	Innovation Proneness Scale, Moulik (1965)
v) Risk Preference	Supe (1969)
vi)Marketing Orientation	Samanta (1977)
vii) Knowledge in Farming	Goswami and Sagar (1987)
viii) Knowledge in Innovation & Modern Agriculture	Bhattacherjee (1977)
Communication	
ix) Mass Media Communication	Bandyopadhyay (1986)
x) Personal Cosmopolite	
xi) Personal Localite	
xii) Communication Skill	Pareek and Singh (1974)

Table 2. Different agricultural Innovations, Practices & Technology and Techniques

Sl. No.	Name of the Innovation/Practice
A.	Adoption of Improved Varieties of Crops.
1	Use of Certified Seeds in every season
2	Whether High Yielding Varieties(HYV) of crop are grown
3	Ever cultivated Hybrid seeds of vegetables
4	Ever cultivated Hybrid seeds of crops
5	Cultivate potato using recommended varieties by CPRI
6	Cultivate using HYV duly recommended by the Department of Agriculture, Govt. of West Bengal.
B.	Adoption of Modern Practices
1	Followed the practice of crop rotation and using one pulse/legume crop every year
2	Do you sow crop like jute, wheat, Rice etc. in line sowing
3	Whether maintain definite number of plant per unit area
4	Paddy cultivation following the method of SRI
5	Use of Drum Seeder for sowing of Rice
6	Do you irrigate the crop in time according to biological cycle and sufficient water supply
7	Do you always harvest the crop in proper time
8	Drying, Sorting and grading of seeds and/or commercial harvest before storing.
9	Do you apply herbicide to control weeds
C.	Adoption of Innovation towards Integrated Nutrient Management
1	Soil Testing before crop season
2	Whether apply Lime or Sulphur on the basis of Soil testing
3	Use N P K fertilizer in balance dose as per Soil Testing Report
4	Use of slow release Nitrogenous fertilizer or use of Neem Oil with Nitrogenous fertilizer
5	Integrated Nutrient Management by combining Organic Manures with Chemical fertilizer
6	Use of Micro Nutrient and Sulphur in Soil before sowing of the crop.
7	Applied Micronutrient as spray or other form in standing crop as deficiency symptom shown
D.	Adoption of Innovation towards Integrated Pest Management
1	Seed Treatment before sowing/planting
2	Seedling root dip with pesticides before transplantation/planting
3	Whether used light trap /Pheromone trap for control of flying insects.
4	Use of Trichoderma(Trichor) as Bio- control agent in plant disease control agent
5	Use of Knap Sack Sprayer for spraying of Plant Protection Chemicals.
6	Use of Power Sprayer for spraying of Plant Protection Chemicals.
7	Apply 300 litres or more water per acre for high volume spraying
8	Whether percentage of pest or disease infestation or loss was evaluated before application of plant protection chemicals
9	Whether resistant varieties of particular crop were grown
10	Whether appropriate and specific chemicals were applied
E.	Adoption of Organic Farming
1	Cultivation through only Organic Fertilizer
2	Growing Blue Green Algae(BGA) in Rice field
3	Whether mixed Rhizobium culture with the seeds of Ground Nut and Pulse crops before sowing
4	Used Bio- Fertilizer like Azophos, RizophosEtc
5	Whether grow Dhaincha/ Sunhemp etc. for Green Manuring
6	Making of compost at farm from crop residue and household westage
7	Used Vermicompost in the field
F.	Adoption of Modern Technology
1	Do you take advice from Krishan Call Centre for farm related problems
2	Are you taking crop loan using Krishan Credit Card
3	Do you get benefit of crop insurance in case of crop failure
4	Do you ever produced certified seeds in Seed Village Mission scheme
5	Application of Zero Tillage Technology in Rice, Wheat or other crops.
6	Ploughing of the field using Power Tiller or Tractor and Tractor driven Rotor /Rotavator
7	Use of sprinkler and/ or Drip system of Irrigation machineries or practices.
8	Application of combined Harvester Thresher for harvesting of crops
9	Use of Conoweeders/ Power Weeder for control of weeds
10	Used Paddy Thresher
11	Have you heard the name of/ever attend Farmers' Field School

**Have you ever used the agricultural technology /practice?**

Are you using the agricultural technology /practice at present?

Selection and list of improved/modern farm practices, technology & innovations was prepared keeping in view the latest schemes and missions in operation by the Government Departments, NGOs, Private & Public Sector Corporate and the products that are available in the market and accessible to the farmers.

