Agriculture, Environment & Society

Journal homepage: www.aes.uoz.ac.ir

Assessing the educational needs of rapeseed growers in Lorestan province for integrated weed management

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ARTICLE INFO

Article history:
Received: 31 February 2023
Accepted: 19 May 2023
Available online: 18 June 2023

Keywords:
Educational needs
Integrated weed management
Lorestan province
Rapeseed

ABSTRACT

In the area of integrated weed management, the objective of this study is to identify and assess the educational requirements of farmers in the province of Lorestan. The research's statistical population comprises all rapeseed growers in Lorestan Province. A stratified sampling method was employed to select 137 respondents from the population using Cochran's formula. As the research instrument, a questionnaire was developed by the researcher. The findings of the study suggest that the participants possess a moderate to limited understanding of integrated weed management as it pertains to rapeseed products. The findings suggest that the knowledge-education modules address the greatest number of educational requirements pertaining to "the impact of weed presence on the farm" and "the competition between weeds and crops on the farm". The findings revealed that sixteen categories of the knowledge-education needs are at an exceptionally high level. Among these, the categories of "plow preparation", "reduction in crop yield", and "manual weeding" are among the most critical. Furthermore, an examination of each module reveals that when it comes to modules that promote the efficient reduction of herbicide usage and the implementation of hygienic and preventive measures, a significant emphasis should be placed on these aspects. According to the correlation results, there is a significant and negative relationship between the number of educational programs participated in by respondents and the frequency with which farmers visit agricultural extension service offices and their educational needs. A positive correlation exists between the needs and the distance between the village and the city. It is suggested that in this region, farmers be informed through the use of mass media such as local radio and television, as well as posters. Additionally, educational workshops and extension visits can serve as influential means to enhance individuals' skill sets.

Highlights

- Lorestan province farmers have a moderate to limited understanding of IWM for rapeseed crops.
- Farmers need training to effectively reduce herbicide use and implement preventive measures.
- Fewer program participations and less frequent visits to extension offices correlate with higher educational needs in IWM.
- Utilizing local radio, television, and posters can effectively reach farmers for IWM education.
- Organizing workshops and extension visits can further enhance farmers' IWM skills.

1. Introduction

Throughout history, crop infestations caused by insects, fungi, weeds, and other potentially detrimental organisms have posed a significant risk to agricultural production on a global scale (Ruttan, 2006). Significant crop losses may result from these detrimental organisms, whereas a severe deterioration in product quality frequently transpires when the product itself is compromised. Pest infestations can result in losses ranging from less than 50% for certain crops (e.g., barley) to over 80% for others (e.g., sugar beet and

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https://doi.org/10.22034/jelsa.2024.327447.1017

cotton) (Oerke and Dehne, 2004). Therefore, it is unattainable to increase crop production to meet the growing demand for food by merely increasing productivity per unit area; this cannot be achieved without an equivalent increase in pest management (Oerke, 2006).

Elevated potential loss rates in crop production coupled with achievable yields render effective pest management a critical determinant of high productivity. Thus, implementing a targeted pest management program to safeguard plants against agricultural pests will perpetually constitute an essential component of any agricultural system. Underpinned by an understanding of agroecosystem biology, integrated weed management (IWM) strategies integrate multiple methods of weed prevention, avoidance, monitoring, and suppression. The establishment of IWM was driven by the objective of offering farmers methodical strategies to decrease their dependence on herbicides (Swanton and Weise, 1991), as well as to impede the emergence of herbicide-resistant (HR) biotypes (Powles et al., 1997). Despite promotion by university extension personnel (Czapar et al., 1995; Hammond et al., 2006), farmers have been comparatively less inclined to adopt IWM in comparison to integrated approaches for insect or disease pests.

It is not well understood why farmers have been slow to adopt IWM. There are those who argue that the implementation of agrichemical marketing strategies, such as performance guarantees on herbicide products, diminished the perceived necessity for alternative weed control methods (Owen, 1998; Llewellyn et al., 2007). Pest management program decisions are often highly subjective and influenced by a variety of farmer characteristics, such as personal beliefs, perceptions, and objectives (Ajayi, 2000; Atreya, 2000). As a result, technologies frequently fail to gain traction or experience adverse social repercussions due to research that neglected to adequately involve farmers and paid insufficient attention to their own knowledge, practices, needs, and desires (Trautmann et al., 1996; Meerman et al., 1997; Prudent et al., 2007). In order to effectively manage pests, farmers must possess a specific collection of information and knowledge, including technical and conceptual expertise, as well as the "know-how" to implement particular procedures.

