

Ameliorative Effect of Dandelion Leaves Extract Against Liver Injury Induced by Schistosomiasis in Mice

Mahmoud. F. S. A. Elngar¹, Hend. H. A. Hassan², Mohamed Sh. Y. Khamees³, Mohamed. F. I. Abdelhalim¹

¹Department of Agricultural Extension & Rural Sociology, Faculty of Agriculture, Al-Azhar University, Assiut 71524, Egypt.

²Department of Rural Society & Agricultural Extension, Assiut University, 71515 Egypt.

³Department of Agricultural Extension & Rural Sociology, Faculty of Agriculture, Al-Azhar University, Cairo 11651, Egypt.

Abstract

This study aimed at: (1) measuring agricultural extension agents' knowledge of organic agriculture; (2) identifying the degree of information sources utilization among the agricultural extension agents; (3) examining the relationship between the agricultural extension agents' knowledge of organic agriculture and their personal characteristics; and (4) determining constraints faced by the agricultural extension agents in diffusing organic agriculture. The study was conducted on 100 respondents representing 78% of the total number of extension agents in Assiut Governorate (128 extension agents). Data were collected by questionnaire forms during January and February 2022. Frequencies, percentages, and Spearman rank-order correlation coefficient were used for data presentation and analysis. The results indicated that the majority of the respondents had low knowledge level of organic agriculture (53%), and medium level of information sources utilization (52%). It came to clear that there's a positive significant relationship between agricultural extension agents' knowledge of organic agriculture and six of their personal characteristics. The study also identified 25 constraints faced by the agricultural extension agents in diffusing organic agriculture.

Keywords: Agricultural Extension Agents, Knowledge, Organic Agriculture, Assiut.

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1. INTRODUCTION

Due to the rapid and intense population growth in the world, which is expected to reach 9.4 billion people in 2050, the process of producing sufficient food for this huge population became necessary, which led to the acceleration of developing methods to increase agricultural production by abandoning the old agriculture system that depends on chemical fertilizers and insecticides resulting in the deterioration of agricultural resources like land and water, as well as damage to the environment and human health (Abdulrazzaq, 2017). Competition between countries intensifies to increase crop production through horizontal or vertical expansion using modern technologies in agriculture from the outward characteristics of the product to a careful analysis of the chemical content that shouldn't exceed the permissible limits of the World Health Organization. As a result of the increasing awareness of consumers in recent years of obtaining food products that are healthy and environmentally safe, many countries have moved towards implementing an agricultural system called "organic agriculture", which is one of the oldest forms of agriculture on earth before the emergence of chemical

fertilizers left over from World War II weapons (Altarwana, 2016).

Existing agricultural systems are highly dependent on chemical inputs, which has resulted in widespread environmental problems (Shiri et al., 2014), such as: reduced genetic diversity, increased rate of soil erosion and reduced soil fertility, water pollution, depletion of natural resources, lack of beneficial microorganisms, spread of pests, emergence of new types of plant diseases and malnutrition, declining quality of food products, displacement of large numbers of small farmers from their land, and poor agricultural management practices. Therefore, there is a need for an alternative method of agriculture which could increase food production as well as provide security against any potential health problems, which is seen in the form of organic agriculture (Janjhua et al., 2019). All these factors made food products safety one of the most important issues of the day and made the international human communities try to find solutions to confront these issues and achieve sustainable agricultural systems (Shiri et al., 2014).

The world is witnessing an increasing trend towards the technology of organic agriculture, as the total cultivated area globally reached about 25 million hectares, and the

sales volume reached 40 million dollars. As for the Arab countries that practice this activity, the total registered area has reached 45,536 hectares, distributed over 5 countries, and this area is considered very small compared to the rest of the countries or as a percentage of the cultivated area in the Arab world. In Egypt, the total organically cultivated area is about 58 thousand feddans (Ghonaim, 2012).

