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Training Needs Assessment: The Case of Female Rice Farmers in Northern Iran

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Abstract: An appraisal of training requirements responds to the issue of why training is needed and gives some assurance that the services needed to establish and conduct training can achieve the required outcomes based on performance. Therefore, the goal of this study was to examine the educational needs of female rice farmers in Sari (the capital of Mazandaran province located in Northern Iran). This study adopted a descriptive-correlational approach consisting of 1677 female rice farmers in Sari in 2013–2015. Finally, 240 respondents were selected and examined using Cochran's formula and through stratified sampling with proportional assignment. The results of multivariate stepwise regression indicated that the level of participation (−0.488), the importance of economic factors (0.369), the number of training courses (−0.284), and marital status (−0.179) of female rice farmers were effective on the training needs level. According to the findings, training programs should take into account the educational needs of female rice farmers in order to gain the necessary expertise and skills in new methods and transfer them to other farmers.

Keywords: educational need; rice farmers; rural women; agricultural agents; agricultural technology adoption

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1. Introduction

For the next 85 years, the world's population will rise by over four billion and will reach 11 billion by 2100, according to the UN 2017 projection. According to a quotation from Prof. Lam's essay [1] "The World's Next 4 billion", there is a discussion on the protection of natural ecosystems, food stability, the future of mankind's nutrition, and training [1]. Therefore, it is necessary to study the training needs of farmers, especially in the case of products that make up the staple food of more than half of the world's population. In the meantime, the role of women farmers as key elements in the field of production, especially in developing countries, should not be left out.

Many agricultural scientists and food security experts suggest that intensification is required to feed the increasing population on a global scale [2]. Ensuring food security

is one of the main problems confronting mankind today [3], and it is converted to a major multidimensional challenge as a result of many variables [4], such as hunger and poverty [5]. As a result, food security is one of mankind's fundamental rights, and in order to accomplish it, global food production, such as grain output, must expand.

Rice is known as the world's major food source, particularly in Iran [6], and its demand will increase day by day. Between 1995 and 2018, the worldwide rice-growing regions grew from 145 to 161.1 million ha [7]. The rice cultivation area of Iran, as an Asian country, is not significant compared to that of large countries such as India and China, but it has increased its production [8]. Now, Iran has 600,000 ha of rice fields, about 85% of which are located in the northern provinces of Iran (Gilan, Mazandaran, and Golestan), which play a key role in ensuring food security and increasing national income [9]. Further, to achieve this goal (socioeconomic development), it is necessary to recognize the limitations of production, identify the needs of farmers, train them, and provide appropriate solutions. Today, education is the starting point and means of beginning intellectual maturity, means of deepening the power of thinking, and mental analyses in individuals, and therefore, it is a strategic tool for social change and development and the construction of society. In addition, it will significantly help increase environmental awareness and sustainable production practices [10]. The training of farmers is aimed at improving their work productivity in agriculture. The form of training known as preparation is not for learning more but for doing and behaving differently. Knowles et al. [11] claimed that farmer training is an education that most frequently takes place outside formal education institutions. It varies from school education because it is based on adult life, and it is the basis for a formal philosophy of adult learning, because adult education will be based on their real needs and wants, not on a predetermined educational programs [12]. In fact, a need is a deficiency or absence of something in a person that must be improved in order to be completed or to reach a better situation [10].

In Iran, rural women in most parts of the country play an essential role in agricultural activities. Today, women are given a special place in national and international development programs. Education, as an essential element of the development of nations, is the key activity in the development of rural women. In this regard, agricultural education programs, if accompanied by good planning and implementation, increase the quality and quantity of agricultural products and, ultimately, improve the incomes of rural households by playing a key role. Therefore, improved incomes of rural households enable better access to education for children and youths in rural areas. This, in turn, will contribute to further social and economic development [13].

However, in reality, rural women are a missing key element in the development of rural society and are deprived of modern education, equitable income distribution, and active participation in important decision-making [14,15]. Evidence and statistics on the activities of rural women in the worlds' developing countries show that, in most cases, women do not receive adequate pay for their work and productive activities [14]. This is because they are informally classified as "inactive" labor force in Iran and also as "domestic workers" [16]. Therefore, education, as an essential element of the development of nations, is the key activity in rural women's development. In this regard, agricultural education programs, if accompanied by good planning and implementation, increase the quality and quantity of agricultural products, and ultimately improve the incomes of rural households.

A large number of rural women in Mazandaran Province are engaged in rice production, and their livelihood directly depends on rice cultivation. They have important roles in the production of this strategic product, which includes preparing seeds for seedling preparation, preparing the transplanting nurseries, transplanting in the traditional way, weeding, harvesting the crop, collecting leftovers from rice cultivation, drying and storage, and supplying rice to local markets [17]. Therefore, identifying their training needs is of great importance and highlights the need for further research. Enhancing the status of women farmers' training is frequently recognized in international development literature as a critical component for improving their well-being, the well-being of their families,

and the well-being of their communities. Women farmers also lack access to training and are frequently underserved by extension services, according to Staudt [18]. As a result, special measures are needed to provide extension training for women farmers. In addition, the development of training programs based on the data obtained from the needs assessment is required. In this regard, it is necessary to pay attention to gender justice and the participation of women farmers in the development and planning of extension programs. However, there has been little study on the exact content, structure, and context of training and extension programming for women farmers that could successfully address their requirements. This study helps to fill this research gap. According to the findings, programs that provide a variety of learning opportunities and encourage debate and exploration of varied perspectives are more likely to provide appropriate learning settings for women. Rice is one of the most essential sources of food in Iran and other countries of the world [10,19]. Therefore, paying attention to the training needs of rice farmers can have many implications. These consequences can increase production per unit area and improve quality, food security, and economic and social growth [17]. It can also improve efficiency; save time and effort of extension agents, farmers, and experts; prevent unnecessary programs and waste of capital, time, and power of executive devices; increase the quality of training programs; improve organizational performance; and lead to better management and planning for producers, planners, and policymakers in Iran and other countries [20].

