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The Investigation and Analysis of the Required Management Skills in Using Pesticides in Farms (A Case Study in West Azerbaijan Province)

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ABSTRACT: The present study was conducted with the aim of investigating and analyzing the management skills in using pesticides in farmlands. This research was a qualitative one due to the description of the research variables. Also, regarding the data collection procedure, it was a fieldwork research. The sample of this study involved all of the staffs of Agriculture Organization in West Azerbaijan Province (N= 1900). The number of the subjects of the sample was calculated to 320 through Cochran formula. A questionnaire, whose validity was confirmed by some experts in the field and the professors, was used to collect the data. The credibility of the questionnaire was calculated 0.89% through the calculation of Cronbachalpha. According to the results of the statistical analysis, it was revealed that factors (the skills of using methods and technologies of organic agriculture, informing skills, farming skills, and production skills) involved 51.46% of the total variance and played crucial roles in using pesticides in the farmlands of West Azerbaijan Province. Among these factors, the factor of using methods and technologies of organic agriculture involved 12.44% of the total variance and played a more important role in using the pesticides in the farmlands of West Azerbaijan Province.

Key words: Factorial analysis, pesticides, skills, West Azerbaijan Province

INTRODUCTION

Nowadays, the world has faced with the problem of population growth. One of the consequences of this problem is food shortage. The supply of the food of this growing population is related to the agriculture sector. The growth of population has caused uncontrolled entry of chemical fertilizers, pesticides, hormone products, and other dangerous factors to the environment so that this sector can respond the growing demand for food. However, this increase in the production has always had various environmental and social problems such as the pollution of water source, the continuation of the economic forces on the farmers, and lack of trust in the existence of appropriate markets. Thus, over the recent decades, due to the growing worries about the food quality, food health, people's health, and the destruction of the natural resources, sustainable agriculture has been attended (Pour Atashi and Shabanali, 2009).

Over the centuries, agriculture has changed very much and humans have been the most important factor of this change. During the recent centuries, because of the population growth, humans' early view about the nature, which was a friendly one, was replaced with a unilateral interaction and anti-nature point of view. In this way, fertilizers, pesticides, hormone products, etc. entered the agriculture and with the aid of improved varieties, great changes occurred in the increase of the production of agricultural products to respond to the increasing demand for food (Jafari, 2004). However, this increase in the production of caused some problems for producers and consumers which needs to be considered. Some of the examples of the bad effects of the use of chemicals are the reduction in the variety of living creatures and the extinction of many animal and plant species, the compilation of harmful materials in the environment, and the suffering of people from some illnesses. For instance, according to the estimations of World Health Organization (WHO), at least three million farm workers are poisoned per year and about 20,000 of them die (Malakouti, 1999). The effect was so bad that due to the concern about the environmental problems, the modern agriculture systems have been very much criticized (Rodriguez, *et al.* 2003). As a result of this, a global consensus has been created to develop a kind of agriculture which is able to increase the productivity, while it has the least harm to the environment (Bagheri, *et al.* 2008). Therefore, offering some strategies like organic agriculture, human tried to stop this disastrous process.

The organic agriculture is a system of agricultural products in which fertilizers, pesticides, hormones, and artificial chemical additives are not used. In this system, in order to enhance the fertility of the soil, control of the pests, illnesses, and weeds are done by non-chemical methods such as crop rotation, green manure, biologic fight (and other non-chemical controlling methods of the pests, illnesses, and weeds), compost, etc. are used (Jafari, *et al.* 2007).

Due to having 887187 hectares of farmlands, West Azerbaijan Province has the noticeable rank of fifth in the country. In average, about 1000 tons of agricultural poisons are yearly used to poison these farmlands (statistical yearbook of west Azerbaijan province, 2012).

Considering that every year spring cultivation and, in recent years, kitchen garden and vegetables (melon, watermelon, tomato, cucumber…) are widely cultivated personally and impersonally and everybody is trying to gain a huge benefit in a short time form the activities on their products, especially in rental farms, do not avoid using more of any materials, particularly, fertilizers and different types of chemical poisons. It can be argued that there are probably a few farmers who don't use the poisons because of the financial problems. They use them abundantly in spring and summer from ground and air in their gardens and farmlands. Most of the farmers do this without being aware of its bad effects on the environment and humans who try to stay healthy (Jafari, *et al.* 2007).

