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Crop protection services by Plant Clinics in Iran: An evaluation through rice farmers' satisfaction

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ABSTRACT

Plant Clinics have been founded in many developing countries as a cost-effective way to provide plant protection advice to smallholders who have limited access to consulting services. However, studies concerning farmers' satisfaction with the Plant Clinics services are scarce in the literature. The objective of the present study was to examine farmers' familiarity, willingness to use, and willingness to pay for services offered by Plant Clinics in Guilan Province of northern Iran. A significant portion of the farmers (44%) had a fair level of familiarity with Plant Clinics and most farmers (54%) showed willingness to use their services. Farmers evaluated customer service (i.e., the level of services offered by the Plant Clinics personnel) and service relevance (i.e., the relevance of Plant Clinics services with farmers' needs) of Plant Clinics with the highest satisfaction rates. The most important factors explaining the variance of farmers' willingness to use the Plant Clinics services were service relevance, service usefulness, familiarity with Plant Clinics services, service quality, and education level of the farmers, which together explained 68.4% of the variance of farmers' willingness to use the Plant Clinics services. The variables service relevance (services that are relevant with farmers' needs), age (young farmers), land area (large farmers), and familiarity with Plant Clinics (knowledge about the responsibilities of these centers and contact with them) had a positive impact on farmers' willingness to pay for the Plant Clinics services. However, farming experience (experienced farmers) had a negative impact on farmers' willingness to pay. Overall, Plant Clinics have a big potential to support decision-making on technical, operational, and strategic matters in the study area, but some farmers were less familiar with them. Farmers' familiarity with the Plant Clinics services should be promoted along with further improving their services.

1. Introduction

In agricultural ecosystems, pests, plant pathogens, and weeds pose a major challenge to crop productivity and global food security (Damalas, 2016). The damage inflicted on agricultural produce by pests would be more severe by almost 30% than that is at present, without the use of pesticides and non-chemical control methods. These hazardous factors, including pests, diseases, and weeds, inflict heavy losses to rice in Iran both in the field and also during storing. Blast, with the causal agent of *Magnaporthe grisea* (Hebert) Barr, is considered to be the most important disease of rice in Iran, resulting in severe losses to susceptible rice cultivars (Mousanejad et al., 2010). Also, the Asiatic rice borer, *Chilo suppressalis* (Walker) (Lepidoptera: Crambidae), is a major pest problem to rice production in rice-growing areas of Iran, causing about 15% yield losses annually (Noorhosseini et al., 2010; Abdollahzadeh et al., 2016).

Evidently, effective pest management is essential for maintaining or increasing rice productivity. However, conditions in developing countries are often very different from those in the developed countries. Approaches suitable for developed countries often do not work well in developing countries. Although chemical control has turned out to be effective on most harmful agents and has revolutionized crop production, its costs and adverse impacts on human health, the environment, and the quality of food cannot

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be neglected (Damalas, 2009; Damalas and Eleftherohorinos, 2011; Razzaghi Borkhani et al., 2013). Consequently, pest control methods that need less or no use of chemicals came into focus (Ranjbar et al., 2007). However, alternative pest control strategies often require more knowledge than chemical strategies and different skills are also needed by farmers (Allahyari et al., 2009; Allahyari, 2012; Khan and Damalas, 2015). Close involvement of extension workers with both farmers and researchers to identify farmers' knowledge and practices and to assist the training of farmers in the new approaches is essential.

Agricultural extension workers often spend considerable time responding to questions dealing with crop protection. This is important as agricultural extension services must be able to anticipate such cases, so that they can quickly identify potential problems and thus advise farmers on the best ways of dealing with them. This also means that the knowledge available in national research centers must be decentralized in a comprehensible manner. Acting as an intermediary, between research centers and national agencies on the one hand and local extension workers and farmers on the other, is the main role of 'Plant Clinics'. Such facilities provide three main functions: correct diagnosis of the problem and prescription of the treatment, training of local extension workers, and experimentation under local conditions (Boa et al., 2016). The most important task remains the diagnosis and prescription, for which clinics must have adequate personnel and equipment.

Plant Clinics have been founded in many developing countries since 2003 as a cost-effective way to provide smallholders with plant protection advice. Plant Clinics are another approach of carrying out extension services. Unlike the conventional extension system, where extension agents visit individual fields, farmers come to the Plant Clinics (Bentley et al., 2011). The concept was first proposed by the CABI-led initiative, Global Plant Clinic (GPC), in Bolivia and was soon adopted in countries like Bangladesh, Uganda, and Nicaragua (Boa, 2010; Danielsen and Kelly, 2010). Plant Clinics are not a new idea and the United States and other developed countries have effective plant health systems that serve farmers and have done so for many years (Campbell et al., 1999). In the context of developing countries, however, Plant Clinics are a 'new' method for farmers and rural communities.