Therefore, organic agriculture, as an integrated socio-environmental agricultural system that takes into account these dimensions, has become one of the most important trends that have imposed itself strongly in the field of agriculture in recent years. Hence, the most important future directions of the agricultural development strategy in Egypt were to rely on integrated pest management programs. With the use of antibiotics and pheromones, which reduces production costs and improves its quality and increases its ability to global competition, as well as preserving human and animal health. Therefore, organic agriculture techniques are considered one of the most important technical methods in modernizing Egyptian agriculture, where attention is focused on the production of agricultural crops that do not use pesticides and chemical fertilizers, but is based only on the use of organic fertilizers and bio-pesticides in order to protect human health and protect the environment from pollution (Alzarka et al., 2013).

This requires the promotion of organic agriculture as part of the development of a sustainable alternative agricultural system and the popularization of organic agricultural practices. Organic agriculture is a pattern to maintain sustainable production through the balanced use of natural resources. It emphasizes the use and recycling of renewable natural resources; because the use of pesticides is not only costly, but also leads to many consequences such as eliminating natural enemies' resistant to pests and increasing the loss (Rana et al., 2017).

Despite the unparalleled beneficial effects and the great environmental roles that organic agriculture plays in supporting crop production and improving soil fertility in the agricultural environment, organic agriculture are not well applied by most farmers (Oluwasusi, 2014).

The organic agriculture sector has face with various challenges, including a lack of awareness of organic products among consumers, low marketing quality, ineffective extension services, an insufficient quantity of organic inputs, and a lack of qualified experts and agricultural professionals in the field of organic agriculture (Hartmann et al., 2012; Alotaibi et al., 2019; Alotaibi, 2020).

Agricultural extension play a crucial role in promoting rural development and supporting the conversion into organic agriculture, and extension services help farmers to solve farming-related problems and make better farming decisions by providing timely and relevant information (Alotaibi et al., 2021), they also act as "brokers" to facilitate farmers' networking with various actors in the agricultural value chain (Maponya and Mpandeli, 2013; Koutsouris, 2015), in addition, extension services mobilize collective action in rural communities by helping farmers to form groups to maximize their competitiveness in local and international markets (Alotaibi et al., 2021).

In many countries, extension agents are an essential source of information for farmers and play a key role in convincing farmers to adopt agricultural innovations (Asadi et al., 2009). Therefore, the first step in conversion into organic agriculture is to educate extension agents on the concept, principles, practices, and certification of organic agriculture (Sarkar and Itohara, 2009; Yadav et al., 2013). The adoption of organic agriculture by farmers is affected by several factors, including the amount of information they require; and the role of extension agents in disseminating information (Shiri et al., 2014). The effectiveness of the extension services provided is influenced by extension agents' perceptions and attitudes toward organic agriculture (Alzaidi et al., 2013; Yadav et al., 2013). Therefore, an understanding of extension agents' knowledge is essential for developing a successful organic educational program and supporting the adoption of organic agriculture among farmers (Abbeam et al., 2018).

The influence and effectiveness of extension agents depend on the knowledge they possess and how effectively they can communicate with the farmers and disseminate any current knowledge and innovative information. Therefore, the success of extension and educational programs primarily depends on extension agents' knowledge of organic agriculture (Alotaibi et al., 2021).

In the face of the previous benefits of organic agriculture over conventional agriculture, and global awareness of environmental degradation and climate change that could result in the continuous practice of non-organic agriculture, and the threats it poses to sustainable agricultural production, it has not yet been practiced as much as inorganic agriculture, especially in Assiut Governorate. Therefore, the main theme of this study is lies in identify extension agents' knowledge of organic agriculture.

2. Objectives:

According to the earlier quick discussion, this study endeavors generally to know about the agricultural extension agents' knowledge of organic agriculture in Assiut Governorate, Egypt, and it aims particularly to reach the following objectives:

1. Study the characteristics of the agricultural extension agents'.
2. Measuring agricultural extension agents' knowledge of organic agriculture.
3. Identifying the degree of information sources utilization among the agricultural extension agents about organic agriculture.
4. Examining the relationship between the agricultural extension agents' knowledge of organic agriculture and their personal characteristics.
5. Determining constraints faced by the agricultural extension agents in diffusing organic agriculture.

