Evaluating the Effectiveness of Agricultural Extension Services: An Exploratory Research

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Abstract: **Agricultural extension services are the process of technology transfer in the field of agriculture. The extension service is designed to provide the useful information necessary to the farmers during various levels of agricultural value chain. Modeling and analysis tools are deployed during the research investigation and attempt has been made to develop a framework for delivering extension services more effectively. This study aimed at conducting the analysis of information needs and search behavior of the farmers. Using a case-study of Davanagere district in Karnataka, farmers' information needs, search behavior, and factors affecting their search behavior are examined. The outcome from the research study generated recommendations for the development of effective extension services. Finally the framework is developed to explain various information needs and search behavior of the farmers.**

Keywords: Agriculture, Extension services, Information needs, Search Behaviors

I. INTRODUCTION

Agriculture is an important sector in Indian economy which is the principal source of income for more than half of the population and accounts for about 14% of the nation's GDP and about 11% of its exports, The significant transformation in the Indian agriculture over the last six decades is reflected in the changing share of agriculture in the national economy and employment. Agriculture contributed more than 51 percent of total output of Indian economy in the early 1950s is declined to about 14 percent in 2012-13. The process of technology transfer in India has been a mix of field extension carried out by line departments, anchored by frontline extension systems of the Indian Council of Agricultural Research Institutes and State Agricultural Universities, Commodity Boards, NGOs and voluntary organizations. Recently, Farmers' Consortiums under different nomenclature have also emerged with this mandate. The successful delivery of the extension services result in the increase of productivity and profitability of the small holder farmers who constitute the larger portion of the farmers in the country. Several initiatives have been undertaken by both public and private sectors in India to enhance agricultural growth and facilitate information availability which are reviewed in this study to assess the information needs and search behaviors of the farmers.

II. PROBLEM STATEMENT

Farmers need to access various kinds of information from production technologies to post harvest processes and also market information based on the cropping pattern, land use and water efficiency and weather conditions. Extension services play a major role in providing information needed to the farmers at the right time to increase productivity, profitability and sustainability of the agriculture. It is observed through the literature review that the public sector extension services often fails to take into account farmers' perceptions and location specific conditions which calls for the detailed study of the information needs and search behaviours of the farmers that can support the measures to improve the content management and delivery mechanisms of the agricultural extension services.

III. OBJECTIVE

This paper aims to review the existing agricultural extension strategies, understands the information needs and search behaviors of the farmers and proposes a framework for the effective delivery of agricultural extension services to the farmers. The main objective of the study is to identify the various factors affecting the information needs and search behaviors of the farmers and to propose a framework for the effective delivery of agricultural extension service.

IV. LITERATURE REVIEW

The role of agriculture policy may be analysed in the context of role of agriculture in the development process of the country. Sekhar [1] explains that the agriculture serves the three main functions in the development of the country which includes providing initial surpluses for the other sectors of the economy, providing usage goods to the industrial sector and to promote growth through forward linkages (provide inputs to industrial sector) and backward linkages (use outputs from the industrial sector in agriculture), hence the overall growth and growth in agriculture sector are indispensable for the sustainable agricultural growth. Propelling growth in agriculture is critical as research as revealed that GDP originating in agriculture is at least twice as effective in reducing poverty as GDP growth originating in agriculture [2].This reveals that the agricultural growth is necessary, not only for attaining high overall growth but also speed of the poverty reduction, as the continuing primacy of agriculture as the primary source of employment in Indian rural economy calls for the acceleration of the agricultural growth[3]. Claire J Glendenning et.al [4] reviews the various agricultural extension approaches in India and suggests that there is an increasing need to work in partnerships and share knowledge and skills in order to provide the locally reliable services that meet the information needs of the small and

