

## ATTITUDES OF VEGETABLE FARMERS TOWARDS RISK IN JORDAN

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### Abstract

This study aimed to know the attitudes of vegetable farmers towards risk in Jordan by examining the sources of risk and the methods of risk management for vegetable farmers in the study area, as they were applied to (186) vegetable farmers in the northern Jordan Valley region in Jordan. The data was collected through a questionnaire containing questions that serve the purpose of the study. After collecting the data, the researcher used the necessary descriptive statistics to show the results. The risk ratio was found to be high, and the most serious situations were plant diseases and insects, as well as factor costs. The degree of management of these risks is moderate, as they are managed through a preventive spraying programme and diversification of vegetable crops. The study recommended that similar studies must be conducted elsewhere in Jordan to generalize the results.

**Keywords:** Vegetable Farmers, Risk Sources, Risk Management Styles, Northern Jordan Valley.

### 1. INTRODUCTION

The agricultural sector in Jordan is considered one of the most important economic sectors. In addition to its social and economic dimensions, it plays a crucial role in political stability and food security, as it can be considered one of the most important productive sectors that have become more evident during the COVID-19 pandemic due to its continued production and the provision of products needed by the local market, as well as through the total added value of the agricultural sector associated with other activities such as food industries, which reached to about 15-20% of GDP (The Department of Statistics (DOS),2019).

Regarding water resources, Jordan is dominated by the dry and semi-arid Mediterranean climate, where rainfall amounts do not exceed 200 mm/year. The rainfall covers 90% of Jordan's area. (Ministry of Agriculture,2019).

However, Jordan is classified as one of the ten water-poor countries in the world as it is the poorest country in water resources in the Arab region and the Middle East, and less than 100 cubic meters

of renewable water resources are available to everyone (less than the absolute global poverty line of water scarcity of 500 cubic meters) (Ministry of Water and Irrigation, 2019). Jordan faces a chronic imbalance in the population-water resources; the annual water deficit is estimated to be at (400) million cubic meters, and only 275 million cubic meters of groundwater can be used annually.

The agricultural sector consumes 62.3% of the total water consumed. The combined water resources constitute about 40% of the total water in the Kingdom (Jasmine, 2019). The groundwater level in the main aquifers decreases by 2 meters per year, and the amount of groundwater overpumping is 200 million cubic meters per year while 52% of the available water resources are used in agriculture, and 46% are of groundwater sources (Ministry of Water and Irrigation, 2019).

In terms of land resources, Jordan has an area of 8.9342 million hectares. In comparison, the arable land is 1.035900 million hectares, of which the exploited agricultural area in the Kingdom is between (230-270) thousand hectares, which constitutes 25% -30% of the total arable area of the Kingdom's land (Ministry of Agriculture,2019).

In terms of human resources, the Jordanian agricultural sector provides job opportunities for a very large percentage of the total workforce. That percentage is gradually shrinking to about(3.8%) of workers in Jordan (DOS, 2019). The most important reasons for this are shifting from agricultural work towards work in other sectors, migration from the countryside to residing in cities and the fragmentation of agricultural properties and holdings, and that work in the agricultural sector is seasonal or occasional for individuals more than it is permanent job opportunities because of the different farm conditions from season to season and from month to month, which makes individuals search for permanent work and move away from agricultural work, and that the percentage of non-Jordanian workers who work in the agricultural sector more than Jordanians because of the hardness of agricultural work as well as for several reasons of prevailing customs, traditions and culture. (DOS, 2019)

Therefore, it can be said that decision-making in agricultural production is very difficult due to the lack of knowledge of many related issues. Therefore, risk-taking is important for Jordan due to the many sources of risk in Jordanian agriculture, and it must be given great attention in decision-making in agricultural production. Therefore, the importance of the study comes from the role played by the agricultural sector and the high implicit relative importance of the study area in terms of limited basic resources such as agricultural land, water and capital to provide the economic information necessary to make decisions that would raise the economic efficiency of available agricultural resources and help decision makers and policymakers in developing strategies that reduce risk. Through what was presented in the introduction, the justifications for the study, and its importance, the study aims to examine the sources of risk and risk management methods for vegetable farmers in the study area.