3. Marital and Methods :

The study depends on 101 items collected from the previous studies (Ministry of environment water & agriculture, n.d.; Hassan, 2011; Oluwasusi, 2014; Shiri et al., 2014; Awad, 2017; Shams et al., 2017) to measure the respondents' knowledge of organic agriculture, these items are divided into five main themes: general information about organic agriculture (23 items), practices of conversion into organic agriculture (19 items), environmental benefits of organic agriculture (13 items), prohibited manufactured materials in organic agriculture (16 items) and permissible manufactured materials in organic agriculture (30 items). Extension agents were asked to respond to the previous items according to their knowledge degree on a 3-point scale ranging from 1 to 3 (low knowledge, medium knowledge, and high knowledge respectively). Information sources utilization was measured by asking respondents to rate their utilization of 11 sources of information sources on four-point exposure scale ranging from 0 to 3 (never, rarely, occasional, and regular respectively). 25 constraints of diffusing organic agriculture were collected from the previous review; the respondents were asked to show their agreement of the existence of these constraints.

The study was conducted on 100 respondents representing 78% of the total number of extension agents

in Assiut Governorate (128 extension agents). Data were collected by questionnaire forms during January and February 2022. Frequencies, percentages, and Spearman rank-order correlation coefficient were used for data presentation and analysis.

4. Results and Discussion:

4. 1. Profile of the agricultural extension agents':

from table 1 it was observed that more than of one half of the agricultural extension agents' (59.0 per cent) belonged to >50 years category, 56.0 per cent studied "intermediate" level, more than of two fifths of them (44.0 per cent) belonged to "general" category, two third of them (66.0 per cent) belonged to "agricultural administration" category, 47.0 per cent "change agent", 44.0 per cent of them >25 years work in ministry of agriculture, three fifths of them (61.0 per cent) <12 years work in agricultural extension, majority of them (69.0 per cent) exposed into 1 to 12 training sessions in agricultural extension, more than of two fifths of them (46.0 per cent) had high benefit from training sessions in agricultural extension, three quarters of them (74.0 per cent) exposed into 1 to 5 training sessions in organic farming, two fifths of them (42.0 per cent) had high benefit from training sessions in organic farming and more than of one half of the respondents (56.0 per cent) had medium attitudes toward organic agriculture.

Table 1: Profile of the agricultural extension workers (n = 100).

SI. No.	Variables	Categories	No.	%
1.	Age:	<42 years	17	17.0
		42 to 50 years	24	24.0
		>50 years	59	59.0
2.	Academic achievement:	Intermediate	56	56.0
		Higher institute for cooperation and agricultural extension	15	15.0
		University	26	26.0
3.	Specialization:	Agricultural extension	33	33.0
		General	44	44.0
		Other	33	33.0
4.	Workplace:	Agricultural association	33	33.0
		Agricultural Administration	60	60.0
		Agriculture directorate	07	07.0
5.	Career status:	Supervisor	03	03.0
		Specialist	21	21.0
		agricultural guide	47	47.0

		head of the section	12	12.0
		director of association	05	05.0
		director of administration	12	12.0
6.	A number of work years in the ministry of agriculture:	<16 years	33	33.0
		16 to 25 years	23	23.0
		>25 years	44	44.0
7.	A number of work years in agricultural extension:	<12 years	61	61.0
		12 to 21 years	21	21.0
		>21 years	18	18.0
8.	A number of training sessions in agricultural extension:	Never	14	14.0
		1 to 12 sessions	69	69.0
		13 to 24 sessions	13	13.0
		>24 sessions	04	04.0
9.	Benefit from training sessions in agricultural extension:	Never benefit	14	14.0
		Low benefit	05	05.0
		Medium benefit	35	35.0
		High benefit	46	46.0
10.	Number of training sessions in organic agriculture:	Never	20	20.0
		1 to 5 sessions	74	74.0
		6 to 10 sessions	05	05.0
		>10 sessions	01	01.0
11.	Benefit from training sessions in organic agriculture	Never benefit	20	20.0
		Low benefit	07	07.0
		Medium benefit	31	31.0
		High benefit	42	42.0
12.	Attitudes toward organic agriculture:	Low attitudes (7 to 16)	22	22.0
		medium attitudes (17 to 26)	56	56.0
		High attitudes (27 to 35)	22	22.0

Source: Questionnaire forms, 2022.

