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Enhancement of diffusion and adoption of local knowledge through social learning: A case study of white fly management in cotton in Haryana

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Risks in agriculture are pervasive so are the adjustment landscapes ranging from research and scientists-driven to heuristic and community driven. Often local knowledge and innovations play a pivotal role in risk adjustment with low external inputs. However, many a times such local and grassroots knowledge and innovations remain confined to a narrow scale in want of any effective mechanism of its dissemination and upscaling. The present study investigated how social learning approach helped the cotton farmers to save the crop from the menace of white fly (*Bemisia tabaci*) by using the principle knowledge of pest management and a local knowledge which refers to application of Dr Dalal solution and use of natural predators. The cotton farmers of Haryana understood the life cycle, economic threshold level, and predators of white fly besides the preparation and use of local knowledge by participating in Farmer Field Schools (*Keet Pathsala*) organized by the community. Since the local knowledge had its roots in Jind district and later spreading to Hisar and other districts, a total of 120 cotton farmers were selected randomly from these 2 districts of Haryana. Out of them, 90 farmers were they who had attended Farmer Field Schools (FFS*)* on white fly management and 30 farmers were they who had not attended any FFS. Criteria based ranking revealed that the FFS farmers and non-FFS farmers differed significantly with respect to their ranking of local knowledge and strategy on criteria like technological efficacy, eco-friendliness, ease of use, labour-intensiveness, and cost-effectiveness. The farmers of FFSs were significantly different ($p<0.01$) from non-FFS farmers with respect to knowledge about effective management of white fly, having favourable attitude towards social learning approach, and extent of engagement in social learning activities. They also differed significantly ($p<0.01$) with respect to their social learning behavior index. Social learning was found to be effective in dissemination of local knowledge and therefore, the study endorses the integration of social learning process in up scaling and out scaling of local knowledge.

Keywords: Social learning, Local knowledge, White fly, *Dr Dalal solution*
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Local knowledge system represents an adaptive strategy to the environment[1] and has played an active role in the lives of rural communities[2]. However, documentation, validation, diffusion and upscaling of local knowledge have been the major challenges related to them[3]. Though documentation of local knowledge and grassroots innovation has gained attention of academicians and researchers; attitude and efforts towards their validation and diffusion are very limited. Diffusion of local innovation across the language cultures and regional boundaries are extremely slow[4]. One of the major barriers for slow diffusion of local knowledge is lack of social networking among the stakeholders which prevent them from faster collaborative learning or from provision of morale support in the times of crisis or failure[4]. Recent changes in agricultural pattern, due to devastating effect of climatic and biotic risks, have led to growing interest in community knowledge and participation. The need of decentralisation of knowledge creation, knowledge integration and knowledge diffusion for bioregional planning and ecosystem management approaches is too being recognized[5]. However, it is imperative to have farmer to farmer linkage and regular participation of people at a platform which could facilitate in-depth and holistic deliberations on agricultural risks and related solutions and issues. What is more pertinent is the outcome of community endeavour as compatible knowledge creation through collaborative effort of local people as individual memory does not contain all the knowledge required for knowledge creation[5]. This participatory form of knowledge creation is termed here as social learning. Social learning is