Personnel for the information related to farming and they often interacts with their neighbour, family members, friends and other villagers more frequently in resolving their farm and other related problems. It is seen that farmers of wider leadership quality, who are strongly against fate and who have very high modern value has the highest effect on adoption of all the innovation and practices as these categories shows highest mean score. Persons having very high marketing orientation and risk preference, higher level of knowledge on farming shows more affinity towards adoption.

Table 3. Adoption of agricultural innovations, technology and ppractices

Dependent variables	N	Minimum	Maximum	Mean	Std. Deviation
Adoption of Improved Varieties of Crops	300	41.67	91.67	63.0547	12.92862
Adoption of Modern Farm Practices	300	50.00	83.33	71.6683	7.96771
Adoption of Innovation towards Integrated Nutrient Management	300	14.29	92.86	52.6424	20.35438
Adoption of Innovation towards Integrated Pest Management	300	40.00	80.00	57.1000	10.86971
Adoption of Organic Farming	300	0.00	78.57	33.2146	20.26326
Adoption of Modern Farm Technology	300	13.64	40.91	28.5891	8.92888
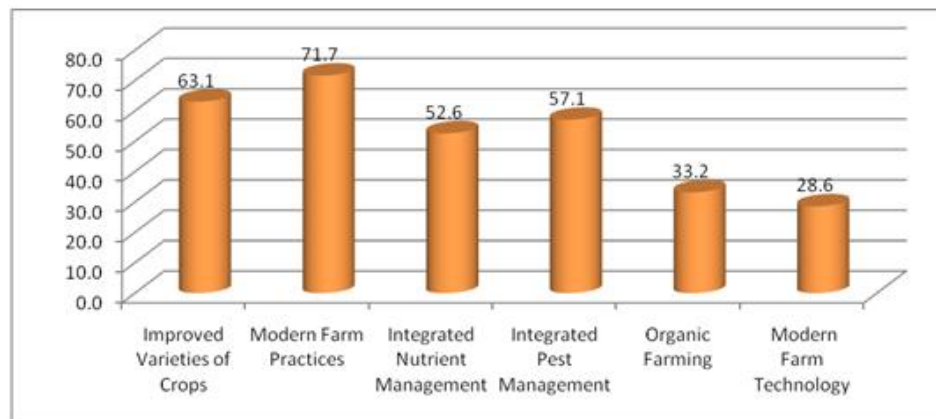
Fig. 2. Adoption Index (Mean) of Agricultural Innovations

RESULTS AND DISCUSSION

Amongst the different agricultural innovations studied it is found that the farmers adopted most the modern farm practices followed by adoption of improved variety of crops. There is also positive trend in adoption of integrated nutrient management and integrated pest management. Farmers adopted less the organic farming and modern farm technology. Thus it is evident from the study that the farmers in one of the most agriculturally advanced block in West Bengal are most keen to adoption of agricultural innovations which have direct bearing and immediate impact on the production and productivity of crops. It is found that majority (42%) of the respondents are member of at least one organization while 29.3% members are not a member of any organization and don't have any role in social participation. 41.7% replied that they still have belief on fate while 44.6% replied that they have no faith on fate. It is found that 50.3% of the farmers possess high modern values, more than 80% farmers possess knowledge about farming above average. People are familiar to Television, Radio and News Paper as the mass media sources. People keep trust to and relied more on Input Dealer, Progressive Farmer, Co-operative Personnel and Panchayet

People who have high level of mass media, personal cosmopolite and locatile awareness and who possess a very high communication skill are more akin to adoption in respect to other groups as these categories shows highest mean value.

Adoption Relations

Regression analysis about the adoption of different agricultural practices, technology and innovations indicates that adoption of improved varieties of crops has significant, positive and direct prediction with the variation of independent variables like social participation, non-fatalistic orientation, innovation proneness, Innovation in modern agriculture, personal localite communication and communication skill. Modern value and mass media show significant, direct but negative value. Regression analysis show that modern farm practices has significant, direct and positive predictions with the variation of independent variables like modern value, farming knowledge and personal cosmopolite communication while with non-fatalistic orientation and risk preference it has direct but negative impact. Adoption of Integrated Nutrient Management has significant positive and direct predictions with the variation of independent variables like social participation, innovation proneness, risk preference, Marketing Orientation, Farming Knowledge Innovation in

Table 4. Mean effect of different independent variables on the dependent variables

