



The Feasibility of Developing the Application of Rural-Agricultural Waste Management in Masal Township, Iran

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Abstract

The waste of agricultural products is considered as one of the major problems in Iranian agricultural sector. The present study is a descriptive-survey that focused on exploring correlations and comparison. Data were collected through a research made questionnaires and were analyzed by SPSS. The relationships between dependent and independent variables were analyzed by obtaining the Pearson's correlation coefficient. The statistical population of the study comprised the participants of vermicompost training courses in 2011-12, farmers of Estalkh Zir Village where the vermicompost project was implemented, and facilitators and promoters of the agricultural sector. The results showed that there was a relationship between the dependent (familiarity, the skills and interest rate) and independent variables (agricultural waste management) and that it was confirmed $p < 0.05$) that the impact of the four independent variables was significant on the dependent variable at 0.05 level. As a result, all factors as independent variables are believed to have contributed to waste management. Duncan's test also indicated that there was a significant difference in terms of waste management among the existing factors, namely interest rate, levels of familiarity and awareness, skills, and support from authorities.

Keywords:

agricultural waste, feasibility, management, rural agricultural

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INTRODUCTION

Today, all nations, faced with population growth, are seeking to meet their needs through the development of all aspects of sustainable development. Agriculture is not an exception. In recent years, we have seen some factors threatening agricultural sustainable development in the developing countries. Agricultural waste is one of these factors that threatens sustainable development. Economic and social developments of all societies highly depend on the optimum use of resources and facilities, given the scarcity of industries, on the one hand, and the prevention of losses to improve efficiency, on the other hand (Yahaghi, 2013). According to FAO statistics, Iran has the 1st to 10th ranks in the production of 15 agricultural crops and 25 horticultural products in the world and stands on the 1st and 3rd places in the productions of saffron and pistachio in terms of diversity of production, respectively (FAO, 2012). Despite abundant potentials and considerable production of agricultural products in the country, some products such as wheat and rice are annually imported, whereas about 30% of the crops are lost during planting and harvesting processes which would feed about 15 million people if they were not lost (Rahmani, 2005). Given the strategic importance of agriculture in GDP and an increase in non-oil exports and employment, reducing waste can be of paramount significance in job creation, development of non-oil exports and food security, as well as enhancement of agricultural and horticultural crop yields (Parse, 2007). In many developing countries, farming is still performed with the help of chemical fertilizers. In these countries, productions are increased by excessive agricultural operations to supply food for the growing population. In the past, farmers were able to harvest three times a year by the use of the existing facilities and proper irrigation; however, they never thought of the devastating effect of this procedure in the long run and the negative impact of the use of fertilizers on soil, especially environment after nearly four decades (Saljooghi, 2009).

Today, in sustainable agriculture, which is the most important objective for agricultural scholars, it has been attempted to protect environment

that belongs to next generations too and to economize the production by various practices including less use of chemical fertilizers, insecticides, and pesticides, as well as the enhancement of soil organic matter. On the other hand, fertilizers are chemical compounds commonly used to increase soil fertility. In the meantime, nitrogen fertilizers accounting for the main part of chemical fertilizers are often derived from petrochemicals. Since fossil fuels are not a permanent source of energy, a serious action to be taken to reduce their use to the lowest possible amount in the recent decade (Saljooghi, 2009).

The disposal of agricultural organic waste, either as plant residues or wastes resulting from the processing of agricultural products, is one of the problems that farmers are facing in this sector. On the one hand, the disposal of these wastes places an economic burden on the producers, and on the other hand, if they are not properly disposed, they can pose serious environmental risks by making the disposal site a place for the gathering of vermin and pathogens, thus threatening environmental health and human communities in addition to contaminating soil and water resources (Hassandokht et al., 2005).

Composting is a viable solution to deal with this kind of waste, since it rules out the waste disposal problem, on the one hand, and leads to the production of valuable products for agricultural use, on the other hand. As the final product of the controlled decomposition of organic wastes, composts improve soil physicochemical properties. The application of compost increases soil organic matter content, which is regarded as one of the most important factors for determining agricultural soil quality and fertility (Rivero et al., 2004).