## **2. THEORETICAL FRAMEWORK**

### **1.2. Why vegetables?**

Vegetables are one of the main elements of plant biodiversity, and their presence is healthy and necessary for our planet. Its types are many, and its reproduction methods are different. It is an important sector of agriculture that we can not mention unless we think of the world of vegetables of all kinds, in addition to its economic importance and importance in the economies of countries, especially the great ones such as China and the United States. The world's production of vegetables reached one million thousand tons in 2020. Let's look at it from our daily health and nutritional perspective for most of the population of the land. Because of their great health importance, there is hardly any dish free from pure agricultural production, especially vegetables. Therefore, 2021 was named the International Year of Fruit Vegetables by the Food and Agriculture Organization of the United Nations (FAO) (Mona, 2017).

Vegetables is a term based on the use of herbaceous plants or parts of plants that are eaten completely or partially raw or cooked in general with an appetizer dish or salad, but not as sweet, and are heavily managed and may require special care, especially in the post-harvest stages to preserve their quality. Vegetables may be annual or perennial crops (Reyes-García et al., 2015). The World Vegetable Center, an international research institute in charge of vegetables, maintains a gene bank of 61,000 samples from 155 countries, including about 12,000 samples of indigenous vegetables (Al Zaabi, 2018).

The agriculture of vegetables is a special case that differs from the rest of the plants. Its life cycle ( from seeds to seeds) needs special care to obtain a high product in terms of quantity and quality. All that are considered risks in vegetable cultivation that must be overcome, including easy and difficult to deal with, some of which are overcome because of agricultural experience, and some of which need the agricultural guide to work on managing the technical risks of vegetable cultivation (Wijethunge & Kirupanathan, 2019).

Vegetable crops of all kinds are grown by direct sowing in the field or through vegetable reproduction, and the most commonly used and artisanal methods are seedling reproduction. The seedling is produced in various basins in plastic houses and protected or open beds, and seedling processes are faster but more expensive. For this reason, seedling production is considered a specialized and important part of the vegetable trade. It has become the rule in many vegetables such as melons, peppers, tomatoes and eggplants. Production by seedling requires special facilities and careful attention to detail, so vegetable farmers buy seedlings in ready-made basins or plant them primarily by seedling production specialists instead of planting these seeds themselves (Geneve, 2009).

Vegetables, as it turns out, are sensitive plant in the dose of their life at every moment that needs a specific process, and it is a living organism that does not stop growing. Therefore, this cycle must be monitored, take into account all the details and dimensions of the risks that can be exposed, and work to respond quickly and logically to everything. Originally, all precautions are taken to avoid these risks and deal well with the surrounding environment, which benefits the vegetable plant (Whelan et al., 2002), not to mention that these details and risks differ from one species to another in the same type and differ from one type to another of many types of vegetables, each type has its own needs and conditions of growth, which are specialized in it, and the appropriate

environment for its cultivation and planting date. These vegetables, whatever have been provided with the appropriate environment, optimal needs, correct handling and greater control over the surrounding conditions, give us a better result, and this is the biggest goal of vegetable cultivation (Yahia & Carrillo-Lopez, 2018).

## 2.2. Vegetables in Jordan

Vegetables are considered the main elements of the agricultural sector in Jordan. Vegetable production is one of the main components of plant production in particular. This production meets much of the country's needs, and the remaining of it is exported abroad, not to mention the provision of job opportunities in the field of production, marketing and manufacturing or even the manufacture of its production requirements in general. There are two main areas for agricultural production in Jordan, namely the Jordan Valley (Alagwar), considered the Jordan food basket in the winter and the highlands area that supplies Jordan with summer crops. Jordan has an area of 8.9342 million hectares. In comparison, the arable area is 1.035900 million hectares, of which the exploited agricultural area in the Kingdom is between (230-270) thousand hectares, which constitutes 25% -30% of the total arable area of the Kingdom's land (DOS, 2019).