Din Panah and Akhavan (2014) investigated and analyzed the effective factors on the organic knowledge among greenhouse keepers of Varamin city. Their findings revealed that the organic agricultural knowledge of 13.3 % of the respondents was low, 44.2% was average, and % 42.5 was high. Also, the ecologic state, social participation, and the visibility of the innovations of the organic agriculture elaborated 70.8% changes in the organic agriculture knowledge.

Rjabi *et al.* (2013) conducted a study to investigate the factors of the acceptance of the organic agriculture products from consumers' point of view (a case study in Karaj). The results of the study showed that people's knowledge and information about the organic products is almost average. Besides, people's point of view about organic products is average and favorable. Finally, using the factorial analysis, four factors were recognized as the effective factors in the acceptance of the organic products. These factors were informing and educating, improving access, improving the qualities of the product, and providing the supportive facilities which involved 26.60%, 23.61%, 9.41%, and 8.8% of the total variance (68.42%)(Rajabi *et al.* 2013).

Moradi and Najaf Abadi (2013) in a study entitled as the recognition of the necessities of applying the integrative pest management (IPM) in garden products from experts' point of view found that the requirements of applying integrative pest management are divided into five factors through factorial analysis. The factors involved educational-promotional, economic planning, policymaking, technical supervision and planning. These factors involve %66 of the total variance of the variables (Moradi and Najaf Abadi, 2013).

Eskandarzadeh *et al.* (2013) carried out a research to study the importance of the essential management skills required for applying precise agriculture in the process of stable development in west Azerbaijan province. One of the results of this study showed meaningful mean differences between the skills in alpha level of 0.01. Moreover, the results of the factorial analysis revealed that the accounting skills, farming skills, the skill of recognizing variability, the information-seeking skills, goal determining and decision making skills, economic skills of using agricultural machinery, technical skills of using agricultural machinery involved 61.27% of the essential skills for precise agriculture in the process of sustainable agriculture development. Among these, accounting skills comprised 23.91% of the total variance (Eskandarzadeh *et al.* 2013).

Ghadimi *et al.* (2012) conducted a study to investigate the effective factors on the farmers' view toward organic agriculture. They found that most of the farmers (49%) in this study had a positive view to organic agriculture. The results of the comparison of the means showed that there were significant differences in the levels of one and five percent between the farmers' point of view toward organic and independent variables like education, participation in promotional classes related to organic agriculture and method of cultivation. Besides, the results of step-by-step multi-regression indicated that, among the variables of the study, four variables, i.e. familiarity with organic agriculture and the negative consequences of the common agriculture, participation in promotional classes related to organic agriculture, education, and the application of the methods and techniques of organic agriculture comprised 42% of the variance changes in the farmers' point of view to organic agriculture (Ghadimi, *et al.* 2013).

Parvin (2011) found that factors such as education, training about pest management, access to regular information, promotional services, and credits are the prerequisites for the farmers' understanding about the ecological dangers resulting from the wide use of the pesticides. Training in farms under the supervision of the promoters along with credit facilities was effective in reducing the use of pesticides.

The increase in the education of the farmers in IPM, the farmers' inputs, the local communities, and employment of the traditional agricultural operations, the fear resulted from the use of pesticides, the quality of the rice production, and safety improve the farmers' lives (Parvin, 2011).

Rains *et al.* (2011) conducted a study on the shift of the direction of technology to support the sustainable management methods in farms. They reported that although agricultural technologies have considerably increased the agricultural production, they have decreased the investment return and are against the environmental concerns. In current methods, intensive operations are conducted in farms. The common technologies and their uses such as product growing and management methods concentrate on monoculture systems which are dependent on chemical inputs fro favorable production. The amount of benefits in the common unstable methods is low or inaccessible and if a family is making a living in the farm, this method must be changes. Rains and his colleagues, through this introduction, offered an ecological approach on the basis of farm management which tries to decrease the dependence on chemical inputs through a better use of the various natural qualities within the agricultural systems. In this method, there is a need for changing directions in developing and using current and appearing technologies. Instances of these certificates in research programs and the development of pest management methods consider genetic engineering and precise agriculture necessary for providing more services of environment and based on the sustainable agriculture approach (Rains *et al.* 2011).