Agricultural soils in Iran are poor in terms of their organic matter (Malakuti, 1999; Quedrago et al., 2001) resulting in reduced soil fertility to a critical level and endangering production security. However, Iranian 2012 Perspective Program says that organic matter of agricultural soils should be increased by at least 1% (Malakuti, 1999). Accordingly, to achieve this goal, that is, enhancing soil organic matter, the use of composted organic matter originating from agricultural residues in farming soils is essential as it is done in other

countries (Nevens & Reheul, 2003; Quedrago et al., 2001). Thus, in addition to increasing soil organic matter, improving agricultural soil quality, and augmenting the agricultural production sustainability, valuable products for soil modification can be produced from inconsumable wastes, the disposal of which will have enormous costs (Hassandokht et al., 2005).

Experience in Iran shows that lack of coordination between the responsible bodies and lack of a coherent strategy for waste management from their generation until their disposal, on the one hand, and failure or lack of specific standards for composting and recycling hazardous waste as well as for health centers, on the other hand, are of the challenges that need to be considered in the waste management strategy (Omrani, 2007). Every year, a lot of agricultural and horticultural crops undergo a quality loss in their various stages, especially after the harvest in such a way that their waste amounts in the third world countries exceed those of the industrialized countries because of scant attention devoted to the principles of conservation of agricultural products, lack of the development of scientific methods for warehousing, as well as the damage caused by storage losses. If the damage to crops in the fields and gardens are also added to them, a lot of losses of agricultural products will be resulted (Bayat, 2004).

The aim of the study was to study the feasibility of developing the application of rural agricultural wastes in Masal Township and the objectives included:

- The study of farmers' awareness of rural waste management
- The study of farmers' skills and abilities to manage rural wastes
- The extent of rural and relevant authorities' support for rural waste management
- The study of villagers' interest in rural waste management

MATERIALS AND METHODS

The data for the present quantitative survey were collected from a field study in Estalkh Zir village, Masal County by a questionnaire. wherever required, observations and interviews were also used for data collection. The statistical population of the study consisted of participants in the training courses of vermicompost which were held in 2011-12, farmers of Estalkh Zir Village where the vermicompost project was implemented, as well as facilitators and promoters of the agricultural sector. The final pool of the participants who took part in the survey comprised 408 individuals. The whole statistical population was examined via a census. Out of 147 questionnaires given to the entire population, a total of 147 completed questionnaires were received and thus the rate of return was 100% (see Table 1). The geographical scope of the study encompassed the activists in the field of waste management in Masal Township, the farmers in whose village the vermicompost project was implemented, the participants in the training courses of waste management and vermicompost

Table 1
Population Specifications and the Number of Completed Questionnaires

Statistical Society	Total population	Number of completed questionnaires
Estalkh Zir Village	304	87
Participants in the classroom	84	40
Facilitators and promoters	20	20

Table 2
Reliability of Questionnaire as Estimated By Cronbach's Alpha

Section	Items	Cronbach's alpha values
Trading with agricultural waste management	9	0.837
Skill and ability to manage agricultural waste	6	0.912
Protection authorities in the field of agricultural waste management	6	0.783
The interest in the management of agricultural waste	8	0.951
Total	29	0.927

production, as well as extension agents and facilitators of the agricultural sector.

The validity of the questionnaire was confirmed by professors and experts, and Cronbach's alpha coefficient was reported as a measure of its reliability, which turned out to be 0.927 (see Table 2). In the present study, descriptive and inferential statistics were employed in order to achieve the pre-determined objectives and answer the research questions, and descriptive statistics such as mean, frequency, percent and standard deviation were used in addition to dispersion indices including standard deviation and ANOVA. For the statistical analysis, Pearson's correlation coefficient and Duncan's test were employed. In this regard, the data collected were analyzed using SPSS.