Although many studies have been conducted on these training needs in the agricultural sector, a study that directly identifies the training needs of female rice farmers has not been conducted in Iran and Mazandaran yet. Therefore, the key objective of this analysis is to assess training needs for female rice farmers in Sari (the capital of Mazandaran Province in Northern Iran) by answering the following questions:

(1) What are the individual characteristics of female rice farmers in Sari?
(2) What is the effect of different factors on assessing the training needs of female rice farmers in Sari?
(3) What is the appropriate model for the training needs of female rice farmers in Sari?

2. Theoretical Framework

A training needs assessment determines an individual's present level of competency, ability, or knowledge in one or more areas and compares it to the needed competency standard for their or other's roles [21]. To put it another way, training needs assessment is the process of identifying whether or not a training gap exists and, if so, what training is necessary to resolve it. In the target surveys, interviews, observations, secondary data, and/or workshops, training needs assessment aims to properly determine the levels of the current situation. The difference between the current and the desired situation highlights issues that may become training needs [22]. The five phases of the Training Needs Assessment process are as follows: (i) identifying problem and needs, (ii) determining the design of needs assessment, (iii) collecting data, (iv) analyzing data, and (v) providing feedback [23].

So far, in many studies around the world, the training needs have been investigated in various fields. For example, Man et al. [24] examined the learning needs of agricultural extension staff in Iraq and indicated that there was a significant relation among marital status, place of employment, training, and number of training courses, and extension agents decided that they needed training in agricultural research areas. A study in Northeast India by Singh et al. [25] showed that the first and foremost activity in planning a good training program is the assessment of training needs.

Manipur state in India has played a major role in crop development [25]. The research by Singh et al. [25] also showed that the most significant factors affecting the estimation of training needs were age, service experience, attitude towards the agricultural profession, and knowledge transmission behavior. In another report, Singh et al. [26] found that growers of chickpeas require further instruction on fertilizers for soil management and the application of insecticides, weedicides, and fungicides.

Saleh and Man [27] found that the greatest training need was expertise and knowledge of teaching methods. While the use of computer, information, and communication technology (ICT) was a moderately required skill, the least needed training field was management skills. Yekinni and Ladigbolu [28] showed, in a training needs assessment, the ecological organic agriculture in Southwestern Nigeria revealed that the high desire for training and difference in needs among practitioners could be associated with inadequate information on ecological organic agriculture standards and high cost of organic fertilizers. Vishal et al. [29] observed that training can be more useful and important as it becomes possible to assess training needs prior to the start of training programs and to impart information according to farmers' needs. Accordingly, training needs and animal health, accompanied by marketing and financial control, farming and general management, hygienic milking methods, animal nutrition, animal welfare management, and housing and environmental management, are seen by livestock owners.

A study by Eftekhari et al. [30] found a great need for education in agro-environmental functions and less need for education in economic functions. The findings by Norouzi et al. [31] showed that participation in training and extension courses has significant contributions to elevating farmers' professional knowledge of agriculture. In addition, farmers' age and professional background were found to be directly and significantly related to their professional understanding. The results of the findings by Sadighi and Roosta [32] showed that the extent of professional competence of farmers has been found to have a major and detrimental connection with their training needs. Additionally, by using the multivariate linear regression technique, Sadighi and Roosta [32] found that the age of farmers, their access to information sources, and their level of technological competence could be clarified by the variation in training needs. A study by Alibaygi and Zarafshani [33] found that agricultural waste management, participatory technology development, water conservation, integrated crop management, and soil erosion were amongst the top five competencies in the training needs in agricultural sector. The policy-making of the human resource planning programs should research how, in preparation sessions, the top in-service areas are discussed. Therefore, extension agencies and district boundary belt training agencies shall put particular emphasis on healthcare, feeding, and breeding during the training of dairy farmers to maximize livestock production and to boost farmers' living standards. In order to reduce the current technical and acceptance gap among dairy farmers, the various dairy extension agents must reorient their trainings based on these results. To explain the theoretical model of the present study, first, the various aspects of the research problem and the relationships between them were identified. Next, the theoretical model was designed and visualized according to the characteristics of the research problem and the study conducted in theoretical foundations. Finally, the theoretical model of this research was obtained as follows (Figure 1). Therefore, based on the literature review in this study, the effect of social characteristics, personal characteristics, economic characteristics, professional educational characteristics, promotional educational extension, source of information, and job property variables on the training needs of women rice farmers in Sari have been investigated.