Because Plant Clinics vary in how they operate and the services they offer (Boa et al., 2016), a brief description of Plants Clinics in Iran is provided below. Plant Clinics in Iran are units founded by individuals or legal entities of the non-governmental sector, which are responsible for examining and diagnosing crop pests and diseases and recommending appropriate tools and practices for their control in accordance with the delegated authority. The responsibilities of Plant Clinics in Iran include i) examination of crop pests and diseases and prescription of pest management practices, ii) laboratorial examination for diagnosing harmful pests in agricultural ecosystems, iii) field visits and inspection of pest problems, advisory and guidance of farmers for the management of plant pathogens, iv) promotion of functions of the crop protection networks and provision of support regarding natural enemies of plant pathogens, and v) implementation of research, extension, and applied projects of plant protection in coordination with governmental authorities of the province. Since all responsibilities of the crop protection networks are performed by Plant Clinics, responsibilities mainly focus on visits of farms and gardens as well as field activities. Nonetheless, in case there is a need for laboratorial examinations, Plant Clinics can perform them. Therefore, their activities can be regarded as a combination of field and laboratory activities.

Eight years after the establishment of these clinics, there are few studies on farmers' satisfaction with their services. Also, most of these studies have focused on consulting firms, agro-technical firms, and farmers' satisfaction with these firms (Moazen et al., 2013; Abbasi et al., 2015; Sulaiman and Sadamate, 2000; Rivera and Gary, 2000). A comprehensive assessment of Plant Clinics access requires more information about the specific context, including feedback from different types of Plant Clinics users (in terms of gender, age, wealth and ethnic groups, level of education, etc.) (Danielsen and Matsiko, 2016). Quality criteria for Plant Clinics include technical quality, timeliness, staff attitude, feasibility of advice, clinic location, materials, organization and outreach (Danielsen and Kelly, 2010). Plant Clinics need an internal quality control system as well as appropriate quality practices to enable organizations to continuously monitor their performance. Effectiveness is realized when consulting services can influence farmers' decisions about changing their current practices (Danielsen et al., 2013).

The present study tried to answer the question: are rice farmers in Guilan province satisfied by the services of Plant Clinics, are they willing to use those services, and what are the main factors underpinning farmers' willingness to use those services? The results can be a guideline for the clinic owners to seek approaches to improve the productivity in their respective clinics and gain a better perspective about farmers' needs and challenges so that they can provide more appropriate and useful services. This can, in turn, boost farmers' satisfaction with Plant Clinics.

2. Methodology

The statistical population composed of all farmers covered by Pests and Plant Diseases Care Networks (PPDCNs) in Guilan Province covered by Plant Clinics (N = 40,304). The least sample size for the study was estimated to 480 farmers, based on the least sample size table proposed by Bartlett et al. (2001), considering a confidence level of 95%. Also, the margin of error used in this table was 3% for continuous data. Due to low return rate in studies of this kind, an additional 10% of the target population was included to the initial sample size to ensure participation of the required sample size. To evenly distribute the questionnaire throughout the province, the sample size was divided, among different regions covered by PPDCNs and different villages, proportionally to the number of farmers (proportional-to-size cluster sampling). Face-to-face interviews were conducted by trained experts. Before starting the survey, we chose experts from different areas and the first author gave detailed instructions about how to administer the questionnaires. Each questionnaire took about 30 min to be filled out. Of the 528 questionnaires distributed throughout the province, 494 were fully completed and usable. Eleven questionnaires were found unusable and were removed from the final analysis.

The questionnaire had three pages and contained four distinct sections. Section 1 was devoted to respondents' demographic data, including residence (city or village), age, gender, education level, income, cultivated land area, land ownership type, and familiarity with Plant Clinics. Familiarity with Plant Clinics services means that farmers know about the role of these centers and have contact with them. Section 2 was related to farmers' willingness to use the services of Plant Clinics, including 17 items for its estimation on the basis of a five-point Likert-type scale (from very low to very high). Of those items of Section 2, 10 were positive and 7 were negative. Section 3 was about farmers' satisfaction with the service of Plant Clinics divided into four subsections: 'service relevance' with four items, 'service quality' with six items, 'service usefulness' with six items, and 'customer services' with eight items. Farmers' satisfaction with Plant Clinics services is defined as the degree of satisfaction of farmers with respect to service relevance, service quality, service usefulness and customer service offered by Plant Clinic