

MESSAGE CONSUMPTION AND ADOPTION OF AGRICULTURAL INNOVATIONS IN NWFP, PAKISTAN

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ABSTRACT

This empirical study develops a framework of adoption of agricultural innovations. The study investigates message consumption and adoption of agricultural innovations by the farmers' of NWFP, Pakistan. This thesis discusses the way in which information transferred through different channels, i.e., mass media and interpersonal communication, influences farmers' decisions to adopt agricultural innovations. Multi-stage cluster sampling method is adopted with severe care to minimize the error due to sampling. All the 24 districts of NWFP (Pakistan) were sampled systematically for the study. Both descriptive and inferential techniques of Statistics will be applied. In the second category two way analysis of variance and chi-square is applied for treatment of statistical hypotheses testing.

- **Keywords:** Message consumption, Adoption, Agricultural innovations, Diffusion of innovation's model, Two-step flow, Individual innovation theory, technology acceptance model, knowledge, attitude, and practice level, North West Frontier Province (NWFP), Pakistan

INTRODUCTION

- This empirical study explores the radio listening and TV watching patterns of agricultural innovations programs that conveys feelings about the nature of a situation without passing judgment on the actions of another. Listening is the deliberate, psychological process by which we receive, understand, and retain aural (heard) stimuli. "Mass media presentations create awareness, disseminate *hardware* (information about the innovation), *software* (information about how the innovation works), and innovation evaluation (information about how well the innovation works) messages, and provide feedback to potential adopters about those who have adopted. Because they create awareness, mass communications place some pressure upon opinion leaders to make decisions about the new technology". If media are the "cause", what were the "effects"? FAO's twenty-five year experience with a communication for development approach to rural and agricultural communication (FAO, 1989, 1990a, 1990b, 1994, 1995a, 1995b, 1996a, 1996b), using media such as rural radio, small format video ("participatory video"), photography and print, is now being applied to the Internet in three small scale initiatives.
- Video has power to capture reality instantly and play it back for critical discussion (Quarry, 1984). This simple and common sense strategy of involving people in assessments of their knowledge and communication needs is the cornerstone of communication for development methodologies. It is not important for participants to become communication professionals: the goal is to provide media that are flexible enough to allow people to articulate and share their ideas. Integrated into development planning activities, such a communication for development approach enables farmers and

rural residents to actively participate in development processes. The purpose is to cultivate an understanding of the extent of message consumption by farmers. This empirical research also explores the phenomenon of interpersonal communication. Secondly it records the attitude of farmers towards new methods of farming and thirdly, to indicate the practicing level.

This project examines the diffusion of innovation involving concepts of hybrid seeds, fertilizers, pesticides/insecticides and technology. Diffusion of innovation is essentially a social process in which subjectively perceived information about a new idea is communicated, sometimes negatively. *Interpersonal communication* between experts and the public opinion leaders and the public and among friends and family are equally as essential as mass communications in bringing about new technology adoption. Knowing the viewpoints of close referent others (e.g., family and friends) and opinion leaders is a critical element of the social comparison process leading to choice shift. Diffusion research originated in the 1940s, proliferated in the 1950s, and expanded into nations (other than the United States of America) during the 1960s. The 1970s became a time of introspective criticism for diffusion research.

OBJECTIVES OF THE STUDY

- to identify and compare the messages of radio and TV and interpersonal communication in diffusion of agricultural innovations.
- to find out the knowledge, attitude and practice level of the farmers.
- to document the use of messages in motivating farmers towards modern technology.
- to explore the extent and amount of the farmers who in turn get opinion and information from opinion leaders.

RATIONALE

Keeping in view the rapid and alarming population growth of Pakistan, food security has assumed a pivotal place in our national development. At the threshold of 21st century to meet with such challenging situation, we as a nation badly required to give central contribution to agriculture development. It is, therefore, essential to launch a massive national campaign to improve agriculture period. The role of communication in this campaign has been stressed on several occasions, Lerner (1958), Schramm, (1964) Rogers, (1983). Numerous scholars emphasize the role of communication for agricultural development. Schramm, (1964) have written of the mass media's potential for stimulating economic growth. Radio and T.V in particular can bypass the need of mass literacy, providing a development input.

This study advocates communication facilities, transmission of related information to farmers and feedback to the top planner and decision makers in agricultural sectors. In order to achieve holistic development, this research will determine a program - oriented, matrix system-based approach through mass media persuasive messages.