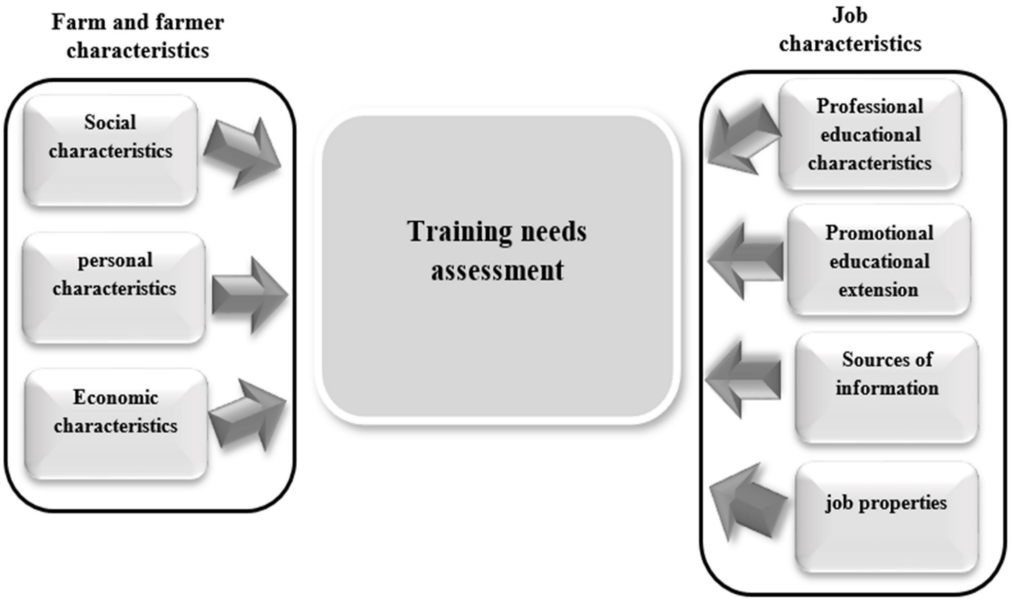

Figure 1. Theoretical model of training needs assessment of female paddy farmers taken from research.

3. Materials and Methods

3.1. Study Area

Mazandaran is located south of the Caspian Sea, in the northern section of the Alborz Mountains, and in northern Iran, west of the Mediterranean Sea [10]. This study was carried out in Sari, Province of Mazandaran (Figure 2). Sari, with a region of 538 km^2, is situated in the east of Mazandaran Province, surrounded in the north by the Caspian Sea. Being situated at 53.06 east longitude and 36.57 north latitude, Sari is situated 32 m above sea level in the time zone of UTCþ3.5. Agriculture is the most significant source of income for the people who live in the villages of around this city. Sari was picked as one of Iran's rice growth hubs, because rice production covers more than half of its agricultural fields. The area under rice cultivation in Sari City is about 25,000 hectares, and 4800 hectares of it is done by women [34].

Given the importance of rice farming in Mazandaran Province and the specific role of women from the planting to harvesting stages of this vital crop, the following are some of the gender roles of men and women in rice cultivation: (1) demarcating, tilling, and preparing the paddies, all of which have traditionally been done by males and are now done by men; (2) erecting a partition wall (full removal of clogs and smoothing the field), which is a male-dominated task that is rarely undertaken by women; (3) slapping the field, which is a type of field preparation for the replanting stage that is only done by males; (4) preparing the seeds for seed replanting, which is mainly an activity performed by women and sometimes with the help of men; (5) preparing the transplanting nurseries, which is undertaken by women; (6) replanting, which is traditionally done by women, but when mechanized cultivation is possible, the field demands the strength of males; (7) weeding, which is mostly done by women; (8) harvesting, which is usually done by women but is now done by males using a combine harvester; (9) women are also responsible for collecting rice residues; (10) drying and storage, which were historically done by women in greenhouses but are now done by males due to technological advancements; and finally, (11) providing rice into the market, which has been done mostly by males from the dawn of humanity, although women in local marketplaces also aid their husbands in selling their wares [10].

Figure 2. Geographical location of the study area (Sari is the capital of Mazandaran Province located in Northern Iran).

3.2. Research and Sampling Methods

The current applied study adopted a descriptive-inferential approach. Descriptive statistics have been used to organize and classify data in terms of different traits and to describe the characteristics of the statistical population using the frequency distribution table, frequency percentage, cumulative percentage, mean, mode, standard deviation, and minimum and maximum. Inferential statistical analysis infers properties of a population. In inferential analysis, the aim is to draw conclusions about the community based on studies of the samples. Structural equation modeling (SEM) is a multivariate statistical tool for evaluating hypotheses regarding the effects of sets of variables on other variables [35]. Hypotheses can include observable and latent variables that have correlational and regression-like relationships. The adequacy of such hypotheses is assessed by modeling the observed variables' mean and covariance structures [36]. Therefore, in inferential statistics, Spearman correlation coefficient, Mann–Whitney, Kruskal–Wallis, multivariate stepwise regression, and SEM were used to estimate the model. The stepwise method is one of the multivariate stepwise regression methods that the variable with the greatest influence enters the equation by comparing all the independent variables; this procedure is continued until no variable can enter the multivariate stepwise regression equation. Accordingly, multivariate stepwise regression has been used to identify the variables that have the greatest impact on the dependent variable and to enter the path analysis. To estimate a structural model, a robust general regression analysis technique was needed to test a set of variables in the form of a linear regression equation. In fact, the development of factor analysis was needed to model structural equations. This method is a combination of regression, path analysis, and confirmatory factor analysis. In this method, there were two groups of variables, including latent variables and observed or explicit variables. The latent variables were not directly observable and was measured through the observed variables. Using SEM, two structural and measurement models have been studied simultaneously. The measurement model or confirmatory factor analysis defined how latent variables or hypothetical structures were measured in terms of a number of observable variables. The

SEM function identified causal relationships between latent variables. In other words, the measurement model answered the questions about the validity and reliability of the observed variables, and the SEM answered the questions about the strength or intensity of causal relationships between latent variables and the amount of variance explained throughout the model.

