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Integrating diverse knowledge bases for empowering local farmers in India

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The dissemination of agricultural information process to the farmers of Baruipur, a community development block in West Bengal, India is studied. Semi-structured interviews were conducted to collect qualitative and quantitative data from 129 farmers and two government officials. The study reveals that among the available wide range of information sources and learning forms, farmers primarily value local knowledge as it is mainly experience-driven, practical and can be shared or transmitted informally among the farmers. But, informal local knowledge gradually gets influenced by extraneous factors, constructing an alternative pathway that resist the flow of information from reaching to the grass-root level. Limitation of genuine and accurate agricultural information impeded the empowerment of farmers at the micro level which demands for a superior integration among diverse knowledge systems with informal local knowledge. Here, the study identifies a more practical approach for knowledge integration, aiming to secure local preference, dynamisms and internal cohesiveness among participants from different domain. Further, this paper forwards a participatory approach based informal communication model, facilitating two ways communication for better and effective flow of need based, value added, accurate information towards holistic empowerment of the farmers at the ground level.

Keywords: Information; Information sources; Knowledge; Knowledge integration; Communication channels; Farmer empowerment

Introduction

Seventeen percent of the total GDP of India is contributed from agricultural sector. For strengthening the Indian economy, it is necessary to secure the socio-economic empowerment of this sector. Singhal and Rogers[1] have established information as a decision-making tool for empowerment. Similarly, in the context of agriculture, researchers have envisioned information and knowledge as an important decision-making tool for the farmer in their day to day life for securing overall empowerment[2,3]. Generally, emphasis has been given to the holistic nature of empowerment that is related with environmental and socio-economic domain and it can only be secured through new forms of knowledge and learning[4]. Among different forms of knowledge, a general preference of the farmers is always with experimental learning, more precisely local knowledge for achieving sustainable agriculture and empowerment[5]. But, involvement of extraneous factors within the process deviate the flow of knowledge from its original linearity, limiting proper agricultural knowledge from farmers at micro level[6].

Therefore, purpose of this study is to construct a practical-based approach for knowledge integration from the ground level investigation as a pathway for farmer empowerment and also, to contribute in the conceptual development of a participatory approach based interpersonal communication model, facilitating two ways communication for better and effective flow of need based, value added, accurate information.

Theoretical framework

Characteristics of available knowledge systems

Local knowledge is based on the practical skills and experience of the farmers, and it transforms over time on the basis of local, social and environmental conditions[7]. As, agriculture is closely linked with local environment, specificity and understanding of particular local entities engaged with local knowledge equips a farmer with proper decision making abilities for farming in local environment[8]. Like local

knowledge, uniqueness and cultural specificity is also embedded in the traditional knowledge. Traditional knowledge is mainly tacit in nature and percolated through the techniques, practices and experiences of the local people[9] and has a strong connection with the social and ethical values of local people[10,11]. However, among the government officials and policy makers, scientific knowledge is still preferable and most dominant knowledge source due to its formal character and standardization[12]. Scientific knowledge and technical knowledge generally involved advanced technologies, demands high growth in agricultural production and also needs continuous updating for maintaining the harmony with constant advances in scientific domain[8], which, as the local farmers expressed, gradually suppressed their tacit knowledge and indigenous farming skills[13]. Noe et al[14] reported, poor linkage and interconnection between scientific knowledge and local knowledge and high power distance between the policy makers and farmers failed to extract full potential of knowledge systems in order to secure the empowerment of the practitioners and sustainable farming.

Collaboration among knowledge systems

In recent times, an increasing body of research works have argued for building more open, cohesive, substantive and democratic knowledge networks which are cross-beneficial to both formal and informal knowledge systems[15]. In the perspective of agriculture too, it is also necessary to combine informal and formal knowledge to achieve the desired results[16,17]. Collaboration among knowledge systems has empowered the farmers by having access to value based, accurate and need specific information on time and at the same time enhance the possibility of addressing their needs and local practices through its diverse information base[18,19]. Integration of indigenous knowledge with modern scientific and technological information helps in eradicating extraneous issues and secure the development of the farmers[20,21]. Therefore, research works that deal with diverse stakeholders and participatory approaches are gaining attention for their multidisciplinary nature and farmer centeredness[22].

