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Factors Influencing Adoption of Protected Tomato Farming Practices Among Farmers in Jordan Valley

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Abstract: The paper investigated the socio-economic characteristics -related factors influencing adoption of protected tomato practices among farmers in Jordan Valley. Data for the study were collected through the use of structured interview schedule from a randomly selected sample of 132 farmers. Frequencies, Descriptive statistics and step-wise multiple regression were used to analyze the data. The findings indicated that majority (93.2%) of the farmers were between 45– 61 years. Averages of (family size, farming experience, farm size and information sources) were(6 persons,13.4 years,27.6 dun,16.7 score) respectively and 9.8% of them were illiterate. There was three categories for farmers adoption level which were low (<40) points, medium (40-62) points and high (> 62) points. It was found that 13.6%, 68.9% and 17.4% of farmers were fall down in the low, medium and high levels respectively. Ranking levels of adoption to farmers in the themes contained in the cultivation of tomato according to the following sequence: crop requirements, agricultural pests, land preparation for planting, house constructed, planting in the houses and finally harvesting as they hit importance relative to the averages of these axes (56.94%) (54.4%) (33.3%), (20%), (15.9%), (15%) respectively. There is need to study the socio-economic environment of the protected tomato farmers in order for research and extension to take adequate advantage of their cultural diversities and uniqueness in promoting adoption. Also, efforts should be made to intensify campaigns on these technologies by extension staff to enable farmers benefit from their usage.

Key words: Agricultural extension · Practices Adoption · Protected tomato farmers · Jordan

INTRODUCTION

Tomato ranks as the leading fresh and processed vegetable crop in Jordan and many other countries in the world. World production which exceeded 133 million metric tons in 2007, occupied approximately 4.7 million hectares [1]. Agriculture in Jordan contributed substantially to the economy at the time of Jordan's independence, but it subsequently suffered a decades-long steady decline. In the early 1950s, agriculture constituted almost 40 percent of GNP; on the eve of the June 1967 War, it was 17 percent [2].

By the mid-1980s, agriculture's share of GNP in Jordan was only about 6 percent. In contrast, in Syria and Egypt agriculture constituted more than 20 percent of GNP in the 1980s.Several factors contributed to this downward trend. With the Israeli occupation of the West Bank, Jordan lost prime farmland. Starting in the mid-1970s, Jordanian labor emigration also hastened the decline of agriculture.Many Jordanian peasants abandoned farming to take more lucrative jobs abroad, sometimes as soldiers in the armies of Saudi Arabia and the Persian Gulf states or inService industries in those countries. Others migrated to cities where labor shortages had led to higher wages for manual workers.

Deserted farms were built over as urban areas expanded. As the Jordanian government drove up interest rates to attract remittance income, farm credit tightened, which made it difficult for farmers to buy seed and fertilizeralthough the agricultural sector's share of GNP declined in comparison with other sectors of the economy, farming remained economically important and production grew in absolute terms. Between 2000 and 2010, total production of cereals and beans rose by almost 150 percent and production of vegetables rose by more than 200 percent, almost all of the increase occurring

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between 2000 and 2005. Production of certain cash export crops, such as olives, tobacco and fruit, more than quadrupled. Because farming had remained labor intensive, by one estimate about 20 percent to 30 percent of the male work force continued to depend on farming for its livelihood.

In the more fertile Jordan River Valley, fruits and vegetables including cucumbers, tomatoes, eggplants, melons, bananas and citrus crops often were produced in surplus amounts. The Jordan River Valley received little rain and the main source of irrigation water was the East Ghor Canal, which was built in 1963 with United States aid [2].

Tomato is an annual vegetable indigenous to Jordan Valley. It is the most commonly cultivated vegetable in Jordan. In Jordan Valley vegetables especially tomato, are of major importance in the livelihood of millions of relatively poor people. In Jordan, tomato is the most important indigenous vegetables extensively grown in most areas Jordan, though consumption is distributed all over the country. However, low yields are a significant attribute of the country's tomato production estimates [3]. The major reasons for low productivity include no adopting of protected farming practices from farmers such as crop requirements, agricultural pests, land preparation for planting, house constructed, planting in the houses, harvesting. The agricultural extension Services of the center for Agricultural Research and Extension (ARE) and the Agricultural Development Programs (ADP) in-charge of disseminating agricultural information to farmers on a nationwide basis, have since 1980S been disseminating research results on these innovations to tomato farmers. However, despite the comparative advantages offered by the use of these improved tomato technologies, acceptance and use of the technologies by farmers to boost tomato production vary and have been far from encouraging generally, the areas and seasons of production as follow:

- Tomato crop from southern part of Jordan Valley: January - February
- Tomato crop from middle part of Jordan Valley: May - June
- Tomato crop from northern part of Jordan Valley: June-July
- Shafa Crop (hilly areas): July-November.