Stratified sampling with proportional distribution was the sampling approach in this analysis. The statistical population included all female rice farmers (N = 1677) who cultivate rice in Sari. The study's sample size was determined using Cochran's formula. To calculate Cochran's formula, it is necessary to estimate the variance. Therefore, an initial questionnaire was completed by 30 female paddy farmers in Ghaemshahr. These people were selected among the women facilitators introduced by the Agriculture Department in Ghaemshahr. All these people had been cultivating rice. Ghaemshahr City has similar conditions in rice cultivation due to its short distance from Sari in terms of geographical and physiological conditions of the region.

$$d = ts/\frac{n}{1 + (n - 1)/N} \quad (1)$$

n = the sample size,
N = the total community size,
s = the highest standard deviation obtained through the preliminary test,
t = the value f, female's, t with 95% confidence or 5% error (t = 1.96), and
d = half distance between confidence limits (optimal probable accuracy).

By substituting the symbols in the formula, the minimum acceptable sample (n = 237) was obtained. Finally, a total of 240 individuals were selected and studied.

The results of descriptive statistics showed that, among the female rice farmers, the youngest was 25 years old, the oldest was 67 years old, and they were 44 years old on average. The marital status of the subjects showed that, out of 240 female rice farmers, 217 (90.4%) were married, and 23 (9.4%) were single. The lowest number of dependents of female rice farmers in Sari was one, and the highest was four. With regard to the standard of education, about one-fourth of the women (25.8%) had the highest frequency of secondary education. In terms of main occupation, about 68.8% of the subjects were rice farmers with the highest frequency. The minimum work record of female rice farmers was 3 years, and the maximum was 40 years. The lowest area under rice cultivation in this study was about 0.5 hectares, and the highest area under rice cultivation was 5 hectares. The lowest annual yield of rice was equal to 1.5 tons per hectare, the maximum was 10 tons per hectare, and the average annual yield of rice was 4.79 tons per hectare. Considering the type of ownership, about 87.9% of the subjects had personal ownership with the highest frequency. It should be noted that the situation of mechanized cultivation in recent years in the study area has grown relatively well, but still, the use of agricultural machinery for planting, holding, and harvesting rice by women is still a limitation. Since women are often unfamiliar with these tools and, even in the case of land ownership, they need the help of men during mechanized cultivation. Unfortunately, the situation of training in the use of these devices for women is limited and needs serious attention.

3.3. Survey Instrument

A quantitative questionnaire was created as the primary testing instrument to address the research questions and to meet the study's objectives, and data was collected using this self-designed questionnaire (the questionnaire can be found as a Supplementary Material). The viability of the questionnaire was determined using the opinions and recommendations of the study counselor and supervisor, as well as researchers and professionals from the Mazandaran Province Agricultural experts. Afterwards, it was ensured that the questions asked in the questionnaire are of the required quality and can estimate the characteristics of this study. To evaluate the validity of the questions, 30 copies of the questionnaires were completed by female rice farmers in Ghaemshahr. The CR was evaluated, and the

results of Cronbach's alpha coefficient for the questionnaire was 0.870, and the results of sequential theta and combined reliability were 0.894 and 0.83, respectively. The results of the Cronbach's alpha coefficient, sequential theta, and combined reliability of different sections of the questionnaire are given in Table 1.

Table 1. Results from Cronbach's alpha, sequential theta, and combined reliability.

Item	Cronbach's Alpha	Sequential Theta	Combined Reliability
Nursery construction operations	0.866	0.878	0.856
Rice planting operations	0.918	0.916	0.855
Rice storage operations	0.895	0.904	0.739
Rice harvesting operations	0.827	0.848	0.836
Rice storage operations	0.797	0.895	0.768
Extension training method	0.868	0.918	0/898
Economic factors	0.916	0.916	0.925
Social factors	0.876	0.884	0.763

Source: Research findings.

It should be noted that communication is sometimes relatively difficult in rural communities. As a result, the first author, who has worked as a rural women expert for many years, stressed the objective of this study by hosting a workshop for rural women assistants and facilitators in order to address this problem. Then, with the help of these helpers, she went to the houses or farms of these female paddy farmers to complete the questionnaires.

3.4. Goodness of Fit

Although various types of tests, commonly referred to as fitting indexes, are constantly being compared and developed, and there is still no general agreement on an optimal test. Therefore, in this study, to determine the degree of fit of the model, the following fit criteria have been used.

- Goodness of Fit Index (GFI): A value close to 0.95 reflects a good fit.
- Adjusted GFI (AGFI): The modified value for a given degree of freedom, with 0.95, indicates a favorable fit.
- Root Mean Square Error of Approximation (RMSEA): A value of less than 0.05 indicates a good fit. Models with an RMSEA of 0.1 or higher have a poor fit.
- Comparative Fit Index (CFI): It must be at least 0.9 to accept the model.
- Non-Normed Fit Index (NNFI): The model's goodness of fit acceptance range is determined by the NNFI above 0.95.
- Normed Fit Index (NFI): It should be above 0.9 to confirm the model fitness.

4. Results

In this study, the training needs assessment of rice farmers in Sari were assessed by measuring the variables of social characteristics, personal characteristics, economic characteristics, professional educational characteristics, promotional educational extension, source of information, and job properties.

Personal characteristics include age, level of education, area under cultivation, and type of cultivar used. Economic characteristics include performance, selling price of product, cost of the whole process from production to consumption, source of ancillary income, and use of seasonal workers. Social characteristics comprise of examining issues and problems, examining family characteristics, using people's opinions in rural development projects, the extent of people's access to the city, and their relationship with experts from the Agriculture Organization. The sources of information include radio, television, newspapers, promotional publications, educational booklets, educational videos, books, magazines, and

testing and research centers and stations. The educational-promotional features include factors affecting the improvement of rice cultivation, innovations and their benefits, participation in classes and educational-promotional activities, and the amount of contact with extension agents. The academic and professional characteristics include the level of education, relationship of field of study with profession, level of experience, and type of field of study. The job characteristics include the type of job, the degree of relationship between the job and the field of study, the degree of relationship between the job and the agricultural profession, and the history of agriculture. In this study, after collecting and categorizing the data, two methods of descriptive and inferential statistics were used to analyze the data.