Mahantesh and Singh (2009) stated that % 41 of the farmers were aware of the dangers of using pesticides. The environmental awareness and the possibility of expansion of pest management strategy can be possible by biological pesticides and positive view toward organic agriculture (Mahantash and Singh, 2009).

Therefore, the present study aimed at investigating the necessary management skills in using poisons and fertilizers in farmlands so that reliable findings for achieving sustainable development can be provided.

The purpose of the study

The general-purpose of the study was to investigate and analyze the essential management skills in using pesticides in farmlands (a case study of west Azerbaijan province). The specific aims of this research were:

1. The recognition of the required skills for using pesticides
2. The investigation of the farming skills required for using pesticides
3. The investigation of the educational skills required for using pesticides

METHOD

Regarding the purpose of the study, this study was an applied research. Also, considering the amount and degree of control of the variables, it was a non-experimental study. Besides, considering the data analysis, the study was descriptive, correlation study. In order to collect the data, in the fieldwork stage, a questionnaire was used as the main means of the data collection. To measure its validity, the necessary amendments were made after getting the professors and experts' opinions. Also, in order to measure the reliability of the questionnaire, thirty questionnaires were completed by the experts and Cronbach alpha coefficient (…= 0.89) was calculated. The sample of this research involved the experts of Agriculture Jahad Organization of west Azerbaijan province who were about 1900 staffs. The number of the sample was computed 320 through Cochran formula. The collected data through the questionnaires was analyzed by SPSS version 15. In the descriptive statistical section, distribution, percentage, and mean were used. In the inferential statistics, factorial analysis method was employed.

RESULTS

A. The personal and professional characteristics of the experts

The description of the age of the sample of the study showed that the mean of the age of the participants was 34, and the maximum age was 55 and the minimum age was 24. The majority of the participants were men (73%) and the rest (27%) were women. Regarding their job experience, the mean of the work experience of the participants was eight years. Most of the participants, 74 subjects (37%), had the job experience of less than five years. Considering their educational level, there were 161 B.Sc., 36 M.Sc, and 1 PhD. 63% of the participants were gradates of field of agriculture and horticulture whose 75.4% had participated in educational-promotional courses in using pesticides. Moreover, regarding their relationship with the researchers of agriculture sector in using pesticides, the highest amount was 56% in high level, 34.5% in average level, and 5.5% in low level. The main goal of using factorial analysis is to reduce the value of the data and to determine the most important effective variables in the formation of the phenomena. For this reason, factorial analysis method was used in this study to classify the variables and have a better understanding of them.

Table 1: The personal characteristics of the participants.

The distribution of the subjects' educational group					
Group	**Distribution**	**Percentage**			
B.Sc.	**161**	**81.3**			
M.Sc.	**36**	**18.2**			
PhD	**1**	**0.5**			
The distribution regarding the subjects' relationship with the researchers of the agriculture sector					
Group	**Distribution**	**Percentage**			
Very low	**3**	**1.5**			
Low	**8**	**4**			
Average	**70**	**34.4**			
Much	**88**	**44.4**			
Very much	**29**	**14.6**			
The distribution concerned with the subjects' participation in educational-promotional courses					
Group	**Distribution**	**Percentage**			
Yes	**147**	**75.4**			
No	**48**	**24.6**			
The distribution of the age groups of the subjects					
Group	**Distribution**	**Percentage**	**Collective percentage**	**Mean**	**Variance**
Less than 30 years	**57**	**28.5**	**28.5**		
31 to 40 years	**111**	**55.5**	**84**		
More than 41 years	**32**	**16**	**100**	**34.45**	**5.50**

The factorial analysis of the effective variables in using pesticides in the farmlands of wets Azerbaijan province. One of the statistical methods for analyzing the data is the analysis of the factors or factorial analysis.

Factorial analysis method can be used to for different purposes. In the present study, the discovery factorial analysis with the view of data summarization was used so that both effective variables in using pesticides in the farmlands is classified ad the variance elaborated by each variable is obtained in classified forms (Zare Chahouki, 2011).