Available channels of communication in India

Availability and access of information can help the farmers to address day to day farming related problems[23,24]. Recent studies have opined that collaboration of diverse knowledge systems derives new farming practices and knowledge which are disseminated through communication network and empower the local farmers in a holistic way[25,26]. Due to the interactive and participatory nature of these channels, they involve farmers into the knowledge generation process.

In India, the process of dissemination of knowledge to the local farmers is mainly performed by the government-run agricultural extension services and NGOs[27-29]. They have tried to meet the requirement of information through their non-priced value added services[28]. Role of these extension services is to provide pertinent, time specific and unbiased technical and management information in response to the queries of the farmers[30,31]. Mainly, information regarding farming practices, plantation, new techniques and technologies are provided by these farm-extension and rural advisory services[32]. However, local farmers are not active contributors in the knowledge generation process as these services are not participatory in nature; and as a result, making the network feeble, from where extraneous factors get invoked into the flow[6] and impede the empowerment process.

In this paper, authors have attempted to develop a conceptual model for integration of indigenous and exogenous knowledge and proper dissemination of that knowledge for empowering the farmer by improving their farming activities in India.

Objectives of the study

- To identify extraneous factors that influence the knowledge network and impede the empowerment of the farmers;
- To integrate diverse knowledge systems for generating advanced agricultural knowledge in order to secure farmers' empowerment; and
- To develop a participatory approach based informal communication model for disseminating the generated knowledge.

Methodology

The study has been conducted in four gram panchayats of Baruipur CD block namely Kalyanpur, Madarhat, Mallickpur and Ramnagar-1. The sample of the study is divided into two parts, where first part includes two state government officials, the Block

Development Officer and the Assistant Director of Agriculture of Baruipur. In second part, a purposive sample of 129 farmers has been interviewed during the study, where the number of respondents ranged between 28 and 36 per panchayats. Participants have been selected after meeting the criteria like: i) above 18 years, ii) able to communicate in Bengali language and iii) have experience of farming. Snowball sampling strategy was used where participants recommended other farmers for participation[33].

An extensive, open-ended, semi-structured interview was held with the Block Development Officer, the Assistant Director of Agriculture and farmers to collect qualitative and quantitative information. Semi-structured interview method was used to maintain consistency among areas while still offering some flexibility[33].

Result and discussion

Available sources of information and specific information needs of the farmers

Findings of the study show that farmers acquired agricultural knowledge from both formal and informal sources of knowledge. Farmers are more inclined to use local sources of knowledge which include personal experiences (99.2%), friends (98.44%), neighbours (95.34%), other farmers (93.02%), mass gathering (92.2%), pesticides and fertilizer dealers and intermediaries (90.7%) (Table 1). Medium range use of extension officer (79.06%), market and shop keepers (75.9%), NGOs (70.54%), Radio (67.4%), TV (53.5%) and village leader (43.41%) are also observed in the block. Farmers made nominal use of scientifically proven[34] formal sources provided through National Food Security Mission (NFSM) such as field day, farm school, newspaper, demonstration programme and researchers as they considered these sources as less important for acquiring agricultural knowledge. The result indicated that in general, farmers preferred informal sources of knowledge and relay more on their personal experience to carry agricultural activities.

The findings are in line with earlier studies on Indian farmers' agricultural knowledge need[35-38], confirming that farmers mainly need knowledge regarding application of fertilizers and pesticides (79.84%), irrigation and soil preparation (79.84%), technological support (72.09%) and selection of crops and preservation of crops (65.11%) (Table 2). Other types of knowledge received less preference from the farmers, which include knowledge related to