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defined as the collective action and reflection that takes place amongst both individuals and groups when they work to improve the management of the interrelationships between social and ecological systems[6]. It encompasses (but is not limited to) how people learn collectively and how the social context influences learning amongst individuals[7]. For these reasons (and others) social learning is increasingly being applied to issues of resource and environmental management[8] and sustainability[9]. It facilitates knowledge sharing, joint learning and knowledge co-creation between diverse stakeholders around a shared purpose, taking learning and behavioural change beyond the individual to networks and systems. An effective mechanism for diffusion and upscaling of local knowledge should facilitate collective action and deliberation. Social learning processes could promote community action, comprehension and conviction for application. It needs a platform for exchange of understanding and for knowing principle base of the knowledge created. Farmer Field Schools (FFS) in Vietnam had ample recognition as a farmer education model and has been defined as social learning platform than as an extension approach[10]. FFS is a participatory approach which provides a conducive platform to both male and female to work together on their major issues which enables them to learn about presence of the practice, working of the practice and most importantly the principle behind the practice. FFS was started in late 1989 in Indonesia as solution for concrete and immediate problem of indiscriminate use of pesticides in rice field[11]. FFS makes effort to make farmers "experts" in managing the ecology of their fields, bringing better yields, fewer problems, increased profits and less risk to their health and environment[12]. The FFS approach was designed to address the problem of ecological heterogeneity and local specificity by placing the control of small-scale agro-ecosystems in the hands of the people who manage them[13]. Principle knowledge of any technology enables an individual and group for judicious application of practice along with further knowledge creation compatible with their own situation. The present study aimed at analyzing FFS approach as social learning platform and to know the effectiveness of social learning in promotion of local knowledge which refers to application of Dr Dalal solution and use of natural predators" for managing white fly infestation on cotton.

Methodology

The study was conducted in the districts of Jind and Hisar of state Haryana which were purposively selected as these were the major cotton belts of Haryana and had been heavily devastated by severe infestation of whitefly since 2014. The other major reason for selecting these two districts was that the local knowledge under study had its roots in district Jind and later spread to Hisar and other districts. The districts Jind and Hisar come under zone 2 of Haryana which constitutes 39% of total area of the state and is quite nearer to Delhi NCR (Haryana state agricultural policy, 2013). The major crops of these areas are Wheat, rice, pulses, cotton and sugarcane whereas soil and water erosion, climatic and biotic risks are the major concerns. Gross cropped area of Jind and Hisar is 470 and 606 thousand hectares, respectively. The cropping intensity of both the districts is 200% and 178.2% respectively. This shows that both districts take two crops each year. Jind has annual rainfall of 487.4 mm, while Hisar has 455.1 mm of annual rainfall (*Census2011.co.in*). It means these districts receive relatively good amount of rainfall around the year. Three Farmer Field Schools (FFSs) by the name of *Keet Pathsala* were selected purposively from Jind & Hisar districts of Haryana as these FFSs are the foundations of whitefly management and are engaged in spreading the local knowledge through social learning process. A total of 90 farmers were selected randomly from these three FFS for interview and data collection purpose. Also a set of another 30 farmers, who weren't participant of any FFS, was selected randomly from these districts for comparing the effectiveness of local knowledge. So, the total sample size of the respondent farmers was 120. A set of 50 randomly selected farmers from this sample were interviewed to identify the pattern of risk adjustment to white fly. The key respondent for the research was Shri Randheer Singh of village Nidana. List of farmers participating in FFS were made and then 90 farmers were randomly selected. For variables knowledge and skill, the responses as knowing or not knowing, and skilled or unskilled, with scores 0 and 1 were taken, while for other variables like attitude, engagement in using the local innovation, trust and social relationship; responses were taken on 5-point continuum with scores of 1 to 5. The methods for data collection were face-to-face personal interviews as well as focus group discussions farmers and farm women associated with promotion of local knowledge & IPM practises. The structured interview schedule was pre-tested among the non-sample of farmers of the study area for refinement and appropriateness of the questions to local context. Prior consent of the respondent farmers was sought before having interviews with them. The structured interviews and focus group discussion of farmers and farm women associated with promotion of local knowledge & IPM practises were held at village and voice recording of songs on local knowledge was recorded. The major respondents were female as the participants of this *Keet Pathsala* were female. An exploratory study was conducted to analyse the knowledge creation, knowledge validation, risk adjustment pattern and social learning among these farmers. The different parameters for evaluating the local knowledge were technological efficacy, eco-friendliness, ease of use, labour-intensiveness, and cost-effectiveness. The farmers were asked to provide score on each parameter according to their importance. A group approach was followed for scoring so that the farmers could discuss and then give a score based on consensus. Higher the importance of the parameter, higher was the score. The score range was from 0 to 10. Statistical tools like criteria based matrix ranking, mean, standard deviation and t-test were used to analyse the result using SPSS software. QuIK (Quantifying Indigenous Knowledge) method was used for ranking of local knowledge and conventional knowledge. QUIK method is combination of PRA tool "Matrix Ranking" and semi structured interview[14].

