IOSR Journal of Business and Management (IOSR-JBM)
e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 21, Issue 5. Ser. VI (May. 2019), PP 88-92
www.iosrjournals.org

Risk Attitude: An Empirical Analysis of Jordan Vegetable Farmers

Ibrahem S. Al-Tahat

Department of Agricultural Economics and Extension, Faculty of Agriculture, Jerash University, Jerash 26150,
Corresponding Author: Ibrahem S. Al-Tahat

***Abstract**: The agricultural sector is characterized by higher exposure to a variety of risks compared to the other economic sectors. The study aims to examine vegetable farmers' attitudes towards risk in Jerash Governorate. All the vegetable farmers (50) in Jerash Governorate was selected. In order to measure risk attitudes, utility functions for vegetable farmers in Jerash Governorate were estimated. For this purpose, Von Neumann– Morgenstern model was used. Based on the estimated utility functions, risk attitudes coefficient for each farmer was measured. Studying farmer's attitudes towards risk is very important in the decision-making process. These attitudes are considered to be the main constraints to the adoption rates of vegetable technology by farmers. Consequently, vegetable production is affected by these attitudes. Of the 50 farmers in Jerash Governorate, a purpose sample of 30 vegetable farmers was selected, i.e. 11 farmers (37%), 13 farmers (43%), and 6 farmers (20%) were falling into three categories: risk avert, risk neutral and risk taker, respectively. They gave answers, which can be used for the purpose of utility function estimation. To analyze the relationship between farmers' personal characteristics such as age, education, farm size, family size, and experience in agriculture and their risk attitudes, a multiple linear regression model was used, The risk – coefficient is taken as the dependent variable, while the farmers' characteristics are taken as independent variables. The regression results of the study indicated that the coefficient of the intercept, the coefficient of age, the coefficient of educational level, were statistically significant at 5% of the significance level. The coefficient of family size, the coefficient of farm size, were statistically significant at 10% of the significance level. The coefficient of agricultural experience was not statistically significant.*

***Keywords**: Vegetable farmers, Risk Attitude, Coefficient of farm size, Jerash.*

Date of Submission: 06-05-2019 Date of acceptance: 20-05-2019

I. Introduction

Agriculture is considered a basic pillar of economic and social development. During the past three decades, agriculture has also started to play a major role in the protection of the environment, including the protection of bio-diversity and ensuring an environmental balance that would secure sustainable use of resources and preserve them for future generations. The agricultural sector, still an essential sector in generating activities for other sectors of the economy such as services and industries. The agricultural sector contributes to the businesses account by 27 percent of the GDP (Department of Statistics, 2006). Vegetable farmers, like other businessmen, hope for satisfactory returns to their Labor, management and owned capital if they stay in business over a period of years. Risk and uncertainty contribute to discrepancies in the rates of adoption by vegetable farmers. The study of risk and uncertainty is very important to farmers in the decision -making process. The farmer's attitudes towards risk are considered to be the main constraints to the adoption rates of vegetable technology by farmers and to rural development programmes. Because of the high risk associated with wide fluctuations in returns and high input prices, the vegetable farmers in Jordan are forced to minimize their risk action by only limiting themselves to the most important inputs of production. To adopt technology and development programmes to the very best, special attention should be paid to the attitudes of various groups of farmers towards risk. Therefore, it is important to research farmers; constraining attitudes and factors towards risk; and to point out their impact on the decision – making process.

II. Review of Literature

(Officer and Halter, 1968) derived utility functions for wool producers in northern New South Wales, Australia. They used three models of utility estimation, namely Von Neumann – Morgenstern, modified Von Neumann – Morgenstern, and Ramsey. The study tested the hypothesis that maximizing expected utility, as a criterion for decision, is superior to maximizing expected monetary values. The results indicated that the Ramsey model was superior to the von Neumann – Morgenstern models.

(Lin, Dean, and Moor, 1974) provided an empirical test for utility vs. Profit maximization in agricultural production in California. Utility and profit maximization crops and plans were determined for six large California farms. The results of the study supported the hypothesis that Bernoullian utility is a more accurate predictor of farmer behavior than profit maximization.