4.2. Agricultural extension agents' knowledge of organic agriculture:

Table (2) presents distribution of the respondents according their knowledge of organic agriculture. It came to clear that four-fifths of the respondents (81.0%) have low knowledge level of general information about organic agriculture, while 16.0% of them have medium level, and 3.0% of them have high level of knowledge.

It also revealed that 47.0% of the respondents have low knowledge level of conversion practices into organic agriculture, while 43.0% of them have medium knowledge level, and 10.0% have high knowledge level. It came to clear from the same table that the majority (88.0%) of the respondents have low knowledge level of organic agriculture's environmental benefits, while 9.0%

and 3.0% of the respondents have medium and high knowledge levels respectively.

It came to light that more than three-fifths (63.0%) of the respondents have low knowledge level of prohibited manufactured materials in organic agriculture, while 32.0% of them have medium knowledge level, and only 5.0% have high knowledge level. It became clear from the same table that 46.0% of the respondents have low knowledge level of permissible manufactured materials in organic agriculture, while 27.0% of them have medium knowledge level, and the same percentage have high knowledge level.

It also came out from table (2) that more than half (53.0%) of the respondents have low total knowledge level organic agriculture, while more than two-fifths of them (45.0%) have medium knowledge level and only 2.0% have high total knowledge level.

According to the previous results, it emerged a big percent of the agricultural extension agents were not aware of general information on organic agriculture, environmental benefits of organic agriculture, prohibited manufactured materials in organic agriculture, practices of conversion into organic agriculture, permissible manufactured materials in organic agriculture and that overall knowledge level about organic agriculture is low for the majority of the respondents. This may be due to a lack of training courses they have, and information sources they exposed to about organic agriculture.

Table 2: Distribution of the respondents according to their knowledge of organic agriculture (n = 100)

Knowledge categories	Frequency	Percentage
General information on organic agriculture:		
- Low (1 – 19)	81	81.0
- Medium (20 – 38)	16	16.0
- High (39 – 57)	03	03.0
Practices of conversion into organic agriculture:		
- Low (5 – 20)	47	47.0
- Medium (21 – 36)	43	43.0
- High (37 – 54)	10	10.0
Environmental benefits of organic agriculture:		
- Low (1 – 13)	88	88.0
- Medium (14 – 26)	09	09.0
- High (27 – 39)	03	03.0
Prohibited manufactured materials in organic agriculture:		
- Low (1 – 16)	63	63.0
- Medium (17 – 32)	32	32.0
- High (33 – 48)	05	05.0

Permissible manufactured materials in organic agriculture:		
- Low (3 – 31)	46	46.0
- Medium (32 – 60)	27	27.0
- High (61 – 90)	27	27.0
Overall knowledge level:		
- Low (43 – 97)	53	53.0
- Medium (98 – 152)	45	45.0
- High (153 – 208)	02	02.0

Source: Questionnaire forms, 2022.

4. 3. Information sources utilization among the respondents about organic agriculture:

Table 3: Information sources utilization among the respondents about organic agriculture (n = 100).

Information sources	Regular		Occasional		Rarely		Never	
	No.	%	No.	%	No.	%	No.	%
Agricultural programs in television	20	20.0	64	64.0	04	04.0	12	12.0
Websites	35	35.0	33	33.0	14	14.0	18	18.0
Researchers at agricultural researches station	23	23.0	33	33.0	30	30.0	14	14.0
Co-agents	47	47.0	32	32.0	13	13.0	08	08.0
Training courses	30	30.0	47	47.0	14	14.0	09	09.0
Farm magazine agricultural newspaper (Agricultural magazines)	32	32.0	50	50.0	09	09.0	09	09.0
Extension bulletins from the ministry of agriculture	21	21.0	45	45.0	20	20.0	14	14.0
Agricultural programs in radio	8	08.0	15	15.0	28	28.0	49	49.0
Studies on organic agriculture	11	11.0	21	21.0	19	19.0	49	49.0
Books on organic agriculture	19	19.0	31	31.0	16	16.0	34	34.0
Central laboratory of organic agriculture	12	12.0	18	18.0	32	32.0	38	38.0

Source: Questionnaire forms, 2022.