LITERATURE REVIEW

The adoption and diffusion of innovations has an extensive literature history. Lindner (1987) classified the literature into studies principally concerned with adopter characteristics (adoption studies) and those concerned principally with innovation characteristics (diffusion studies), with each category having both cross-sectional and temporal studies. While the literature has expanded considerably in the intervening years, as reviewed by Feder and Umali (1993), the essential dichotomy described by Lindner (1987) still exists, albeit assisted by an increasingly sophisticated set of mathematical and econometric techniques. Gabriel Tarde was the main European forefather of the diffusion field. He was a French lawyer and judge by occupation. Even though he had no formal schooling, he was very innovative and ahead of his time. He observed certain generalizations about the diffusion of innovations that he called the *laws of imitation*; today it is called the *adoption of an innovation*.

Bryce Ryan and Neal Gross: Neal Gross received his PhD in Sociology from Iowa State University in 1946. He was a researcher at Iowa State University from 1946-1948. He then took a faculty position at the University of Minnesota from 1948-51 before moving to Harvard University. Bruce Ryan was a graduate assistant for Neal Gross. No biographical information could be found on him. The British and German-Austrian *Diffusionists*: They were a group of anthropologists that emerged in England and in German-Austria. The viewpoint of each school was similar, and both are considered roots of diffusion research.

Diffusionism: was the point of view in anthropology that explained social change in a given society as a result of the introduction of innovations from another society (Rogers, 1995).

Many farmers have found the transition process to be an unsupported, isolating, and stressful experience. Relevant government support has been usually lacking (Oelhaf, 1978; Lampkin, 1985a; Henning et al., 1990) and ridicule by neighbors and professionals has been common. Because farmers have had difficulties obtaining relevant information from conventional sources, they have tended to rely instead on other farmers (at field days, conferences), sellers of alternative products, on-farm experiments, popular organic-farming magazines, and classic, largely European, literature from several decades past (Hanley, 1980; Blobaum, 1983; Kramer, 1984; Robinson, 1985; Baker and Smith, 1987). These classics include scholarly works by Howard (1943, 1947) and Albrecht (1975) and more popular discussions by Steiner (1924), Bromfield (1947), Sykes (1949), Hainsworth (1954), Turner (1955), Voisin (1960), and Balfour (1975). With regard to agricultural innovations, Everett Rogers has been instrumental in synthesizing a typology that associated personal characteristics of farmers with the timing of their adoption/non-adoption of the innovation in question (Rogers, 1962; 1983; Rogers and Shoemaker, 1971).

Approximate year of origin:

- Early 1900's: Gabriel Tarde, beginning of his diffusion observations.
- 1920's: The beginning of anthropological research tradition in diffusion.
- 1960's: An explosion of diffusion investigations in Latin America, Africa, and Asia began.

There are two major approaches to using media and technology in agriculture: farmers can learn "from" media and technology, and they can learn "with" media and technology (Jonassen & Reeves, 1996). Learning "from" media and technology is often referred to in terms such as instructional television, computer-based instruction, or integrated learning systems (Hannafin, Hannafin, Hooper, Rieber, & Kini, 1996; Seels, Berry, Fullerton, & Horn, 1996). Learning "with" technology, less widespread than the "from" approach, is referred to in terms such as cognitive tools (Jonassen & Reeves, 1996) and constructivist learning environments (Wilson, 1996).

In spite of vast literature on innovation adoption in agriculture our understanding about adoptive behavior of the farmer is incomplete. Up to now, farmers obtain most of their information from both popular literature and other farmers. Consequently, the diffusion process should emphasize activities that bring farmers together, e.g., short courses, field days, the creation of on-farm research associations, and the establishment of networking newsletters. Farmers in transition tend to be more interested in systems of farming rather than in specific crops. There is a lot of deviation between the actual and recommended practices. The role of mass media, of course, significant and the message makes attitude and behavior. After reviewing the existing literature, we are in need of a detailed empirical study on the agricultural innovations and the adoption level of farmers. Farmers' are message recipient of various sources. But the existing literature does not cover maximum variables in our country. This study will explore the present situation in Pakistan especially in NWFP. It is the dire need of the time, to investigate the message consumption and the adoption level of the farmers of agricultural innovations in North West Frontier Province (NWFP) Pakistan.

THEORETICAL FRAMEWORK

The theoretical framework I have applied to my research is (1) Rogers and Shoemaker's (1973) model "diffusion of innovation" which is a simplified version of a causal scheme outlined and the outcomes that describe how whole communities perceive and experience the end-of-life. It is; of course, a deductive inquiry tends to test established model/ theory. Deductive studies tend to be quantitative and look to see whether or not a prominent model/theory explains a given set of phenomena.