Social learning behavior index (SLBI) was developed in order to analyse the social learning behaviour of the farmers. The various parameters used for the index included Knowledge, Attitude, and Engagement in social learning, and Skill developed through Social learning. The data obtained were normalized (Normalisation= [(Obtained score-minimum score)/ (Max. score- Min. score)] and social learning behavior index [Index formula= € (W.i.Xi)/4] was computed.

Conceptual framework of the study: The conceptual framework for study has been adapted from on social learning for river basin management[15]. The concept study has been classified into three stages *i.e.* Context, Process and Outcome. In this study, the context is management of infestation of whitefly. Process to manage the risk is social learning. Different steps of social learning have been identified by observation of the process, voice recording of songs developed by local people for management of whitefly and also through questionnaire developed based on literature on social learning. The steps identified were (i) identification of risk individually or collectively (ii) prediction of loss (iii) spreading awareness about local knowledge (iv) Reflective observation with the help of peer farmers (v) Abstract conceptualisation, and (vi) Active experimentation (Fig-1). With the help of feedback, the cycle continues. Third stage of study is outcome. At this stage effectiveness of social learning process in terms knowledge creation, knowledge validation and knowledge dissemination of new knowledge among similar social and agro-eco systems was analysed.

Understanding the situation: Cultivation of cotton is one the major *kharif* crops in Punjab and Haryana. Adoption of Bt cotton hybrids provided a great relief from the dreaded insect pest American bollworm besides a phenomenal increase of yield by about 1.5 to 2 times. Bt cotton hybrids were introduced in Haryana in 2005-06 and since then the acreage had been increasing. A comparison of average of initial 3 years (2005 to 2007) of Bt cotton deployment in