(Moscardi and Janvry, 1977) examined attitudes towards risk among peasants in Puebla, Mexico. An econometric approach was used in the analysis. Results of the study indicated that estimation of risk aversion, following the indirect method outlined in the analysis (safety – first behavior), shows that risk aversion is indeed responsible for substantial differences between the demand for fertilizer without risk and actual demand. Risk premiums were high, discouraging the use of high rates of fertilizer. Also, the study found that knowledge of the purpose of tailoring technological recommendations to particular categories of peasants.

(Salem, 2009) used Von Neumann-Morgenstern model to examine the farmers' attitudes towards risk, utility functions for vegetable farmers in the Jordan Valley. The results of the study showed that 26% of the farmers were risk averse, 30% were risk neutral, and 44% were risk preferential. The relationship between farmers' personal characteristics and their risk attitudes are also examined. The regression results of the study indicated that the coefficient of farm size (X3) and the coefficient of family size (X5) were statistically significant at the 5% level of significance.

III. Methodology and Procedure

The data used to analyze the sources of vegetables farmer's attitudes towards risk in Jerash Governorate were obtained by personal interviews conducted during the vegetable season of 2018/2019, Secondary data necessary to this study also collected. All the 50 vegetable farmers was selected and interviewed (Jerash Agriculture Department, 2018).

To realize the objectives of the study, the main sample of 68 farmers and purpose sample of 30 vegetable farmers were selected. Those farmers gave answers that can be used for the purpose of utility function estimation. It is believed that those farmers took the subject seriously so that their decisions are good indications of their preferred choices. Relatively; older, illiterate, and religious farm managers did not accept the idea. This is due to their limited capability to understand and comprehend the information, or/and their religious beliefs, where the respondents have the anti-gambling beliefs.

*Von Neumann – Morgenstern model

This technique is based on a concept called standard reference contract. Two alternatives are considered: Alternative A: probability P of winning, for example, J. D. 1000 and probability (1-P) of losing J. D. 1000. Alternative B: Given a certain amount of cash, (certain cash) different probability levels are assumed by considering the gains and losses of a certain range (e. g.-1000 to 1000 J. D.) to obtain the indifference points between having a certain amount of money (certain cash) and risk taking.

Assumption made by Von Neumann and Morgenstern:

The existence of a utility function implies that the decision-maker satisfies the following four assumptions concerning his preferences among the prospects (Halter and beringer,1960).

1-The person making the choice has in his mind a transitive and complete of all alternative open to him. Thus, if $A \geqslant B$ and $B \geqslant C$.

2-If among entities A, B, C, $A \geqslant B \geqslant C$, then there exists some probability value $0 < p < 1$, which will make the person who is choosing indifferent between a certain prospect composed of B and an uncertain prospect composed of A with probability p and C with probability 1-p.

3-If $B \geqslant C$ and A is any entity, then $p B+(1-p) A \geqslant p C+(1-p)A$.

4-The process by which the outcome of the gamble is determined does not affect the choice, which is made. Thus, if a person were to choose between a certain prospect of B and an uncertain prospect A and C, it would not matter to him whether his gamble takes the form of a business venture or playing roulette. Thus, love or dislike of gambling per se is ruled out.

Appendix A illustrates the Von Neumann – Morgenstern model.

IV. Result and Discussion

Using the Von Neumann – Morgenstern quadratic utility functions for 30 vegetable farmers in Jerash Governorate were estimated. Then the attitude towards risk coefficient for each farmer was estimated. The risk attitude coefficient is defined as the negative ratio of the second to the first derivative of the utility function evaluated at the 2018/2019 farmer's gross income level. This is called the Pratt – coefficient.

When the 30 utility functions were evaluated for the Pratt – coefficient at the decision– makers' gross income level and classified by the sign of the coefficient into risk averse, risk neutral, and risk preferential, it was found that 11 farmers (37%), 13 farmers (43%), and 6 farmers (20%) were falling into the above mentioned categories, respectively. The high percentage of risk–neutral of the sample farmers was consistent with the farmers' attitudes and practices. This is due to the high risk in the vegetable production that is associated with wide fluctuations in returns and high input prices and other natural & environmental factors that farmers can't control. Results of the utility functions estimation are shown in Table1. Three of the utility functions estimated from the sample are shown in Figure1, where Type1 represents risk-averse, Type2 represents risk-neutral, Type3 represents risk-preferential.