Table 1—Distribution of the sources of knowledge in the block

Sources of knowledge	Category (Formal/Informal)	No. of respondents (N= 129)	Usage (%)
Newspapers	Formal	27	20.9
TV	Formal	69	53.5
Radio	Formal	87	67.4
Mass gathering	Formal	119	92.2
Village leader	Informal	56	43.41
NGOs	Formal	91	70.54
Extension officer	Formal	102	79.06
Researchers	Formal	8	6.2
Other farmers	Informal	120	93.02
Friends	Informal	127	98.44
Pesticides and fertilizer dealers	Informal	117	90.7
Market and shop keepers,	Informal	98	75.9
Neighbours	Informal	123	95.34
Personal experience	Informal	128	99.2
Proposed communication channels under NFSM			
Demonstration programmes	Formal	18	13.9
Field day	Formal	30	23.25
Area of operation	Formal	5	3.9
Farm school	Formal	24	22.48
Exposure visit	Formal	2	1.55

Table 2—Information requirement by farmers

Information requirement	Kalyanpur		Madarhat		Mallickpur		Ramnagar-1		Total	
	No (28)	(%)	No (36)	(%)	No (33)	(%)	No (32)	(%)	No (129)	(%)
Government policies	14	10.86	19	14.72	13	10.07	18	13.95	64	49.61
Application of fertilizers and pesticides	26	20.16	28	21.7	22	17.05	27	20.93	103	79.84
Climate	7	5.42	9	6.98	7	5.42	13	10.07	36	27.9
Marketing and financial support	17	13.17	15	11.62	11	8.52	16	12.4	59	45.73
Technological support	16	12.4	23	17.82	25	19.37	29	22.5	93	72.09
Irrigation and soil preparation	21	16.27	29	22.5	27	20.93	26	20.15	103	79.84
Selection of crops and preservation of crops	10	7.76	18	13.95	28	21.7	28	21.7	84	65.11

Table 3—Purpose of use of formal sources by farmers

Purpose	Kalyanpur		Madarhat		Mallickpur		Ramnagar-1		Total	
	No (28)	(%)	No (36)	(%)	No (33)	(%)	No (32)	(%)	No (129)	(%)
Proper use of pesticides and fertilizers	23	17.82	25	19.37	28	21.7	21	16.27	97	75.13
How to use technological equipment?	26	20.15	28	21.7	24	18.6	29	22.48	107	82.94
Measuring soil fertility	13	10.07	18	13.95	14	10.85	22	17.05	67	51.93
Policy and financial benefits related issues	20	15.5	27	20.93	22	17.05	24	18.6	93	72.09
How to solve crop diseases?	23	17.82	29	22.48	27	20.93	22	17.05	101	78.29

government policies (49.61%), marketing and financial support (45.73%) and climate (27.9%).

Use of formal sources of information by local farmers

With respect to use of formal sources of knowledge, it is found from the study that nearly three-fourth of the respondents (82.94%) used formal knowledge sources for seeking information related to usage of technical equipment, followed by solving crop disease issues (78.29%), proper usage of pesticides and fertilizers (75.13%), policy and financial benefits related issues (72.09%) and soil fertility measurement (51.93%) as shown in Table 3.

Extraneous factors that affect the dissemination of knowledge

The findings showed that in Baruipur CD block there are several extraneous factors available which have direct influence on the dissemination of knowledge from both formal and informal sources. The result indicated that local dealers and intermediaries (88.37%), low education level of the farmers (80.62%), inaccessibility to technology (74.41%) and insufficiency of extension staffs are the main extraneous factors, which leads to sharing and acquisition of distorted knowledge (Table 4). Other factors such as low economic level of farmers (66.67%), lack of supervision (62.79%) and discrimination in execution of the scheme (27.9%) have some impact on the dissemination of knowledge.

These factors delinked the direct connection between farmers and proper sources of information, raising issues like insufficiency in need identification and extension services. Lack of proper information has made local dealers to influence the farmers to use chemical fertilizers and pesticides in a heavy range which have adverse effects on environment and gradually decreases the fertility of the soil. Apart from these, unavailability of agricultural information regarding farming made the farmers incompetent to adopt modern techniques.