marginal farmers. Rashid et.al[5] explored the various aspects that the extension support needs to address and found that public sector expansion system focuses mostly on production and emphasis that the focus should also be on other aspects such as technological options to overcome constraints in land, labor, capital and knowledge, optimal use of inputs such as fertilizers, seeds and pesticides, diversification of crops, market driven cropping patterns, quality specifications for produce, collecting decision on resource used and marketing, quick accessible to most reliable and relevant knowledge and information. Literature reveals that research in the areas of performance and challenges in agriculture, process of extension services and role of extension services in sustainable agricultural development, Innovative use of mass media and ICT tools and their adaptability to extension approaches for providing various services has been carried out, but there is limited emphasis on location specific and context specific information delivery mechanisms to satisfy the information needs of the farmers, which requires the adequate knowledge about the information needs and search behaviours of the farmers.. This research investigation has attempted for identifying the various factors affecting the effectiveness of extension services in agricultural sector.

V. METHODOLOGY

The methodology involves collection of data about the information needs and search behaviors of the farmers by survey, cluster analysis to identify the search behavior, factor analysis to identify Important factors and a logistic regression model to determine factor influencing search behavior of the farmers.

A. Survey data and methodology

The data collection involves the survey of the farmers in the Davangere District of Karnataka to identify the needs and search behavior. The target population for the survey was all the farmers who cultivated during the last monsoon. Farmers were sampled using the stratified random sampling strategy, in which the entire district is geographically stratified into different taluks and hoblis within the taluk. 10 villages were selected in random from each taluk in which the number of villages from each hobli were selected in proportional to the total number of villages in the hobli. In each village, 6 farmers were selected randomly which gave a total of 360 respondents as shown below,

Table 1:Survey sampling strategy.

Number of taluks	Number of villages in each taluk	Respondents per village	Total Respondents
6	10	6	360

B. Cluster analysis

The information search behaviours of the farmers were analysed using the ward's hierarchical clustering technique which divided them into meaningful categories based on the

correlation between the number of sources accessed by the farmers, mean of frequency of information from the sources and the number of sources from which the information was acted on the farmer fields. The frequency of the information sources was measured on a likert scale (5-daily, 4-weekly, 3-monthly, 2-seasonally, 1-yearly, 0-none). Overall the average number of information sources accessed was 6.989(SD=2.493) and information was usually accessed seasonally on a need basis (2.491). The information search behaviours of the farmers were analysed using the ward's hierarchical clustering technique which divided them into meaningful categories based on the correlation between the number of sources accessed by the farmers, mean of frequency of information from the sources and the number of sources from which the information was acted on the farmer fields. The frequency of the information sources was measured on a likert scale (5-daily, 4-weekly, 3-monthly, 2-seasonally, 1-yearly, 0-none). Overall the average number of information sources accessed was 6.989(SD=2.493) and information was usually accessed seasonally on a need basis (2.491). The socio demographic variables that are analysed include gender, age, annual agriculture income(INR), membership of primary agriculture co-operative bank , membership of farmer based organisation , irrigation facility , education, distance to the market and type of ration card(APL or BPL) which indicates the income level of the farmers. The kruskal wallis test was performed on the demographic variables for the analysis of variances between the different search behaviour clusters. The kruskal wallis H test shows that the four search behaviour cluster differed significantly by agricultural income , membership of a farmer based organization , irritation facility , education and availability by APL card. The low searcher group had lowest number of respondents who had studied beyond high school studies, whereas the high search group had the largest which indicates that the education level of farmer plays a major role in increasing the capacity and awareness of farmer and access more information sources. The high searchers group also had relatively higher agricultural income and more frequent APL status while the farmers in low searcher group had the relatively lower agricultural income and less frequent holders of APL cards. This reflects that the capacity to access and try information from various sources is high among the farmers with higher agricultural income which may also serve as a motivation to search for information as the interest in agriculture may be greater. Membership in farmer based organization is also highest among the high searchers and lowest among the low searchers, farmer based organizations serves as a platform for discussion, exchange of ideas and innovative practices among the farmers which may affect the searching ability of a farmer to the greater extent.