Diffusion of innovations refers to the spread of abstract ideas and concepts, technical information and actual practices within a social system, where the spread denotes flow or movement from a source to an adopter, typically via communication and influence [4, 5].

A critical component in adopting an agricultural innovation is the educational process that extension practitioners use to equip individuals with the knowledge and skills necessary to use an innovation. Information sources used in the educational process have a significant impact on the adoption of agricultural innovations [6]. Diffusion of Innovations (DOI) theory indicates that perceived attributes of an innovation (new practice) strongly affect adoption and diffusion of that practice[4].A brief description of each perceived attribute follows. Relative advantage - degree to which an innovation is perceived as better than the practice it supersedes.

- Compatibility - degree to which an innovation is perceived as being consistent with existing values, past experiences and needs of potential adopters
- Complexity - degree to which an innovation is perceived as difficult to understand and use
- Trialability - degree to which an innovation may be experimented with on a limited basis
- Observability - degree to which results of an innovation are visible to others.

The diffusion of innovations theories, developed over a half century ago, have provided a popular framework to explain how new ideas and technologies are spread and adopted in a community [7]. The framework has been used for program planning, it has been empirically tested and it has undergone critique from various perspectives since its inception in the 1950s [8]. Throughout the years, it has remained instrumental to extension professionals, scholars and students alike and continues to be useful in countless other fields, including medicine, telecommunications, information technology and social marketing. This change process includes a progression consisting of five stages from first awareness of something new to its acceptance and regular use [7]. These stages are characterized as:

- Knowledge,
- Persuasion,
- Decision,
- Implementation and
- Confirmation.

To enhance their effectiveness as change agents, practitioners must understand the unique characteristics that describe the nature of their clientele. Two decades ago, Rogers and Shoemaker suggested conducting research on adopter characteristics to enable diffusion agencies to appropriately categorize and address adopter audiences. They analyzed research publications and summarized hundreds of empirical diffusion studies that either supported or didn't support more than four dozen generalizations about technology adoption. Their findings related various independent variables to innovativeness (dependent variable) that were then grouped into three categories of generalizations: (1) socioeconomic status, (2) personality variables and (3) communication behavior.

Rogers and Shoemaker and McEwen [9, 10] conceptualized the innovation decision process to consist of these four functions: knowledge, persuasion, decision and confirmation. A synthesis of this four-stage adoption paradigm shows that for a farmer to adopt an innovation, there are variables pertaining not only to the farmer but also related to the innovation and method of information dissemination that influence farmers' response. They further observed that agricultural innovations vary tremendously in their inherent characteristics, which to a large extent influence the decision of the farmers to participate. As a result the farmer is more inclined to accept (and participate in) a recommended practice if the practice is profitable, compatible with existing farming system, divisible, simple to use, has relevance for his labor use, farm inputs, marketing, credit, community values and crop situation [11] observed that farmers would adopt new technologies and modify their resource use when they believe that the proposed change is relevant to their circumstances and can help them achieve their objectives. They further stated that the rate of adoption of a technology (using technology adoption as a proxy for any desirable change in resource use) by a farming population would depend on the characteristics of individual's production circumstances, characteristics of the technology itself, socio-cultural characteristics of individual farmers and the speed with which the population is made aware of the technology and its application to local production systems.

Purpose and Objectives: The purpose of this study was to determine which aspects of the protected tomato practices package and farmers' socioeconomic characteristics were responsible for the variations in the adoption behavior of the tomato farmers in Jordan Valley. The specific objectives were to:

- Describe the socio-economic characteristics of the protected tomato farmers;
- Determine the level of adoption of the protected tomato practices disseminated to thefarmers; and,
- Examine socio-economic characteristics of the farmers influencing on the adopting thepractices.

Methodology: The study was conducted in Jordan Valley (Deir Alla area). Using the three areas and six extension blocks were randomly selected from Jordan Valley, from each block 40 to 43 farmers were selected for interview using a simple random sampling technique. In all 132 tomato farmers were sampled using structured interview schedule. However, the interview schedule was designed to generate information in the following areas: crop requirements, agricultural pests, land preparation for planting, house constructed, planting in the houses, harvesting and farm characteristics of the farmer's related variables.

