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Theoretical Model for Extension Education to Decrease Agricultural Waste to Secure Agricultural Development in Mazandaran Province, Iran

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ABSTRACT

This research was conducted with the aim of designing a strategic extension-education theoretical model for agricultural waste management to sustain agricultural development in Mazandaran Province. The statistical population of this study included experts, gardeners, and farmers in Mazandaran Province, among whom 30 people were selected using the purposeful sampling method and snowball technique. A semi-structured interview was conducted to collect research data. The data collection process continued until the theoretical saturation level. A qualitative data analysis was performed using MAXQDA12 software. Analyzing this model showed that factors affecting agricultural waste generation consisted of five categories as, respectively, farming practice, market and transportation, processing procedures, agricultural and natural and support policies, based on their impact factors. In addition, 12 factors within these categories affected the establishment of agricultural waste management extension education were identified. Based on their impact factors in the model, these categories included class participation, food processing industry development and expansion, general knowledge and information about agricultural waste, appropriate farming practice education, educational workshop participation, farm visits, farmers and gardeners education, listening to the radio and TV educational programs, group discussion participation, transfer of new applied waste management technologies, and contact with agricultural extension agents, respectively. Therefore, it is highly recommended to put in action the theoretical model provided in this research for the sake of agricultural development in Mazandaran, Iran.

Keywords: Agricultural waste extension, Agricultural waste management, MAXQDA12 software, Waste reduction.

INTRODUCTION

Most human activities generate waste. Despite this, production of wastes remains a major source of concern. Recently, the rate and quantity of waste generation have been increasing. As the volume of wastes increases, the type of waste also increases. Unlike the prehistoric period where wastes were merely a source of nuisance that needed to be disposed of, proper management was not a major issue as the population was small and a vast amount of land was available to the population at that time (Amasuomo and Baird, 2016). Agricultural residues and/or the post-harvest by-products generated via different production processes of agriculture are known as agriculture-originated wastes (agro-wastes), which have the potential to be a promising source of energy and feedstock for the production of high value-added chemicals and other substances (Hoang *et al.*, 2023). Official data shows that, from production to consumption, on average, 35% of agriculture products go to waste, in Iran.

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This much of waste is equal to the products required to prepare decent meals for 15 to 20 million people in the country (Asadi *et al*., 2010). Agricultural wastes occur in the cultivation, pre-harvesting, harvesting and post harvesting processes, but the majority of wastes are related to both stages of harvesting and post harvesting (Angrosino, 2007). The purpose of waste management is to protect the environment and the public by keeping manure and contaminated waters out of surface and ground water, and controlling application of manure nutrients to crop lands so that nutrients are available in the right quantity, at the right time, and at the right place (Classen and Lal, 2012). In addition, it has been approved that food wastes have a direct and negative impact on the income of both farmers and consumers (Gustavsson *et al.*, 2011). United Nations defines agricultural waste as waste produced as the result of various agricultural operations. It includes manure and other waste from farms, poultry houses, and slaughterhouses (Malek Mohammadi, 2006). Review of developed countries' strategies in agriculture sector, however, shows that constructing and implementing a solid waste management strategy is crucial (Kuppamuthu *et al.*, 2016). Some studies also show an efficient waste management system in agricultural production positively affects the environment and plays a vital role in enhancing human health and quality of life (Khoshnoodifar and Asadi, 2016). The considerable amount of agriculture wastes that are being produced around the world is overwhelming. Production of agricultural wastes increases annually at an extremely alarming rate of 5-10% on average (Wang *et al.,* 2016). The high rate of agricultural waste has been one of the main contributors and significant obstacle to the long pursued and strategic goal of food self-sufficiency and security in Iran. Therefore, it is believed that by eliminating or minimizing the agricultural waste, Iran can achieve this goal much easier (Pirmoradi *et al.*, 2013). Agricultural wastes are non-product outputs of production and processing of agricultural products that may contain material that benefit man, but whose economic values are less than the cost of collection, transportation, and processing for beneficial use. Estimates of agricultural waste growth are rare, but they are generally thought of as contributing a significant proportion of the total waste matter in the developed world. Agricultural development is usually accompanied by wastes from the irrational application of intensive farming methods and the abuse of chemicals used in cultivation, remarkably affecting rural environments in particular and the global environment in general. Generally, agricultural wastes are generated from a number of sources, notably from cultivation, livestock and aquaculture (Obi *et al.*, 2016). The meaning of waste in this research is the amount of agricultural products that are lost and not used in the production stages (pre harvest, harvest, post-harvest) and in the marketing stage, whether they are spoiled or thrown away.