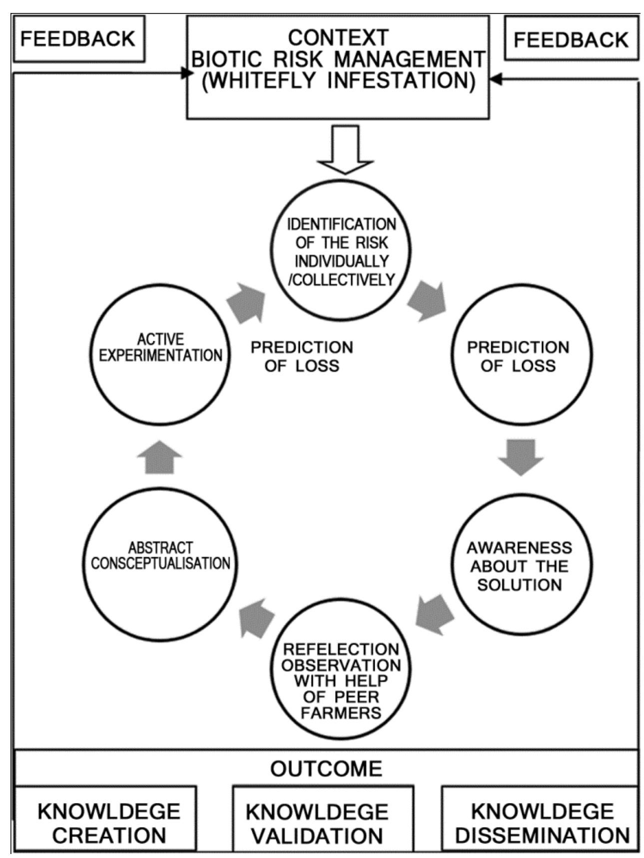

Fig. 1 — Conceptual Framework of Social Learning

Haryana with 3-year average of the period 2012-14 shows that acreage, production and yield increased by about 423.42%; 121.58% and 46.91%; respectively. Effective management of American bollworm, reduced cost on insecticide, reduced the number of sprays, and realization of higher yield and remuneration (benefit cost ratio of about 1.65) led to unprecedented rate of adoption of Bt cotton hybrids. During 2005-06 to 2011-12; the major cotton growing districts of Haryana viz., Sirsa, Hissar, Fatehabad and Jind witnessed compound annual growth rates of 81%, 80%, 77%, and 87.74%, respectively (Min.of Agriculture, 2016). Though the deployment of Bt cotton since last decade had provided safety against the most dreaded insect pest of cotton i.e., American bollworm (*Helicoverpa armigera*), the respite to cotton farmers was very short-lived. The euphoria of Bt cotton's success began to be dampened by the growing menace of whitefly (*Bemisia tabaci*) insect pest in the Punjab and Haryana region for last 3-4 years. During 2015-16 out of total 5.83 lakh hectares of cotton acreage in Haryana, 3.06 lakh hectares were affected by whitefly insect pest (The Hindustan Times, 2016). Its incidence led to colossal loss to the cotton farmers in tune of 35-40%, while many farmers experienced complete loss of the crop. Consequently, the farmers have begun to shift to some other crops. During 2016-17, a decline of about 14% in cotton acreage in Haryana has been reported (The Hindustan Times, 2016). Several factors have been delineated for the outbreak of whitefly in Punjab and Haryana regions, such as susceptible hybrids, late sowing, hairy or bushy genotypes, application of high nitrogenous fertilizers during vegetative stage, inadequate level of phosphorus and potash in soil, indiscriminate use of pyrethroids, acephate, fipronil and mixtures, improper spray application methods and the most important the hot and humid weather conditions with deficient rainfall, which favourable for whitefly[16]. Indiscriminate use of pesticide has also led to destruction of bio-agents and natural enemies of whitefly in cotton fields[16]. The farmers perceived outbreak of whitefly as one of the most severe risks to cotton cultivation. Under such grave situation, a local knowledge showed a ray of hope for cotton farmers. The sprays of solution were done based upon the economic threshold level (8-10 adults or 20 nymphs per leaf[17]) of white fly, which refers to "the population density at which control action should be determined (initiated) to prevent an increasing pest population (injury) from reaching the economic injury level"[18].

Results and Discussion

Pattern of risk adjustment to white fly: Grappling with the threatening risk of whitefly, the cotton farmers adopted several measures for risk adjustment (Fig. 2). Though the state department of agriculture and state agricultural university has been making attempts for educating the farmers about effective management of whitefly, the risk adjustment pattern among farmers are varied and so are the results. It suggests for intensive extension efforts for promotion of effective knowledge and practices. Application of more than the recommended dosage of pesticides like cypermethrin+profenophos[16] is practiced by a majority of farmers (46%), while the major effective practices like monitoring of pest population in field, economic threshold level (ETL) based scheduling of spray, use of pheromone traps, promotion of natural enemies are being adopted by 14, 6, 2, and 8% of farmers, respectively. Practicing reduced use of urea during vegetative stage, effective management of weeds, and timely sowing (completion of sowing by second week of May) were reported by 26, 30 and 10% of farmers, respectively. It has been suggested