The questionnaire consisted of two parts: The first part was related to participants' personal characteristics such as age, marital status, educational background, agricultural and horticultural areas under cultivation, type of land ownership, annual income, income from agricultural and non-agricultural activities, and main job, and the second part was concerned with the attitudes and skills, support from public sector, and farmers' rates of interest in agricultural waste management

in Masal Township. The latter part had five features measured on a 5-point Likert type scale (from very high=5 to very low=1) as follows.

RESULTS

The results of descriptive findings showed that 4% of participants were illiterate and 7%, 12%, 34% and 43% were graduates of elementary schools, intermediate schools, high schools and universities, respectively. The mean age of the subjects was 36 years. Moreover, the youngest and oldest subjects were 17 and 70 years old, respectively. Their average land area was 1.5 ha. Furthermore, 76% of the subjects were farmers. In addition, 2%, less than 1%, 14%, and 7% of them were found to be ranchers, engaged in handicraft businesses, employees, and working in different jobs, respectively. Therefore, farmers had the highest population in this study (see Table 3).

The participants rated the variable of "familiarity and awareness" to be slightly higher than the mean (M=27.6, SD = 6.12). They also gave a high score to the variable of "interest rate" (M= 29.8, SD = 6.25) implying their interest for the implementation of the project. The participants described the variable of "skills" as to be slightly

Table 3
Participants' Demographic Characteristics

Property	Class	Frequency	Percent
Sex	Female	73	52.1
	Male	67	47.9
Age	Under 30 years	52	37.1
	31 to 40 years	49	32.9
	41 to 50 years	24	17.1
	More than 50	18	12.9
Level of education	Illiterate	6	4.3
	Primary	10	7.1
	Guidance	17	12.1
	Secondary	47	33.6
	Collegiate	60	42.9
Area of land	Less than 1 ha	92	65.7
	1 to 10 ha	44	31.4
	More than 10 ha	4	2.9
Land ownership	Personal	95	68.8
	rental	25	17.9
	Share in	20	14.3
Main job	Agriculture	106	75.7
	Livestock	3	2.1
	Handicrafts	1	0.7
	Employee	20	14.3
	Other	10	7.1

Table 4
One Sample T-test to Assess the Status of Variables (N=140)

Factor	Mean	SD	SE	t-statistic	P-value
Familiarity	27.55	6.01	0.52	53.307	0.000
The skills	19.11	4.28	0.36	52.760	0.000
Interest rate	29.76	6.25	0.53	56.340	0.000
Support of authorities	14.62	4.83	0.41	35.784	0.000

Table 5
Variance Analysis Between and Within Groups of Variables

Factor	Mean	SD	SE	t-statistic	P-value
Familiarity	27.56	6.01	0.52	53.307	0.000
The skills	19.11	4.28	0.36	52.760	0.000
Interest rate	29.76	6.25	0.53	56.340	0.000
Support of authorities	14.62	4.83	0.41	35.784	0.000

Table 6
Duncan Test Results Variables

Variables	N	Sub alpha = 0.05			
		1	2	3	4
Support of authorities	140	14.6214			
The skills	140		19.1143		
Familiarity	140			27.5571	
Interest rate	140				29.7643

higher than the mean (M=19.11, SD = 4.29). In addition, they described the variable of “support from authorities” to be lower than the average (M = 14.6, SD = 4.83). This reflects their frustration with official supports. Implementation of t-test on the variables revealed that all studied variables were higher than average except for the support from authorities. Therefore, it can be said that there is a significant difference between the variables in terms of waste management with a 95% probability (see Tables 4).

Overall, Pearson's correlation coefficient showed a significant relationship between the variables of rate of interest, skills, support from authorities, and familiarity and awareness and the dependent variable of agricultural waste management based on the significant level obtained with a 1 probability. A significant relationship was found between economic factors and agricultural and domestic waste management according to Pearson's correlation coefficient at the 95% probability level. Also, according to analysis of variance and Duncan's test, it can be concluded that all four variables had an impact on waste management

though with different affectabilities. Based on the above results, the variables of interest and familiarity rates had the highest effects, respectively, but those of skills and support from authorities exhibited lower impacts (see Tables 5 and 6).

