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Farmers Perception about gains from Integrated Pest Management Farmer Field School

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The study was conducted among the two farmer groups in Bhaktapur and Kavre districts of Nepal. The main objective of the study is to evaluate the differences in belief, attitude and practices felt by the farmers after participation in the IPM FFS. The study has been based on data collected through personal interview with the farmers, focus group discussion, personal observation in the farmers field, discussions with the leader farmers, agro-vet owners, farmer facilitators of the FFS and also on secondary data collected from related publications of various organizations. The study has revealed that FFS is being an effective tool in increasing IPM knowledge and techniques of ecological pest management among the farmers. Integrated Pest Management through Farmer Field approach has not only been a means to sustainable management of pests thereby ensuring sustainable yield of crops but also the IPM based crop management has positive effect on household food security, income and empowerment of farmers. This justifies the potential of IPM FFS as an effective mechanism for increasing the knowledge and techniques of sustainable pest management vis-à-vis being a driving force for socio-economic changes in the lives and livelihoods of the smallholder farming communities.
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1. Introduction

The agriculture sector remains the economic backbone of Nepal, employing about 65.6% of the working population, producing around 33.5% of the GDP[1] (ABPSD, 2006). One of the main constraints to increase agriculture production and value-addition in the farm produce is the pest attack. Loss from crop pests is estimated to be around 35% annually. To reduce the loss, farmers are increasingly using chemical pesticides, which are not only expensive but also hazardous to environment. The illegitimate use is due to unawareness of toxicity, availability of toxic pesticides, aggressive marketing by dealers and profit interests. Although the agricultural policies during the last few decades promoting higher input of chemicals, particularly in the irrigated areas of the Terai region, have resulted in higher yields and more food, they have also resulted in poisoning, health related poverty and environmental degradation (Esser et al., 2012). During the green revolution period, pesticides were considered as one of the yield increasing inputs and so being used widely even without its real need to manage the pests. Current extension and research approaches and global tendency of dumping relatively cheaper and environmentally unsafe pesticides in developing countries attribute to increased use of pesticides (Upadhaya, 2003). Consequently it caused frequent pest outbreaks, pest resurgence, pesticide resistance issues and to handle this Integrated Pest Management (IPM) has emerged as an important approach of pest control strategy, which encourages applying measures that causes least disruption of agro-ecosystem (FAO, 2011).

Government of Nepal has adapted IPM as crop protection strategy since 1990 and incorporated the IPM as an integral component of agriculture program. The initiative of IPM based Farmer Field School was started in Nepal in 1997 through Technical Cooperation Programme of FAO under "Implementation of Integrated pest Management in Rice". This was followed by Nepal's participation in the FAO "Regional Programme on Community IPM in Asia" between 1998 and 2002. Upon phase out of the FAO Community IPM Programme in 2003, bilateral funding from the Government of Norway became available for a 4-year project "Support to the National IPM Programme in Nepal" implemented from 2004 to 2007. To continue the initiatives of IPM programme, the Government of Norway has further

1-Gross Domestic Product

granted financial assistance to Nepal in support of the consolidation, up-scaling and institutionalization of the National IPM Programme for five years starting from October 2008. This support is based on the realization that IPM is not just about pest control, but about a holistic and sustainable production management that can help achieve food security and alleviate poverty while contributing to human health and environmental protection. The programme has been implemented through two interrelated and complementary components: Intensive IPM pilot component supported by FAO and Regular IPM component internalized within the Plant Protection Directorate under the Department of Agriculture. The focus of the intensive component is placed to assist in developing and testing modules, methodologies and procedures for the intensification of IPM through pilot mode in selected 12 districts, whereas the regular component has emphasized on setting up the overall management and institutional structures of the National IPM Programme involving multiple stakeholders from GOs and I/NGOs, universities, research and educational institutes, as well as private sector in the remaining districts (IPM 2012).

Various researches on IPM FFS in Nepal, like elsewhere assert that this approach has been successful in sustainably managing the pest while contributing to the socio-economic development of the farmers. These benefits have been recognized by a broad range of stakeholders, including farming communities, local and national governments, NGOs and donors, who are now supporting such programs. However, regular assessments are needed to evaluate, modify and improve their effectiveness. In this scenario farmers' belief and attitude towards the IPM approach must be assessed as this will eventually affect their insect pest management practices and ultimately to the sustainability of the IPM program. Therefore the main purpose of this study is to evaluate the differences in belief, attitude and practices felt by farmers after participation in the IPM FFS.