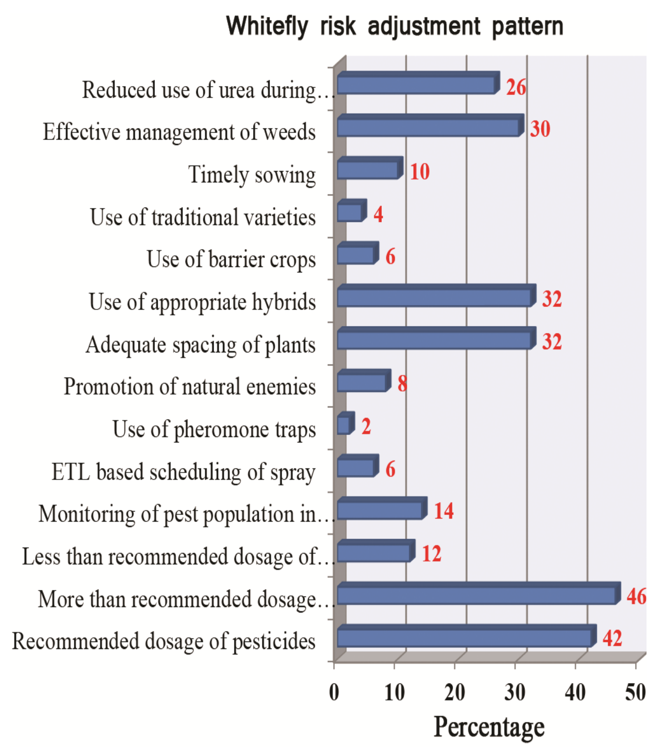

Fig. 2 — White fly risk adjustment pattern among the farmers in Haryana

that the desi cotton (*Gossypium arboreum*) is not affected by whitefly; therefore, the farmers have also begun to replace Bt cotton with desi cotton. It has been realized that chemical control alone cannot be the effective answer to the menace of whitefly. Rather an integrated and a comprehensive crop management package of practice is required. The local innovation and related movement has shown the way to shun pesticide and combat the menace of whitefly with local solutions.

White fly management should be done when their population is at low levels[19]. Policy initiatives of promoting appropriate spray method, facilitation of early sowing before the end of April by assuring irrigation, eschewing of susceptible varieties, and keeping fields weed free have been suggested[7].

Application of Dr Dalal solution and use of natural predators - a local knowledge to combat whitefly menace

The local knowledge was developed by Dr Surender Dalal, erstwhile an agriculture development officer of Haryana, in an informal setting while working with community. The solution comprises of 2.5 kg DAP, 2.5 kg urea and ½ kg zinc which are mixed in 100 L of water. The solution is sprayed for about 6 times. This local knowledge was tested by farmers of Ridhana village of district Jind who later promoted it through concept of Farmer Field School in the name of *Keet Pathsala*. With the use of the local knowledge, the cotton farmers in Jind district of Haryana not only checked the incidence of whitefly but also secured good yield. The farmers of followed not only the local knowledge but also the ideologies of using benign insects and proliferation of natural enemies in crop fields, besides adequate plant nutrition. Nearly 250 farmers from Jind district obtained good yield without using any chemical in the year 2014 when Punjab and other parts of Haryana were in huge loss[20]. The solution and the natural predators not only helped in effective management of whitefly but also in management of other insects like mealy bug, Jassid and thrips and also in fertilizer management. Beside risk adjustment, use and effectiveness of this solution have triggered an ideology of non-pesticidal management and has brought user groups together. Although, this locally bound technique has huge potential, its dissemination and promotion on large scale was major challenge. The promoters followed social learning as tool for dissemination of above knowledge mainly through FFS, group interactions and knowledge processing as well as folk songs composed in their local language. Nearly 250 farmers including 100 women from 16 villages of Jind- Nidana, Nidani-Joura, Lalit Khera, Radana, Chabri, Samla, Igra, Rajpura Bhain, Mohangarh, Samla, Khargram Ji, Hathangarh, Aleva and Chati Sampla have been working as ambassadors spreading the knowledge among other farmers[16] through "*Keet Pathsala",* which functions like Farmer Field School and serves as a platform for facilitating social learning and enrichment of the knowledge and skill of the farmers about agro-ecosystem to obtain maximum output with sustainability in their agricultural enterprises. The FFS is governed by certain principles (FAO,1989), such as growing healthy crop by using resistant varieties and efficient water and soil management; monitoring of field regularly in order to assess crop development, incidences of insect pests and diseases, population count of insect pests and natural enemies; conservation of natural enemies of crop pests as plenty of natural enemies are present in the field, which would avoid the use of pesticide that killed the natural enemies; and developing the expertise of farmer in ecological phenomenon and helping them to make decision based on observations and analysis of their field situation.

