ANALYZING THE EFFECTIVE FACTORS IN REDUCING APPLE WASTES IN WEST AZARBAIJAN PROVINCE

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Abstract

Apple crop is one of the most important products in exports and foreign currency arrival. In addition, this crop has very high value added inside the country in processing terms. Therefore, studying apple wastes and analyzing wastes reducing methods will have special importance. Therefore; the present research was conducted in descriptive-survey methodology to study the effective factors on lowering apple wastes in West Azarbaijan Province in Iran. The statistical population of the research included all apple growers in West Azarbaijan Province (N=35,000). The size of samples in the research has been assessed in Cochran formula (n=149). The samples were taken in classes and simple random type. The field information in the research was collected by questionnaires. The validity of questionnaire was confirmed by the supervisor and advisor professors and the relevant field experts. The reliability of the questionnaire was confirmed by Cronbach Alfa coefficient (83%). The data was analyzed by using descriptive and inferential methods (percent, mean, correlation coefficient and regression analysis) by using SPSS statistical software. Findings showed significant relations with one percent error level between reducing apple wastes and educational, technical, transportation, support-governmental, marketing and production factors variables. The results of regression analysis showed the sum of educational, technical, transportation, support-governmental, marketing and production factors variables constituted approximately 46 percent of the research dependent variable; that is, reducing apple wastes.

Key words: *wastes reduction, factors, apple, orchard owners, farmers, West Azarbaijan province*

INTRODUCTION

Agriculture in general plays major role in economy. Therefore, using suitable methods for high productivity in this sector might be able to eliminate many economic, and social limitations.

Currently, foodstuffs wastes have changed into one of the challenging techniques in the economic policies of the countries. This problem has questioned the foodstuffs security, social and economic welfare in world. On the other hand, large amount of resources are lost due to increase in wastes and have been led to great harms to the countries' economy [24]. In the process of developing agriculture sector, due to increasing rate of population growth and limitations in resources, the necessity of optimized use of resources and promoting the production factors as well as productivity have become greatly important; as by this approach, agricultural sector, in addition to meeting the increasing demand to food products, can perform its other duties in sustained development as well [17] .

Fruits and vegetables are the most important garden fruits and crops that play an important role in meeting food demand and human health. Due to high contents of moisture, this group of agricultural products is easily spoiled and a major portion of them (between 5 to 50 %) is lost after cultivation. This rate of loss in some cases reaches 80 % [21].

A review on economic indexes shows tree apple has a high share in non-oil exports of the country. The high quality of Iranian apple, long period before spoilage, and low price are the most important advantages of our country in producing apples.

West Azarbaijan Province has been keeping first place among tree apple growing regions of Iran in producing tree apple in the past 20 years. Studies show, for many reasons, that this region has a great potential in growing this fruit. The suitable quality of the soil,

mountainous condition of the region, and cheap work force have introduced this province as the main center of tree apple production in the country [7].

From the viewpoint of FAO and environmental plan, any changes in the quality which lead to the inaccessibility of the product and emergence of unsafe product, and ultimately, making agriculture products unusable for human consumption are considered as foods wastes [12].

There are many developing countries which do possess the capability of producing large amount of fruits and vegetables in high quality; however, due to absence of market information, lack of necessary relationship between producer and buyer; and absence of suitable, fast and relative facilities to have the products reached by consumer, suffer from large amounts of wastes [26].

The World Food Conference – Rome 1974 was the first international gathering which paid attention to the importance of reducing the post- harvest wastes of foodstuffs. It has been claimed that lack of attention to post - harvest maintenance has played an important part in agricultural project failures around the world in the past 50 years. There are many factors including technical, economic and social factors involved in agricultural products wastes.

Azizi (2009) emphasizes that different factors such as technical factors in production process (durability of product and mechanization), technical market factors (transportation, storage and packaging), economic factors (price risk in market and government's support coefficient) and social factors (type of marketing agricultural products, absence of packaging and sorting) cause wastes in products [6].