2. Materials and methods

The study was conducted among the two farmer groups which had participated in the IPM FFS conducted by DADO[1] in Bhaktapur and Kavre districts namely, Bimaleswor IPM FFS and Saradadevi IPM FFS respectively. The total member population of Bimaleswor IPM FFS was 21 and that of Saradadevi IPM FFS was 25. Purposive sampling method was used to select the farmer groups after the consultation with officers in the DADOs of both districts. The study has been mainly based on the primary sources of data collected by organizing personal interview with the farmers, focus group discussion, personal observation in the farmer's field and discussions with the leader farmers, agro-vet owners and farmer facilitators of the FFS. Secondary data were collected from publications of government line agencies DADO in Bhaktapur and Kavre, NARC[2], PPD[3] and international agencies like FAO and IPGRI[4]. The collected data were carefully edited for missing and incomplete information. It was then processed in computer using statistical and non-statistical software tools.

3. Results and discussion

3.1. Socio-economic profile of the farmers

Analysis of some key socio-economic variables of the respondents was done. Findings reveal that majority of the respondents were between the age group 20-40 years, 60 percent were female and 35 percent were illiterate. The average household size of farmers was 7 members with the range of 3-19 members. The average land holding of the farmers was 8 ropani, with the range of 1-25 ropani and in 60 percent of the respondents' households, male hold the land titles. Data on major sources of household income reveal that majority of respondents rely on other non-farm activities along with agriculture for their livelihood.

3.2. Change in knowledge about the negative impacts of pesticides

All the respondents interviewed reported that they were aware about the negative impacts of pesticides on human health and environment. However their level and extent of awareness was found varying. Negative impacts known to the respondents were headache, infertility in male, respiratory problems, skin diseases, decline in the soil fertility, environmental pollution etc. Knowledge on identifying the beneficial insects on the field by the respondents is presented in the figure 1. Of the total respondents, 43 percent could easily identify Spider, Dragonfly, Bee, Ladybird beetle as the beneficial insects while 33 percent could identify Spider, Dragonfly, Bee, Ladybird beetle, Ants and Wasps. However 24 percent identified more numbers of beneficial insects e.g. Spider, Wasps, Ants, Dragonfly, Long horned grasshopper, Ladybird beetle, Tiger beetle and Bee. This indicates that majority of the respondents understood about some key beneficial insects in their fields.

1-District Agriculture Development Office

2- Nepal Agriculture Research Council

3- Plant Protection Directorate

4- International Plant Genetic Resources Institute

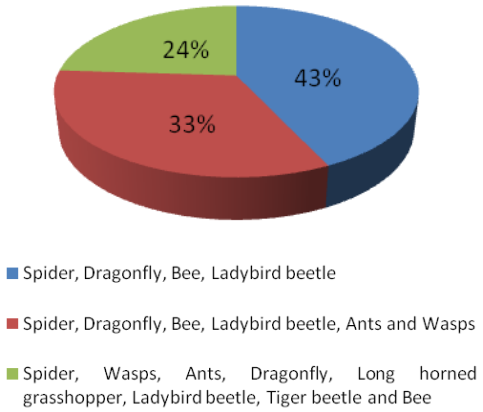

Figure 1. Knowledge on identifying the beneficial insects on the field by the respondents