Following these principles, the "*Keet Pathsala*" for IPM in cotton promotes agro-ecosystem analysis and use of local knowledge. It engages a group of 25-30 farmers in season-long learning activities. Weekly sessions of 3-4 hours are organized to carryout participatory learning activities related to development stage of crop and problems emerging at a particular stage of crop. The farmers go to the field in the sub-group of 5 farmers, choose10 plants randomly and observe plant health and growth, pests, natural enemies, weeds, weather related impacts, etc. Each sub-group presents the observations and analyses the observations regarding plant, weather, insects of diseases, disease symptoms, pests, natural enemies, soil moisture using pictorial drawings. The ETL of insect pests is worked out (Fig. 3 and Fig. 4). Each sub-group presents its analysis. The observations are discussed in detail in group and the decision about pest control method is made based upon economic threshold level. Generally in FFS, the discussion is facilitated by either any extension agent or a trained expert. However, in the study area of Jind district of Haryana, FFS has become farmer-led FFS, where farmers are the facilitators and they give training to their peer farmers. The farmers of Nidana village of Jind have spread this local knowledge to several villages of Haryana and Punjab. Several FFSs have been started on cotton. FFS is providing platform for social learning where farmers come together, observe the situation, discuss on the situation, and come to a solution. Also female farmers are widely spreading the local knowledge through songs in local languages. They compose the folk song which contains whole procedure of the local knowledge preparation method, insect identification method, symptoms of white fly attack, ETL level and negative consequences of pesticide application. Songs are the best tools for social learning process as it can spread messages quickly and widely. Songs being in local languages create trust and social relationship which are the major factors of social learning. So, local knowledge can be easily disseminated through traditional approach of social learning *i.e., folk lores.*

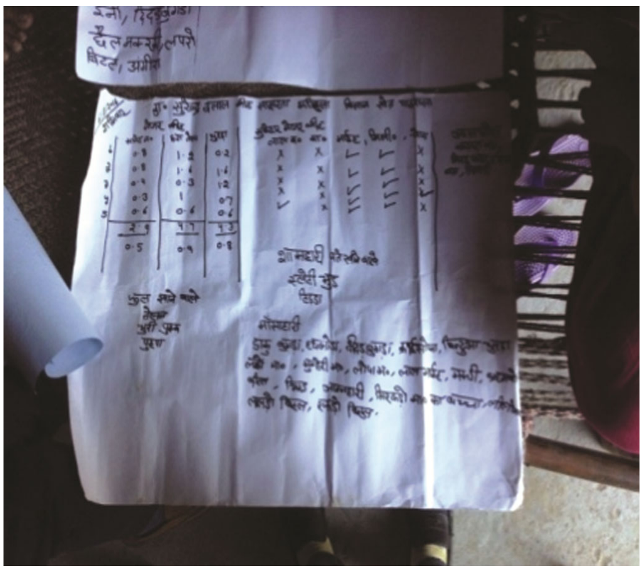

Fig. 3 — Calculation of ETL by Women farmers

Fig. 4 — Ranking of Local knowledge by under *Keet Pathshala* (FFS) in Haryana Women farmers

Benefit of this local knowledge of whitefly management over other methods

Criteria based ranking (Table 1) revealed that the FFS farmers and non-FFS farmers differed significantly with respect to their ranking of local knowledge and strategy on criteria like technological efficacy, eco-friendliness, ease of use, labour-intensiveness, and cost-effectiveness. The mean values for the criteria namely ease of use and labour intensiveness in case of non-FFS farmers were very low in comparison to the FFS farmers. These criteria were considered as the constraints by the non-FFS farmers to use local knowledge. However, the non-FFS farmers realized and stated that the local knowledge was efficacious, eco-friendly as well as cost-effective. The local knowledge for white fly management was reported cheaper[21] than the recommended method (Table 2). The ranking of local knowledge and strategy on criteria like technological efficacy, eco-friendliness, ease of use, labour-