C. Information needs of the farmers

The farmers were asked to access the importance of various information needs using the likert scale, (1=Not-important, 2=Somewhat Not-important, 3=Neutral, 4=Somewhat important and 5=Very important) The figure shows the

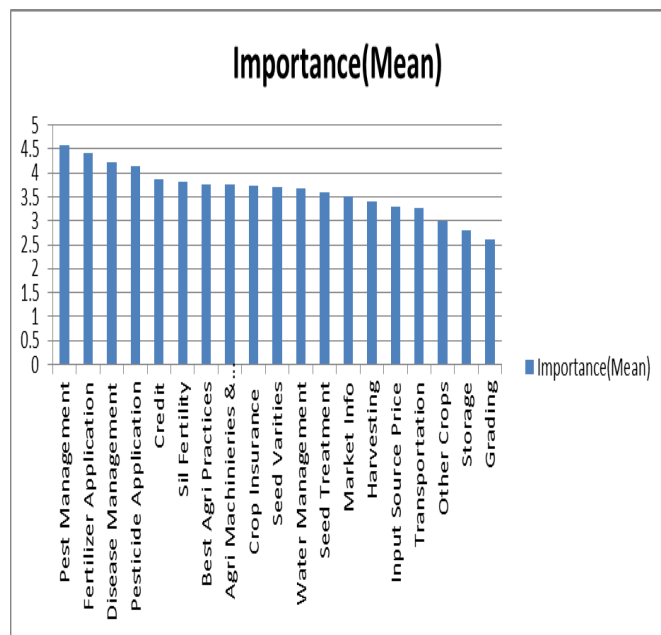importance accessed by the farmers to the various information needs,

Fig 1 : Importance given to various information needs by the farmers.

The most importance was given to needs related to the protection and fertilizers i,e disease management, pest management, pesticide application and fertiliser application and the information regarding them were obtained primarily from the input dealers as it was stated by the farmers during the interaction. The information regarding finances (credit and crop insurance) were accessed from primary agricultural co-operative societies and state departments which were given more importance by the farmer but were reported about the poor benefits available to the farmers from the schemes related to assist farmers financially. The information about the agricultural practices was also obtained from extension staff at rural areas. The insights into the information needs gives us the gaps involved in the information availability to the farmers, the information related to seed varieties which was assigned much importance has a very less percentage of access, this shows that the extension system needs to address the information needs of farmers regarding seeds, i.e. seed testing for quality and certification of seeds and that information should be made available for the farmers which helps the farmers in effective decision making.

The information accessed by the farmers also shows that the extension systems are increasingly focussing on crop production and protection about which the farmers already have an extent of knowledge by their experience, interaction with other progressive farmers and hence post-harvest needs of farmers such as storage of crops for preserving the quality, optimal transport facilities and grading which helps them to gain profits at the market and also increase the quality of agricultural produce should also be addressed by the public sector extension systems in order to increase the impact of extension services on overall agricultural growth.

D. Preferred information sources

The figure 2 shows the preference given by the farmers to the various information sources,
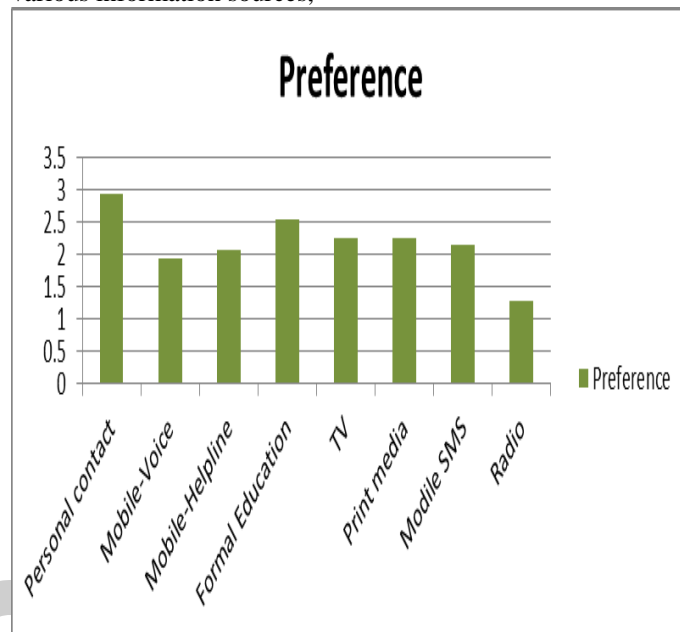