This conceptual framework outlines adoption of agricultural innovations, farmers' knowledge, attitudes and practice level. And also to see that to what extent they are exposed to the messages of radio, TV and the interpersonal network of communication. The most important feature of this model about work on diffusion is the weight in which the behavioral changes are sought by giving information and trying the influence motivation and attitude. The second model to this empirical study is Katz and Lazarsfeld (1955), Two-step flow model of mass media and "personal influence". Lazarsfeld and Katz developed the theory of the two-step flow.

Key concepts: Message consumption, Adoption, Agricultural innovations, Diffusion of innovation's model, Two-step flow, Individual innovation theory, technology acceptance model, KAP level. Agriculture comprises a number of intrinsic concepts and benefits, which have been elaborated here in the form of media and interpersonal communication messages. These messages enhance the understanding of the farmers about the new ideas of agriculture yield.

HYPOTHESES

Hi: Greater the exposure to the messages of agricultural innovations, the greater is the knowledge, attitude and, practice level

Hi: Farmers interconnected through interpersonal communication are likely to have a higher agricultural innovations' adoption score than those who are not.

Hi: The higher is the exposure to agriculture technological innovations, the higher will be the relevant index of use.

METHODS

All the 24 districts of NWFP (Pakistan) were sampled systematically for the study. Our hope was to retain at least the exact number from districts in this cross-sectional survey. Within each district, data are solicited for all farmers residing therein. *Union councils of a tehsil* within each district are ordered according to the size of population (census 1998) and proportional-to-size sampling procedures are used to select proportional number of farmers in each Union Council (UC).

In both urban and rural substrata, interviewers were required to visit each selected farmer from the sample frame personally to secure face-to-face interview. There was a high degree of clustering, the effects of which are well known. In such a situation, multi-stage cluster sampling method is adopted with severe care to minimize the error due to sampling.

All people in sampling frame are divided into "strata" (groups or categories). Within each stratum, a simple random sample or systematic sample is selected. For the proportional allocation we have a formula as $(n/N) \times N_h$ where n is the desired sample, N is the population size for a district/ UC and N_h is the number of union Council.

DATA ANALYSIS AND FINDINGS

Data was collected from 500 farmers. For data analysis both descriptive and inferential techniques of Statistics have been applied. For easy understanding I have categorised the numerical information according to the nature of the question asked from the farmers.

RESULTS

The findings of this empirical study have shown that farmers were significantly exposed to the messages of TV as compared to radio and the first null hypothesis was not found accepted. The predicted weekly time spent on listening radio and watching TV index indicated equal time spent. The critical region for rejecting H_0 , was then given by generally, $F_{cal} \geq F_{tab}$. When $F_{tab} = F(3.3) = 9.28$ which was less than $F_{cal} = 2.53$. Since the calculated F value was less than the observed *value* obtained from the table. Therefore, we reject H_a and concluded that farmers equally spent time on listening radio and watching TV.

In order to understand the exact nature of interest, the results showed that farmers have taken interest in radio and TV agro-campaign. This empirical study explored the independent variables like radio, TV, friends/ relatives, extension agents; sign boards newspapers and, posters as a source of information but farmers have used radio, friends and TV more frequently to get information. The critical region for rejecting HO, was then given by generally, $F_{cal} \geq F_{tab}$. When $F_{tab} = F(6.18) = 2.66$ which is less than $F_{cal} = 1.93$. Since the calculated F value is less than the observed table value. Therefore, I reject HO and concluded that they got information from various sources.

This research has further provided evidences that farmers have equally taken interest in TV's agricultural programs. Gandam Ki Kaasht Sonaa Chandi Ke saat, agricultural advertisement, expert discussion, matti sonaa and, Kisaan Time were found the most favorite agricultural programs.

Analysis of Variance for taking interest in TV's agricultural programs

Source	DF	SS	MS	F	P
C2	3	52045	17348	17.63	0.000
Error	16	15745	984		
Total	19	67790			

Individual 95% CIs for Mean
Based on Pooled St Dev

Level	N	Mean	St Dev	
1	5	155.80	30.85	(---*---)
2	5	168.60	40.30	(---*---)
3	5	113.20	26.25	(---*---)
4	5	38.00	25.91	(---*---)

Pooled St Dev = 31.37 60 120 180

This study found that our friends and relatives who we saw as “opinion leaders” primarily guided our decisions. Friends/relatives were found 50% among other sources of information (agricultural inputs; extension education; agricultural technology). *Opinion leader* emerged as social factors to influence adoption level, specifically in groups. It was also among those that appeared to be emphasized in the effort to introduce agricultural innovations.