In addition, vegetable production constitutes the largest proportion in terms of quantity, as it constitutes more than 50% of the total production of vegetable production in most years, and this indicates the importance of vegetables as strategic crops, as they reached their peak in 2018, reaching 77% of the total production by more than 2.5 million tons. (Ministry of Agriculture,2019). Looking at the global statistics (FAO) for tomatoes and cucumbers, it was found that the global production of tomatoes is 182 million tons, and Jordan's production of tomatoes is 717,865 thousand tons, meaning that Jordan produces almost 0.004 of the world's production of tomatoes. This is a large ( very large) number if we take that the number of countries is 210 countries, the area of Jordan related to other countries, furthermore the area that is suitable for agriculture in comparison to the world, and if we took in our consideration that Jordan is the second poorest country with water sources!

This also applies to the cucumber crop. Vegetable production reached 75 million tons globally in 2018. The same year, Jordan's cucumber production was 208226 thousand tons, representing 0.003 of the world's production. This is a very good amount for a country with limited resources and risky agricultural production. Table (1) shows the annual production between 2017-2019 of the most important vegetable crops in Jordan, the most important of which are tomatoes and cucumbers( Ministry of Agriculture,2019).

Table No. (1) Production of varieties of vegetables 2017-2019

Item	2019	2018	2017
	Production (tonnes)	Production (tonnes)	Production (tonnes)
tomatoes	496216.00	717865.00	690477.00
Cucumber	163484.00	208226.00	190847.00
Zucchini	65,786.00	57237.00	72091.00
Eggplant	55630.00	61254.00	65319.00
Cauliflower	46,799.00	46513.00	46449.00
Cabbage	35074.00	52262.00	50436.00
Onion	54500.00	67949.00	56354.00
Carrot	19220.00	15768.00	12,712.00
Green beans	16628.00	12904.00	8727.00
Watermelon	93800.00	93589.00	95527.00
Cantaloupe	62509.00	71125.00	60220.00

### Agricultural Risk Management Fund

It is a stand-alone fund affiliated with the Ministry of Agriculture. It is concerned with plants, plant products, animals and animal products. The farmer and everyone who carries out the agricultural production process, let him be an owner, lessee or partner, can benefit from the fund; the person who wishes to benefit must participate in the fund. Agricultural risks are the risks that affect the property and agricultural products of the beneficiaries and include natural hazards such as drought, snow, heavy rain, cold, storms, floods and frost, as well as disease, insects and epidemic pests that may affect the plant and animal in an epidemic manner. The Fund aims at: (Jordan legislation, 2020)

- Managing the risks to the agricultural sector in Jordan and reducing their effects.
- Compensating the beneficiaries in the case of agricultural risks according to the principles, mechanisms and limits determined by a system issued for this purpose includes determining the number of the beneficiaries' contributions.
- Compensate affected farmers in the event of agricultural risks.
- Institutional capacity building in agricultural risk management.
- Contribute to sustainable agricultural development.
- Encourage farmers and beneficiaries to adopt modern means to reduce agricultural risks as much as possible and develop biographical techniques to reduce losses resulting from them.

### 3. METHODOLOGY

The objective of the study was based on the initial data, as a questionnaire was designed to collect data and information through a personal interview with the farmer or a member of his family or with whoever supervises the management of the farm, if not in the study area. Secondary data were

collected from the publications and bulletins of ministries, government departments and other entities that have information that was used in this study, in addition to relevant references and books.

As for covering the field and collecting the necessary primary data during the agricultural season 2021/2022. The study community consists of vegetable farmers in the northern Jordan Valley region, who number(1077) farmers (Ministry of Agriculture, 2019). The random sample was used to choose a sample representing the region's farmers. 284 farmers determined the sample size, and agriculture in the valley is at the forefront of vegetable cultivation, trees, and field crops in terms of area.

The comparative advantages of the study area: It is characterized by a warm climate in the winter and hot in the summer, and Aliwa is considered the Jordanian food basket area for its richness of arable land, and it has tourist and religious importance due to the presence of prophets' companions' and many archaeological sites such as the Tabqet Fahel, the existence of the Jordan Valley crossing with the Palestinian lands, and the presence of mineral water (Northern Shauna) and it is considered a therapeutic place.