Table (1): The Farmers' Utility Functions

Farmer No.	Utility Function	$R^2$100%	Risk Coefficient*
1	U(X)=1.574534 + .004839X + 0.00000326X2	99.1	- 0.000147
2	U(X)= 3.408849+ .005158X + 0.00000165X2	97.1	- 0.00039
3	U(X) =8.425466+ .004839X - 0.0000033X2	99.1	+ 0.01202
4	U(X) = 5 + .01X + 0.0000000X2	100	0.00000
5	U(X)= 3.408849+ .005158X + 0.00000165X2	97.1	- 0.00039
6	U(X) = 5 + .01X + 0.0000000X2	100	0.00000
7	U(X) = 5 + .0048X + 0.0000000 X2	98.7	0.00000
8	U(X) = 5 + .01X + 0.0000000 X2	100	0.00000
9	U(X) =7.586507+ .004216X - 0.0000025 X2	95.1	+ 0.01157
10	U(X) =8.07733+ .004602X - 0.0000028 X2	98.3	+ 0.02295
11	U(X) = 5 + .01X + 0.0000000 X2	100	0.00000
12	U(X)=2.097961 + .005338X + 0.00000317X2	94.3	-0.00011
13	U(X)= 3.408849+ .005158X + 0.00000165X2	97.1	- 0.00039
14	U(X) =5.583441+ .00421X - 0.00000015X2	93.5	+ 0.00033
15	U(X) = 5 + .01X + 0.0000000X2	100	0.00000
16	U(X) =14.19082+ .005088X - 0.0000093X2	99.8	+ 0.14091
17	U(X) =7.482832+ .0046X - 0.0000021X2	96.2	+0.01050
18	U(X) = 5 + .01X + 0.0000000X2	100	0.00000
19	U(X) = 5 + .004684X + 0.0000000X2	99	0.00000
20	U(X) = 4.947568+ .004862X - 0.00000022X2	98.2	+ 0.00025
21	U(X) = 5 + .01X + 0.0000000X2	100	0.00000
22	U(X) = 6.41 + .01X + 0.0000000X2	97	0.00000
23	U(X) =7.709013+ .004448X - 0.0000024X2	97	+ 0.0375
24	U(X) = 5 + .01X + 0.0000000X2	100	0.00000
25	U(X) =5.204781+ .004409X - 0.00000048X2	95.5	+ 0.00092
26	U(X) =7.598523+ .004367X - 0.0000024X2	96.3	+ 0.05106
27	U(X) = 5 + .01X + 0.0000000X2	100	0.00000
28	U(X) = 5.57 + .01X + 0.0000000X2	99	0.00000
29	U(X)=1.574534 + .004839X + 0.00000326X2	99.1	- 0.000147
30	U(X) =7.482832+ .0046X – 0.0000021X2	96.2	+ 0.0105

* Negative sign (-) = risk preference; Positive sign (+) = risk averse;
Zero (0) = risk neutral.
** X = money in J.D (Jordanian Dinar).

The risk – coefficient was taken as the dependent variable and the farmers' characteristics were taken as independent variables. The independent variables were age, educational level, family size, farm size, and experience in agriculture.

Linear, semi-log, and double-log equations were used. Log-log equation was the best. The regression results of the study indicated that the coefficient of the intercept, the coefficient of age (X1), the coefficient of educational level (X2), were statistically significant at 5% of the significance level. The coefficient of family size (X5), the coefficient of farm size (X3), were statistically significant at 10% of the significance level. The coefficient of agricultural experience (X4) was not statistically significant. The adopted log-log equation is the following:

$$\ln \hat{Y} = 48.65 - 14.91 \ln X_1 - 9.20 \ln X_2 + 2.38 \ln X_3 - 0.58 \ln X_4 + 3.4 \ln X_5$$

$$R^2 = 0.45 \qquad F = 3.94$$

Where
Y = risk-coefficient
X_1 = age in years
X_2 = education level in years
X_3 = farm size in dunums
X_4 = experience in agriculture in years
X_5 = family size in number of members