Need for collaboration between informal and formal knowledge systems

Most of the farmers (92.24%) in Baruipur CD block opined that a single knowledge system is not sufficient to alleviate all daily problems of farming. One

Table 4—Extraneous factors present in the block

Extraneous factors	Kalyanpur		Madarhat		Mallickpur		Ramnagar-1		Total	
	No (28)	(%)	No (36)	(%)	No (33)	(%)	No (32)	(%)	No (129)	(%)
Insufficiency of staff	19	14.72	28	21.70	20	15.50	23	17.82	90	69.76
Prevalence of the local dealers and intermediaries	24	18.60	35	27.13	29	22.48	26	20.16	114	88.37
Discrimination in execution of the scheme	8	6.20	7	5.42	11	8.52	10	7.75	36	27.90
Lack of supervision	13	10.07	23	17.82	21	16.27	24	18.60	81	62.79
Low education level of the farmers	22	17.05	29	22.48	27	20.93	26	20.16	104	80.62
Inaccessibility to technology	18	13.95	31	24.03	24	18.60	23	17.82	96	74.41
Low economic level of farmers	21	16.27	26	20.16	22	17.05	17	13.17	86	66.67

respondent remarked, *"We can't fulfil the market need with our local knowledge; we adopt exogenous knowledge from different sources like local fertilizers and pesticides dealers, block agricultural office, market and from other intermediaries perform high yielding farming."* Due to extraneous factors this collaboration failed to bring out the full potential of both knowledge systems and the intermediaries influence the farmers with their misleading and distorted information. The study reveals that a good number of the farmers (75.19%) are reluctant to acquire information from these intermediaries but due to lack of extension staffs, poor economic condition and low education level they are bound to gather knowledge from them. But, the study showed that majority of the local farmers (81.39%) was keen to share their local knowledge with external sources to develop a steady collaboration among all the knowledge system, which will reduce the effects of the extraneous factors and improve their farming[39]. Hence, the study finds a need to develop a model by collaborating formal and informal knowledge systems together to secure the empowerment of farmers in Baruipur.

Integration of knowledge systems and development of communication model

Previously, studies have shown that local knowledge, traditional knowledge, scientific knowledge, technical knowledge and policy related information are needed by the Indian farmers for advancing farming activities, but these knowledge systems are not properly managed within a knowledge network. Information brokers or knowledge mediators can play a key role here; by managing multi-actors effectively, these mediators can inculcate local culture and values into agricultural learning network to make it robust, realistic and acceptable to the local farmers. Village leaders, NGOs, extension officers, researchers and knowledgeable persons can act knowledge mediators. These actors can enable interactive and participatory knowledge generation process by involving farmers as co-producers of knowledge.

Beckford and Barker[7] opined that farmers should be involved in the knowledge generation process to understand their need and the practical applicability of the generated knowledge. This notion corroborates the farmer's active participation in knowledge generation process. Direct participation in knowledge generation develops sustainable farming techniques among local farmers and also creates robust social structures by increasing internal cohesiveness among different stakeholders[8].

For implementing active participation of farmers in knowledge generation, the study considered 'parallel approach' as the suitable one. "Parallel approach" of knowledge integration is a prominent way which is based on participatory process, functions through peoples' networks, personal relations, co-learning, daily routine activities, local conditions and active participation of the farmers in knowledge generation. In 'parallel approach' each type of information is pursued separately but in parallel process; as a reason every knowledge system gets same scope to showcase their strength and at the same time mutually enrich each other as needed[40]. Another reason for selecting

parallel approach is to reduce the level of discrimination among different knowledge system as in knowledge hierarchy, scientific knowledge still gets more preference to the policy makers as compared to local farmers' knowledge[41,12]. For implementing parallel approach in context of Indian agricultural knowledge integration the study follows some methodical steps which are as follows:

Involvement of all stakeholders

The study involves all existing stakeholders of each knowledge system into the network to enhance robustness and practicality (Table 5). Participatory approach brings farmers into the knowledge generation activity; involves farmers in the knowledge generation process, and helps the policy makers to understand preferable knowledge diffusion ways eventually benefits farmers. This builds mutual respect, reciprocity, information sharing and trust among each and every stakeholder. It will help to narrow down the knowledge hierarchy between local and formal knowledge, which in the long run develops informal relations among local farmers, local administration and the researchers. As a result, all the knowledge systems will get equal attention in policy making and knowledge generation which will raise a shared vision and strategy for advancing farming activities and also helps to embed agriculture and the empowerment of the farmers in a broader context of rural development with more dedicated focus.