Typically, a disparity exists between the information at the disposal of farmers and the information they require to make informed decisions. Despite the dissemination of information to the farmers, their potential for effective utilization may be hindered due to their insufficient foundational knowledge. Involved in this situation is an increased emphasis on farmer education. Training programs can significantly influence decisions regarding pest management by equipping farmers with the technical expertise required to select suitable pest control methods and to utilize pesticides safely and effectively (Norvell and Hammig, 1999; Prudent et al., 2007) (Norvell and Hammig, 1999; Prudent et al., 2007). The primary aim of this study was to investigate the effects of extension workshops on the level of assurance that farmers possessed regarding pest management practices, as well as to ascertain the training requirements of farmers in this area.

2. Material and methods

This applied research is structured as a descriptive investigation. The Statistical population consisted of Rapeseed farmers in Lorestan Province, Iran (N=1012) and 131 respondents were selected as samples based on the Cochran's formula by proportional stratified sampling method. A research-made questionnaire, whose validity was verified by a panel and whose reliability was assessed using Cronbach's alpha (0.996), served as the primary instrument for this study. A questionnaire employing structured five-point Likert scales from 1 (extremely low) to 5 (extremely low) was utilized to gather the necessary data. When analyzing data in terms of mean rank and standard deviation, the correlation coefficient was applied. The data that was gathered were analyzed using SPSS20. The questionnaire comprises two sets of items: 1. A demographic item that is pertinent to farmers; and 2. A needs assessment regarding IWM, which comprises 76 items.

3. Results and discussion

It became apparent subsequent to the study that the median and mean for the education of the respondents are both at the primary school level. Furthermore, the mean age of the respondents is approximately 47, suggesting that the age of operators is relatively high. Additionally, with regard to the rate of referrals to agriculture propagation and agriculture Jihad services in the region, the average number of family members is four. The frequency of such referrals is described in Table 1 and provides an overview of the statistical universe's study situation.

Table 1. Distribution of farmers Characteristics

	Farmers characteristics	Age	Family Size	Dry land (ha^{-1})	Wetland(ha)	Training courses	Visiting the Extension office in year
Mean	10.64	46.96	4.07	1.86	3.70	1.28	10.64
Median	10	48	4	1	3	1	10
Mode	10	48	4	0	2	0	10
LSD	8.12	12.48	1.81	2.16	3.09	1.34	8.12

3.1. Need assessment of the total module

The intent of the training module is to provide an overview of pertinent topics within a particular field. The foundation of a structured on-the-job training (OJT) program (Prudent et al., 2007) consists of training modules. The research subject was divided into fourteen modules (Table 2), with the integration of weed management, which was informed by case studies and local experts. With an average rate exceeding four out of five, it can be asserted that the maximal rate of training requirements is pertinent to the training modular, "the impact of weed existence on

farms", and the competition between weeds and crops on farms. The instructional modules on "the significance of influential factors in managing weed resistance to pesticides", "effective steps to reduce the use of pesticides", and "the significance of effective steps to reduce the use of pesticides" address the training requirements of the modules and the influential factors in the competitive ability of weeds, as well as the efficiency and importance of physical factors that influence the management of weed resistance to pesticides" at the intermediate to advanced level. The respondents' prioritization of educational needs with regard to general items (specifically educational modules) pertinent to integrated weed management is depicted in Table 2.

The fourteen multiple-choice questions in each module assess the farmers' expertise in the respective field. This field involved evaluation and categorization. The "The impact of weeds on the farm" module: The two concepts that require the most attention in this module are "reduced crop yields" and "reduced agricultural product quality", with mean scores of 4.38 and 4.22 out of 5, respectively.

Table 2. Priority of educational modules in IWM

Knowledge modules required in IWM	Mean	SD	Priority
Despite the impact of weeds on the farm	4.10	0.71	1
Weeds compete with the crop on the farm	4.08	0.78	2
Factors affecting the ability of competitors weeds	3.86	0.69	3
The importance and effectiveness of physical strategies effective in reducing weed	3.85	0.60	4
The importance of agricultural strategies IWM	3.74	0.67	5
The effective implementation of the IWM	3.69	0.74	6
Factors affecting the performance of herbicides	3.67	0.83	7
Plowing operations affecting performance IWM	3.65	0.82	8
The importance of the principles to improve IWM	3.57	0.73	9
IWM role	3.44	0.73	10
The importance of programs IWM	3.41	0.87	11
Important factors in the management of weeds Herbicides resistant	3.29	0.74	12
Effective steps to reduce herbicide use	3.24	0.62	13
The importance of effective IWM	3.12	0.84	14

3.2. Training needs of farmers based on detailed modules

Module "weed competition with the crop on the farm": "water absorption of plants" (mean = 4.18), "absorb of chemical fertilizer" (mean = 4.09), and "mixed with seed crops" (mean = 4.08) are the most critical requirements for this module.

Module "role IWM": "Preventing weed invasion", "Reducing the environmental impact of toxins and chemicals", and "Quickly identifying weed outbreaks" are the three most important requirements of this module, with respective average scores of 3.73, 3.68, and 3.53.