Table 4 shows distribution of the respondents according to their information sources utilization about organic agriculture, it can be noticed that 52.0% of the respondents have medium information sources utilization level, 31.0% of them have high utilization level, whereas 17.0% of them have low information sources utilization level.

Utilization of sources of information increases level of information and develop self-confidence (Atar et al., 2012), and an individual gains variety and more amount of knowledge if he has an opportunity to expose with more number of sources of information (Thombre et al., 2013). According to the previous results, it emerged that majority of the agricultural extension agents don't listen to agricultural programs in radio, don't read studies and books about organic agriculture and don't refuged to central laboratory of organic agriculture and majority of respondents have medium information sources utilization level about organic agriculture.

Information sources utilized by the respondents about organic agriculture are presented in table 3. It revealed that: 64.0% of the respondent expose to television's agricultural programs occasionally, 35.0% of them browse websites regularly, 33.0% of them resort to researchers occasionally, 47.0% of the them refuge to co-agents regularly, 50.0% of them reads agricultural newspaper occasionally, 45.0% of them reads extension bulletins occasionally, 49.0% of them never listen to agricultural programs in radio, 34.0% of them never read books about organic agriculture, and 38.0% of the respondents never refuged to central laboratory of organic agriculture.

Table 4: Distribution of the respondents according to their information sources utilization about organic agriculture (n = 100).

Category	Frequency	Percentage
Low (11 to 22)	17	17.0
Medium (23 to 33)	52	52.0
High (34 to 44)	31	31.0

Source: Questionnaire forms, 2022.

4.4. The relationship between the agricultural extension agents' knowledge of organic agriculture and their personal characteristics:

Table 5 presents the relationship between the agricultural extension agents' knowledge of organic agriculture and their personal characteristics. It emerged that there's a positive significant relationship between the respondents' knowledge of organic agriculture and the next characteristics: workplace, number of work years in

agricultural extension, number of training courses in organic agriculture, benefit from training courses in organic agriculture, attitudes towards organic agriculture, and information sources utilization. On the other hand, there's no significant relationship between the respondents' knowledge of organic agriculture and the next characteristics: age, academic achievement, specialization, career status, number of work years in ministry of agriculture, number of training courses in agricultural extension, and benefit from training courses in agricultural extension.

Table 5: Spearman rank-order correlation coefficients between the respondents' knowledge of organic agriculture and their personal characteristics:

No.	Variables	Spearman values
1	Age	0.119 ^{NS}
2	Academic achievement	0.037 ^{NS}
3	Specialization	0.009 ^{NS}
4	Workplace	0.173*
5	Career status	0.044 ^{NS}
6	Number of work years in ministry of agriculture	0.141 ^{NS}
7	Number of work years in agricultural extension	0.398**
8	Number of training courses in agricultural extension	0.166 ^{NS}
9	Benefit from training courses in agricultural extension	0.143 ^{NS}
10	Number of training courses in organic agriculture	0.315**
11	Benefit from training courses in organic agriculture	0.287**
12	Attitudes toward organic agriculture	0.464**
13	Information sources utilization	0.260**

Source: Questionnaire forms, 2022.

4. 5. Constraints faced by the agricultural extension agents in diffusing organic agriculture:

Table 6 shows various constraints faced by the respondents in the diffusion of organic agriculture. Regarding constraints related to agricultural extension, the respondents pointed to many constraints like: shortage of extension agents, non-availability of adequate expertise of extension agents in organic agriculture, shortage of training courses, lack of extension symposiums to raise farmers' awareness about organic agriculture practices, shortage of audio and visual extension programs, absence of extension fields to diffuse organic agriculture, and non-availability of extension publications on organic agriculture.