On this matter, Rezaei (2011) also believes factors such as light intensity, irrigation procedures, nutrition management, harvest time, pre-cold treatments, controlling pathologic features, warehousing technology, products packaging and handling technology effective in increasing wastes in agricultural products. [21]

Goletti (2003) paid attention to all elements of producer to consumer's chains helps developing countries to gain more profits from their orchards. In these regards, [8] sees orchards maintenance management improvement including optimized nutrition, pest and plant disease control and optimized use of chemical fertilizers and poisons effective in reducing wastes and improving productivity in agricultural products. Packaging and sorting fruits as per consumer's demand in production place or before delivery to the consumer market are also effective in these regards [9, 21]. Also, they emphasize that to increase production and meeting human consumption need, various approaches such as increase in cultivation area, increase in performance per area unit, achieving superior varieties, managing farming operations including pest and disease control, irrigation, nutrition, trimming, etc. In fact, maintaining and sustainment in agricultural yields products proportion to consumption market requires serious management in suitable cultivation model, developing cold storages, processing industries and marketing in order to be introduced as an exceptional opportunity in production, productivity, investment, employment creation and increasing in value added and exports. In the meantime, planning to teach producers and distributors is another issue which should be put in the country's priority. Supervision on fruits and vegetables health is highly necessary and if there will be investments on this line too, its effects on man and community will be significant; and at the same time, it could prove to be highly valuable for the country due to preparing better grounds for exports.

Apple is one of the most important products both in exports and foreign currency promotion. On the other hand, this product contains very high value added inside the country in processing terms. Therefore, studying apple in terms of wastes is very important. Since agricultural yields, particularly apple wastes in West Azarbaijan Province affects large percent of products; and due to its impact on gross domestic product and agricultural self-reliance; it is necessary to seek effective and essential approaches to reduce it. In this respect, identifying different

and effective factors in reducing apple wastes seems necessary.

For this reason, the present research tries to identify and study different factors and present suitable approaches for reducing apple wastes. This research can help farmers and orchard owners in increasing their income; in addition, it will be helpful to managers of cold storage, production industries, scientific and university centers and they benefits from the results of this research as well.

MATERIALS AND METHODS

This research is applied in terms of goal and descriptive in research methodology. The statistics population of this research included 35,000 apple orchard owners in West Azarbaijan Province. The sample size of this research, according to Cochran formula is assessed to be 149. Questionnaires were used to collect the field data. The questionnaire of this research contained three sections, 93 closed end question and one open question. The questionnaire was developed by the author to draw up and complete the structures and items, the views of supervisor professor, advisor professor and experts in this business were used too.

The questions were arranged in 5-degree Likert scales of (1= very little, 2= little, 3= average, 4= high, and 5= very high). The questions validity was confirmed by the advisor professor. 25 of the questionnaires were distributed, completed, collected and checked via SPSS software for measuring the reliability; and, the results were studied by using Cronbach Alfa. The average reliability of questions was assessed to be 83%. Thus, the questionnaire had acceptable validity and reliability. The data for the research was collected by using two conventional methods; i.e., literature review and field survey. In literature review, the journals, books, papers, dissertations and virtual bases were studied for building theoretical literature and research records. In field method, also the items designed by author-made questionnaire were used to answer the research goals and questions. The findings were described by using descriptive statistics such as percent, mean, criteria deviation, for describing findings, inferential methods such as correlation coefficient, and if necessary. To study the relationship among variables and their effects, regression analysis was used.

RESULTS AND DISCUSSIONS

Pearson correlation coefficient was used for calculating and studying the relationship among research variables.

As it can be seen in Table 1, there is significant relationship between reducing apple product wastes, and the educational factors variable, with 0.570 correlation coefficient, technical factors (0.652), transportation factors (0.697), support-governmental factors (0.773), market factors (0.646) and production value (0.791) in one percent error margin.

Table 1. Correlation coefficients found between reducing apple products and independent variables

Variables	Correlation coef. (r)	Significant level (p)
Variables	0.570**	0.000
Educational factors	0.652**	0.000
Technical factors	0.697**	0.000
Support-governmental factor	0.773**	0.000
Marketing factors	0.646**	0.000
Productive factors	0.792	0.894

**significance level 0.01
Source: Own findings.

To determine the share of any of the independent variables (educational factors, technical factors, transportation factors, support-governmental factors, marketing factors and productive factors), the multi-regression in Enter method was used. The results in Table 2 show around 46 percent of changes related to the dependent variable (reducing apple products wastes) took place by the mentioned variables (p<0.001).