In the present research, 42 items in using pesticides in the farmlands of west Azerbaijan province were investigated. The aim was to determine a summary of the factors on the basis of the responses of the experts and reach a more precise understanding. In line with the factorial analysis were employed in four phases as following:

B. The calculation of the correlation matrix

The first decision in using factorial analysis is calculating the correlation matrix from all variables involved in the analysis (Kalantari, 2005). According to the results obtained, it was revealed that 31 variables were removed from the analysis due to not having a meaningful correlation with other variables and 65 items were reduced to 34 items. In order for the suitability of the collected data, the statistical tests of KMO were used. Besides, to ensure about the suitability of factorial analysis and to prove non-zero of the correlation matrix, Bratlet test was employed. Table 2 shows the value of KMO and the results of Bartlet test. The meaningfulness of Bartlet test in the level of 99% and the appropriate value of KMO index showed that the correlation matrix in the sample is not zero. Therefore, the act of finding factors is justifiable.

Table 2: KMO and Bartlet test for determining the suitability of the data for factorial analysis.

Test type	Value	Degree of freedom	Meaningfulness level
KMO test	**0.90**	**-**	**5819.485**
Bartlet test	**5819.485**	**1176**	**0.000**

C. The extraction of the primary factors and the selection of the factors

The specific value of each factor is a portion of the total variance of the variables which is elaborated by that factor. The specific value is calculated by the sum of the squares of factorial loads related to all variables. Thus, the specific values show the discovery importance of the factors in relation to the variables. The low amount this value for a factor means that this factor has a minor role in the elaboration of the variance of the variables (Zare Chahouki, 2011).

One of the main issues in factorial analysis is the determination of extractable factors. Although there isn't a precise basis for deciding on the number of the extracted factors, there are some rules which are used to make decisions about the number of the elicited factors. Table 3 shows the number of the extracted factors along with specific values of each of them, the variance percentage of each factor, and the cumulative percentage of the variance of the factors. The specific value indicates the portion of each factor from the total variance of the variables. The greater this value, the more importance and impact of the factor it shows.

Table 3: The extracted factors along with the specific value, variance percentage, cumulative percentage, and their variance.

No.	Factors	Specific value	The percentage of the variance of the specific value	The cumulative distribution of the variance percentage
1	1st factor	6.09	12.44	12.44
2	2nd factor	5.19	10.6	23.05
3	3rd factor	5.09	10.4	33.45
4	4th factor	4.76	9.72	43.17
5	5th factor	3.99	8.20	51.46

Table 4 : Factors and accompanying items related to each factor along with their coefficients.

Factors	variables	coefficients
	making the lands fallow	0.50
The skills of using methods and technologies of organic agriculture	change in the time of cultivation and harvest	0.54
	animal grazing	0.50
	Mixed cultivation	0.55
	Biologic control	0.53
	Mulching	0.61
	Cutting and transplanting	0.69
	waterlogged soil	0.64
	using compost, livestock, and herbal compost, and household and industrial waste	0.77
The informing skills	Informing about the nutritional value of organic products,	0.57
	The publication and distribution of simple journals for making people aware of the organic products,	0.54
	The promotion of the consumption of organic products	0.69
	The effects of the production of organic products on the environment	0.61
The agricultural skills	Using the resistant types,	0.53
	Ambiguity and discontinuity of the government's supports,	0.50
	Familiarity with the ways of leveling and drainage of precise farmlands,	0.65
	Using protective tillage methods	0.56
	Familiarity with the type of the crop for cultivation	0.55
	Familiarity with modern methods of irrigation in precise agriculture	0.69
	Familiarity with the ways of precise use of the amounts of the recommended fertilizers	0.53
	Familiarity with cultivation method and using appropriate amounts of seeds in the unit of level	0.65
The educational skills	The recognition of how o use manure for supporting the soil	0.58
	The nutritional value of organic products	0.67
	The necessary operations for producing organic crops	0.62
	Crop sequence	0.50
	Releasing useful insects for controlling harmful pests	0.50
	Light plowing in winter for eliminating the seeds of pests,	0.64
	The cultivation of trap plants	0.58
	Using big vacuum cleaners for collecting pests	0.56
	The principles of organic agriculture are not sufficient by themselves	0.58
The production skills	The high wage of these technologies	0.77
	These technologies depend on the climatic conditions	0.62
	They are inefficient in biologic fight in some crops,	0.63
	The full control of pests is not provided in these technologies,	0.53