Table 6: Constraints faced by the agricultural extension agents in diffusing organic agriculture (n = 100)

No.	Constraints	F.	%
I	Constraints related to agricultural extension:		
1	Shortage of agricultural agents	94	94.0
2	Non-availability of adequate expertise of extension agents in organic agriculture	89	89.0
3	Shortage of training courses	87	87.0
4	Lack of extension symposiums to raise farmers' awareness of organic agriculture practices	79	79.0
5	Shortage of audio and visual extension programs	79	79.0
6	Absence of the extension fields that applying organic agriculture	79	79.0
7	Non availability of extension publications about organic agriculture	72	72.0
II	Constraints related to farmers:		
1	Farmers' desire to increase production more than their desire for production quality	85	85.0
2	Farmers' believes that chemical fertilizers gives faster results than organic fertilizers	84	84.0
3	Change some of the wrong practices and behaviors of farmers difficult	77	77.0
4	Farmers don't know the cost of organic agriculture requirements	74	74.0
5	Lack of support for farmers' (equipment and production requirements) to the application of organic agriculture	73	73.0
6	Farmers' preference of fertilizers and chemical pesticides	72	72.0
7	Farmers' believe that organic agriculture techniques are inappropriate for application	71	71.0
8	Low farmers' awareness of using predators in organic agriculture	71	71.0
9	Farmers' believes that technical recommendations for organic agriculture are mostly boring and non-diverse	62	62.0
10	Farmers rejects organic agriculture	18	18.0
11	Difficulty of implementing certain organic agriculture practices	18	18.0
III	Constraints related to inputs:		
1	Non availability of organic fertilizer	76	76.0
2	Non availability of organic production requirements	74	74.0
3	The preparation and manufacture of organic fertilizer needs great efforts and time	74	74.0
4	Lack of governmental institutions that grant certificates of organic production	70	70.0
IV	Constraints related to marketing:		
1		77	77.0

	Lack of consumers' knowledge about the benefits of organic agriculture products		
2	Low demand for organic products in local markets	74	74.0
3	Strong competition between organic products and inorganic products in markets	71	71.0

Source: Questionnaire forms, 2022.

With reference to constraints related to inputs, the respondents stated four constraints as follows: non availability of organic fertilizer, non-availability of organic production requirements, the preparation and manufacture of organic fertilizer needs great efforts and time, and lack of governmental institutions that grant certificates of organic production in the research area.

With reference to constraints related to marketing, the respondents defined three constraints named: consumers don't know the benefits of organic agriculture products, low demand for organic products in local markets, and strong competition between organic products and inorganic products.

With respect to constraints related to farmers, the respondents mentioned eleven constraints as follows: farmers' desire to increase production more than their desire for production quality, farmers' believes that chemical fertilizers gives faster results than organic fertilizers, the difficulty of change some of the wrong practices and behaviors of farmers, shortage of farmers knowledge about the costs of organic agriculture requirements, lack of directed support for farmers' (equipment and production requirements) for the application of organic agriculture, farmers are prefer to fertilizer and chemical pesticides, farmers' believes that organic agriculture techniques are inappropriate for application, low farmers awareness of how are used predators in organic agriculture, farmers believe that technical recommendations for organic agriculture are mostly boring and non-diverse, farmers are reject to organic agriculture system and implementing certain organic agriculture practices is difficult.