Variables	Categories	Adoption of Improved Varieties of Crops.	Adoption of Modern Farm Practices	Adoption of Integrated Nutrient Management	Adoption of Integrated Pest Management	Adoption of Organic Farming	Adoption of Modern Farm Technology
Social participation	Not Member of any Organisation	52.936	68.182	44.724	0.420	24.269	24.638
	Member of One Organisation	64.418	71.473	48.753	0.587	29.252	27.525
	More than One Organisation	69.406	74.658	64.481	0.877	45.988	33.437
	Wider Leadership	82.692	80.342	77.473	1.000	60.440	38.462
	Chi-Square	108.673	40.880	54.653	43.936	68.302	54.075
	Sig.	.000	.000	.000	.000	.000	.000
Non Fatalistic Orientation	Strongly dependent on Fate	46.67	60.00	37.14	0.00	11.43	18.18
	Dependent on Fate	56.73	70.18	43.83	0.47	23.71	24.18
	Not Dependent on Fate	66.60	73.09	56.66	0.77	38.11	32.02
	Strongly against Fate	84.62	78.21	83.24	1.00	66.21	38.11
	Chi-Square	122.61	57.03	87.35	64.78	116.69	100.62
	Sig.	.000	.000	.000	.000	.000	.000
Modern Value	Very Poor	61.05	66.89	48.40	0.53	28.43	29.68
	Moderate	60.12	70.86	48.47	0.52	28.04	26.59
	High	70.91	77.68	66.79	1.00	49.62	33.25
	Very High	91.67	77.78	78.57	1.00	71.43	36.36
	Chi-Square	51.35	58.16	49.84	48.31	62.42	27.53
	Sig.	.000	.000	.000	.000	.000	.000
Innovation Proneness	Poor	61.02	70.56	49.67	0.55	32.10	29.10
	Sound	63.80	71.12	58.78	0.66	36.24	28.79
	High	63.86	73.38	49.01	0.63	31.75	28.22
	Very High	64.58	70.14	54.91	0.81	30.36	26.99
	Chi-Square	6.83	9.89	15.34	4.81	2.69	.46
	Sig.	.078	.020	.002	.186	.442	.928
Marketing Orientation	Poor	54.80	69.03	37.33	0.35	21.16	24.19
	Moderate	64.76	70.99	56.11	0.69	31.35	29.67
	High	68.23	77.26	58.71	0.91	46.43	31.25
	Very High	78.76	77.78	84.10	1.00	68.66	36.36
	Chi-Square	91.41	63.11	133.70	66.44	124.93	50.96
	Sig.	.000	.000	.000	.000	.000	.033
Risk Preference	Poor	26.14	69.27	36.16	0.31	20.54	54.17
	Moderate	26.64	71.68	46.78	0.64	28.40	57.86
	High	29.76	72.05	59.71	0.64	38.28	68.75
	Very High	37.88	73.15	71.43	1.00	52.38	73.61
	Chi-Square	29.17	6.13	53.23	24.33	37.67	75.82
	Sig.	.000	.105	.000	.000	.000	.000
Knowledge Level on Farming	Poor	53.57	59.52	30.61	0.00	16.33	18.18
	Moderate	59.34	70.98	46.68	0.58	26.05	26.96
	High	78.65	77.95	79.91	1.00	62.83	37.50
	Chi-Square	106.32	89.92	142.86	75.42	150.20	91.84
	Sig.	.000	.000	.000	.000	.000	.000
Innovation Level on Modern Farming	Very Poor	53.596	64.152	33.158	0.074	12.632	19.139
	Poor	64.535	74.774	58.596	0.860	40.615	31.712
	Moderate	82.576	77.104	77.706	1.000	53.896	39.532
	Chi-Square	120.211	151.796	163.352	183.401	177.592	179.776
	Sig.	.000	.000	.000	.000	.000	.000
Mass Media	Poor	52.717	66.667	33.385	0.000	12.578	18.182
	Moderate	63.971	71.111	54.412	0.647	32.311	29.064
	High	66.865	75.529	59.609	0.929	46.344	33.333
	Chi-Square	48.606	67.609	70.097	109.874	98.986	85.152
	Sig.	.000	.000	.000	.000	.000	.000
Personnel Cosmopolite	Poor	56.818	59.848	36.039	0.136	15.584	21.281
	Moderate	60.278	69.556	48.190	0.440	26.714	24.939
	High	67.383	76.172	60.714	0.930	43.862	34.126
	Chi-Square	37.695	96.377	46.657	94.866	83.416	86.307
	Sig.	.000	.000	.000	.000	.000	.000
Personnel Localite	Poor	57.037	71.975	41.905	0.711	25.873	31.212
	Sound	61.728	69.273	49.868	0.506	26.940	26.712
	High	68.280	75.687	62.673	0.796	47.696	30.596
	Chi-Square	21.514	40.520	35.826	22.707	64.329	11.626
	Sig.	.000	.000	.000	.000	.000	.003
Communication Skill	Poor	52.813	65.625	42.768	0.338	19.821	21.932
	Sound	66.085	72.351	53.267	0.543	33.998	29.387
	High	66.872	75.789	59.700	1.000	42.769	32.772
	Very High	75.000	77.778	66.429	1.000	52.857	37.727
	Chi-Square	89.391	69.660	34.935	86.410	64.334	72.082
	Asymp. Sig.	.000	.000	.000	.000	.000	.000