3.3. Change in pest management practices

Before the participation in IPM FFS, all of the farmers adopted chemical method as the only method of pest control. Therefore the priority for pest management methods given by the respondents was studied to reveal if there has been any change in use of chemical pesticides and adoption of environmental friendly pest control measures. Of the total respondents, 65 percent expressed that the trend in use of pesticides had decreased compared to the past, 20 percent expressed the trend was still increasing while 15 percent expressed the trend was constant. Also after the participation in IPM FFS, 70 percent of respondents allotted chemical method of pest management the first priority whereas 17 percent allotted botanical method, 9 percent allotted cultural method and 4 percent allotted physical method of pest management as first priority. It was learned that farmers due to the unavailability of organic pesticides compared to chemical pesticides in the local agro-vets and lack of time due to involvement in other off-farm activities for income generation were not practicing other methods of pest management. The changes brought in using chemical pesticides were application of less hazardous pesticides, judicious application to targeted pest according to the pest severity and use of alternate safer pesticides. Pesticide application was found more in vegetable crops than cereals. Among the vegetable crops Potato, Tomato, Cole crops and Cucurbits received the highest dose and frequency because of their high commercial value in terms of quality and quantity, farmers were reluctant to take risks in these crops using other methods of pest control. If these crops are damaged by insect pests and diseases, yield reduces significantly this in turn reduces the major share of household income through sales of these crops.

Table 1. Pest management practices

Management	Priority after IPM Training			
	1st	2nd	3rd	4th
Chemical	32(70)	10(21)	4(9)	-
Botanical	8(17)	-	-	8(17)
Physical	2(4)	4(9)	5(11)	-
Cultural	4(9)	5(11)	-	-
Total	46(100)	19(41)	9(20)	8(17)

Note: Numbers in parenthesis indicate percentage

3.4. Change in cultivation practices

Among the total respondents surveyed, 88 percent replied that they have brought change in the cultivation practices after the participation in IPM FFS. Major changes were use of improved seeds, use of mix of organic and inorganic fertilizers, reduction in use of chemical pesticides along with increase in spacing between plants, reduced seed rate, crop rotation, proper timing of irrigation and fertilizer application etc. Earlier farmers planted local varieties of seeds of cereals and vegetable crops. Now hybrid seeds are used in almost all vegetables. In case of cereal crops like rice, maize and wheat, recommended improved seeds from government farms were being used. Some farmers also use hybrid varieties of maize. Newly introduced crop species by the farmers include Squash, Cabbage as seasonal vegetables and Cauliflower, Radish, Tomato as major off-season vegetables. This change is not solely due to the contribution of participation in IPM FFS but also due to the availability of irrigation facilities in the area.

3.5. Change in crop production

Before the participation in IPM FFS, farmers used to grow very limited species of vegetable crops that included basically Broad leaf mustard, Radish, Local cucurbits, Beans. They rarely consumed such a wide variety of green vegetables grown in their own field as they do now. Now farmers grow wide varieties of vegetables, fruits along with cereals and majority of the farmers were commercial vegetable growers. Vegetable production has not only contributed to the household nutrition but also has significantly improved the household economy. The respondents remarked that vegetables such as cauliflower, cabbage, beans, potato, tomato, cucumber and pumpkins was found much rewarding both from nutritional and economic view point. However, production of fruit crops was basically for household consumption. Of the total respondents 64 percent reported that they experience increase in production of cereal, vegetable and fruit crops after the participation in IPM FFS while the remaining 36 percent reported no change. However, no respondents replied decreased production of crops. In case of

respondents reporting increased production, 5 percent reported yield increase by 0-5 percent, 40 percent reported yield increase by 5-10 percent, 20 percent reported yield increase by 10-20 percent and the remaining 35 percent reported yield increase by 20 percent or more. As an impact of the IPM FFS, farmers were found allocating much effort both in terms of space and time for vegetable production. The production was increased due to increased area under cultivation and higher yield from improved and hybrid varieties of crops.

3.6. Change in cost of cultivation and farm income

Among the total respondents surveyed, 71 percent reported that there has been increase in the cost of cultivation, 19 percent reported no change while 10 percent reported decreased cost of cultivation after the participation in IPM FFS. The reasons behind the increase in the cost of cultivation were due to cost increment in purchasing of hybrid varieties of crops, fertilizers, labor charges, farm machineries like power tiller, expansion of cultivation area etc. Earlier only family labor was used for cultivation in less area and no hiring of extra labor was done. However, after the participation in IPM FFS the area of cultivation has increased considerably for vegetable crops especially potato that requires greater amount of fertilizers and labors. Albeit the increase in the cost of production, 76 percent of the respondents replied that they have increased their income while the remaining 24 percent reported no change. However, no respondents reported decreased income. The main contributing factors for increased income were increase in farm production especially of vegetable crops, expansion of the cultivated area, high yields from improved and hybrid varieties, increase in price of the products and also due to involvement in other off-farm income generating activities.