The results showed that the relationship between a farmer's age and level of education and his desire to take risk is inverse. It is understood that the older a farmer is, the less likely he is to take risks. The relationship between the size of the family and the farmer's desire to take risk is positive relationship. Because the farmer needs to achieve a minimum to meet the various expenses. And so is the relationship between farm size and the desire to take risk. A farmer of a big size allows a wide range of diversity in crops production, thus avoiding the dependency on one kind of products. In other words, a high income that a farmer gets from certain activities can compensate the low income of some activities. Consequently, the total income will be at acceptable level.

V. Recommendations

On the basis of the above study, it can be concluded that farmers adopt different adoption rates of vegetable technology and management practices because they have different attitudes towards risk. Therefore, the extension agents and farm management consultants should take into consideration farmers' attitudes toward risk in their work and recommendations.

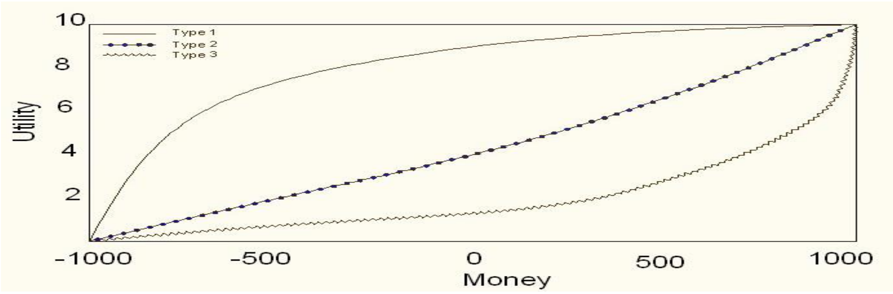

Figure 1: Utility Functions

References

1. SALEM M.A., 2009 "Attitudes of Vegetable Farmers towards Risk in the Jordan Valley, DIRASAT, 21 (2): 51-63.
2. McIntyre, B. D., Herren, H. R., Wakhungu, J. and Watson, R. T. (2009). Agriculture at a Crossroads. International Assessment of Agricultural Science and Technology for Development Global Report. Washington, DC: IAASTD.
3. Department of Statistics, Statistical Yearbook, 2006, Jordan.
4. Jerash Agriculture Department, 2018.Annual Report.
5. Central Bank of Jordan, (2015).Publication and Statistics. Monthly Report.
6. OFFICER R.R.; HALTER A. H., 1968- "Utility Analysis in a Practical Setting," Am. J. Agric. Econ., 50, 257 – 277.
7. 8. LIN W.; DEAN G.; MOORE C., 1974-" An Empirical Test of Utility vs. Profit Maximization in Agricultural Production," Am. J. Agric. Econ., 56, 497 – 508.
8. MOSCARDI E.; DE JANVRY A., 1977- "Attitudes toward Risk among Peasants": An Econometric Approach, Am. J. Agric. Econ. 59, 710 – 716.
9. HALTER A.N.; ROBERT M., 1978- "Utility Measurement and Managerial Behavior," J. Farm Econ. 42, 118 – 132.USDA, 2014, Global Agricultural Information Network, Jordan Grain and Feed Annual.

APPENDICES

Appendix A

Von Neumann – Morgenstern Model

For Estimating Utility Functions

This model is based on a concept called standard reference contract. Two alternatives are considered (Halter and Dean,1971):

Alternative A: A reference contract with Probability P of winning J.D. 1000 and probability (1-P) of losing J. D. 1000.

Alternative B: A Given amount of cash for certain (certain cash).

The following probabilities for P are assumed: P = 1.0; P = 0.8; P = 0.6; P = 0.4; P = 0.2; P = 0.0. The gains and losses are considered over the range of -1000 J. D to 1000 J. D. in order to obtain the indifference points between having a certain amount of money (certain cash) and risk taking.