Table 1 — Criteria based matrix ranking by farmers a bout local knowledge

Criteria	Mean score		t-Value	p-value
	FFS farmers (n=30)	Non-FFS farmers (n=30)		
Efficacy	9.3	7.3	10.57	<0.1
Eco-friendliness	9.8	7.5	16.37	<0.1
Ease of use	7.8	3.7	36	<0.1
Labour intensiveness	7.7	3.7	22.9	<0.1
Cost- effectiveness	9.7	7.5	16.5	<0.1
Overall	8.9	5.9	45.5	<0.1

Table 2 — Comparison of methods of whitefly management

Parameters	Local method	Recommended method
Pesticides	No use of pesticide	Use of Pesticides
Fertilizer	Local knowledge	Chemical
DAP(Kg)	15	100
Urea(Kg)	15	200
Zinc(Kg)	3	10
Potash(Kg)	1	40
Productivity(gm/Ball)	4.94	3.5
Net investment (RS)	517.81	2,273

(Source: Down to Earth, 2015)

intensiveness, and cost-effectiveness by FFS farmers was significantly (p<0.01) higher in comparison to conventional chemical based strategy for management of white fly (Table 3). Interestingly, the non-FFS farmers too ranked local knowledge and strategy higher than conventional chemical based strategy on criteria of efficiency, eco-friendliness and cost-effectiveness, while they ranked chemical based strategy higher than local knowledge and strategy on criteria ease of use and labour-intensiveness (Table 4). The slow spread of local knowledge and strategy is due to these constraints too.

Social learning behavior of farmers

(SLBI) was developed in order to analyse the social learning behaviour of the farmers. The various parameters used for the index included knowledge, attitude and engagement in social learning and skill developed through Social learning. The farmers of FFSs were significantly different (p<0.01) from non-FFS farmers with respect to knowledge about effective management of white fly, having favorable attitude towards social learning approach, and engagement in social learning activities (Table 5). They also differed significantly (p<0.01) with respect to their social learning behavior index (Table 6). The social learning behaviour index was high to very high among FFS farmers, while it was low to very low among non-FFS farmers. About 89% of the FFS farmers belonged to high and very high group of social learning index as compared to just 3.33% in case of non-FFS farmers. On the contrary, 90% of the non-FFS farmers belonged to low to very low group of social learning index as compared to about 5.5% in case of FFS farmers. Analysis of trust and social relationship shows that participants of FFS had more trust and better social relationship among themselves with t-value 28.2 and 15.25 (p<0.01), respectively (Table 7).

Table 3 — Criteria based matrix ranking by FFS about local knowledge *vis-a-vis* conventional chemical based strategy

Criteria	Mean score		t-value	p-value
	Local knowledge	Conventional chemical based strategy		
Efficiency	9.3	4	22.04	<0.01
Eco-friendly	9.8	1.6	55.29	<0.01
Ease of use	7.8	6.5	11.23	<0.01
Labour intensive	7.7	7.6	0.80	>0.05
Cost effectiveness	9.8	2.3	42.39	<0.01

Table 4 — Criteria based matrix ranking by non-FFS Farmers about local knowledge *vis-a-vis* conventional method

Parameters	Mean score		t-value	p-value
	Local knowledge	Conventional chemical based strategy		
Efficiency	7.3	6.2	6.3	<0.1
Eco-friendly	7.5	3.6	26.7	<0.1
Ease of use	3.7	6.4	-21.7	<0.1
Labour intensive	3.7	7.7	-22.6	<0.1
Cost effectiveness	7.5	5.4	10.1	<0.1

Table 6 — Distribution of FFS and non-FFS farmers according to their level of Social Learning Behavior Index

Range of SBLI	FFS (n=90)%	Non-FFS (n=30)%
Very Low (0.06-0.244)	2.22	40
Low (0.244-0.428)	3.33	50
Medium (0.428-0.612)	5.56	6.67
High (0.612-0.796)	50.00	3.33
Very High (0.796-0.980)	38.89	0.00
Mean	0.765	0.273
Std.dev	0.170	0.136