Results prescribed that majority of the target sampled were intended to use processed seeds, fertilizers and, pesticides. Farmers were intended to use innovations for the increase in yields. The first formulated alternative hypothesis “higher the exposure to the messages of agricultural innovations, the higher is the knowledge, attitude and, practice level” has found accepted.

Table 1.1 If not then why?

Categories	Frequency	% age	Valid %	Cumulative %
It is expensive	68	32%	32%	32
I have no money	102	48%	48%	80
It is not easily available	23	11%	11%	91
The innovations are not effective	17	9%	9%	100%
Can't say	-	-	-	-

Efforts were made to see that “if the farmers don’t adopt the innovation” then what the reasons were? The perceived perceptions of the farmers explored that a great majority of the respondents (48%) ranked the reasons as: “they have no money” for purchasing these innovations number first. Some of them have chalked out, “it is expensive”, “it is not easily available” and, “the innovations are not effective” respectively. Furthermore, the phenomenon of interpersonal communication, extension workers, numberdaars and, co-farmers was also explored. Interaction with co-farmers and numberdaar was found significant as compared to extension workers. Statistical calculation showed that 57% of the farmers fall in the response category of “always contact” with co-farmers. It led to the conclusion that the notion of two-step flow of information about agricultural innovations was highly supported through the obtained findings. It might be said that interpersonal contact play a significant role in diffusion of agricultural innovations and farmers easily converge towards adoption. The second hypothesis” farmers interconnected through interpersonal communication is likely to have a higher agricultural innovations' adoption score than those who are not” was supported by the findings.

Table 1.2 Confirmation of decision

Coding categories	(f)	% age	Valid %	Cumulative%
Very often	106	21.2	21.2	21.2
Less often	223	44.6	44.6	65.8
Never	121	24.2	24.2	90
Can't say	50	10	10	100%

Total	500	-	-	-
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The empirical evidence illustrated that majority of the total sample “less often” spent time in confirmation of decision, while 21.2% were those who “very often” spend time on the case, and 24.2% never confirm their decision. The response to the farmers’ link with extension agents for technical innovations’ discussion and suggestions was not significant. It was concluded that there was no significant link between farmers and extension workers. Results revealed that change agents might not motivate the farmers. It is evident that majority of the farmers were falling into the low level of motivation. This suggested that a *change agent* may have playing a mediating role rather than a direct influence on users. Findings showed that farmers were not satisfied with the government’s incentives.

Table 1.3: Table 2x2 showing the link between the extension agents and farmers

H0: Farmers remains linked with extension agents for technical innovations’

Ha: There is no significant link

To test the hypotheses, the level of significance is set at α 0.05. The test statistic here is X^2 , under H0, if it is true. It is why to test whether the attributes vary with the same intensity.

Link

Categories	Yes	No	
Discussion on technical innovations	190 (137.74)	44 (96.25)	234
Getting suggestions	59 (47.65)	130 (53.47)	189

249

174

423

$$X^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

Calculation

f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
190	137.74	26	676	4.90

44	96.25	52.25	2730.06	28.36
59	47.65	35	1225	25.70
130	53.47	76.53	2859.04	53.46

$$X^2 = 112.42$$

Within each cell, f_o is in the upper left-hand corner and f_e is in parenthesis.

Since the computed value at $df (r-1)(c-1) = 1$ is higher (which is 112.42) than the tabulated value at $\alpha .05$ significant level (which is 3.84). Therefore, we can reject H_0 . It is concluded that there is no significant link between farmers and extension agents. The result reveals that among the various innovation that extension agent have been equipped with for onward dissemination to farmers, the farmers claimed to be not involved in technical discussion and also have not been getting involved in suggestions.

Result demonstrated that the technological innovations i.e. cultivator, front and back blade, thresher, harvester, spray machine, gobar, plough and, tractor were at the high percentage of score. This results has accepted the third alternative hypothesis “the highly the exposure to agriculture technological innovations, the highly will be the relevant index of use”. This study concluded that arrangement of training facilities by research centers in NWFP were not satisfactory. Refresher course and radio talk were the favorite among other activities of extension centers.