The decision maker (the farmer) is asked to indicate his preference between A and B for a series of different values of P and levels of "certain cash". This process can be clarified by considering Table 2. Alternative B (certain cash) is listed in the left- hand column. Alternative A, providing either J. D.1000 with probability P or – J. D. 1000 with probability (1-P), is listed across the top. The decision maker is then asked to indicate, for each cell in each column, whether he prefers A or B, or is indifferent. For example, start from the bottom of the first column of the Table 2. Do you prefer J. D. 1100 certain cash (B) or a preference contract (A) with probability 1.0 of winning J. D. 1000 and probability 0 of losing J. D. 1000. Alternative B is obviously preferred. Moving up to the next cell, ask a similar question: Do you prefer J. D.1000 certain cash (B), or a reference contract (A) with probability 0 – 1 of winning J. D. 1000 or probability 0 of losing J. D. 1000. These alternatives are obviously identical and we write "indifferent". Moving up to the next cell and asking a similar question, we find that A is clearly preferred and likewise for all cells in the remainder of the first column. The remainder of Table 2 is filled out in similar fashion. The indifference points obtained can be used to graph utility functions after associating utilities to each indifference point (Figure 3). We define U (-1000J. D.) = 0 and U (1000J. D.) = 10 as an arbitrary scale. Tasking the other indifference points to calculate the utility associated with as follows:

U (200) = 0.8 * u (1000) + 0.2 * u (-1000) = 0.8 * 10 + 0 = 8
U (-300) = 0.6 * u (1000) + 0.4 * u (-1000) = 0.6 * 10 + 0 = 6
U (-600) = 0.4 * u (1000) + 0.6 * u (-1000) = 0.4 * 10 + 0 = 4
U (-900) = 0.2 * u (1000) + 0.8 * u (-1000) = 0.2 * 10 + 0 = 2
U (-1000) = 0.0 * u (1000) + 1.0 * u (-1000) = 0.0 * 10 + 0 = 0

Polynomial functions can be fitted to the points by ordinary least squares (QLS) in order to determine and illustrate different types of utility functions for different individuals

Table(2): Choice Table for Finding Indifference Points between Certain Cash and Various Reference Contracts

Certain Cash Alternative B	Choice Table for Finding Indifference Points between Certain (Alternative A)					
(J. D.)	P = 1.0	P = 0.8	P = 0.6	P = 0.4	P = 0.2	P = 0
-1100	A	A	A	A	A	A
-1000	A	A	A	A	A	I
-900	A	A	A	A	I	B
-800	A	A	A	A	B	B
-700	A	A	A	A	B	B
-600	A	A	A	I	B	B
-500	A	A	A	B	B	B
-400	A	A	A	B	B	B
-300	A	A	I	B	B	B
-200	A	A	B	B	B	B
-100	A	A	B	B	B	B
0	A	A	B	B	B	B
100	A	A	B	B	B	B
200	A	I	B	B	B	B
300	A	B	B	B	B	B
400	A	B	B	B	B	B
500	A	B	B	B	B	B
600	A	B	B	B	B	B
700	A	B	B	B	B	B
800	A	B	B	B	B	B
900	A	B	B	B	B	B
1000	I	B	B	B	B	B
1100	B	B	B	B	B	B

A = Alternative A B = Alternative B I = Indifferent points

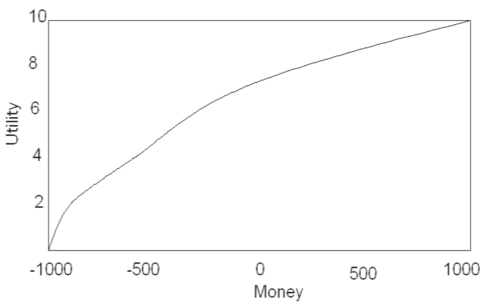

Figure 2: Utility Functions

Ibrahem S. Al-Tahat. " Risk Attitude: An Empirical Analysis of Jordan Vegetable Farmers ". IOSR Journal of Business and Management (IOSR-JBM), Vol. 21, No. 5, 2019, pp. -.88-92