Module "IWM Importance": "Reduce weed resistance" and "Avoid weed dispersion" are ranked highest on this module with mean scores of 3.57 and 3.54, respectively. "Prevent uncontrolled weed growth" is ranked third with mean scores of 3.43.

Module "Factors Affecting the Efficacy of Herbicides": "Considering the Appropriate Mitigation Time" (mean = 3.91), "Weed Age in the Time of Mitigation (mean = 3.82), and "Weed Number in the Time of Mitigation (mean = 3.84)" are the sections of this module that require the most improvement.

Module "Full and Inclusive Application for Mitigation": "Planting certified seeds" (4:18), "Utilizing completely rotted manure" (4.01), and "Managing weeds at the margins of fields, streams, and roadways" (3.68) are the areas that require the most attention from this module.

Effective plowing efficacy of modules on IWM: "Buried up full plant weed" (mean = 3.94), "Embest underground organs in cold and dry weeds" (mean = 3.73), and "evacuate nutrition supplies in the underground organs of reproduction" (mean = 3.28) comprised the greatest need for this module.

Module "The Importance and Efficacy of Effective Physical Strategies for Weed Control": "Plowing" (mean = 4.47), "Manual weeding (4/8), and "Grazing livestock" (mean = 3.91) are the areas with the greatest need according to this module.

Module "Farming strategies in IWM": "farm rotation" (mean = 4.11), "competition with the crop plant" (mean = 3.61), and "standing with crops" (mean = 3.25) are the areas with the highest demand, respectively.

The module titled "Factors Affecting the Capability of Competitors' Weeds" reveals that the areas with the highest average scores are "preparing seed bed" (4.18), "observing the planting date" (4.08), and "appropriate quantity of seed crops" (3.91).

The modules "Importance of factors influencing the management of weed resistance to herbicides": "Crop rotation based on the use of different herbicides" (mean = 3.51), "Herbicide mixing (mean = 3.50), and "Utilizing herbicide alternation with varying yields" (mean = 3.22) are the most in need.

The module titled "Effective Reducing Steps on Herbicide Use" primarily addresses three areas: "Utilizing herbicides during the growth stage of weed scattering", which received an average score of 3.89; "Utilizing herbicides under suitable soil and weather conditions", which received an average score of 3.87; and "Application of tape herbicide in conjunction with cultivators", which received an average score of 2.87.

Module "application of essential principles to improve the IWM": "farmer participation" (mean = 3.72), "instructing and learning about weed control" (mean = 3.67), and "use of appropriate technology" (mean = 3.64) are the aspects of this module that require the most improvement. The results of evaluating all educational needs associated with IWM without detailed modules

would comprise 76 items, which are arranged in the following three categories by mean order: “very high need”, “high need”, and “low need”, in that order.

There are sixteen items in the category of “very high need”, with “plow operation”, “reduce crop yields”, and “manual weeding” having the greatest demand. There are 56 categories of educational needs, the most significant of which are high-level categories such as “Buried-up full plant weed”, “Attendance to weed control time”, “Adequate quantity of seed crops”, and “Grazing livestock. “The educational requirements of low-need categories, such as “Utilize Flamethrowers”, “Utilize Specific Herbicides in Conjunction with the Cultivator”, “Mulch”, and “Utilize Cover Crops. “The comprehensive educational requirements of the participants:

The respondents' general training requirements range from unknown to average. (The mean is 3.60 and the standard deviation is 5.7.) In contrast, its mode and median both equal four. Its minimum rate in this domain is 2 (knowing) and its maximum rate is nearly 5 (completely unsure) (Table 3).

Table 3. The situation of training needs about IWM

The situation of training need	Frequency	Valid percent	cumulative percentage
Average	22	16.06	16.1
low	85	62.04	78.1
very low	30	21.90	100
total	137	100	-

Mean: 4 SD: 0.57 Minimum: 2Maximum: 4.88 Range: 2.88

3.3. Correlation Analysis

The Spearman correlation analysis was employed to examine and ascertain the relationship between the primary variables and the variable representing the rate of educational needs, taking into account the ranked nature of the need variable. It can be deduced from table 3 that the critical research variable, “general educational (scientific) need”, has a positive and significant correlation with the village's distance from the nearest city (r=0.286, p=0.0000). Furthermore, the stated variable has a positive and meaningful correlation with the research variable. (p=0.011, r=0.216) In contrast, a significant inverse correlation was found between the total training requirement and both the monthly travel rate (r=-0.181, p=0.034) and the annual referral rate to the Center for Agricultural and Propagation Services (r=-0.249, p=0.003). Furthermore, a significant and negative correlation (r=-0.373, p=0.0000) was found between the aforementioned critical variable and the quantity of educational sessions or periods an individual has attended. There was an absence of significant correlation identified between the age of respondents and the variable of educational need.