Two trained interviewers under close supervision of the researchers administered copies of the interview schedule. In some cases the interviewers had to interpret the questions in Colloquial for the illiterate farmers. Todetermine individual adoption scores of farmers, request of the farmers to answer the questionnaire paragraphs, where the score was given for the case of the selection of the correct answer and zero in the case of the wrong answer. Items included in the package of protected tomato farming practices were: crop requirements, agricultural pests, land preparation for planting, house constructed, planting in the houses andharvesting [12] and farm characteristics of the farmers' related variables. Data relating to socio-economic variables of the farmers were analyzed using frequencies, percentages, averages, standard deviations, Pearson & Spearman correlation, chi-square and t-test were used that test of hypothesis and determine the relationship between the socioeconomic characteristics of farmers and technology related variables influencing the adoption of protected tomato practices among farmers.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Farmers Entries in Table 1 show that 3.8% of the farmers were below 30 years of age. Those that fell within the age range of 30-45 years accounted for 48.5%, about 44.7% of the respondents were of the age range of 46 - 61 years, while

Table 1: Number and Percentage distribution of the farmers by socio-economic characteristics (n = 132)

Socio-Economic Characteristics	*F*	%	Mean	S. d
Age Range (years)				
< 30	5	3.8	45.8	8.8
30-45	64	48.5		
46-61	59	44.7		
> 61	4	3.0		
Educational level				
illiterate	13	9.8		
elementary school education	37	28.0		
Secondary school education	70	53.0		
Community College	12	9.1		
University	13	9.8		
Family size				
< 5	56	42.4	6	3.2
10-5	61	46.2		
>10	15	11.4		
Holdings type				
Owner	57	43.2		
renter	51	38.6		
Participant	24	18.2		
Holdings Size(dun)				
< 20	53	40.2	27.6	19.2
20-40	58	43.9		
> 40	21	15.9		
Farming Experience				
< 5	23	17.4	13.4	8.4
10-5	38	28.8		
> 10	71	53.8		
Exposure to sources of information				
<13	29	22.0	16.7	3.8
13-21	85	64.4		
> 21	18	13.6		

about 3.0% of the respondents were either 61 years of age or more. The average age of the respondents was about 45.8 years. The implication of these findings is that majority of the respondents belong to the young and middle aged group. This is an advantage since they are supposed to be physically able and more mentally alert in learning new technologies than the older farmers.

Table 1 further shows that those who had between zero and less than five people in the family consisted 42.4% of the respondents. About 46.2% of the respondents had between five and ten people in the family, while about 11.4% had over ten people in the family. The average family size of the respondents was approximately 6. One of the most important factors conditioning the level of production and productivity of small-scale farmers is the composition and size of the family. Hence the relatively large family size of the farmers is an obvious advantage, since it may likely enable the farmers to use family labor, thereby reducing labor cost required in tomato production.

It is also evident from table 1 that 9.8% of the farmers had no education. About 53.0% of the respondents attended illiterate school education, 28% had secondary school education, 9.1% had secondary school education and the remaining 9.8% attended university education. Education has been shown to be a factor in the adoption of yields increasing modern farm practices. The low proportion of illiterates in the respondents' group implies that the majority of them are in a better position to be aware of, understand and adopt protected tomato practices.

About 17.4% of the respondents had below five years of farming experience (Table 1). 28.8% had between 5 and 10 years of farming experience, while about 53.8% had 10 years of farming experience and above. The average number of years of farming experience of the farmers was 13.4 years. This implies that majority of the tomato farmers had long period of farming experience and therefore would be conversant with constraints to increased tomato production. This could increase their

level of acceptance of new ideas as a means of overcoming their production constraints and hence could serve as an advantage for increased tomato production.

Farm size in Jordan Valley (Tabel1) fall into three broad categories: small scale, medium scale and large scale. Small-scale farmers in this study comprise 40.2% of the respondents less than 20dun. Medium-scale farmers (43.9%) between 20 to 40 dun.; and large-scale farmers (15.9%) more than 40 dun of land. The average of farm size of the farmers was 27.6dun. This implies that farmers in the Jordan Valley cultivate relatively larger dun. Of land than their counterparts in other areas. This is an advantage for adoption of innovative practices. It is also evident from (Table 1) that 43.2% of the farmers had owner. About 38.6.0% of the respondents had renter and the remaining 18.2% had participant. Holdings type has been shown to be a limited factor in the adoption protected farm practices. Exposure to sources of information Table 1 further shows that those who had (less than 13 score) in the low exposure level 22% of the respondents. About 64.4% of the respondents had between (13 -21 score) in the medium exposure level, while about 13.6% of the respondents had (more than 21 score) in the high exposure level. The average exposure to sources of information level of the respondents was approximately 16.7 and the standard deviation 3.8.