Nowadays, waste management and its control pose a considerable challenge from collection point to disposal unit. Therefore, identification of sustainable approach to solve the problem of waste management caused by the agricultural and industrial sectors, food supply chains as well as retailers, and final consumers is necessary. Recognition of appropriate management of waste has been implemented as an essential prerequisite for sustainable development (Tiwari, and Khawas, 2021). It is also widely accepted that agricultural extension services are vital components of any agricultural development process, which may include the transfer of a particular technology or specific information to help farmers form sound opinions and make sound decisions about their agricultural production systems (Kwaw-Mensah, 2008). Recent studies have modeled knowledge and decision-making capacities to determine how production factors (i.e., water, capital, chemicals, etc.) can be utilized in agribusinesses. Besides, agricultural extension services are a significant factor in

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creating knowledge and transferring useful findings to farmers to make them more competent decision makers (Malek Mohammadi, 2006). Therefore, agricultural extension services play an essential role in many agricultural development projects, including Agricultural Waste Management Extension and Education (AWMEE), which is part of a system of agents that help farmers to make appropriate decisions rather than influencing or intervening in their decision-making process (Ibid). Yu-Chen Lin *et al*. (2009) revealed that the existing waste management strategies warrant further study. In sum, the main purpose of the present study is to determine how agricultural waste management extension-education can diminish agricultural waste stringent norms for waste reduction at source. Awareness through education could reduce food waste and its consequences. Findings of the study by Kumar *et al.* (2015) showed that the strategies for reducing post-harvest losses in developing countries include application of current knowledge to improve the handling systems; overcoming the socioeconomic constraints, such as inadequacies of infrastructure, poor marketing systems, and weak R&D capacity; and encouraging consolidation and vertical integration among producers and marketers of horticultural crops. Omidi *et al.* (2014) revealed that factors affecting wheat waste management are variables of age, history of wheat cultivation, number of family labor, the rate of wheat yield per hectare, area under cultivation, access rate to machinery required in the planting stage, access to needed machines at harvesting stage, awareness rate, education, and credit. The variables of farmers' awareness rate had the highest effect in reducing wheat crop losses, and the education levels had the highest influence of wheat waste management. 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 are effective in increasing wastes in agricultural products. Ommani (2015) concluded that the most important extension goals according to the wheat farmers in favorable conditions were problem solving and decision making right spirit in the face of problems, the expertise of farmers in crop losses, strengthening social organizations for action to reduce, institutionalization of culture and improving wheat farmers participation in waste reduction. Malek Mohammadi (2006) states that "agricultural waste management extension education is the ultimate need for intellectual productivity" and waste management extension is highly significant because of the millions of tons of annual waste in vegetal, animal, environmental and natural resources products as well as millions of hectors of land degradation. Waste management extension deals with raising the efficiency and productivity of the agricultural industry, intellectually and/ or economically. Also, results show that the greater the use of agricultural waste management extension education, the less the agricultural waste, the higher the agricultural productivity, and the lower the land degradation. However, review of similar studies and projects showed that lack of an adequate scientific method for agricultural waste management extension and education model has always been a significant concern in Iran. Moreover, previous studies could only list some of the main contributing factors in producing the current devastating level of wastes in Iran's agricultural sector, but did not recommend any integrated management model to address this issue. Therefore, this study aimed to propose a model that frame agricultural waste management extension and education services into a strategic and practical model and reduce the waste in this section in Iran, focused on farmers of Mazandaran Province, which has a substantial role in producing a variety of products and high level of waste. It seems that the extension and education department can play an effective role in the awareness

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of the society and reducing the amount of waste of manufactured products as a field agent and an intermediate link between agricultural knowledge production resources and users. Therefore, it is conceivable that agricultural development can be carried out by applying the waste management extension and education model._Table 1 shows a number of studies similar to this study.

The results of the recent studies showed that the robust connection with the locals is a fundamental factor in implementing a sustainable waste management plan at a local level (Fehr. *et al.*, 2020).

