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WHAT ORCHARDISTS EXPECT FROM FARMER FIELD SCHOOLS ON INTEGRATED PEST MANAGEMENT: A CASE OF IRAN

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ABSTRACT

Since 2002, the implementation of integrated pest management (IPM) program through farmers' field schools (FFS) approach has gained some priority on the agenda of Iran's extension services. Different nature of agricultural activities and the specific context of farming in each area of the country have raised some questions regarding the suitability of these training programs to meet the needs of participants. In line with this, a need assessment survey in the summer of 2015was conducted to extract the educational needs of orchardists living in west part of Iran. The study population consisted of all the grape and pomegranate growers that participated in the IPM/FFS programs (N= 420). A sample of 201 individuals was selected through a simple random sampling manner. To collect data, a questionnaire based on Borich model was administered. Results indicated that the most important need was "to be skillful in tree pruning" and the least important was "to train participants based on lecturing and formal classes", scoring 4.30 and 3.24 out of 5, respectively. Moreover, "the ability to recognize the best time to spray pest-herbicides", "practical identifying of the symptoms of plant diseases and direct observations", "pre-assessment of participants' information before launching the programs" and "acquisition of the know-how knowledge to use bio-fertilizers and manures" were the first four priorities of respondents' needs among a total of 49. The study concluded with the idea that most of orchardists were aware of the need to conserve the environment and produce safe crops but IPM/FFS training programs could not provide them with adequate skills to perform the sound method and practice in their professional activities.

Key words: *IPM/FFS programs, orchardists, Borich need assessment model, Iran*.

INTRODUCTION

Integrated Pest Management (IPM) was born in the late 1950s primarily out of a crisis in agriculture from the overuse of synthetic pesticides and an increasing concern over the ecological consequences of these pest-control tools (Brunner, 2014). The main objective of IPM is to reduce pesticide use to minimize/reduce risks to human health and environment (Sharma *et al*., 2015). However, chemical pesticide is a two edge sword. While the rising level of pesticide use certainly has helped farmers to reduce crop yield loss, the high level of pesticide use may have had a number of adverse consequences (Chen *et al*., 2013). Excessive use of pesticides can threaten food and user safety, the environment, and increasingly, the export of agricultural products to global markets (Hashemi *et al*., 2008). Nonetheless, in many cases, farm workers engaged in pesticide application are the most affected by pesticides, as they do not wear any protective clothing while applying pesticides (Sharma *et al*., 2015).

IPM is an approach that applies the principles of ecology, especially population biology, to the management of pests in agricultural, forest, or urban environments (Brunner, 2014). IPM requires farmers to integrate different pest control methods including varietal resistances, cultivation, mechanical, biological and chemical control according to their specific field conditions (Yang *et al*., 2008). An IPM program is built on a foundation that includes the knowledge of pest and natural enemy biology, their correct identification, and ecology. Intervention against a pest should be based on the risk of crop injury and is only taken if the pest's population exceeds a level where the cost of preventing injury exceeds the cost of the intervention. Control actions are not implemented unless the pest's population exceeds a specified level, a treatment threshold. Multiple tactics to mitigate the negative impacts of pests are used in an integrated approach with the goal of limiting or relegating the use of tools that disrupt natural controls to options of last resort (Brunner, 2014). There are many factors affecting farmers' pesticide use activities. These factors include farmers' characteristics, environmental factors as well as the level of pest infestation (Chen *et al.*, 2013). Thus farmers need skills in pest monitoring and knowledge of pest ecology (Yang *et al*., 2008). Farmers are facilitated to conduct their own research, diagnose and test problems, and come up with solutions (Davis *et al*., 2012). Recent farmer field school (FFS) training on integrated pest management has involved adult, non-formal, education using the learning-discovery approach (Yang *et al*., 2008).

To overcome the negative consequences of pesticide use in Iran agricultural sector, the Ministry of Agriculture, promoted the Integrated Pest Management (IPM) as a strategy for plant protection. Since 2002, the implementation of integrated pest management (IPM) program through farmers' field schools (FFS) approach has gained some priority on the agenda of Iran's extension services. During recent years, FFS approach has been implemented by extension workers for orchardists especially grape and pomegranate growers in west part of Iran, Ilam Province. This region produces 6094.68 tons of grape and 1742.09 tons of pomegranate annually from an area of 1101.731 and 274.44 hectares, respectively. The average

productivity of these two crops is 6237.01 and 8958.59 kg per hectares, respectively. Local orchardists annually lose a huge part of their production due to invasion of insect pest. However, the extent of crop loss due to insects varies with the crop type, crop location, damage potential of the insect pests involved, and the cropping season (Sharma *et al*., 2015). The main insect pest of pomegranate is the *Ectomyelois ceratoniae* zeller (Lep.: Pyralidae) which annually inflict crop losses of 40% in pomegranate production. In addition, the extent of annual crop loss due to *Polychrosis* (=Lobesia botrana), as the main insect pest of grape farms, is about 20% of the total crop production.