The descriptive statistics method was used to categorize the subjects in terms of different traits and to describe the characteristics of the statistical population using the frequency distribution table, frequency percentage, cumulative percentage, mean, mode, standard deviation, and minimum and maximum. In the inferential analysis, the aim was to draw conclusions about the community based on studies of the samples. Spearman correlation coefficient, Mann–Whitney test, Kruskal–Wallis test, and multivariate stepwise regression were used in inferential statistics. A correlation coefficient was used when variables were used as rank measures instead of distance or relative measures. The basis of Mann–Whitney test is to rank variables. This test is used when the statistical data are ranked and when a comparison of two means of two different propositions are involved. The Kruskal–Wallis test is used when the number of groups compared is more than two and when the variables are ranked. The multivariate stepwise regression method is used to investigate the collective effect of independent research variables on dependent variables. The main importance of multivariate stepwise regression is in explaining the simultaneous use of relationships and effects of independent variables with the dependent variable.

4.1. Results of Spearman Correlation Coefficient

The results of Spearman test between the rice cultivation area of rice farmers and their training needs assessment (r = 0.195 and sig = 0.002) showed that there is a statistically positive and significant link between these two variables with a confidence level of 99% and an error level of less than 0.01. The results of the correlation coefficient between the two variables of income and the amount of training needs assessment of rice farmers (r = −0.218 and sig = 0.001) showed that, with 99% confidence and an error level of less than 0.01, there is a significant but negative relationship between these two variables. The results of the correlation coefficient between the two variables of access to urban areas and the training needs assessment of rice farmers (r = 0.173 and sig = 0.007) presented that there was a positive and significant link between these two variables with a confidence level of 99% and an error level of less than 0.01. Therefore, the research hypothesis was confirmed with 95% confidence, and the null hypothesis was rejected. The calculation of the correlation coefficient between the two variables of social characteristics and the amount of training needs assessment of female rice farmers (r = −0.443 and sig = 0.00) indicated that there is a negative but significant relationship between these two factors. This relationship is confirmed with 99% confidence, and error level less than 0.01. The calculation of the correlation coefficient between the two variables of the difficulty of economic factors and the level of training needs assessment of female rice farmers (r = −0.044 and sig = 0.046) indicated that there is a statistically positive and significant link between these two variables with a confidence level of 99% and an error level of less than 0.01. The calculation of the correlation coefficient between the two variables of the importance of economic factors and the level of training needs assessment of rice farmers (r = 0.288 and sig = 0.00) showed that there is a positive and significant link between these variables at the level of less than 0.01 error and 99% confidence. The existence of the relationship was confirmed, and the null hypothesis was rejected. The calculation of the correlation coefficient between the two variables of the number of times of participation in training courses and the training needs assessment of rice farmers (r = −0.373 and sig = 0.00) revealed that with 99% confidence

and an error level of less than 0.01, there is a significant but negative relationship between these two variables (Table 2).

Table 2. Results of the Spearman correlation coefficient.

Independent Variable	Dependent Variable	r	Significance
Age	Training need assessment	0.015	0.814
number of dependents		0.275	0.059
Experience in rice cultivation		−0.109	0.093
Area under rice cultivation		0.195	0.002 **
Annual rice yield		−0.094	0.147
Income from rice cultivation		−0.218	0.001 **
Access to urban areas		0.173	0.007 **
Social characteristics		−0.443	0.00 **
The extent of the problem in economic factors		−0.044	0.046 *
The importance of economic factors		0.288	0.00 **
Number of times of participation in training courses		−0.373	0.00 **

*: Significance at the level of 5% error. **: Significance at the level of 1% error. Source: Research findings.

4.2. Kruskal–Wallis Test Findings

The Kruskal–Wallis test results indicate that the type of main occupation, type of arable land ownership, and level of education affect the training needs assessment of female rice farmers but that not participating in training courses does not affect the training needs of female rice farmers (Table 3).

Table 3. Results of the Kruskal–Wallis test.

Dependent Variable	Independent Variable	Significance	Chi-Square	DF = k − 1
Training needs assessment	Type of main occupation	0.02	11.649	4
	Type of arable land ownership	0.0441	3.748	4
	Level of education	0.009	13.485	4
	Not participating in training courses	0.312	5.939	5

Source: Research findings.

4.3. Mann–Whitney Research findings

The Mann–Whitney test results (Table 4) showed that there was a considerable gap among the degree of evaluation of the training needs of female rice farmers and cooperatives in the area, marital status, use of support facilities, membership in cooperatives, participation or nonparticipation in the training course, and willingness or unwillingness to form a training course. However, the findings showed that there was no important difference among the estimation of the training needs of rice farmers and the existence of women's fund in the region, the existence of women's organizations in the region, and formation whether there is no training course.

Table 4. Results of the Mann–Whitney test.

Dependent Variable	Independent Variable	Significance	Z	U
Training needs assessment	Cooperatives in the region	0.003	−2.949	1082
	Marital status	0.037	−2.087	1835
	Use of support facilities	0.034	−0.954	5069
	Membership in cooperatives	0.064	−1.852	7200
	The existence of women's fund in the region	0.766	−0.298	6363
	The existence of women's organizations in the region	0.999	−0.001	6580
	There is no training course	0.182	−1.333	6360
	Participation or non-participation in the training course	0.028	−2.199	3360
	Willingness or unwillingness to form a training course	0.011	−2.544	4370

Source: Research findings.

4.4. Multivariate Stepwise Regression Line Equation

In the present study, using a step-by-step method, four variables, which were mentioned in the following sections, were entered into the multivariate stepwise regression equation.