MATERIALS AND METHODS

Description of Study Area

Mazandaran Province has an area equal to 1.46 percent of Iran, and is one of the leading agricultural producing regions, in particular for rice and citrus. This very populated and narrow strip of land and woods is the number one province among 32, by providing 10% of the economic value added of agribusiness in Iran, in 2018. The province is small, but has a distinguished record in agricultural production, continually ranking between the top three producers of over 15 different products, including rice, citrus, kiwi, flowers and plants, and livestock. According to the Agricultural Jihad Organization of Mazandaran Province, the province production of major horticultural crops (citrus, kiwi, peach, and nectarine) was over 1.76 million tons in 2018, of which close to 13.5% was wasted. Therefore, to address the primary goal of this study, which falls in the paradigm of qualitative researches, the grounded theory approach was adopted. Interestingly, using qualitative research has grown dramatically in social sciences (Angrosino, 2007). At the same time, among all various types of qualitative analyses, the Grounded Theory has a profound significance in social studies because of its unique features that explore social processes in human interaction (Strauss and Corbin, 1998). Grounded Theory is a design for qualitative research through which researchers attempt to establish a theory grounded in the relations between data and the categories derived from that data (Lindlof and Taylor, 2002; Strauss and Corbin, 1990). This theory always begins with a research situation, and the task is to understand what is happening through observation, conversation, and/or interview. After the initial data collection phase, the key issues are jot down and constantly compared until, eventually, a theory emerges. According to Dick (2005), one of the most important steps is the axial, open, and selective coding in grounded theory implementation. In open coding, labels refer to things that are the nouns and verbs of a conceptual world; adjectives and adverbs are properties of these categories (Borgatti, 1996). The next step of coding is the axial coding procedure where data is pieced together in new ways after open coding, allowing connections between categories (Kolb, 2012). Axial coding is the appreciation of concepts in terms of their dynamic interrelationships. These should form the foundation for the creation of the theory. The focus of axial coding is to construct a model that details the specific conditions that give rise to a phenomenon's occurrence (Moghaddam, 2006). In the final stage of coding, Corbin and Strauss (2008) define selective coding as the process of identifying and choosing the core category, systematically connecting it to other categories, validating those similarities and relationships and then completing categories that need further refinement and development. In terms of purpose, this study is practical and, in terms of nature, classified as qualitative research. The statistical population in this part of the research was agricultural experts, farmers, and gardeners in Mazandaran, Iran, selected according to purposeful sampling and using the snowball technique. The research instrument was a questionnaire with open questions and the required data gathered by performing in-

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Table 1. Reviewed literature applicable in agricultural Waste Management Extension Education modeling.

Reference	Title	Results
Rajabi *et al.* (2020)	Application of Structural Equation Modeling to Scrutinize the Causes of Grape Losses in Production Chain	The provision of participatory on-farm education, understandable educational programs in local media and financial resources were most important in reducing grape losses.
Razeghi and Sadigh (2018)	Investigation of Mechanisms to Reduce Agricultural Waste Utilizing Delphi Technique	Based on the results of the research, the specialists agreed on 48 mechanisms to reduce agricultural waste that were classified into seven factors including infrastructure - social, economic policy making - planning, productive – production, technical,– extension-education and research.
Abdeshahi *et al.* (2015)	Components Affecting Vegetable Waste Reduction Emphasizing on Food Security; View Points of Producers in Hamidiyeh Township	Based on the results, from the viewpoints of producers, operating support and training were the most important factors affecting waste reduction that indicting the government support and extensional education role.
Asadi *et al.* (2010)	Agricultural Wheat Waste Management in Iran	With regard to the results of the study, appropriate storage and processing of products after harvesting along with development of agricultural converting industries can be effective in wheat waste management.
Khoshnoodifar and Asadi (2011)	An Analysis of Wheat Farmers' Attitudes towards Wheat Management in the Markazi Province.	The most effective variable in wheat farmers and extension agents' relationship was the duration of participation in educational-extension courses. Moreover, the most effective variable in the usage of information and relationship resources was the extent of their relationship with the extension agents.
Yu- Chen Lin *et. al* (2009)	Waste Management to Improve Food Safety and Security for Health Advancement	Awareness through education could reduce food waste and its consequences.
Kumar *et al.* (2015)	Strategies Used for Reducing Post-Harvest Loses in Fruits and Vegetables	Strategies for reducing postharvest losses in developing countries include inadequacies of infrastructure, poor marketing systems.
Malek Mohammadi (2006)	Agricultural Waste Management Extension Education (AWMEE)	Results show that the greater the use of AWMEE, the less agricultural waste, the higher the agricultural productivity and the lower the land degradation.
Omidi *et al.* (2014)	Analysis of the Factors Affecting the Management of Wheat Losses in Iran (Ilam Township)	The variables of farmers' awareness rate had the highest effect in reducing wheat crop losses
Ommani (2015)	Agricultural Extension Goals for Supporting Waste Management (A Case Study of Wheat Farmers in Iran)	The most important extension goals according to the wheat farmers in favorable conditions were: problem solving and decision making right spirit in the face of problems, the expertise of farmers in crop losses, strengthening social organizations for action to reduce, institutionalization of culture and improving participation in waste reduction programs by wheat farmers.

