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Farmers' competence and training needs on pest management practices: Participation in extension workshops

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ABSTRACT

A survey of farmers in Karaj, Iran explored impacts of extension workshops on farmers' level of competence on pest management practices and identified farmers' needs for pest management training. Three groups of farmers, each one consisting of 30 individuals, were included in the study. Group A included farmers who had recently participated in a local workshop for pest management, group B included farmers who had never participated in a similar workshop, but they were from the same town with farmers of group A (workshop participants) and had close contact with farmers of group A, and group C (control group) consisted of farmers who had never attended a similar workshop and were outside of this community. Training needs were assessed using the Borich Needs Assessment Model. The top three training needs for group A were on a) identification of pesticide application frequency, method of application, and amount, b) pesticide record keeping, and c) knowledge on pesticide selection. The top three training needs for group B were on a) awareness of different pesticide products, b) identification of pesticide application frequency, method of application, and amount, and c) identification of various types of insect damage. The top three training needs for farmers of group C were on a) knowledge of chemical/cultural/biological pest control options, b) biological control of pests, and c) differentiation among fungal, viral, and bacterial diseases. Group A showed the highest level of competence for all three areas of pest management practices (pest identification, pesticide management, and IPM principles), whereas little spread of the acquired knowledge was observed from group A to other community members.

1. Introduction

Infestations by insects, fungi, weeds, and other potentially harmful organisms to crops have always been a major threat for the agricultural production worldwide (Ruttan, 2005). Crop losses due to these harmful organisms can be substantial, whereas serious reduction in product quality can often occur when the product itself is attacked. The potential losses due to pest infestations may vary among crops from less than 50% (e.g. barley) to more than 80% (e.g. sugar beet and cotton) (Oerke and Dehne, 2004). Thus, the intensification of crop production which seems necessary to meet the increasing food demand through enhanced productivity per unit area is impossible without a concomitant intensification of pest management (Oerke, 2006). As potential loss rates in crop production increase with attainable yields, high productivity depends largely on effective pest management. Thus, protecting plants from agricultural pests through a selected pest management program will always be a vital part of any agricultural system.

For several decades pesticides have been used as the primary method to control pests in agriculture. They helped to increase crop yields and improve product quality (Cooper and Dobson, 2007). Today, pesticides are widely recognized as an important management tool in most areas of the agricultural production. However, despite their many benefits, it is now clear that pesticides may also have unfortunate consequences (Pimentel, 2005). Undesirable side effects of pesticides usually stem from a lack of adequate understanding of the impact of chemicals on the environment, compounded by indiscriminate use of pesticides. Thus, pesticides can pose serious threats to human health and the environment in rural areas all over the world, particularly in developing countries (WHO, 1990).

Pest management problems are often complex, requiring detailed and valid information about many factors. This complexity is further compounded by the fact that farmers usually have little or incomplete information about both the problem and the potential techniques to manage it. When pesticides are the selected method for pest control, it is important that the products are used properly

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to ensure maximum efficacy, personal and environmental safety, and legal compliance. Careless handling of pesticides by operators may be due to wilful negligence, lack of information, or lack of training. This can reduce pesticide efficacy and may pose a serious health risk for farmers (Salameh et al., 2004; Recena et al., 2006; Polidoro et al., 2008). Also, poor knowledge of pest biology and pest management practices, violation of the recommended rate of a pesticide, erroneous beliefs about safety practices required during pesticide use, and poor maintenance of spraying equipment can reduce pesticide performance in the field. It may also lead to several serious problems such as crop damage, kill of beneficial organisms, high levels of residues on crops which render edible products unfit for consumption, soil contamination, and waste of money.