DISCUSSION AND CONCLUSIONS

The exploitation of rural people's potentials in the management of rural wastes suggests the use of their high capabilities. Since the villages of Guilan Province are production and consumption centers, rural people play a considerable role in agricultural products, in the processing and marketing of foods, and in the wastes management. Accordingly, they can be very effective in the management of wastes and their recycle.

Voskuyi Eshkevari and Lahijanlian (2010) studied the role of environmental training of women in environment management in 24 villages of Nowshahr, Chalus, Tonekabon and Ramsar, all in Mazandaran province. They found that most women attended the training courses held by female extension agents. The reasons for non-participation in classes were mentioned as

the lack of interest (in 14.5% of cases), the lack of trust to this sort of trainings (13.9%), unsuitable training (12.8%), time constraints (16.4%) and the lack of the use of women's capabilities (31.5%, i.e. almost one-third of women). Accordingly, it can be concluded that one main reason why women do not participate in environmental training courses is that their capabilities are not used which is in agreement with the results of the present study and Zarabi et al. (2012).

In terms of the methods for acquiring environmental awareness, 28.5% of women improved their awareness by attending classes held by Literary Movement¹ teachers, 21.2% by mass media, 27.3% by attending classes held by extension agents, 17.6% by other family members like student children, and 5.5% by attending classes held by environment experts. So, it can be concluded that environmental training classes held by Literary Movement teachers and by female extension agents play an important role in promoting women's environmental awareness. The role of training in enhancing environmental awareness was assessed to be very high by 26.1% of women and to be moderate by 35.2% of women. The latter had the highest frequency. Therefore, it can be said that training is fairly effective on enhancing environmental awareness. In the present study, a positive, weak relationship was found between the variables of acquaintance and awareness which is in agreement with Yahaghi (2013) and Zarabi et al. (2012).

Majlesi (2007) concluded that people's awareness, training and motivation were the most effective factors on enhancing public participation. However, awareness by itself was not effective, because it should lead to the change in attitude and the consequent change in behavior leading to participation. This finding is in agreement with our results.

In a study on rice waste, Tavvaly (2008) found that rice cultivation area was 18,300 ha and rice straw yield was 6 t ha⁻¹ and concluded that this straw, which could have been used for various purposes like packaging and the production of fungal compost and ethanol, was burnt by farmers due to their ignorance inflicting enormous damages

to the environment. This finding is in disagreement with the present study regarding the importance of farmers' awareness and acquaintance.

It was observed that significance level was lower than 0.05. Therefore, two variables are correlated with the 95% confidence. Therefore, these two variables (skill and ability) have positive, weak relationship. This result is in agreement with Voskuyi Eshkevari and Lahijanani (2010), Yahaghi (2013) and Zarabi et al. (2012).

Naghavi et al. (2012) concluded that the most important factor in villagers' participation in the separation and management of wastes is their personal benefits and that the answer to the question 'what benefit does it have for us?' is crucially important for them. Moreover, they found that the lack of knowledge, experience and publications were the main obstacle for vermicompost production plan in villages, which is in agreement with our results.

In a study on the impact of training on garbage separation at source in Tehran, Abedi et al. (2012) found that all studied groups evaluated the trainings to be effective on citizens' participation and that they only disagreed on training priorities. Likewise, they did not find any significant differences in participation rate in terms of age and gender; however, they found significant differences in participation rate in terms of participants' education field, earning and residential area, which is in agreement with the present study with regard to the importance of attendance in educational courses.

Jozi and Zareie (2007) used SWOT to propose a strategic plan for the management of rural wastes in Minab Township, Iran. They proposed the strategy of 'increasing public awareness of rural wastes by media propagation and their awareness of wastes-related pollution and how to manage them by village officials' as the best approach with the highest rank. This is not in agreement with our findings because the present study showed that villagers' interest was the most important factor in waste management.

Results showed a very weak positive correlation between officials' support and waste management at 95% confidence level. This is in agreement

with Voskuyi Eshkevari and Lahijanian (2010), Yahaghi (2013) and Zarabi et al. (2012).