Diffusion of agricultural knowledge

Generally, a farmer's family is the main source for learning agricultural activities. Therefore, it is necessary that the network should connect the families of the farmers as well. Agricultural extension staffs, researchers, village leaders and educated persons from the community should work as knowledge mediators, maintain liaison between an individual farmer and other stakeholders such as government officials, policy makers and regulatory institutions (Figure 1). Participatory approach facilitates two-way communication between farmers and other representatives from diverse sectors on relevant agricultural issues. Two- way communication embeds feedback mechanism, giving scope to the farmers to participate in decision making process in an informal way. The study suggests that this informal communication can help the farmers to adopt target-based learning system.

We propose a target-based learning system called "*Each one, teach two, reach two*" which is devised by acknowledging the socio-economic background of the local farmers (Figure 1). In this system, stakeholders from different knowledge systems discuss about agricultural practices with the local farmers. The

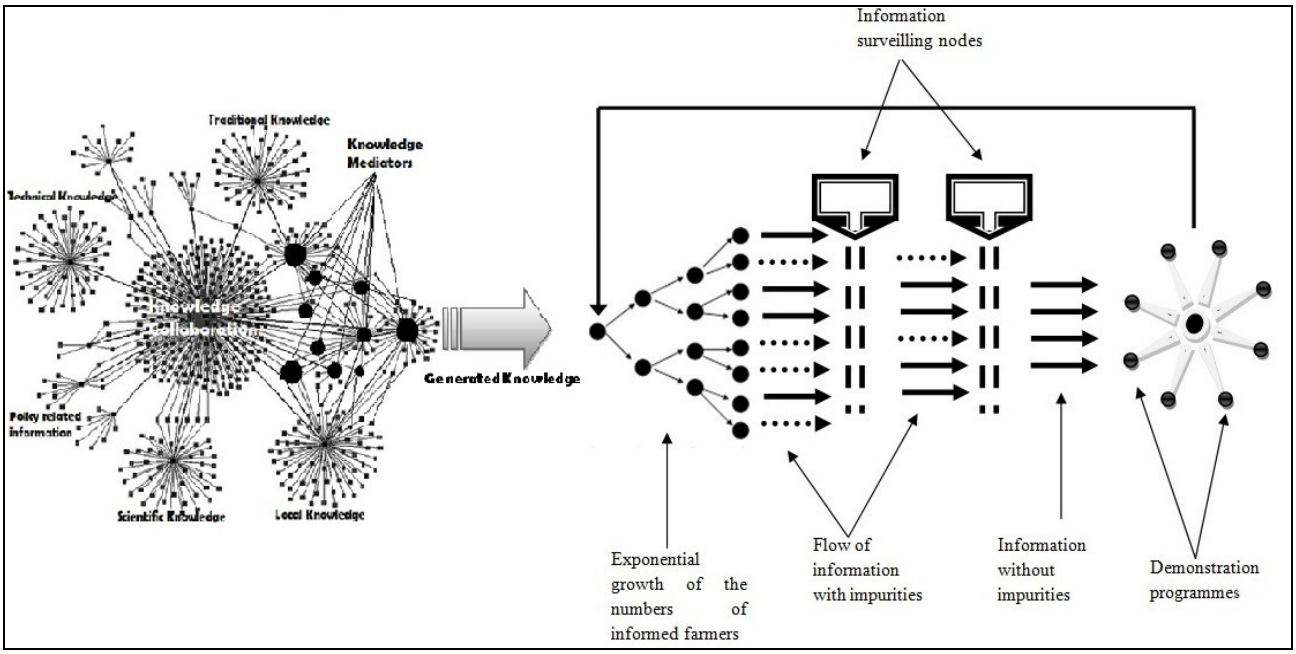

Fig. 1—Participatory approach based informal communication model

Table 5—Building learning network by involving different stakeholders

Knowledge systems	Stakeholders/ Communication mediums	Stage 1 Informational inputs	Stage 2 Distillation	Stage 3 Diffusion
Local Knowledge	Other farmers, friends, market and shop keepers, pesticides and fertilizer dealers, mass gathering, family member and neighbours	Observation, practical experience, detailed understating, local variation of crop, soil, climate etc.	• Try to understand the socio-ethnographic structure of the area for measuring farmers' capacity to adopt new techniques. • Select relevant and pertinent inputs from the gathered information. • Open discussion with the representatives of each stakeholder for increasing the cohesiveness. • Develop a strategy from all the new informational input from all domains. • Generalization of that strategy for effective use at the ground level.	Diffuse the developed knowledge informally through constructed knowledge network.
Traditional Knowledge	Other farmers, friends, neighbours, progressive farmers and mass gathering	Traditional resources, traditional farming techniques, effective resource management		
Scientific Knowledge	Scientists, Research scholars	Scientific reasons, new developments, generalization of scientific research		
Technical Knowledge	Field workers, TV, radio, newspapers, demonstration programmes, field day, farm school, area of operation, NGOs, Mobile and Internet	Demonstration, hands on practices, field work, details and utility of machines		
Policy related information	Field workers, Government officials, Panchayat, TV, Radio, Newspaper, Political leaders	Financial benefits, Technological benefits, scheme related information, governance		

discussion is expected to highlight the value and benefits of need-based accurate agricultural knowledge for securing the empowerment of the farmers. Further, they are instructed to disseminate that information to other farmers (one farmer inform at least other two). This chain process can result in an exponential growth in the numbers of informed farmers..