Table 2. Summary of regression model in Enter method

Multi-correlation Coef.	Determining factor	Modified determined coef.	Criteria error	F
0.679	0.460	0.412	1.694	9.529

Source: Own findings.

By considering the existing coefficients, according to Table 3, the final multi regression model in this research based on B coefficients significance is as follows:

$$Y=60.598+1.226\ X_1+0.693X_2-1.506X_5$$

Table 3. Variables coefficients included in multi-variable regression equation

Multi-correlation coefficient	B	Std.Error	beta	t	Sig
Educational factors (X1)	1.226	0.338	0.350	3.624	0.001
Technical factors (X2)	0.693	0.177	0.360	3.904	0.000
Transportation factors (X3)	0.820	0.467	0.177	1.755	0.084
Support-governmental factors (X4)	0.066	0.178	0.035	0.373	0.711
Marketing factor (X5)	-1.506	0.344	0.412	4.376	0.000
Production factor (X6)	0.347	0.345	0.095	1.006	0.318
Constant value	60.598	22.796	-	2.650	0.010

Source: Own findings

On the share of each one of the independent variables which included in regression line equation in determining the independent variables, it can be admitted, as calculated by attention to Beta values, the variables of educational factors, technical factors and market factors had the highest share and role in determining the mentioned variables than other variables; and other variables were lacked of any significant effects on reducing apple production.

As most of the orchard owners participated in the educational- improvement classes, they have therefore relative familiarity with educational and improvement factors effective in reducing apple wastes; and by using their findings, they can prevent apple loss and wastes. As the average of number of orchard farmers' tools, which is about 3, and the average area of their orchard, which is 4 hectares, the tools seem suitable with respect to the orchard garden. Most major orchard owners have stated factors such as insects and no on time pesticide as the main factors of wastes.

With respect to the prioritization of educational factors items effective on reducing apple wastes, the three items of training farmers to transport, improving the orchard owners' skills in apple harvest and eliminating the existing inefficiencies in storage, converting and distributing product had high priorities and were in agreement with the research results of Khoshnoudifar and Asadi (2010), Gholifar et al., (2009), Atefi (2003), Ahmadi (2010), Moradi (2010) and Malek-Mohammadi (2006) [1, 5, 13, 17, 19, 20]. Teaching and improving agriculture as one of the most important foundation and pillars of modern agriculture can play effective role in productivity and reducing agriculture wastes; and in sum, improving the farmers' living conditions.

In view of the results of prioritizing the items of technical factors effective in reducing apple wastes, the three items of suitable packaging of the product, type of packaging box and availability of agricultural tools to orchard owners were high priorities and the most important items. This finding is in agreement with the research results of Saeidirad *et al* (2012), Rezaei (2011), Khoshnoudifar and Asadi (2010), AfkariSayyah and Minaei (2009), Moradi (2010), Asiedu (2003), Dixit (2008) and Kader and Rolle (2004), Kader (2005). [2, 4, 11, 15, 16, 17, 20, 21, 22].

By employing the available technical factors and technologies, it is possible to reduce the wastes percent of agriculture sector; however, usually, due to not observing technical and scientific principles from production place to final consumption, unrecoverable damages occur to agricultural sector.

In view of the results of prioritization of transportation factors items effective on reducing apple wastes, the three items of using suitable transportation technology by orchard keepers, identifying the climate and environment conditions and lowering the time delays resulted from harvesting time to deliver to the warehouse or factor were in high priorities as the most important items; and showed to be in agreement with the results of the research conducted by Saeidirad et al (2012), Rezaei (2011), Afkari, Sayyah and Minaei (2009), Moradi (2010), Asiedu (2003), Dixit (2008) and Kader and Rolle (2004). [2, 4, 11, 15, 20, 21, 22]

The absence of sufficient knowledge on the scientific principles on foodstuffs

transportation should be recognized among major and effective factors in foods products wastes. Suitable transportation controls damages to the orchard fruit yields.