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Continued of Table 1. Reviewed literature applicable in agricultural Waste Management Extension Education modeling.

Reference	Title	Results
Rezaei (2011))	Reducing Orchard Products Wastes in Post-harvest period	Factors such as light intensity, irrigation procedures, trees nutrition management, harvest time, pre-cold treatments, controlling pathologic features, warehousing technology, products packaging and handling technology are effective in increasing wastes in agricultural products.
Ghadimi *et al.* (2014)	Analysis Factors Affecting Potato Waste	The results revealed that factors affecting potato waste are to be tabulated in five separate factors including: conversion, economy, technical, market, manufacturing, and education- organization factors.

depth interviews. Ten members in each group were interviewed in depth in 20 to 45 minutes up to the theoretical saturation point. General standard validity and reliability tests were performed and data analysis were implemented through Strauss and Corbin's technique, applying three encoding stages (namely, open, exile and axial), and finalizing using $MAXQDA_{12}$ to obtain the qualitative model of the study. After reviewing and coding all interview scripts and memos, the key points and implications of interviews with agricultural experts, farmers, and gardeners were extracted, identified, and sub-grouped. To explore the relationship among all factors and agents, and to uncover constructs of the model, three different stages of coding were performed.

RESULTS AND DISCUSSION

In order to design and identify measurement indicators and effective factors on the waste management extension-education to the agricultural development of Mazandaran Province, 30 experts, gardeners and farmers were studied. In the meantime, some general questions were asked from the selected sample, e.g. "In your idea, what factors are involved in creating waste? What factors are involved in reducing waste? What elements does the extension of waste reduction management include? In what stage is the amount of waste greater? And what factors are effective in the development of agriculture?" In each phase of the research, the collected data, which were in the form of field notes and recorded tapes, were typed into Word Microsoft by the researchers, and after a line-by-line review of the interviews, the sentences related to the research questions were identified. Data analysis was done using content analysis and two stages of open and axial coding in MAXQDA12 software. During the process of data analysis in the open coding phase, meaningful units related to strategic waste management extension education indicators were determined in the form of sentences or concepts from the statements and transcripts of the interviews. In the next stage and during axial coding, the primary codes resulting from open coding were classified and categorized. Therefore, those signs that had a close relationship with each other were placed in a main category. According to the results of the open and axial coding stage, the concepts and points obtained from the interviews were classified into 12 sub-categories, and five main categories or axes. Eighty-nine codes from stage one and two coding systems of the gathered data were summarized and are shown in Table 2. The main categories are causing waste, reducing waste, amount of waste, extension of agricultural waste reduction management, and agricultural development.

According to the aforementioned information in the previous sections and also based on the main purpose of the research and through selective coding, the categories were integrated and developed into a theory, the basic and general model of which is drawn in (Figure 1).

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Table 2. Categories and sub-categories related to the main components of waste management extension and education as well as the extracted concepts**.**

Main category	Sub-category	Number of extracted concepts
Causing waste	Education	8
	Farming	16
	Marketing	10
	Conversion	7
	Climate	5
	Government Support	8
Reducing waste	Strategies to prevent effective factors in waste	12
Amount of waste	Waste at the various stages	3
Extension of agricultural waste reduction management	Principals of extension	9
Agricultural development	Economical	7
	Environmental	3
	Knowledge	1