The study suggests that the farmers should adhere methods like folklore, storytelling, songs, informal discussions and other indigenous ways with high level of penetration and acceptance for diffusion of agricultural knowledge. For the robustness and practicality of this entire process, financial credit-based approach should be adopted where officials will give financial assistance to the farmers on the basis of their performance in this process.

Supervision on knowledge exchange

Collaboration of different knowledge systems usually brings diverse actors from wide range of social, economic and environmental domains. Out of these actors, some of them create an unholy nexus within the system and invokes biasness and impurities into the flow by challenging the proper exchange of agricultural knowledge. Therefore, diffusion of knowledge, especially in block level, should come under supervision for proper functioning. The study,

for resolving this issue suggests construction of information nodes into the process (Figure 1).

Information node is a kind of concept, consisting of the knowledge mediators such as government officials or academics or experts, maintaining a liaison with the agricultural workers in an informal way. Here, these information nodes shall help the local farmers in selection of the proper learning practices by curbing the effects of unholy nexus. Information nodes shall work through informal discussions in the places like large market, shops of fertilizer, pesticides and seed dealers where the agricultural workers generally meet frequently. The nodes should track farmer activities, encouraging them to participate in knowledge generation and exchange for securing their own empowerment.

Field demonstrations based on generated knowledge and empowerment of the farmers

Although schemes of Government of India have already offered this kind of approach, but due to some limitations, the desired results are not fully achieved. Here, active participation from all the stakeholders provide scope overcoming some of the limitations. Researchers, experts and extension staffs should analyse the generated knowledge and demonstrate its implications through the real life activities so that farmers can rely on these external knowledge systems for advancement to their agriculture practices.

Information related to one successful micro-level demonstration can easily be disseminated informally to a large section of farmers through robust farmer's learning network (Figure 1). A farmer, who has gained knowledge for advancing his farming practices from this process, should share his experience with his or her peers for collective development. In this way the process can run in a cyclic manner. Continuous exchange of accurate, need based, culturally embedded, local value mixed agricultural knowledge will in the long run empower the local farmers in a holistic manner.

Conclusion

The investigation has documented how some extraneous factors influence or hinder dissemination of agricultural information. The study has identified that the informal means of knowledge sharing has greater acceptance by the farmer. The study suggests a participatory approach based model where stakeholders from diverse knowledge systems including the local farmers can participate in knowledge generation process to ensure practicality, robustness and fruitfulness of the process. The model can work as a tool to develop and design need-based information dissemination process by effective use of the derived findings for the farmers and can also assist the policy makers in formulating a more grounded national policy for other rural areas of India with similar socio-economic and environmental conditions.

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