Table 7 — Trust and Social Relationship among FFS Participant Farmers in Comparison to Non-participants of FFS

Statements	Mean difference	Std. Error difference	t	df	Sig. (2-tailed)
Trust	2.433	.086	28.2	118	.000
Social relationship	1.31	.085	15.25	118	.000

Table 5 — Differential Social Learning Behavior Index among FFS and non-FFS Farmers

Component	Mean		Std. Deviation		t-value	p-value
	FFS (n=90)	Non-FFS (n=30)	FFS (n=90)	Non-FFS (n=30)		
Knowledge	0.8528	0.3000	0.12370	0.15256	19.958	<0.01
Skill	0.9815	0.3056	.06343	0.13898	36.346	<0.01
Attitude	4.8156	1.9933	.27187	0.51053	38.676	<0.01
Engagement	4.8667	1.3000	.27314	.25052	63.184	<0.01
Social learning behavior index	0.7649	0.2731	0.17016	0.13594	14.363	<0.01

Conclusion

Social learning has a distinct focus on the sustainability of human-environment interrelations[6] and helps people learn from each other and from nature[22]. The findings of the study show that social learning creates platform for more communicative action between participants and enables the existence of a conducive environment for knowledge creation and adoption of indigenous techniques. Having participated in the social learning process the farmers realized its potential benefits as they had sharing of subjective evaluation of the technology and practices related to either management of white fly through local knowledge and application of IPM principles. Criteria based ranking revealed that the FFS farmers and non-FFS farmers differed significantly with respect to their ranking of local knowledge and strategy on criteria like technological efficacy, eco-friendliness, ease of use, labour-intensiveness, and cost-effectiveness. Interestingly, the non-FFS farmers too ranked local knowledge and strategy higher than conventional chemical based strategy on criteria of efficiency, eco-friendliness and cost-effectiveness. This result finds support from studies on social learning. Social learning for sustainable management of natural resources through case in rural areas of India, Bolivia and Mali has been reported[23]. This study also shows that social learning helps in strengthening trust and social relationship among actors, which is an important input for common understanding, knowledge creation and its diffusion. The predominant pattern of extension in India remains linear marked by one-way flow of information from experts to the farmers. Though the farmers place high value to experts' advice, while making adoption decision, they also consider several other characteristics of innovation like compatibility to resource endowments and previous experiences. This study has shown that social learning facilitated communicative action and demonstrated a new vista of farmer-centred extension approach to conventional expert dominated extension system. It offers learning for extension agencies that mere prescription of any remedy is not the key to transfer of technology and management of risk in agriculture. Extension system must look forward to community engagement process for better knowledge creation, assimilation and application, while facilitating openness to accept and promote the merits of any local solutions. There is need to integrate social learning process in extension endeavours. Extension agents have to play a role of learning advisors, who could be keys to facilitate social learning. As indigenous knowledge system is a shared knowledge system, social learning process could be crucial in its production, enrichment and continuance. The study amply showed that social learning could be intensified through platforms like Farmers Field Schools. Social learning process improved the participation, engagement and collaboration among the farmers. It enabled development of favourable attitude towards local knowledge and building of mutual trust among the members. When the farmers, scientists and extension agents are involved in social learning process a better inter-subjective understanding of risks and solutions could be created. Joint monitoring and scouting of level of white fly infestation, working out the economic threshold level population, making collective decision for taking up remedial measures, preparing the local solution and educating other farmers about the management schedule enhanced better learning among the farmers through social learning. From the above discussion it has been clarified that social learning has wide scope in agriculture and dissemination of local innovation. It can be effectively employed for creation, validation and upscaling of grassroots innovations and indigenous knowledge. Many studies have been done on theories and concept of social learning, but now there is need of more studies on its application part, so that it can be applied to different sectors. Further, it stems from the analysis that the local knowledge needs promotion not only for horizontal transfer but also for refinement with new scientific approaches as well as for providing continuity in innovation generation at grassroots.

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