Decisions on pest management programs are quite subjective and frequently depend on several characteristics of farmers including also personal beliefs, perceptions, and objectives (Ajayi, 2000; Atreya, 2007). Thus, technologies often have not been adopted or have failed with negative social consequences mostly because the research was conducted without adequate participation of farmers and with little consideration of farmers' own knowledge, practices, needs, and desires (Trutmann et al., 1996; Meerman et al., 1997; Prudent et al., 2007). If farmers are to manage pests in the best way, there is a certain set of knowledge and information they need to be aware of including conceptual and technical knowledge, as well as the "know-how" to carry out certain practices. In most cases, it is likely that there is a difference between the information that farmers have and that which they should have to make good decisions. Even when information gets through to the farmers, they may not be able to utilize the information properly because they lack the necessary background knowledge. In this case, more effort devoted to farmers' training is implicated. Training programs can play a crucial role in pest management decisions, providing farmers with the technical knowledge necessary for the selection of appropriate pest control methods and also for safe and effective pesticide use (Norvell and Hammig, 1999; Prudent et al., 2007).

The objective of this research was to explore impacts of extension workshops on farmers' level of competence on pest management practices and to identify farmers' needs for pest management training.

2. Material and methods

The study was conducted in Aghtapeh and Hussein Abad towns, which are located near Karaj City, Karaj County, Iran in Tehran Province, near the Alborz Mountains. It is the fifth largest city of the country with a population of more than 1.3 million inhabitants, occupying an area of about 162 km^2. It serves as the bridge between the Iranian capital city and the Caspian Sea, providing necessary transportation. It is a major agricultural trade center with some chemical industry.

Following a 6-day agricultural extension workshop in early August 2006, three distinct groups, each with 30 farmers, were surveyed from late October to December 2006. The selected towns have great similarities on rural population, cultivated land area, cultivation type, and education level of farmers. Cabbage is the most important crop in the surveyed areas. Group A included farmers who had recently participated in a workshop for pest management, group B included farmers who had never participated in a similar workshop, but they were from the same town with farmers of group A and they had close contact with farmers of group A (workshop participants), and group C consisted of randomly selected farmers who had never participated in a similar workshop and were outside of this community (control group). Farmers of group A and group B were selected from Aghtapeh town, whereas farmers of the third group were selected from Hussein Abad town, a nearby town. The workshop's objective was to facilitate consideration of principles and advantages of pest management among farmers of the area and to raise farmers' awareness of the serious impact of pesticide use and particularly of the use of highly toxic pesticides on human health and the environment. The content of the workshop included education and training in three major areas: pest identification, pesticide management, and IPM principles. However, the main objective of the workshop was to educate farmers on the second (pesticide management) and especially the third area (IPM principles). In particular, the workshop focused on practical issues about pesticide management and IPM concept including pesticide selection, application rates, time and frequency of applications, application methods, pesticide record keeping, sprayer calibration, pesticide alternatives for pest control (cultural and biological pest control options), pest thresholds, natural enemies, and similar topics.

The selection of farmers in groups intended to compare the needs for pest management training of each group and to find out whether and to what extent acquired knowledge on pest management practices had been diffused from participants to non-participants of the workshop. Farmers gave oral consent to participate in the study after they heard a brief explanation of the study's objective. To avoid any potential bias, it was made clear to the farmers that the survey was only for academic research. All participants were full-time farmers earning their income mainly from agricultural activities. The participants can be characterized as small-scale farmers (the average size of landholding was about 2 ha). It is worth mentioning that about 70% of the Iranian

Table 1
Comparison of some socio-economic variables among the three groups of farmers.

Variable	Group A	Group B	Group C (control group)	*F*/Kruskal–Wallis test
Age	40.43	41.16	47.26	1.849 ns[b]
Sex	90.0% male, 10.0% female	96.7% male, 3.3% female	100% male	3.649 ns
Education (years)	3.7	4.9	4.5	0.632 ns
Farming experience (years)	27.36	21	30	1.778 ns
Land tenure status	40.0% owner, 40.0% tenant, 6.7% worker, 13.3% other	36.7% owner, 53.3% tenant, 10.0% worker	43.3% owner, 56.7% tenant	1.417 ns
Hectares of cultivated land	2.36	3.36	3.73	3.557*
Farm income (Toman[a])	9,333,333	7,833,333	4,550,000	2.900 ns
Off-farm income (Toman)	1,686,667	321,668.9	513,333.3	6.394**
Production yield (ton/ha)	51.43	42.50	35.33	14.180**

*Significant at $P < 0.05$.
**Significant at $P < 0.01$.
[a] 1 US dollar = 949.58 Iranian Toman.
[b] Non significant.