With respect to the results of prioritizing the items of support-government factors effective on reducing apple waste, the three items of lowering the cargo exchange costs in agriculture sector, supporting farmers in increasing the yield productivity and sorting, and checking the products were in high priorities as the most important items; and are in agreement with the researches carried out by Rezaei (2011), ZhalehRajabi (2011), Kohansal et al (2007), Shadan and Mahinkhah (2004), Moradi (2010), Alston and Tokoze (2007), and Saurundara and Gaush (2009). [3, 18, 20, 21, 23, 25, 27,] In order to reduce apple wastes, it is necessary to lower exchange costs through improving the status of infrastructures, specially developing suitable roads via the relevant agencies and distance of producers to sale market, improve the producers' information in market and production cargoes; and take necessary measures for suitable productivity in terms of sorting, controlling and quality of product. By attention to the results of prioritizing the items of effective marketing factors on reducing apple wastes, the three items; namely, stability and improvement of foodstuffs production and supply chain, attention to apple exports, reducing exports tariffs, and attention to the customers' demands had highest priorities as the most important items; and were in agreement with the results of the researches conducted by Shadan and Mahinkhah (2004), Curic et al (2008), and Saurundara and Gaush (2009). [10, 23, 25]. Suitable marketing for agricultural products is one of the important categories in reducing agricultural products wastes; as, inaccurate analysis of market demands leads to wastes in agricultural products.

In view of the prioritizations results of the effective factors items in reducing apple wastes, the three items; controlling pests and insects, optimized use of chemical fertilizers and poisons and suitable production management were in high priority as the most important items; and were in agreement with the results of researches carried out by Rezaei (2011), and Alston and Tokoze (2007). [3, 21] Controlling pests and insects will be suitable in reducing apple wastes only when the chemical fertilizers and poisons on time and through suitable administration. In view of the results of prioritizing the apple products wastes reduction items, the three items of improving the traditional productivity and marketing systems, establishing suitable cold storage and suitable coordination between the orchard keepers and transportation agents were in high priorities as the most important items; and were in agreement with the research results of Rezaei (2011), Afkari Sayyah and Minaei (2009), Moradi (2010), Asiedu (2003), Kader and Rolle (2004) and Saurundara and Gaush (2009). [2, 4, 20, 21, 23].

Processing is a suitable method in reducing post-harvest wastes of agricultural products. Product processing leads to wastes reduction, increase in farmer and orchard keeper's income and consumers' benefits.

Results of Pierson coordination coefficient, which was used for analyzing correlation among the variables (educational factors, technical factors, transportation factors, support-governmental factors, marketing factors and production factors) and reducing apple wastes showed significant relationship between reducing apple wastes and the variables of educational factors in correlation coefficient (0.570), technical factors (0.652), transportation factors (0.697), support-governmental factors (0.773), marketing factors (0.646) and production factors (0.792) in one percent error margin. That is, each one of these factors plays roles in reducing apple yield wastes. The findings of the research are in agreement with the researches of Khoshnoudifar and Gholifar et al (2009), Atefi (2003), Ahmadi (2010), Moradi (2010), Asiedu (2003), Dixit (2008), Saeidirad et al (2012), Rezaei (2011), Kohansal et al (2007), Shadan and Mahinkhah (2004), and Alston and Tokoze (2007) [1,3, 4, 5, 11, 13, 18, 20, 21, 22, 25].

Different factors, including the educational, technical factors, economic factors, social factors, marketing, production factors and

support factors are involved in agricultural products wastes. Lack of information or poor planning in each one of the factors cause wastes.

According to the results gained through regression analysis in Enter method, the determining coefficient (R^2) which was 0.682 indicates the sum of the variables namely educational, technical, transportation, support-governmental, marketing and production factors defined around 46 percent of the dependent variable of the research; that is, reducing apple wastes. In another word, those results showed approximately 46 percent of changes took place to the dependent variable (reducing apple products wastes) through the mentioned variables ($p<0.001$).

CONCLUSIONS

According to the results, among the variables: educational factors, technical factors, transportation factors, support-governmental factors, marketing factors and production factors, the dependent variables: marketing factors, technical factors and educational factors have the highest share and impact. The other variables are lacked of significant effects on reducing apple products wastes. Based on the information gained by regression analysis, it can be seen the marketing factors, due to high Beta coefficient, which pointed out the most effective variable with impacts on reducing apple wastes. In fact, as the marketing factors are reinforced more, they will have more effects in reducing apple products.

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