4.4.1. Step One

At this stage, the first variable that entered the equation was X_1, (i.e., the participation rate (social characteristics) of rice farmers), which means that this variable had the greatest effect, the correlation coefficient was R = 0.484, the coefficient of determination was R = 0.234, the adjusted coefficient of calculation was calculated to be R = 0.225, and the significance level was 0.000. Observing the obtained coefficient of determination, it can be stated that about 23% of the changes in the dependent variable were due to the X_1 variables (Table 4).

4.4.2. Step Two

At this step, after the X_1 variable, the X_2 variable, (i.e., the importance of economic factors) was entered into the equation. In addition, the value of F from the analysis of variance was F = 24.815, which was significant at the 0.000 sig level. Observing the obtained coefficient of determination, it can be stated that about 36% of the changes in the dependent variable were due to the variables of X_1 and X_2 (Table 4).

4.4.3. Step Three

At this stage, after entering the variables of participation rate (social characteristics) of rice farmers and the importance of economic factors in the third step, the variable of the number of training courses (X_3) was entered in the multivariate stepwise regression equation with a correlation coefficient of R = 0.654 and a coefficient of determination of 0.427, R = 0.0, and the adjusted coefficient was calculated to be R = 0.407. Furthermore, the value of F obtained was F = 21.396, which was significant at the level of less than 0.001 and sig = 0.000. Observing the obtained coefficient of determination, it can be stated that about 42% of the changes in the dependent variable was due to the variables of X_1, X_2, and X_3 (Table 4).

4.4.4. Step Four

At this stage, after entering the variables of participation rate (social characteristics), the importance of the economic factors, and the range of educational courses, the variable of marital status of female rice farmers, (i.e., X_4) were entered into the multivariate stepwise regression equation with a correlation coefficient of R = 0.675 and a coefficient of determination equal to R = 0.456, and the adjusted coefficient was calculated to be R = 0.430. Furthermore, the value of F was equal to F = 17.791, which was significant at the level of

less than one thousandth (Sig = 0.000). Observing the obtained coefficient of determination, it can be stated that about 52% of the changes in the dependent variable were due to the variables of X_1, X_2, X_3, and X_4 (Table 5).

Table 5. Multivariate stepwise regression in relation to the effect of independent variables on the amount of training needs assessment of female rice farmers.

Step	Variables Entered into Regression	Coefficient b	R^2	Adjusted R^2	F	sig	B	β
Step one	Participation rate	−1.596	0.484	0.225	26.911 **	0.000	−1.480	−0.449
Step two	Participation rate The importance of economic factors	−1.815 1.421	0.363	0.349	24.815 **	0.000	1.569	0.403
Step three	Participation rate The importance of economic factors Number of training courses	−1.504 1.647 3.379	0.427	0.407	21.396 **	0.000	−0.386	−0.285
Step four	Participation rate The importance of economic factors Number of training courses Marital status of rice farmers	−1.480 1.569 −0.386 −0.809	0.456	0.430	17.791 **	0.000	−1.809	−0.175
Constant							4.859	

** = Significance at 1% error level; Source: Research findings.

According to the coefficients of the table above, the multivariate stepwise regression line equation in step four is "$Y = -1.480\ X_1 + 1.569\ X_2 - 0.386\ X_3 - 1.809\ X_4 + 4.859$", and its standardized equation is "$Y = -0.449\ X_1 + 0.403\ X_2 - 0.285\ X_3 - 0.175\ X_4$".

4.4.5. Results of the Study of Paths

The findings of the factor path study indicate that the degree of involvement (social characteristics) had the greatest effect on the estimation of the training needs of female rice farmers among the factors analyzed (Table 6). Based on the path analysis results, the model for assessing the training needs of female rice farmers in Sari is shown in Figure 3.

Table 6. Direct, indirect, and total effects in analyzing the training needs assessment of female rice farmers.

Path Analysis	Direct Effect	Indirect Effect	General Effect
Participation in training needs	−0.488	-	−0.488
The importance of economic factors in training needs	0.369	-	0.369
The number of training courses in training needs	−0.284	−0.18	−0.464
The marital status in training needs	−0.179	-	−0.179

Source: Research findings.

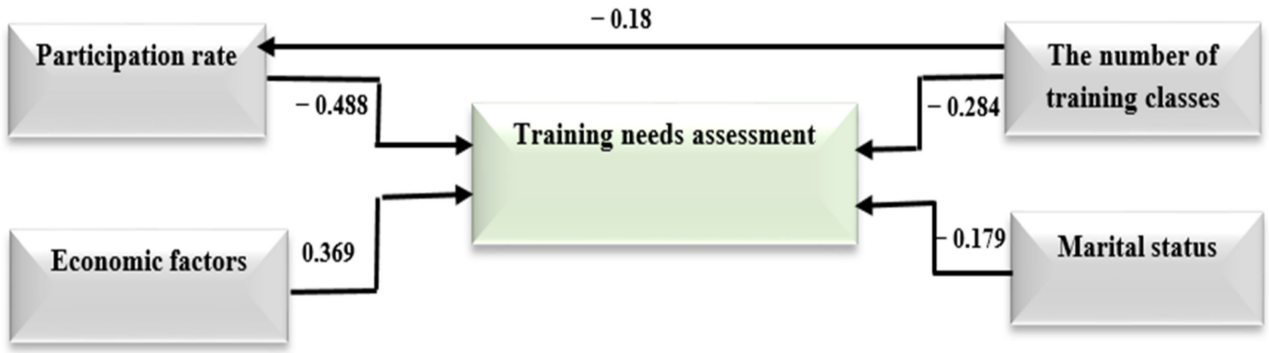

Figure 3. The training needs assessment model of female rice farmers.