Concerning the survey method of data, the data, once collected, are checked and converted into quantitative data and analyzed using a computer, based on some available systems such as(Excel) and(SPSS). The method of statistical analysis and standard analysis will be used by calculating descriptive statistical analysis by:

Likert Scale: This measures vegetable farmers' attitudes towards risk sources and risk management methods and their importance in the study area in Jordan(Al-Manasir, 2012). The Von-Neumann Morgenstern Model was used to estimate the benefit functions in the least squares method (OLS), through which the risk coefficient was obtained for each farmer. Accordingly, the farmer is classified as a risk taker, risk-averse, and risk-neutral.

## 4. RESULTS

### 4.1. Statistical Description

In this section, the study variables, according to the tool used for data collection (questionnaire), are described statistically as follows:

The first dimension: farmer, in terms of age and years of experience

Table (2) shows the distribution of the study personnel according to the "age of the farmer"

Variable	Number	Mean	standard deviation
Age of the farmer	186	49	13.8
Years of agricultural experience	186	17.22	12.37

Table (2) shows the distribution of the study personnel by age, as the results showed that the average age of farmers is (49) years, with a standard deviation of (13.8). Distribution of study personnel according to years of agricultural experience, where the results showed that the years of agricultural experience for farmers are (17) years and with a standard deviation of( 12.37).

The second dimension: the farm

This dimension was measured by the variables listed in Table (3).

Table (3) shows the distribution of the study personnel according to each variable.

Variable		frequencies	Affiliation
Type of tenure	Individual property	45	25.1
	Shared	6	3.4
	Hired	25	14.0
	Guarantee	103	57.5
Total		179	100.0
Farm Type	Protected	122	74.4
	Exposed	19	11.6
	Mixed	23	14.0
Total		164	100.0
Employment by nationality	jordanian	10	9%
	Syrian + Jordanian	1	1%
	syrian+ Egyptian	5	4%
	Egyptian.	97	86%
Farm Irrigation Source	Government	145	84.3
	Private	27	15.7
Total		172	100.0
The amount of water provided by the government suits the requirements of the farm	Yes	4	2.3
	No	168	97.7
Total		172	100.0
Risk to crops	Yes	128	74.4
	No	44	25.6
Total		172	100.0
Irrigation cost supported	Yes	62	42.5
	No	84	57.5
Total		146	100.0
The way that depends on the buy production inputs Cash.	Seeds	76	40.9
	Fertilizers	72	38.7
	Pesticides	72	38.7
	Other	42	22.6
The way that debts production inputs for the harvest season	Seeds	64	34.4
	Fertilizers	90	48.4%
	Pesticides	79	42.5
	Other	47	25.3

Variable		frequencies	Affiliation
Highlight the problems you face in providing production inputs	Rising prices	89	70%
	Human resources.	26	21%
	Water	5	4%
	Lack of materials	6	5%
Support from certain parties to provide production inputs	Yes	17	17.2
	No	82	82.8
Total		99	100.0
Do you have a participation in the Risk Management Fund	Yes	0	0
	No	119	100
Total		119	100
The reason the farmer did not participate in the risk management fund	Difficulty in collecting official papers	5	10%
	Inefficient	17	33%
	Not interested	20	38%
	Having no idea about it	10	19%
Benefit from compensation	Yes	33	32.7
	No	68	67.3
Total		101	100.0

Table (3) shows the following:

- Most of the sample members have farms according to the type of tenure (guarantee), where their percentage was (57.5%) of the study sample, and they were the most frequent. In comparison, the percentage of the sample members in the type of tenure ( shared) was (3.4%) of the sample size, and they are the least frequent.
- Most of the respondents had years of experience (more than 10 years), where their percentage was (50.8%) of the study sample, and they were the most frequent, while the percentage of respondents with years of experience less than 5 years was (23%) of the sample size, and they were the least frequent.
- Most of the respondents had permanent agricultural labour of Egyptian nationality, where their percentage was (86%) of the study sample, and they were the highest frequency. In contrast, the percentage of respondents with seasonal agricultural labour of Jordanian nationality was (66%).
- Most of the irrigation sources for the sample farms were from the government, whose percentage was (84.3%) of the study sample and the most frequent. In comparison, the percentage of irrigation sources for the sample farms from a private source was (15.7%) of the sample size, and they are the least frequent.
- Most respondents answered that the amount provided by the government does not match the requirements of the farm with a percentage of ( 97.7%) of the study sample. They were the

highest frequency, while the percentage of respondents who answered that the amount provided by the government fits the requirements of the farm was (2.3%) of the sample size, and they were the least frequent.