5. Conclusion and Recommendations:

Despite the great potentials of organic agricultural in improving soil, environmental and human health as well as improving Farmers' income, the knowledge of agricultural extension agents' about organic agricultural seems to be low. Based on the findings the following recommendations may be put forward:

1. Organization of training programmes is needed be increased for improving the agricultural extension agents' knowledge concerning organic agriculture's environmental benefits, general information about organic agriculture, prohibited manufactured materials in organic agriculture, conversion practices into organic agriculture, permissible manufactured materials in organic agriculture.
2. Providing training and placing a stronger emphasis on organic agriculture motivate the agricultural extension agents, increase their skills, and add to their knowledge base; to enable them to transfer the wealth of knowledge they have more efficiently and effectively.
3. Intensification of efforts by the agriculture ministry to increase of the agricultural extension agents' information about organic agriculture.
4. Intensification of efforts by the agriculture ministry to overcome constraints to the diffusing of organic agriculture.
5. The findings of the study be used to develop a training program for agricultural extension agents in Assiut governorate. Specifically, such a training program should aim to help agricultural extension agents to learn more about organic agriculture and be confident in providing information related to organic agriculture.

REFERENCES

1. Abbeam, G. D.; Ehiakpor, D. S. and Aidoo, R. (2018). Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana, *Agriculture & Food Security*, 7 (74): 1-10.
2. Abdulrazzaq, A. H. (2017). Attitudes of protected vegetable farmers in Wasit towards practicing of eco-friendly methods and its relation to some variables, *Euphrates journal of agriculture science*, Supplement No. 4: 565-579.
3. Alotaibi, B. A.; Yoder, E.; Brennan, M. A. and Kassem, H. S. (2019). Training needs of extension agents' regarding organic agriculture in Saudi Arabia, *Evaluation and program planning*, 77 (101711): 1-7.
4. Alotaibi, B. A. (2020). Farmers' perception of organic agriculture in Southern Saudi Arabia, *Journal of agricultural extension*, 24 (4): 17-28.
5. Alotaibi, B. A.; Yoder, E. and Kassem, H. S. (2021). Extension agents' perception of the role of extension services in organic agriculture: a case study from Saudi Arabia, *Sustainability*, 13 (4880): 1-15.
6. Altarwana, M. S. (2016). Attitudes of vegetable farmers towards organic agriculture in Jordan, *Jordan Journal of Agricultural Sciences*, 12 (1): 123-136. <https://search.emarefa.net/detail/BIM-804347>
7. Alzarka, Z. M., Fayed, A. A. A. and Mustafa, M. A. A. (2013). Some determinants of farmers adoption of some practices of clean agriculture in two villages of Abohoms district, Behira governorate, *Journal of Agricultural Economics and Social Sciences*, Mansoura University, 4 (6): 947 -970.