Research results have shown that farmers, who can cope with very high levels of uncertainty about a new innovation, can understand and apply complex technical knowledge, and possess both the willingness to risk failure and the resources to absorb the possible costs of that failure. It was found that in the *innovators* group in a very little number were the ones who carry new ideas of agricultural innovations. The second group has a reputation for making careful and considerate adoption decision. This group of *early adopters* of the farmers comes with 16.2%. They have adopted new methods and innovations through the consultancy of potent opinion leaders/peers. The analysis showed that 19.6 % of the target sample fallen into *early majority* adopters. They were the deliberate evaluators of the agricultural innovations. *Late majority* category was 21.8% of the total sample. The late majority views the presence of any uncertainty that surrounds an innovation as a possible drain on their very limited resources. **Majority of the farmers falls in Laggards** group. They were tending to adopt agricultural innovations at a point when the innovation is being replaced by something newer.

DISCUSSION

This study supported Rogers and Shoemaker’s model, which in its first stage provides primary exposure to the innovation and gives us a basic understanding of how the innovation works. The communication activities surrounding the innovation can incorporate both the mass media and personal contact. The decision stage of the model in this study is evaluated through asking question of satisfaction and adoption of farming tools. Most of the farmers have been found satisfied. During the implementation stage the actual “use-behavior” found occurs. Farmers desire to reduce uncertainty about adoption. The deliberate evaluations of the innovation by these farmers serve an important persuasion link (peer pressure) to the remaining members of

the community. These farmers tend to be a bit distrustful of new innovations and will adopt them rather reluctantly.

Innovators were respected for being successful, but ordinarily do not enjoy the highest prestige in the farming community. Because they adopt new ideas so much sooner than the average farmer, they were sometimes ridiculed by their conservative co-farmers. This fellow group pressure was largely ignored by the innovators, however. The innovations were watched by their fellow-farmers, but they were not followed immediately in new practices.

Early adopters were found younger than the average farmer, but not necessarily younger than the innovators. They also have a higher average education, and participated more in the formal activities of the farming community. They participated more than the average in agricultural cooperatives and in government agency programs in the community (such as Extension Service or Instruction on Field). In fact, there was some evidence that this group furnishes a disproportionate amount of the formal leadership (elected officers) in the community. The early adopters are also respected as good sources of new farm information by their fellow-farmers. Early majority was slightly above average in age, education, and farming experience. They have medium high social and economic status. They were less active in formal groups than innovators or early adopters, but more active than those who adopt later. The people in this category were most likely to be informal rather than elected leaders.

Late majority in this group have less education and are older than the average farmer. While they participate less actively in formal groups, they probably form the bulk of the membership in these formal organizations. Individually they belong to fewer organizations, are less active in organizational work, and take fewer leadership roles than earlier adopters. They do not participate in as many activities outside the community as do people who adopt earlier.

Laggards have the least education and were the oldest. They participate least in formal organizations, cooperatives, and government agency programs. They have the smallest farms and the least capital. Many are suspicious of county extension agents and agricultural salesmen. This situation also endorsed the Rölting, 1988; Vanclay & Lawrence, 1994; 1995, findings of their study that traditional extension methods have only had limited success in promoting the widespread adoption of new management practices and technology.

Agricultural innovations and diffusion of new technologies are important factors in our country, quests for food security. Public agricultural research, both at national and local level, like much of development strategy, has bypassed the needs of small and marginal farmers and concentrated primarily on better-endowed districts, commodity-intensive production systems, and commercial crops. Small producers, particularly those operating in resource-poor areas, have benefited much less from the recent technological breakthroughs in agriculture. In order to attack poverty and hunger, it is critical to redirect and augment resources devoted to agricultural research to the farming and livelihood systems of poor rural communities.

Many people in extension are ill prepared for extension and an extension communication job. The emphasis in their training is more on technical proficiency rather than on rhetorical and persuasive skills. An extensionist trained in this way, is unlikely to make an impact on a

conservative farmer who is not likely to put his farm inputs to risk by trying the extensionist's improved technique. There is real need for extension agents training to be relevant to their jobs at the grass root.

Extension is achieved by using advisory methods, participatory monitoring and evaluation, or by assigning responsibility for diffusing innovations to producers' organizations (farmers' organizations, NGOs, etc.). This, partnership in the diffusion of innovations requires two-way communication. Technical language used in communicating information is incomprehensible to the farmers.

The incentive framework for the creation and adoption of valuable innovation is also vital. Again, the degree of poor farmers' organizations is crucial here. Only strong farmers' organizations can ensure the adoption and implementation of government policies that reflect their needs and concerns, and create an enabling environment for sustainable production and development.

The formal media of mass communication such as radio, television, are generally believed to have an insidious influence in the dissemination of new ideas. They are hastily employed in campaigns such as those aimed at diffusing innovations in agriculture practice. Personal sources of communication, as exemplified by extension agents, are more effective in creating awareness and influencing adoption of agricultural innovations among rural farmers than mass media sources.

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