Fig 2 : Preferences given to various information sources.

The most preferred information sources among the farmers was the personal contact , whereas formal education, TV and print media were also preferred by the majority of respondents. The mobile sms was preferred by the farmers to access majorly the market information which was noticed during the discussion with the farmers through mobile helpline was preferred due to its ease of use, farmers reported that the quality of advisory services provide by the mobile helpline was of poor quality and sometime risky as it was not tailored to needs of local conditions. The radio was most less preferred medium by the respondents. The preference to various info sources differed significantly across the various search behaviour clusters as show in figure 3,
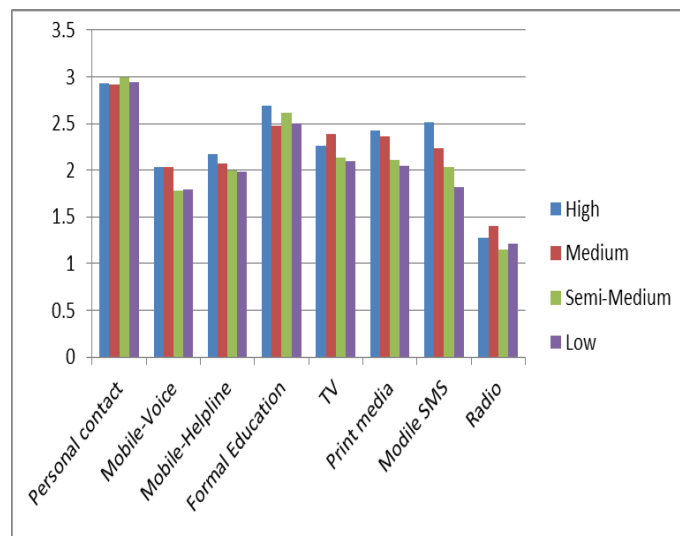

Fig 3: Information sources preferred , by search behaviour clusters.

Personal contact was given high importance by all the search behaviour clusters whereas for voice messages facility and mobile helpline was preferred to an extent by the high and medium searchers and relatively less preferred by the semi-medium and low searchers. Radio was the least preferred source by all the search behaviour clusters. The significant difference was noticed among the preference accessed to TV, print media and mobile messages (SMS) by different search behaviour clusters as shown in the table.

E. Factor analysis

The information needs of the farmers were reduced to three groups based on the principal component method of the factor analysis. Factor analysis using the principal component method and varimax rotation reduced the information variables into three factors, the eigen value for each variable greater than 0.5 were selected suitable to be included in the defined components. The composite variables were placed for the reliability analysis using the cronbach's alpha and the factors that produced the minimum coefficient of 0.5 were selected appropriate for further analysis. The factors that emerged from the analysis were named as "Post-Harvest", "Crop Production Practices & Market information" and "Plant Protection". The attitudinal responses of the farmers were reduced to two groups based on the principal component method of the factor analysis. Factor analysis using the principal component method and varimax rotation reduced the information variables into three factors, the eigen value for each variable greater than 0.5 were selected suitable to be included in the defined components. The composite variables were placed for the reliability analysis using the cronbach's alpha and the factors that produced the minimum coefficient of 0.5 were selected appropriate for further analysis. The factors that emerged from the analysis were named as "Source Problem" and "Ability and Experience"

F. Logistic regression model

The analysis of the various information needs , sources used and preferred information medium has demonstrated that the farmers differ significantly in their search behaviours and needs, to further understand the determinants of the high and low search behaviours of the farmers, a logistic regression model was estimated.