Adoption of Practices

Overall Adoption Level: the adoption of the overall-tomato farming practices disseminated to the farmers are presented in Table 2. Ranking levels of adoption level to farmers in the themes all in the cultivation of tomato. Table2 further shows that those who had (less than 40 score) in the low adoption level 17.4% of the respondents. About 91% of the respondents had between (40 -62 score) in the medium adoption level, while about 18% of the respondents had over people (more than 62 score) in the high adoption level. The average adoption level of the respondents was approximately 56 and the standard deviation 10.8.

Adoption Level in Protected Tomato Aspects: The adoption of the 6 -tomato farming practices disseminated to the farmers are presented in Table 3. Ranking levels of adoption to farmers in the themes contained in the cultivation of tomato according to the following sequence: crop requirements, agricultural pests, land preparation for planting, house constructed, planting in the houses and finally harvesting as they hit importance relative to the averages of these axes (56.94%) (54.4%) (33.3%), (20%), (15.9%), (15%) respectively.

Socio-Economic Characteristics of Farmers influencing Adoption: To examine the farmers' characteristics that influence adoption of protected tomato practices, adoption scores of the farmers were regressed stepwise on the selected characteristics. Table 4 summarizes the order in which the variables entered into the regression equation. The result indicates that only three variables (family size, farming experience and level of education) out of the four selected variables (age, holdings type, holdings Size and exposure to sources of information) positively and significantly influenced adoption of protected tomato practices ($p < 0.05$) and hence were

Table 2: Overall adoption level of tomato farmers' about protected farming practices. n=132

Overall adoption level	*f*	%
Low (Mean-1 SD) less than 40	23	17.4
Medium(Mean ± 1 SD) (40-62)	91	68.9
High (Mean + 1 SD) more than 62	18	13.6

Mean = 56.1 SD= 10.8

Table 3: Adoption level among farmers in the aspects of protected farming. n=132

	Aspects											
	crop requirements		agricultural pests		land preparation for planting		house constructed		planting in the houses		harvesting	
Adoption Level	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Low (Mean-1 SD)	13	9.8	14	10.6	26	19.7	29	22.0	99	75.0	25	18.9
Medium(Mean ±1 SD)	88	66.7	118	89.4	94	71.2	98	74.2	26	19.7	100	75.8
High(Mean+1SD)	31	23.5	-	-	12	9.1	5	3.8	7	5.3	7	5.3
Mean	1.8		2		4.3		20.5		0.6		8.2	
Relative importance of mean	20%		33.3%		15.9%		56.94%		15%		54.5%	
Ranking of aspects	4		3		5		1		6		2	

Table 4: Summary Result of Stepwise Multiple Regression Analysis of the Influence of Socio-Economic Characteristics on Adoption of protected tomato practices

Steps	Socio-Economic Characteristics	R^2	R^2 Change	Regression Coefficient	F
1	Family size	0.217	0.015	0.207	**
2	Farming Experience	0.202	0.029	0.195	**
3	Educational level	0.173	0.173	0.170	**

R^2 =0.592 ; F = 6.53067; [$p < 0.05$]

important in predicting adoption behaviors. Family size contributed 21.7% the variation in adoption; farming experience contributed 20.2% the variation in adoption, while level of education contributed 17.3%. The three variables jointly explained 59.2% of the variation in adoption of protected tomato practices and by implication; increases in family size, farming experience and level of education would increase the adoption of protected tomato practices. The result also shows that age, holdings type, holdings Size and exposure to sources of information had no significant influence on the adoption of protected tomato practices. However the study of Shadiadeh [13] show that farmers' age, farming experience and organizational participation significantly influenced adoption. The difference might be the type of technologies studied among other factors.

CONCLUSION

It has become evidently clear that the efforts of Agricultural Extension Services in study area at disseminating protected tomato practices to farmers had not made the desired impact and as such most of the improved technologies had low adoption scores. Only the house constructed and harvesting on tomato farms had high adoption scores. This calls for better information on user needs. Hence, determining farmers' criteria for selection and using such as a basis for adopt protected tomato practices will save scare resources that would otherwise be wasted. The step-wise regression analysis postulates adoption as a function of some socioeconomic variables. The result reveals that among the socio-economic variables considered; only family size, farming experience and level of education were the most significant factors that influence farmers' adoption of protected tomato practices in the study area.

The relationship between education and adoption of protected tomato practices must be fully exploited. In this regard, extension agents should determine for illiterate farmers who should be taught the technical skills involved in protected tomato practices and who should be used to disseminate useful information to other farmers in the area. Again, appropriate extension publications such as guides, leaflets and posters (preferably in local languages) could be used. In conclusion, efforts at increasing the rate of protected tomato practices adoption by farmers should include studying the socioeconomic environment of tomato farmers in order for research and extension to take adequate advantage of their cultural diversities and uniqueness in promoting adoption.

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