In a study on citizens' satisfaction with urban garbage recovery system, Arasteh et al. (2007) concluded that historically and politically talking, people are not interested to participate in city affairs and they will show more interest and will trust more to government officials if a part of benefits of urban waste management is devoted to them. This is in agreement with our findings in the sense of moderate level of interest and weak level of officials' support.

Minoosepehr et al. (2012) stated that public awareness and participation are the keys for the success of waste management and that specific trainings should be delivered to specific target groups under the support of officials. Also, Farmohammadi et al. (2007) showed that the rate of garbage separation at source in rural areas was only 4% in Chaharmahal Bakhtiari province and 18% in Isfahan Province, but the villages of Yazd Province almost entirely lacked separation at source. Also, they reported that people moderately participated in collection, disposal and shipping of garbage in villages of the studied provinces which would be enhanced to an optimum level in a short time by training and increasing their awareness of health, economic and environmental importance of garbage separation at source and the cooperation in their recycle. On the other hand, the factors which should be considered by policy-makers and planners in order to narrow the gap between people and government include mutual trust between officials and people, highlighting the importance of participation in policy-making for fair distribution of facilities and opportunities, publicizing social services, employment, etc. Training pioneering people out of users and stakeholders of waste management plans and their participation can improve public awareness which is in agreement with the results of the present study.

Given the significance level of less than 0.05, it can be argued that there was a positive, moderate correlation between interest and waste management at the 95% confidence level. This finding is consistent with Arasteh et al. (2007), Khourzani (2007), Voskuyi Eshkevari and Lahijanian

(2010), Yahaghi (2013) and Zarabi et al. (2012).

Omrani (2007) found such problems as inter-department disharmony in all agencies responsible for waste management, the lack of practical studies and the lack of support of research organs, the existence of plentiful foreign interaction and incorrect imitation from western technology without considering the priorities and conditions of the country, spending large but unsuitable expenses for unnecessary programs without considering the priorities and the results including mixed compost plants, the large gap between health and sanitation and the lack of studies to reflect the impact of pollution on human health and environment, the problems of insanitary recycling which is already common in urban areas, and limited number of professionals and consulting firms in the field of waste management. In addition, training of growers plays a considerable role in reducing agricultural waste, and agricultural extension and training is directly related to the use of agricultural waste. He suggests that the main strategy of waste management is based on eight components: culture and training, research materials, regulations, minimization, recycling, collection and shipping, specific garbage, and disposal. It is in agreement with the present study in terms of culture and training and the need to increase farmers' capability and awareness.

RECOMMENDATIONS

1. Due to the significant impact of having an outlook on agricultural and domestic waste management behaviors, it is necessary to provide training to correct the wrong attitude towards waste management both at home and in agriculture. Given the fact that the rural people's attitudes and behaviors were different about agricultural waste management, training courses are suggested to be conducted in such a way that the behaviors as well as attitudes are affected. Such courses must also incorporate a practical part.

2. Due to the significant impact of social factors on attitudes toward agricultural waste management, it is recommended that due attention is devoted to the issue of organizing women in the production communities in order to provide job opportunities, cut the costs, increase the produc-

tion, reduce the waste, and enhance the productivity since effective and practical programs can change and regulate inappropriate consumption patterns into optimal models with their active participation and organization.

3. Given the significant effect of economic factors on agricultural waste management attitudes and behaviors, it is recommended that necessary measures are taken for rural people's further access to credits and income-generating projects.

4. It is suggested that we estimate the amount of waste of agricultural products in various stages from planting to harvest. The causes of wastes must be investigated in various processes to provide solutions to reduce them. The strategies for turning wastes into useful products and its economic feasibility should be also reviewed. The technical conversion of wastes into useful products must be evaluated in terms of economic feasibility. Since in this study, the roles of the five components of social, educational, cultural, economic, and individual factors were investigated in agricultural and domestic waste management and no significant relationship was found for individual features, it is suggested that the impact of the mentioned features be reviewed besides identifying other factors in future research.

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