The hierarchical cluster analysis which divided the farmers into the high and low searchers is used as the dependent variable, the socio demographic factors such as gender, age, membership in the PACB, membership in an FBO, education level, holding an APL card, distance to the nearest market, annual agricultural income and availability of irrigation facility are used as independent variables as they are hypothesised to determine the search behaviours of the farmers, the factors obtained from the factor analysis of the information needs of the farmers and the attitudinal responses are also used as the independent variables for the logistic regression model as shown in the table 2

Table 2 : Logistic regression model.

Parameter	Z (Co-eff)	p-value	Odds ratio	Standard Error
Gender	0.875	0.382	1.667	0.973
Age	0.208	0.835	1.004	0.020
PACB member	1.447	0.148	1.704	0.627
FBO member	2.241	0.025	2.227	0.796
Education	0.933	0.351	1.139	0.159
APL card	3.885	0.000	5.669	2.552
Distance	-1.992	0.046	0.958	0.021
Annual Income	1.317	0.188	1.000	0.000
Irrigation	0.411	0.681	1.149	0.388
Post -Harvest	-1.224	0.221	0.749	0.177
C.P.P and market	7.290	0.000	12.667	4.411
Plant Protection	-2.188	0.029	0.429	0.166
Source Problem	-3.056	0.002	0.510	0.112
Ability Experience	3.745	0.000	2.645	1.590

VI. RESULTS AND DISCUSSIONS

The four application search behaviour clusters differed significantly with regard to all the three factors, mainly with respect to crop productive practices and market info which was given the greater importance by the high searchers and medium searchers than did the semi-medium and low searchers. The plant protection factor was assigned relatively greater importance by the low searchers than the other search behaviour clusters. The postharvest factors has relatively identical means across the different search behaviour clusters as shown in table 3

Sl No	Factors	K-W Test
1	Post-Harvest	H=6.921 P=0.074
2	Crop Production Practices and Market	H=74.571 P=0.000
3	Plant Protection	H=30.804 P=0.000

The attitudinal factor varied significantly across the search behaviour clusters as the low searchers showed a greater agreement towards the source problem factor. This implies that the extension services need to be delivered effectively so that the farmers are equipped with that information which helps then in the decision making. The high searchers showed a strong agreement towards the Ability and experience factor with high searchers has the greater ability to search for information than the other search behaviour clusters, the logistic regression model shows that the factors that determine low search behaviour are plant protection and source problem. The low searchers assigned more importance to plant protection factors which include pest management and pesticide applications which are basic information for farming and this information was mostly available with high searchers by virtue of experience and ability to search. The low farmers faced problem with sources for accessing information, in was difficult for them to decide on the information source and the information that can be trustworthy so has to apply in their fields the reason for this can also be implied as the risk taking capacity will be relatively more in high searchers than the low searchers.

B. Discussions

The design of an extension program and advisory services can be effective if the policy makers have the clear understanding of the information the farmers' needs, the way they search for the information and the sources they depend on for accessing information.

The study explored the information search behaviour of the farmers in Davanagere district of Karnataka and confirms the heterogeneity of behaviour within farming communities. The policy implications proposed can support the targeted extension programs in the study area.

VII. CONCLUSIONS

The agriculture in developing countries like India are becoming increasingly knowledge intensive which has made it crucial to the farmers to access and use of information both for their financial success and the sustainable agricultural development. This study highlights the heterogeneity within the farmers in Davanagere district of Karnataka; greater understanding of differences in farmer information search strategies across the state and farming systems in India will be helpful in reforming agricultural extension policy in a greater extent. Further research is needed to explore the organizational performance challenges in extension systems that are restricting the timely delivery, appropriate availability and reliability of information to the farmers.

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