The data presented in table 3 showed the effective variables in using pesticides in farmlands of west Azerbaijan province. According to the table, the set of the extracted factors, after rotation, indicated that three factors had capabilities to elaborate variances. F the obtained factors are rotated through Varimax method, the first, second, third, fourth, and fifth factors will include 12.44%, 10.60%, 10.40%, 9.72%, 8.20% of the variance, respectively, and in sum 51.46% of the total variance. The highest specific value is related to the first factor is about 6.09 and involves around 12.44% of the variance concerned wih the effective factors in using pesticides in the farmlands of west Azerbaijan province from the subjects' point of view.

D. The extraction of the final set through rotating the factors

After determining the number of the factors, it is necessary to consider what variables each factor involves. In this study, Varimax method was used to rotate the factors. In order to interpret the factorial matrix in which each column shows one factor, the values of each factor, which indicate the factorial load of each variable to a factor, were investigated. The meaningfulness basis was determined 0.5 through SPSS software and the variables without meaningful factorial load were removed from the analysis and only the meaningful variables were interpreted. The position of the variables in the factors and their factorial value with the relevant factor in accordance with the results obtained from the rotation of the factors are presented in Table 4.

The results revealed that 9 variables had factorial load on the first factor, 7 variables on the second factor, 7 variables on the third factor, 7 variables on the fourth factor, and 5 variables on the fifth factor. As it is observed, all of the variables were in line with the analysis of the main components with the factorial load more than 0.5 and were meaningful. This indicated the high correlation between the variables. According to the results of the study, fie factors elaborated 51.46% of the variance.

E. Naming the variables or inference of the conceptual sharing

After the rotation of the factors, the conceptual inference should be done by assigning variables to factors, i.e. a common concept should be determined for each set of variables which belong to a factor so that they can be interpreted. According to the findings, the determined factors were named on the basis of the loaded variables on them.

As the data presented in the table show, these factors involve 51.46% of the total variance of the effective variables in using pesticides in farmlands of west Azerbaijan province. Also, 48.54% of the variance is related to the variables whose prediction was not feasible in this study.

DISCUSSION, CONCLUSION AND SUGGESTIONS

Regarding the nature of the constituent variables such as (change in the time of cultivation and harvest, making the lands fallow, animal grazing, combined cultivation, biologic control, mulching, cutting and transplanting, waterlogged soil, and using compost, livestock, and herbal compost, and household and industrial waste), the first factor was called the factor of the skills of using methods and technologies of organic agriculture. This factor involved the highest percentage of the variance (12.44). Organic agriculture has been attended as a type of sustainable agriculture and one of the strategies of reducing the environmental problems and a way to achieve the stable development of the agriculture. It has introduced methods and technologies in accordance with the principles of sustainable agriculture to decrease the environmental consequences of the common agriculture. The development of these methods and technologies is one of the important goals of agricultural policies around the world. This was in line with the opinions of Bet (2008), Tatlidil (2009), Ghadimi *et al.* (2011), and Rains *et al.* (2011).

Considering the nature of the constituent variables such as (informing about the nutritional value of organic products, the publication and distribution of simple journals for making people aware of the organic products, the effects of the production of organic products on the environment, using the resistant types, ambiguity and discontinuity of the government's supports, the promotion of the consumption of organic products), the second factor, which involved 10.60% of the variance, was named informing factor. Since one of the leading and effective factors in the production of these products is the taste and interest of the consumers, it requires their basic and necessary awareness about this issue. Thus, along with creating the culture in the level of production systems, the awareness of the consumers should be improved and increased through the media. The findings of this part of the study were in line with the findings of Rajabi *et al.* (2013), Hejazi and Sharifi (2012), and Yaqubi *et al.* (2010).

Regarding the nature of the constituent variables like (familiarity with the ways of leveling and drainage of precise farmlands, the recognition of how to use the recommended fertilizers accurately, the familiarity with modern methods of irrigation in precise agriculture, familiarity with cultivation methods, using appropriate amounts of seeds in the unit of level, and using protective tillage methods), the third factor involving 10.40% of the variance was named as the skills of factorial agriculture.