○ Most respondents answered that there is a danger to the crops according to the insufficiency of the government-provided quantity to the farms, where their percentage was (74.4%) of the study sample. They are the highest repeatedly, while the percentage of the respondents who answered that there is no danger to the crops according to the adequacy of the quantity provided by the government to the farms, where their percentage was (25.6%) of the sample size. They were the least frequent, as the most important prevention that occurred and affected the farms is the lack of production, followed by production damage, and finally, frost, where the respondents agreed that the most important solution proposed according to the sample is to increase the hours of pumping water to the farms.

○ Most respondents answered that the cost of irrigation was not subsidized, as their percentage was (57.8%) of the study sample. They were the most frequent, while the percentage of respondents who answered that the cost of irrigation is subsidized (42.5%) of the sample size was the least frequent.

○ The repetitions and percentages of the method adopted by farmers to purchase production inputs, where the results showed the following:

– According to the seed inputs, it was found that (40.9%) of the sample depends on cash and (34.4%) on debt for the harvest season.

– According to fertilizer inputs, it was found that (38.7%) of the sample depends on cash and (42.5%) on debt for the harvest season.

– According to the pesticide inputs, it was found that (40.9%) of the sample depends on cash and (34.4%) on debt for the harvest season.

– According to other inputs not mentioned, it was found that (22.6%) of the sample depends on cash and (25.3%) on debt for the harvest season

○ Most of the respondents face the problem of high prices, where their percentage was (70%), followed by the problem of employment (33%), followed by the lack of water (5%), and finally the problem of the lack of materials (4%).

○ All the respondents who answered this question are not subscribers to the risk management fund, and the reasons for non-participation are that most of them are not interested (38%), followed by the fact that the subscription is ineffective (33%), and by (19%) they do not know about it, and (10%) because of the difficulty of collecting official papers, and Table (3) shows this.

○ Most of the respondents did not benefit from the compensation, as their percentage was (67.3%) of the study sample, which is the most frequent. In comparison, the percentage of the respondents who benefited from the compensation was (32.7%) of the sample size, which was the least frequent.

### The third Dimension: Sources of Risk

The means, standard deviations and relative importance of each risk source were extracted separately, and Table (4) shows this:

Table (4) means and standard deviations related to sources of risk arranged in descending order according to means

Rank	Number	Items	Mean	standard deviation	Relative importance
1	2	Plant and insect diseases	3.94	0.239	high
2	1	Weather (frost, lack of rain,...)	3.9	0.297	high
3	6	Availability and distribution of irrigation water	3.75	0.433	high
4	7	production elements costs	3.7	0.461	high
5	15	Vegetable Marketing	3.65	0.831	high
6	5	Rented work and its availability	3.55	0.694	high
7	14	Vegetable prices	3.47	0.947	high
8	13	Classification of vegetables	3.32	-0.929	high
9	4	Availability and Lease of Land	3.11	0.988	high
10	12	Laws and Instructions	3.02	0.552	high
11	10	Financial status	2.94	1.028	Average
12	11	The opinion of the family and others	2.85	0.762	Average
13	16	Agricultural guide	2.76	1.175	Average
14	8	Financial Loan	2.63	2.296	Average
15	3	New technology	2.62	0.959	Average
16	9	Loan charges	2.36	0.842	Average
		Sources of risk as a whole	3.08	.47	high

It is clear from Table (4) that the relative importance of the items of the risk sources was high, as the general mean (3.08) and with a standard deviation of (.47), source No. (2), which states "plant and insect diseases", came first among the items with a mean of (3.94) and a standard deviation of (2.39) and of high relative importance. Whereas source No. (9), which states the "loan costs" came in the last rank among the items with a mean of (2.36) and with a standard deviation of (0.842) and of medium relative importance.

### The fourth Dimension: Risk Management

The means, standard deviations and the relative importance of each risk management strategy were extracted separately, and the Table shows this (5).