3.7. Change in food sufficiency situation at the household

Food sufficiency is the important determinant for the food security of the household. Food sufficiency here means the sufficiency of the cereals, vegetables and livestock products produced in own farm. Food sufficiency is affected by several factors such as land holding, livestock holding, on farm income, off farm income etc. with varying magnitude of effect. The study reveals that before the participation of farmers in IPM FFS, 30 percent of the respondents had surplus food produced in their farm. Remaining 70 percent had insufficient food produced in their farm, including 23 percent having sufficient for 3-6 months, 15 percent having sufficient for 6-9 months and 32 percent having sufficient for 9-12 months. No farmers were found food insufficient below 3 months. After the participation in IPM FFS, the food sufficiency situation has changed considerably. About 54 percent of the respondents had surplus food produced in their farm. Remaining 46 percent had varying magnitude of food insufficiency, including 18 percent having sufficient for 3-6 months, 19 percent having food sufficient for 9-12 months and 9 percent having food sufficient for 6-9 months. Small size of land holding, low productivity, lack of knowledge of improved production technology and increase in household size remained the main reason for the deficit food production. Respondents were found maintaining the household food deficit by borrowing from the neighbors, relatives and purchasing from the local markets. Figure 2 gives the overall picture of food sufficiency situation before and after the participation in IPM FFS.

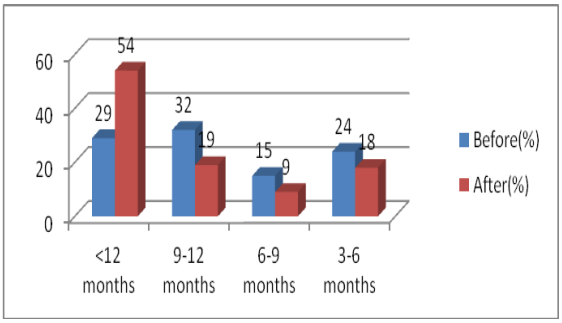

Figure 2. Changes in the food sufficiency situation

3.8. Change in the lifestyle, empowerment and leadership capacity

With the adoption of IPM technologies in the farming system, farmers' lifestyles have changed due to increase in production and/or decrease in the cost of production thereby increase in the income. Of the total respondents, 80 percent felt they were empowered and have developed leadership capacity after the participation in IPM FFS, however the level of empowerment and capacity development was found varying. The responses such as improvement in health, easy to bear expenses for kids' school, easy for daily expenses were the indicators expressed by the farmers of the changes in their lifestyle whereas leadership capacity development was expressed in terms of able to talk in mass meetings, take part in village level planning, mobilize the society etc. FFS participants acquire leadership skills that they apply in organizing collaborative approaches to local ecosystem management (Pontius et al, 2002a). During the participation in IPM FFS, farmers involve in regular discussions, discovery based learning and presentation that helps develop self-confidence which

leads them to increase in decision-making capacity and outcome of these developments is considered as empowerment. Farmers expressed empowered in terms of skill development, increase in income, increase in decision making capacity, confident enough to participate in group discussions, increase in awareness etc. Empowerment might begin in the FFS, but the FFS is just the first step along a road that is built by alumni throughout Asia (Pontius et.al. 2002b). Many of the respondents expressed that they experience increase in awareness and felt much more self-confident in managing their fields and taking pest control decisions. Women farmers felt difficulty to speak with men and in the social gatherings earlier but now they can easily talk anywhere. Though some of these responses do not directly link with empowerment process but ultimately the results will lead to empowerment.