One of the most important sources which has a considerable share in the economic development and achieving the developmental goals is the human factor. Providing appropriate context for the promotion of knowledge, insight, and technical skills has gained attention of managers and planners. Although planning in formal education is of great importance, it is necessary to update and improve the knowledge of the adults who are currently the active workforce of the society. Considering the vital role of agriculture in the stable development with regard to the noticeable capabilities of the sources and factors of production, the necessity of planning for production and productivity is inevitable. Therefore, in order to enhance the knowledge, skills, and technical-professional qualifications of the beneficiaries of agriculture; or in other words, to develop their management abilities in line with the goals of national development perspective, paying attention to continuous education in accordance with their individual and asocial characteristics is absolutely necessary. The results of this section of the study were in agreement with the findings of Eskandarzadeh (2012), Bordbar and Mousavi (2009), Ghaadi, *et al.* (1999), and Onyuma, *et al.* (2006).

Considering the nature of the constituent variables such as (the nutritional value of organic products, using big vacuum cleaners for collecting pests, crop sequence, releasing useful insects for controlling harmful pests, light plowing in winter for eliminating the seeds of pests, the cultivation of trap plants, the necessary agricultural operations for the production of organic products), the fourth factor involving 9.72% of the variance was named the educational skill. One of the important issues for farmers is education since the number of studies in the field of agriculture is increasing and the technologies and information is constantly improving. Educating and making farmers aware of the new developments in agriculture t improve their agricultural methods is of great significance so that they can develop their industry through today's up-to-date equipments. In this regard, getting help from specialists and advisors to understand the conditions and difficulties of the work is important. Also, visiting farms as a pattern to enter the farmers to the fields of policy and management can lead to success. This has already been mentioned in the studies of Pour Atashi and Shaban Ali Fomi (2009), Ghadimi, *et al.* (2011), Rajabi, *et al.* (2010), Kitchen *et al.* (2002), and Parvin (2011).

Regarding the nature of the constituent variables such as (these technologies depend on the climatic conditions, the high wage of these technologies, the full control of pests is not provided in these technologies, they are inefficient in biologic fight in some crops, the principles of organic agriculture are not sufficient by themselves), the fifth factor involving% 8.20 of the variance was called the production skills. Regarding the high potential of producing healthy crops, our country can have a desirable position in domestic and international markets. This requires appropriate policies by the government. In this regard, the government can reduce the obstacles to ease the movement toward stable systems. Achieving this is possible by overall contribution of different sections such as beneficiaries of agriculture sector, governmental institutes, and private institutions. The findings of this part of the study were in line with the findings of Haji Maleki, *et al.* (2012), Kalantari and Mir Gohar (2002), Yaqubi, *et al.* (2009).

Considering the existence of high potentials of producing healthy crops in the country, the essential infrastructures for cultivating organic products in the country must be created. Moreover, in order to prevent the exit of organic products from the country, in addition to creating a clear mechanism in this section, supplementary regulations for import, export, and quarantine of organic products must be legislated. This requires the government's appropriate policies in this regard. In this regard, the government can reduce the obstacles to ease the movement toward stable systems. Achieving this is possible by overall contribution of different sections such as beneficiaries of agriculture sector, governmental institutes, and private institutions.

Finally, regarding the findings of the present study about the effective factors in using pesticides in agriculture sector, the following suggestions were offered:

1. Considering the results of the factorial analysis, the factor o using the methods and technologies of organic agriculture is regarded as the most important factor. Thus, the creation of the essential intellectual bases for the acceptance of the technologies of integrative pest management in upper levels among farmers by implementing educational and practical capacity building for farmers to improve their knowledge, insight, and scientific abilities is suggested.
2. Paying attention to the provision of sustainable agriculture inputs like organic fertilizers along with promotional and educational activities which facilitates the acceptance process.
3. Creating the essential infrastructures for marketing of organic products.
4. Changing the view and understanding the necessity for using organic agriculture methods and also training skilled and competent workforce for offering better integrative pest management methods.
5. The mechanization of agricultural units and training expert forces in this regard will increase the coefficient of productivity of the sources and institutions' equipments as well as the quality and quantity of the products.

6. More attention and concentration on promotional and educational activities in the area as an information source in the field of agriculture.
7. Considering the role of the innovations of organic agriculture, it is suggested that the activities and education should be directed to a direction in which the beneficiaries of can observe

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