Table (5) the means and standard deviations related to risk management strategies in descending order according to means

Rank	Number	Items	mean	standard deviation	Relative importance
1	12	Preventive spraying program	3.62	0.657	high
2	2	Diversity of markets	3.41	0.595	high
3	9	Outbound marketing	3.4	0.661	high
4	1	Availability of market information	3.39	0.686	high
5	5	Diversification of vegetable crops	3.25	0.872	high
6	4	Administrative flexibility	3.03	0.666	high
7	14	Crop insurance against diseases	3.03	1.192	high
8	6	Diversification in farming methods	3.02	0.808	high
9	13	Sell production to retailer or consumer	3.02	0.855	high
10	3	Cash reserve	2.97	0.752	Medium
11	7	Sale of production in advance by contract	2.8	0.828	Medium
12	11	Family business off the farm.	2.55	0.837	Medium
13	8	Agricultural loan administration and access	2.54	0.761	Medium
14	10	The farmer worked off the farm.	2.41	0.749	Medium
Risk management strategies as a whole			2.89	30.	Average

It is clear from Table (5) that the relative importance of the items of the risk management strategies has been average, as the overall arithmetic mean was (2.89) with a standard deviation of (0.30). The strategy that provides for a "preventive spraying program" came first among the items with a mean of (3.62) and with a standard deviation of (0.657) and with high relative importance. At the same time, the strategy that stipulates "farmer work off the farm" came last among the items with a mean (2.41) and a standard deviation (0.749) and with medium relative importance.

## 5. DISCUSSION

According to the previous results, the percentage of risk sources in the northern Jordan Valley during vegetable cultivation is high, while their sources of risk were plant and insect diseases, weather conditions such as (frost, lack of rainfall,...), the costs of expensive production elements, uncertain vegetable marketing methods, rented work fees, different vegetable prices in the market, vegetable classification, government laws and instructions, the cost of irrigation, lack of water, the general financial situation of the Jordanian, the financial loan, loan costs, and lack modern technology. All of them are considered among the risks facing vegetable farmers in Jordan, and this was confirmed by the study (Mona,2017), which showed the importance of studying the risk factor under the current production conditions and showed that the risks are the cost of irrigation, lack of water, the general financial situation, the financial loan, and loan costs. At the same time,

Jasmine (2019) confirmed the risks in agriculture, government instructions, policies and laws, and the different prices of agricultural products in the studied area. Duong et al. (2019) stated that the risks increase due to various factors, including globalization, increased trade in agricultural products and climate change, which threaten agricultural projects and force farmers to adapt and draw their own strategies and management. Komarek et al. (2020) study considered five main types of agriculture risks: production risks, market risks, institutional risks, personal risks, and water risks.

As for risk management, the results showed that the level of risk management among farmers in the northern Jordan Valley during vegetable cultivation was medium. At the same time, the programs it adopts were a preventive spraying program, market diversification, external marketing, availability of market information, diversification of vegetable crops, administrative flexibility, payment of crop insurance against diseases, diversification in cultivation methods, sale of products to the retailer or consumer, cash reserve, sale of production in advance by contracting, family work off-farm, management of and access to agricultural loan, farm work off-farm. This was confirmed by the study of Bencová and Boháčiková (2021), which showed that one of the methods of managing agricultural risks is agricultural diversity. Onubuogu and Esiobu's (2016) study showed that farmers started with smart determinants to deal with risks by adopting many smart risk options to frustrate the negative effects of risks in the region, and among the main smart risks that farmers used was livelihood diversification. The study of Senapati (2020) also identified the specific socio-demographic and economic characteristics of risk situations of farmers in irrigated and rain-fed areas in Odisha, India, and that agricultural risk management is carried out through improving extension facilities in an area and training farmers on risk management best practices, and improving storage facilities for irrigation systems.

## 6. CONCLUSION

This study aimed to find out the attitudes of vegetable farmers towards risk in Jordan by examining the sources of risk and risk management methods for vegetable farmers in the study area so that they were applied to vegetable farmers in the northern Jordan Valley . The risk ratio was found to be high, and the most serious situations were plant and insect diseases, and factor costs . The degree of management of these risks was medium, as they are managed through several programs, the most important of which is a preventive spraying program, and diversification of vegetable crops. The study recommended that a similar study can be carried out elsewhere in Jordan in order to generalize the results.

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