As shown in Figure 3, the level of participation (social characteristics) of female rice farmers and the importance of economic factors were the most important and influential

variables in estimating the training needs assessment. In this regard, the most important indicators of the latent trait of dependent variable (educational needs) that had the highest value in the structural equation include knowledge of cultivars compatible with the region, familiarity with land preparation for planting, and familiarity with the correct method of planting in the main land. The results also show that the variables of familiarity with the criteria for selecting suitable cultivars, methods of storage and protection of seedlings in the main land, knowledge of how to combat rice diseases, knowledge of common rice pests in the region, knowledge of how to combat these pests, familiarity with ways to prevent crop wastage, and identifying common rice pests and diseases affect the educational needs of rice farmers.

The most important indicators of the hidden variable of participation rate (social characteristics) of female rice farmers that affected the dependent variable (educational need) were the participation rate in treasury preparation, participation in transferring seedlings to the main land, and participation in rice harvesting. The most important indicators of the hidden variable of the importance of economic factors that affect the dependent variable were the fulfillment of commitments by the government in purchasing rice, preparing the government to provide the required inputs for rice, and providing the required inputs.

4.4.6. Determining Model Goodness of Fit

As the fit characteristics of Table 7 show, the mean root square index of the estimation error (RMSEA) is 0.029, indicating the optimal fit of the model. Another criterion for the model of fit is the approximate high fit index goodness (GFI), which is equal to 0.080, and adjusted fit index goodness (AGFI), which is equal to 0.79 and is another confirmation of the appropriate fit index of the model. In addition, the value of CFI is equal to 1.00 and that of NFI is equal to 0.90, which is another confirmation for the optimal fit of this model. The closer the root mean square index (RMR) for a model is to zero, the better the goodness of fit of the model, which is also desirable in terms of this criterion.

Table 7. Fitness indicators of training needs assessment of female rice farmers.

RMSEA	NFI	CFI	GFI	AGFI	RMR	P	df	Indicator
0.029	0.90	1.00	0.80	0.79	0.13	0.000	1267	Amounts

Source: Research findings.

5. Discussion

In the present era, due to the rapid and comprehensive growth of human knowledge, most jobs and professions, including agricultural profession, are becoming more and more knowledge-intensive and complex. Therefore, agricultural farmers face various needs for their career success. Technical job skills and a general understanding of agriculture are among those needs but not exclusively, because new training needs that must be met are emerging every day. The assessment of training needs is a systematic process to set objectives and to identify differences and priorities for planning. In other words, in order to achieve development goals among rural communities, it is necessary to identify and focus on the training needs of villagers. Therefore, need is the foundation of educational planning, and in order to formulate the desired goals in educational planning, we must first examine the needs. Researching and identification of weaknesses have not reached the desired level in individuals. Accordingly, the general purpose of the present study was to investigate and identify female rice farmers' training needs in Sari. The correlation coefficient results showed that there was no significant relationship between age, number of dependents, experience in rice cultivation and annual rice yield, and training needs of female rice farmers. This means that the training needs of female paddy farmers will not change with increase or decrease in age, number of dependents, work experience, and rice

yield. These findings are in line with the findings of the studies by Hashemi et al. [37] and Kataike et al. [38].

According to the results, the level of training needs of female rice farmers has a positive and significant relationship with the level of cultivation, access to urban areas, and the importance of economic factors. This means that, with the increase of each of these factors, the amount of training needs of women will increase. These findings are confirmed by the findings of Rokonuzzaman [39] and Olorunfemi et al. [40]. They found that the higher the area under cultivation, income, access to urban areas, and the level of participation of farmers, the greater the need to participate in training courses. In addition, based on these results, it can be said that the training needs of women rice farmers have a significant but negative relationship with income, social characteristics, difficulty of economic factors, and the number of participants in training courses. This means that, with declining incomes, reduced access to economic factors, and a lack of training courses, the need for extension training among female rice farmers will increase. As increasing the area under cultivation leads to an increase in farmers' incomes, they need more training in the various stages of planting, holding, and harvesting crops so that they can have more yields while incurring lower costs. Proximity to urban centers, on the other hand, encourages farmers to learn and use newer technologies due to increased demand, better markets, and ultimately higher incomes. This indicates an increase in farmers' desire for being trained. The results on the difference between the average training needs of female rice farmers in terms of the type of main job indicated that, in terms of the key work, there was a major gap between the training needs of rice farmers. According to this result, it can be inferred that the need for training is higher among women whose main occupation is rice cultivation. Therefore, training needs assessment by an agricultural agent is necessary before launching training-extension courses. The research conducted by Olorunfemi et al. [40] showed that the main job had no effect on the amount of training needs, but the study conducted by Kataike et al. [38] showed that the main job had an effect on the number of training needs, which was also approved in the present study. A study by Man et al. [24] found that the primary form of work has a favorable and important impact on agricultural extension agents' training needs. According to the findings, there was a significant difference between their training needs in terms of the type of ownership. This means that the need for training is directly related to the main ownership of arable land. That is because the people who are the main owners of their paddy lands will be more motivated to increase yields and earn more, while the tenants of the agricultural lands are less inclined to acquire more and newer knowledge and skills due to their division of income with another person (the original owners).

The findings of the Kruskal–Wallis test on the disparity between the average education-related training needs of female rice farmers revealed that there was a substantial difference between their education-related training needs. They were taken into consideration. The analysis of the average training needs of female rice farmers in terms of nonparticipation in training courses showed that there was no significant difference between their training needs in terms of education. In their study, Mohamed et al. [41] showed that the level of education affects the training needs of individuals. That is, the number of training needs of people decreases with the increase in their level of education. In other words, people with lower education need more training.