There seems to be an essential need to monitor and evaluate the efficacy of such IPM/FFS program. To make decisions about training program priorities, a need assessment is a useful tool. Training programs can apply Borich model by defining what is as the measured behaviors, skill, and competencies of the trainee and what should be as the goals of the training program. The distance between these two poles can then be used as an index of the training program's effectiveness. Discrepancies can be ranked for priority by a panel of trainers or by statistical techniques that weight the relative importance of each goal statement from values assigned to them by the respondents. Discrepancies ranked in descending order of priority provide the framework for deciding what parts of the program to modify or revise (Borich, 1980). The overall objective of this study was to identify performance requirements and the gap between what performances are required and what presently exists. Put another words, the question of interest was to investigate how much the changes brought about by IPM-FFS program at orchardists could meet their training needs? What training needs were addressed by IPM-FFS programs compared to conventional training courses? And what are the opportunities for upgrading IPM training and to direct future IPM programs?

MATERIAL AND METHODS

A need assessment survey was conducted to extract the training competencies of orchardists living in west part of Iran, Ilam Province. The study population consisted of all the grape and pomegranate growers that participated in the IPM/FFS programs (N= 420) during three recent years. A sample of 201 individuals was selected through a two-stage simple random sampling manner. First, the districts where the integrated pest management courses had been implemented identified, and then, at the second stage, 50 percent of participants in the IPM courses of each district randomly selected. All participants were male. To collect data, two questionnaires based on Borich (1980) needs assessment model was developed for assessing the orchardists' perceived level of importance and perceived level of performance regarding 49 competencies. These two forms of questionnaire were administered for conventional and IPM training courses. To develop the questionnaires an in-depth literature review following with several interviews with local extension workers and field observations were used and then, a list of competencies for fruit production (e.g. grape and pomegranate) as well as for holding a training course was provided. All competencies should be checked

against program activities and materials to ensure that they actually represent program objectives (Borich, 1980). To find these competencies/training needs, seven categories based on the main components needed for holding a training course i.e. content (knowledge-awareness, attitude, and skill), goal and objective, teaching-learning method, instructional media, time, place, and evaluation of outcomes were taken into account. For each one, three measurements containing competency importance, present performance (knowledge) and satisfaction of courses in addressing the needs were launched. Finally two questionnaires consisting of seven multi-item constructs, that were measured on a five-point Likert type scale (1 = very low, to 5= very high), were developed. A response of one indicated the competency was not important and a five indicated the competency was very important to production process. Survey data were collected, via face-to-face interviews with randomly selected participants. The instrument's content and face validity was approved by a panel of agricultural experts and its reliability, also, was confirmed by calculating the Cronbach's alpha coefficient through a pilot study. All scales indicated an acceptable reliability coefficient. After collecting data, a *discrepancy score* for each individual on each competency was calculated by taking the importance rating minus the ability (competence) rating. A *weighted discrepancy score* was then calculated for each individual on each of the professional competencies by multiplying the discrepancy score by the mean importance rating (Garton and Chung, 1997). To analyze data SPSS software was used.

RESULTS AND DISCUSSION

Descriptive analysis of the data revealed that the age of the participants ranged from 19 to 88 with a mean value of 48.21 years (standard deviation=15.20). Most of them aged over 50. While the majority of participants (27.4%) had high school level, the minority of them (9.25) had academic educational level. The average of the garden ownership was 1.43, with the minimum and maximum of 0.1 and 4 hectares, respectively. Most of the orchardists (47.5%) had less than 1 hectare grape and pomegranate garden.

Analysis of the participants' needs, using the Borich model for IPM/FFS programs, indicated that 15 of the 49 competencies were in greater need for grape and pomegranate growers (Table 1). The 15 highest rated competencies had mean weighted discrepancy scores greater than 3.70. Table 1 also shows the perceived importance of the first 15 competencies. The mean score of all the 49 needs was obtained as 3.6 out of 5. The most important need was "to be skillful in tree pruning" and the least important was "to train participants based on lecturing and formal classes", scoring 4.30 and 3.24 out of 5, respectively. Moreover, Weighted Discrepancy Score shows that "the ability to recognize the best time to spray pest-herbicides", "practical identifying of the symptoms of plant diseases and direct observations", "pre-assessment of participants' information before launching the programs" and "acquisition of the know-how knowledge to use bio fertilizers and manures" were the first four priorities of respondents' needs among a total of 49.

Table 1. The needs of orchardists using the Borich Needs Assessment Model for IPM/FFS program (N=201).