4. Discussion

The findings of the research suggest that the participants possess an intermediate to low level of scientific knowledge and expertise regarding IWM in relation to rapeseed (Mean=3.6 out of 5, SD=0.57). Furthermore, the findings from the frequency distribution regarding the overall training requirements of the participants reveal that the “Low-level Category” training needs occur most frequently (16.06 percent), while the “Intermediate level” training needs occur least frequently (62.04 percent). The findings revealed that the training needs items with the greatest magnitude are “the impact of weed presence on the farm” and “the competition between weeds and crops on the farm” (with a mean score exceeding four out of five). The training requirement of the sections that cover “the influential factors in the competitive ability of weeds” together with “efficiency of physical strategies in reduction of weeds” are classified as “intermediate to high level”. The training requirements of the module titled “Weed Resistance Management to Pesticides” assigns an intermediate to low level of importance to IWM. In relation to the training requirements, the findings revealed that sixteen categories are deemed “extremely high level”, with “manual weeding”, “plow operation”, and “reduction of yields” constituting the categories with the greatest demand. There are 56 categories with “very high level” training needs. Among these, “complete burying of weed bushes”, “considering the proper time in the struggling day”, “proper amount of crop seeds”, and “grazing the livestock” have the highest training needs. Conversely, four categories, including “using flamethrowers”, “stripped application of herbicides in addition to operating the cultivator”, and “mulching the crops”, have “low level” (less necessary) training needs.

The correlation coefficient results suggest that there is a significant negative correlation (r=-0.181, p=0.034) between the number of visits to the county agricultural extension office (AEO) by respondents and the number of training courses they have completed, and their training needs. A significant positive correlation is observed between the training needs and the distance of the village from the city center. Consequently, despite the relatively low rate of training course enrollment and the limited number of annual farmers visiting AEO, the initiative may still prove efficacious in augmenting the knowledge of farmers.

4.1. Recommendations

On the basis of the results obtained, the following recommendations can be made: Given that the training needs of the entire respondents (i.e., their knowledge of struggling weed integrated management) range from intermediate to high, it is imperative to employ approaches, informatic methods, and knowledge promotion that are commensurate with the rural community and its operators. In this regard, informational brochures, provincial and national media, agricultural propagation posters, and mass media such as provincial television and radio have the potential to enlighten and pique the interest of operators regarding IWM. The program content should align with the

identified priorities and consist of general educational modules that aim to correct operators' perceptions regarding the “influence of weed existence in the farm” and “weed competition with the crop in the farm”, “the impact of following IWM on crop function enhancement”, and “the influence of manual weeding (i.e., mechanical methods) on the improvement of the equality between agricultural product and IWM and the crop”, among others.

In order to enhance the understanding of operators, it is imperative to utilize educational materials such as manuals and photographs, conduct educational-propagation classes, organize tours of propagation for pioneering farmers, establish thematic demonstration farms, and identify and introduce role model farmers who are pertinent to the aforementioned programs in accordance with the priorities determined. The subsequent elements should be duly considered: The competitive ability of weeds is influenced by various factors. This includes the significance and effectiveness of influential physical strategies in weed reduction, as well as specific cases such as “the way livestock are grazed on farms”, “the method and correct steps of weed burial”, and “the proper IWM for plough based on complete observation of weed bushes”. Based on the findings derived from the inferential correlational analysis, the following recommendations can be made: 1. Given the positive and significant correlation between the distance between the village and the nearest city and educational need, and the negative and significant correlation between the monthly travel rate and educational need, it is imperative to establish some foundational strategies for enhancing communications infrastructure.

2. Given the respondents' low attendance at IWM propagation centers (1.28 times) and the negative and significant correlation between educational requirements and educational periods, it follows those organizing educational sessions on knowledge, insight, management skills, and agriculture services will have a significant impact.

3. Given the existence of a significant and negative correlation between the annual referral of clients to the agricultural propagation and services center and their educational requirements, providing hardware and software to these centers in the region that addresses this matter could have a positive impact on the improvement of learners' knowledge and abilities.

4. Furthermore, in-service trainings for personnel training newcomers and active experts in agricultural propagation centers, as well as justification courses for experts from active companies in the region and member experts of the Agriculture and Natural Resources Engineering Organization of Lorestan Province, may indirectly contribute to the enhancement of operators' knowledge and abilities in this field.

5. Taking into account the impact of indigenous or vernacular leaders and native villagers, it is suggested that, in addition to identifying the most enthusiastic and pioneering farmers and the demonstration farms, the Agriculture Jihad Organization of the Province of Lorestan and the managing organization in the townships sponsor and provide service support to these individuals until we are able to maximize the utilization of the pioneer farmers, leaders, and demonstration farms as well.

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