The results of the Mann–Whitney test on the difference between the average training needs of female rice farmers in terms of marital status revealed that there was a considerable gap between married and single women in terms of educational and extension needs. Studies conducted by Man et al. [24] confirmed the mentioned results. These results showed that single people are more inclined to learn about their agricultural activities due to their having more time. Married women, on the other hand, will have less opportunity for training due to their role as wives and mothers.

The results showed that the use of support facilities will play an important role in the training needs of women rice farmers. This means that the training needs of individuals

will be related to the type of support they will receive from the public sector. In addition, membership in agricultural cooperatives does not play an important role in the training and extension needs of women. A study by Abiola [42] confirmed these findings. Unfortunately, today, despite the transfer of part of the agricultural activities to the private sector, farmers are practically dissatisfied with the educational extension and agricultural services provided. Therefore, membership or non-membership in agricultural cooperatives will not have an effect on solving their educational problems. In fact, the existence of these organizations has no effect on meeting the training needs of women, while rural women have often expressed a desire to participate in training courses. This shows the inefficiency of rural women's organizations in the agricultural sector. The studies by Idiku [43] and Olorunfemi et al. [40] also confirmed the above results.

The results of multivariate stepwise regression on the effects of independent research variables on the training needs of female rice farmers in Sari revealed that the variables of social factors, number of training courses, and marital status, respectively, had an inverse impact on training needs. This result did not confirm the findings of Jasim et al. [44]. They found that there was an essential correlation among training criteria and marital status and the number of training courses attended.

On the other hand, the variable of the importance of the economic factors had a positive impact on the level of training needs. The results of the analysis by Rahman et al. [45] agreed with these findings. According to the research results of the path analysis, participation (social characteristics) had the greatest impact on training needs. According to this result, the more social characteristics, the less the need for education. This result is consistent with the findings of the study by Sajeev et al. [46], which showed that increasing the participation of rural women had an effect on their educational empowerment. In other words, the extent of their training needs declined with the increase in participation. The importance of economic factors from rice farmers' point of view in Sari had an effect on training needs. As mentioned by Vennila et al. [47], economic conditions had a positive and important impact on the criteria for the training needs of farmers to develop agricultural activities. The number of training courses affected the training needs. That is, the fewer these courses were, the greater their educational need would be. Marriage of female rice farmers had a negative effect on training needs. These results are consistent with the findings of the study by Man et al. [24].

6. Conclusions

This study concluded that rural women in the study region required training in a variety of production (on- and off-farm) activities. Such training would have to be focused on raising awareness, enhancing indigenous traditional skills, and converting them to more scientific ones in order to raise output, reduce drudgery, and boost sale profit margins.

According to the findings, a comprehensive program of study should be undertaken to identify suitable needs for the production of strategic crops such as rice in the study area. In addition, agricultural agents should prepare a training program focused on the needs of farmers. Otherwise, no positive effects would occur in increasing the crop yield and improving farmers' livelihoods. Not-so-good training should be replaced with training based on new information and experiences. Additionally, the planning and design of training programs for farmers should focus on interconnected agricultural systems and technology.

For growers, both detailed and intensive hands-on training programs should be stressed by careful consideration of their training needs. Farmers should have regular contact with agricultural extension agents to benefit from the new techniques and knowledge for crop processing. As a result, the Agricultural Organization should offer training workshops, such as farm days, model sites, and research-extension programs in various places, to address the educational requirements of farmers. Due to advancements in rice cultivation technology, there is a great need to teach producers in order to keep them informed about new technologies that might help them increase their productivity and

profitability. According to the findings of this study, in order to meet the training needs of female rice farmers in Sari, the Agriculture Department's agricultural policies must aim to empower rice farmers technically by training them using both traditional (i.e., demonstration plots) and technology-led approaches (i.e., Information Communication Technologies (ICTs), social media, and electronic media). It is vital to consider farmers' demands in production systems while creating policies and programs for agricultural development in developing nations. This method can be used as a guide to any technical assistance, such as identifying possible areas of intervention to assist program and project implementers in achieving the set goal(s) and gaining support from policymakers, the government, and international donor agencies, to lead to improved and sustainable agriculture. Therefore, it is suggested that future studies focus on developing farmers' awareness and attitudes about their training needs based on the current technologies and behavioral patterns.

By examining the training needs assessment and challenges of female rice farmers, this analysis is related to knowledge of the expectations of an agricultural audience about the learning, education, instruction, and distribution of information. The extension service will develop programs that address the needs of its small-farm clientele with this knowledge and design programs that can assist small-scale farmers in resolving or handling the difficulties they face. This study only explores the training needs of northern Iranian rice farmers, and the results are confined to this region. This is one of the limitations of this study when applying the findings of this study to other products and countries. Therefore, conducting studies on the educational needs of farmers with a variety of samples of agricultural products in other regions can be a good research study in the future that will confirm the validity of these findings for use across countries. It is also suggested that the educational and extension needs of rice farmers from the perspective of Agricultural Jihad promoters and experts assess the effectiveness of training courses for rice farmers.

The implication for rural development is that the empowerment of women farmers through adequate training in all activities is a predisposing factor in sustainable livelihood and consequent participation in rural development. Therefore, the results of this study can be a base for planning future interventions in the agricultural training area and better planning for agricultural extension programs, and it can be further developed in the future. This study might be used as an example to be followed for developing a training approach for female farmers' needs in other regions of Iran and, also, other parts of the world, especially in developing countries where women farmers are mostly captivated by the culture of patriarchy, and despite much effort (in the field of housekeeping and agriculture), they are often marginalized, and their training needs are ignored.

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