3.9. Involvement in developmental activities through farmer groups and cooperatives

Prior to the participation in IPM FFS, there were hardly any respondents involved in farmers groups and/or cooperatives. At present there are many farmer groups and cooperatives registered in the area where the participant farmers are involved in various socio-economic development activities. Of the total respondents, 82 percent were involved in farmer groups and/or cooperatives. Household members were also found involved in more than one group and/or cooperatives. Examples of such farmers groups and cooperatives are Agriculture production and marketing farmer groups, Women farmer groups, IPM District Committee, Community Forest, Community Irrigation, Rural Saving and Credit cooperatives etc. Community participation, including those of women, local ownership to natural resources (land, forest and water) and collective empowerment and sustainability are essential characteristics of sustainable development process that assures attainment of sustainable livelihoods. Organization and empowerment of farming communities should, therefore, be the most important strategy of the sustainable livelihoods and development approach (Rajbhandari, 2002). These social organizations were also were engaged in many other socio-economic development activities e.g. road construction, drinking water supply, irrigation management, farmer trainings etc. along with agriculture related activities. With the formation of female and mixed community organizations, rural women are actively participating in the planning, implementation as well as management of local development programmes and projects. Such changes have also transformed the role of rural women within the household. Once limited to household chores, they are now managing the household budget. The positive impact of women's empowerment can also be seen in reduced social problems such as gambling and alcoholism among men as well as child marriages (FAO, 2004).

3.10. Discussion

Findings of the present study suggest that the subsistence traditional agricultural production systems have been shifting towards commercial mode of production, especially in vegetable crops. The benefits of increased commercialization of small-scale production system are increasing food self sufficiency at the household level and increased cash income to the family. Majority of the respondents have increased the production of cereal and vegetable crops. In agreement with this finding, K.C. et al in their FFS report also found yield increase of rice and vegetable along with changes in knowledge, attitude and practices. The cropping pattern has been changed and the demand of inputs for production has increased. Majority of the respondents increased their level of income despite the increase in the cost of cultivation. They learnt to differentiate insect pests and natural enemies and became aware about the misuse of pesticides. The priority of using chemical pesticides was decreasing. Similar findings have been obtained by Jha et al and K.C. et al in a study on the impact of IPM FFS participation on pesticide use level in Bhaktapur district where results showed significant difference in the amount of pesticide used by IPM trained farmers. Empowerment of farmers was initiated and great majority of farmers were member of various farmer groups and cooperatives and were involved in socio-economic development activities. Social participation of the farmers especially the women's is encouraging. Participation of women in the FFS has created an opportunity for women's to get exposure in the society and develop skills to deal with emerging challenges in the society. Farmers have developed leadership capacity and changes in the lifestyle were also observed. This assessment indicates FFS being an effective tool in increasing IPM knowledge, and IPM knowledge is the most important variable in explaining the adoption of IPM strategies. Consequently adoption of IPM strategies has not only brought positive effects on agriculture production but also various other socio-economic benefits that have equitably benefitted the men and women farmers at the household and in the community level as well.

4. Conclusion

Integrated Pest Management through Farmer Field approach has not only been a means to sustainable management of pests thereby ensuring sustainable yield of crops but also the IPM based crop management has positive effect on household

food security, income and empowerment of farmers. With the increase in farm production, food sufficiency situation has changed considerably and the food and livelihood securities of the majority of the small and marginal farm families have been ensured after participation in IPM FFS. The finding also shows a significant shift from traditional chemical based agricultural production systems to more ecological based sustainable agricultural system. The change in the cultivation practices brought by farmers tends to conserve the environment. From these findings conclusion could be drawn that FFS empowered the farmers in many ways such as decision making, analysis of their problem and finding its solution, get organized, express themselves in group etc. which indicates the positive effects of FFS on farming community.

5. Recommendations

Based on the findings of the study, following suggestions have been made for the further conduction of farmer field school for IPM in order to achieve the expected goal and outputs and help improve the overall livelihoods of the farming communities.

Growing of healthy crops should be the principle of all kind of FFS. IPM focuses on factors mainly related to pests and pesticide management. A more holistic approach of overall crop, soil, pest and ecosystem management will be more appreciable to farmers. Integrated crop management needs to be the common goal of all FFS.

Farmers have been found benefited from IPM FFS but it was realized that it has multiple effects on women compared to men. Since women are more involved in agricultural activities, the technical aspects should be suited to their need. Presence of women farmers should be made mandatory for the institutionalization and effectiveness of the IPM FFS at the farmer's level.

Presence of an IPM club, IPM farmers' group etc. in the village could be an important factor in the sustainability of IPM practices. These groups provide a forum for farmers to discuss new field problem, interpret new events as they occur, and carry out studies or other activities to address issues of local importance. Equally crucial is the sense of community and shared experience that comes with the membership. Thus, formation of such farmers' group and/or cooperatives should be encouraged.

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