Rank	Needs	Imp. level	Present Perf.	WDS
1	The ability to recognize the best time to spray pest-herbicides	3.92	2.30	5.83
2	Practical identifying of the symptoms of plant diseases and direct observations	3.87	2.40	5.29
3	Pre-assessment of participants' information before launching the programs	3.72	2.25	5.29
4	Acquisition of the know-how knowledge to use bio-fertilizers and manures	3.83	2.51	4.75
5	To match the content with orchardists' profession	3.64	2.34	4.68
6	To be skillful in tree pruning	4.30	3.02	4.61
7	Awareness of cultural (agronomic) control (irrigation time management; collecting infected fruits; variety selection; etc.)	3.67	2.41	4.54
8	Formative evaluation and modifying the deficiencies (if any)	3.59	2.33	4.54
9	Favorable educational place based on ventilation	3.78	2.55	4.43
10	Using instructional media (poster, leaflet, etc.) to motivate more participation in discussion	3.60	2.38	4.39
11	Long-time and several-days instructional courses along with issuing certification	3.51	2.30	4.36
12	Using instructional media in accordance with the class content	3.22	2.02	4.32
13	Seeking ideas regarding the satisfaction of extension classes	3.68	2.49	4.28
14	One-day instruction	3.27	2.21	3.81
15	To train participants based on lecturing and formal classes	3.24	2.20	3.74

Imp. Level: Importance level; present perf.: present performance; WDS: Weighted Discrepancy Score

- To avoid prolonging the table, only 15 first needs have been reported.

These 15 competencies with regard to conventional courses have been rated differently from the participants' viewpoint (Table 2). With the same score on importance, present performance of participants based on conventional courses was different. With the mean score of 3.6, the weighted discrepancy score for each competency was calculated. Surprisingly, the outcomes on the same competencies for conventional courses were much higher than those for IPM/FFS program. This shows that our participants feel more need to learn competencies in the conventional courses. A precise examination of findings indicated in Table 2 revealed that the first three competencies are practical skills which have gained the least performance score in conventional courses. This finding also can be

confirmed by the result of the measuring of participants' satisfaction indicated in Table 3. The results showed that the mean score of participants' satisfaction on the seven categories of main components needed for holding an IPM/FFS course (Mean= 2.35) was higher than conventional courses (Mean=2.11). As expected, the conventional courses were perceived weak in transferring need skills from the orchardists' point of view. In total, the mean of orchardists' satisfaction of both programs were lower than average.

Table 2. The needs of orchardists using the Borich Needs Assessment Model for conventional courses (N=201).

Rank	Needs	Imp. level	Present Perf.	WDS
1	To be skillful in tree pruning	4.30	1.57	9.83
2	The ability to recognize the best time to spray pest-herbicides	3.92	1.35	9.25
3	Practical identifying of the symptoms of plant diseases and direct observations	3.87	1.39	8.93
4	Favorable educational place based on ventilation	3.78	1.55	8.03
5	Pre-assessment of participants' information before launching the programs	3.72	1.53	7.88
6	Acquisition of the know-how knowledge to use bio-fertilizers and manures	3.83	1.90	6.95
7	Using instructional media (poster, leaflet, etc.) to motivate more participation in discussion	3.60	1.73	6.73
8	Seeking ideas regarding the satisfaction of extension classes	3.68	1.99	6.08
9	Long-time and several-days instructional courses along with issuing certification	3.51	1.85	5.98
10	Awareness of cultural (agronomic) control (irrigation time management; collecting infected fruits; variety selection; etc.)	3.67	2.15	5.47
11	To match the content with orchardists' profession	3.64	2.13	5.44
12	Formative evaluation and modifying the deficiencies (if any)	3.59	2.24	4.86
13	Using instructional media in accordance with the class content	3.22	1.93	4.64
14	One-day instruction	3.27	2.11	4.18
15	To train participants based on lecturing and formal classes	3.24	2.47	2.77

Imp. Level: Importance level; Present Perf.: Present Performance; WDS: Weighted Discrepancy Score

Table 3. Participants' satisfaction of IPM/FFS and conventional courses

Item		Awareness	Skill	Attitude	Aim/objectives	Teaching-learning method	Instructional Media	Time	Place	Evaluation	Mean (out of 5)
No. of Statement		14	6	2	2	8	3	4	4	6	-
Mean (out of 5)	IPM/FFS	2.39	2.38	2.30	2.29	2.37	2.40	2.32	2.32	2.38	2.35
	Conventional Courses	2.02	1.81	2.11	2.22	2.14	2.16	2.21	2.21	2.14	2.11

CONCLUSIONS

The substantial feature of IPM program is to utilize all appropriate pest management techniques to keep pest populations below economically injurious levels. Each technique must be environmentally sound and compatible with producer purposes. While most of the orchardists were aware of the need to conserve the environment and produce safe crops, the current implemented IPM/FFS training programs in west part of Iran, could not provide them with adequate skills to perform the sound method and practice in their professional activities. Nonetheless, the orchardists are more satisfied by IPM/FFS programs compared to the conventional courses implemented by the agricultural extension and education services centers. With regard to this point that for leaf vegetable a similar project has been promoted through April 2015, the extension workers must emphasize more on practical aspects.

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