Multiple Regression Analysis of different Agricultural Technologies, Practices and Innovations against Socio-Cultural, Psychological and Communication variables												
Dependent Variables	Improved Varieties		Farming Practices		INM		IPM		Organic Farming		Farm Technology	
Independent Variables	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig
Social Participation	.296	.000**	0.069	0.247	.413	.000**	.063	.358	.152	.114	0.078	0.338
Non Fatalistic Orientation	.444	.000**	-0.652	.000**	-.645	.000**	.091	.397	-.332	.029*	-0.111	0.391
Modern Value	-.588	.000**	0.72	.000**	-.547	.000**	-.554	.000**	-.138	.348	-0.232	0.066
Innovation Proneness	.266	.000**	-0.09	0.106	.237	.010**	.184	.004**	.064	.469	-0.054	0.475
Risk Preference	.035	.665	-0.206	.002*	.326	.003**	-.233	.002**	.124	.239	0.036	0.687
Marketing Orientation	.152	.093	-0.053	0.474	.495	.000**	-.035	.678	.303	.011*	-0.137	0.176
Knowledge in Farming	.280	.056	0.792	.000**	1.756	.000**	.733	.000**	1.736	.000**	1.277	.000**
Innovation in Modern Agriculture	.810	.000**	0.061	0.619	1.385	.000**	.776	.000**	1.367	.000**	0.764	.000**
Mass Media	-.359	.001**	-0.145	0.106	-.202	.174	-.150	.142	.595	.000**	0.253	.039*
Personal Cosmopolite	-.242	.053	1.235	.000**	.917	.000**	.870	.000**	.665	.000**	0.81	.000**
Personal Localite	.404	.000**	-0.129	0.111	.257	.056	.455	.000**	.584	.000**	-0.543	.000**
Communication Skill	.219	.023*	0.143	0.07	-.595	.000**	.547	.000**	-.204	.104	0.095	0.374

modern agriculture, mass media and personal cosmopolite communication. In case of non-fatalistic orientation, modern value and communication skill the adoption has significant but negative impact. Adoption of Integrated Pest Management has significant and direct predictions with the variation of independent variables like innovation proneness, farming knowledge, innovation in modern agriculture, personal cosmopolite, localite communication and communication skill while with modern value and risk preference the adoption negatively related. Adoption of organic farming has significant positive and direct predictions with the variation of independent variables like marketing orientation, farming knowledge, innovation in modern agriculture, mass media, personal cosmopolite and localite communication and non-fatalistic orientation plays a significant, direct but negative impact on the adoption of organic Farming. Adoption of modern farm technology has significant and direct relationship with farming knowledge, innovation in modern agriculture, mass media and personal cosmopolite communication. An increase in the magnitude of these independent variables results in increase in the magnitude of adoption. Whereas personal has significant, direct relationship but negative values that means increase in magnitude of the variables results in decrease in adoption level.

Conclusion

It is found that 42% of the respondents are member of at least one organization. 41.7% farmers still have belief on fate while 44.6% no faith on fate. 50.3% of the farmers possess high modern values and 80% farmers possess farming knowledge above average. People are familiar to Television, Radio and News Paper as the mass media sources. People used to keep trust and relied more on input dealer, progressive farmer, co-operative personnel and panchayet personnel for the information related to farming. They adopted more the modern farm practices followed by adoption of improved variety of crops, pest and nutrient management. Farmers showed comparatively less interest in the adoption of organic farming. Regression analysis of the dependent variables i.e. adoption of different agricultural technologies, practices and innovations with the independent variables established some significant relationship. Study signifies that different socio-cultural, psychological attributes and communication characteristics of the farmers plays very important and dominant role in the adoption of different agricultural technologies, practices and innovations of the farmers.

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