- https://jaess.journals.ekb.eg/article_43175_6e9b854b015a2b8892f7c0ad054a26be.pdf
8. Alzaidi, A. A.; Baig, M. B and Elhag, E. A. (2013). An investigation into the farmers' attitudes towards organic farming in Riyadh Region – Kingdom of Saudi Arabia, *Bulgarian journal of agricultural science*, 19 (3): 426-431.
 9. Asadi, A.; Akbari, M.; Sharifzadeh, A. and Hashemi, S. M. (2009). Analysis of factors affecting agricultural organic products diffusion among consumers: perception of extension workers, *World applied sciences journal*, 6 (3): 331-338.
 10. Atar, S., Thombre, B. M., Suradkar, D. D. and Ainlawar, G. R. (2012). Adoption of recommended grape cultivation practices by the grape growers, *Advance Research Journal of Social Science*, 3(2): 234-237. http://www.researchjournal.co.in/upload/assignments/3_234-237.pdf
 11. Awad, A. H. A. A. (2017). The level of vegetable farmers trends in Ghur Alsafi concerning the organic agriculture & its relationship with some variables, *M. Sci. (Agri.)*, faculty of agriculture, Garish Univ., Jordan.
 12. Ghonaim, M. G. (2012). Comparison study on farmers' attitudes to applying organic farming at Siwa Oasis, *Journal of Agricultural Economics and Social Sciences*, Mansoura University, 3 (3): 419-429. https://journals.ekb.eg/article_45058.html
 13. Hartmann, M.; Khalil, S.; Bernet, T.; Ruhland, F. and Alghamdi, A. (2012). Organic agriculture in Saudi Arabia, Sector study, Saudi organic farming association.
 14. Hassan, A. A. (2011). Organic agriculture origins, 1st ed, Arab publishing and distribution house, Cairo, Egypt.
 15. Janjhua, Y., Rashmi, C., Piyush, M., and Kumar, (2019). Determinants of farmer's attitude toward organic agriculture and barriers for converting to organic farming systems: Research insights, *International Journal of Economic Plants*, 6 (2): 97-103. https://www.pphouse.org/upload_article/21640764_10_IJEP_Ma y_2019_Janjhua_et_al.pdf
 16. Koutsouris, A. (2015). Exploring the emerging intermediation roles (facilitation and brokerage) in agricultural extension education, *International journal of agricultural extension*, 21-37.
 17. Maponya, P. and Mpandeli, S. (2013). The role of extension services in climate change adaptation in Limpopo Province, South Africa, *Journal of agricultural extension and rural development*, 5 (7): 137-142.
 18. Ministry and environment water & agriculture (n.d.). Convert indicator into organic agriculture, Kingdom of Saudi Arabia. <https://www.mewa.gov.sa/ar/Ministry/Agencies/AgencyofAgriculture/OrganicCompain/PublicationsDocs/%D8%AF%D9%84%D9%8A%D9%84%20%D8%A7%D9%84%D8%AA%D8%AD%D9%88%D9%84%20%D9%84%D9%84%D8%B2%D8%B1%D8%A7%D8%B9%D8%A9%20%D8%A7%D9%84%D8%B9%D8%B6%D9%88%D9%8A%D8%A9.pdf>
 19. Oluwasusi, J. O., (2014). Vegetable farmers' attitude towards organic agriculture practices in selected states of South West Nigeria, *Journal of Agricultural Extension and Rural Development*, 6 (7): 223-230. https://www.researchgate.net/profile/Oluwasusi-Oluwatoyin/publication/280717857_Vegetable_farmers'_attitude_towards_organic_agriculture_practices_in_selected_states_of_South_West_Nigeria/links/55c2485608aeca747d5dcb89/Vegetable-farmers-attitude-towards-organic-agriculture-practices-in-selected-states-of-South-West-Nigeria.pdf
 20. Rana, S., Hasan, H. Md., Alam, S. M. and Islam, M. S. (2017). Farmer attitude towards organic vegetable cultivation in Rangunia Upazila, Chittagong, Bangladesh, *Journal of Bioscience and Agriculture Research*, 14 (1): 1151-1156. https://www.journalbinet.com/uploads/2/1/0/0/21005390/141_farmer_attitude_towards_organic_vegetable_cultivation_in_rangunia_upazila_chittagong_bangladesh.pdf
 21. Sarkar, Md. A. and Itohara, Y. (2009). Farmers' perception about the extension services and extension works: the case of organic agriculture extension program by PROSHIKA, *American journal of agricultural and biological sciences*, 4 (4): 332-337.
 22. Shams, A.; Hooshmandan, Z. and Fard, M. (2017). Factors affecting wheat farmers' attitudes toward organic farming, *Polish Journal of Environmental Studies*, 26 (5): 2207-2214. <http://www.pjoes.com/pdf-69435-24145?filename=Factors%20Affecting%20Wheat.pdf>
 23. Shiri, N., Faghiri, M., Pirmoradi, A. and Agahi, H (2014). Attitudes of agricultural extension workers towards organic agriculture in Iran, *Journal of Organic Systems*, 9 (1): 5-15. <https://www.organic-systems.org/journal/91/9102.pdf>
 24. Thombre, B. M., Atar, R. S. and Suradkar, D. D. (2013). Knowledge of recommended grape cultivation practices by the grape growers, *Agriculture Update, Hind Agricultural Research and Training Institute*, 8 (1&2): 115-118. http://www.researchjournal.co.in/upload/assignments/8_115-118.pdf
 25. Yadav, D. S.; Sood, P.; Thakur, S. K. and Choudhary, A. K. (2013). Assessing the training needs of agricultural extension workers about organic farming in the North-Western Himalayas, *Journal of organic systems*, 8 (1): 17-27.