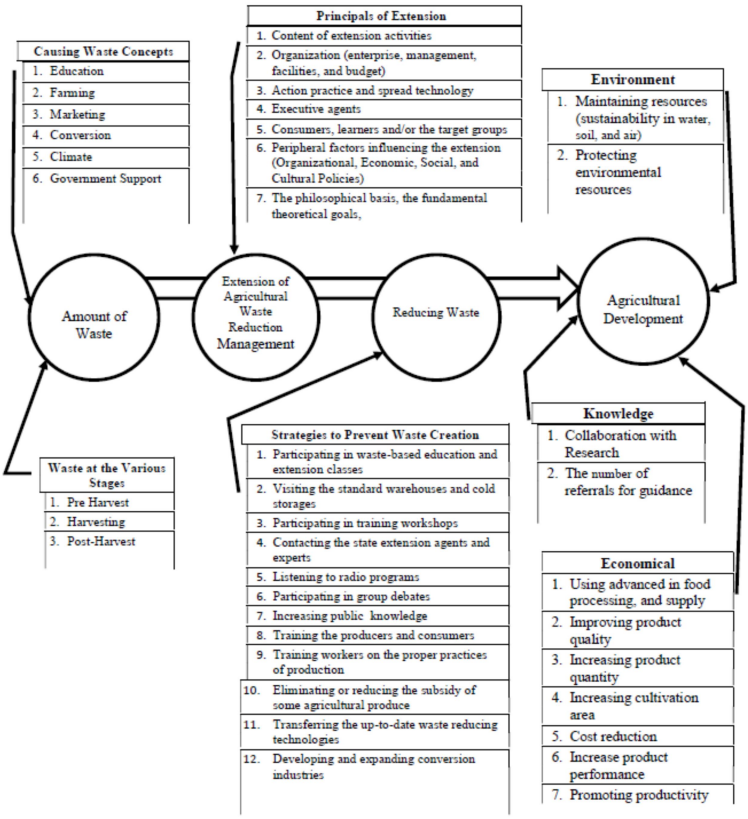

Figure 1. Strategic waste management extension education theoretical model to secure agricultural development (Research results derived from literature and data collected).

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The output of the analysis of the interviews using MAXQDA12 are presented in Table 3 and Figure 2, where, based on the frequency of each of the signs and, based on the thickness and boldness of the lines of each of the signs, they are prioritized within each category. Since eliminating or reducing the factor of subsidy of some agricultural produce related to the "Reducing Agricultural Waste" construct had a coefficient of 1, which was not effective in the research findings, it was deleted from the study.

As shown in Table 3, based on the frequency of each component, they were prioritized and the most influential was recognized in that category. The main factors affecting the agricultural waste included the following:

- In the educational dimension: Not holding education and extension courses aiming at providing instruction to reduce agricultural waste and not participating in extension and education courses,
- In the farming dimension: Late-harvest operations and being unaware of the optimal use and proper rates of fertilizer and pests poison,
- In the market dimension: Inappropriate means of transportation of the product to the market,
- In the conversion dimension: Lack of cold storage and silo, and inappropriate storage in the region,
- In the climate dimension: Outbreak of pests and diseases,
- In the government support dimension: Lack of guaranteed purchase of the products. These results are in congruence with the findings of Kumar *et al.* (2015), Abdeshahi (2015), Rezaie (2011), Ghadimi *et al.* (2014) and Asadi *et al.* (2010). Moreover, the most effective component of the extension of the agricultural waste reduction management was participation in waste-related education and extension classes. This finding is consistent with the results of Rajab (2020), Razeghi and Sadigh (2018), Khoshnodifar and Asadi (2011), and Malek Mohammadi (2006).

Therefore, more extensive use of agricultural waste management extension education as well as a better recognition of its components leads to less agricultural waste, higher agricultural productivity and, consequently, agricultural development. Agricultural extension education as a source of applied knowledge and information, in the studied area, can play a significant role in the agricultural development by increasing the awareness of the amount of waste of agricultural products and its consequences, as well as familiarization with ways to reduce waste. Therefore, it is suggested that training courses be held regarding the importance of the issue of the waste.

CONCLUSIONS

Analyzing the MAXQDA model (Figure 2) and Table 3 showed that factors affecting agricultural waste generation are in five categories as farming practice, market and transportation, processing procedures, agricultural and support policies based on their impact factors, respectively. In addition, 12 variables within these categories affecting the establishment of agricultural waste management extension education were identified based on their impact factors in the model. These variables included class participation, food processing industry development and expansion, general knowledge and information about agricultural waste, appropriate farming practice education, educational workshop participation, farm visits, farmers and gardeners education, listening to the radio and TV educational programs, group discussion participation, transfer of new applied waste management technologies, and contact with agricultural extension

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Table 3. Identification of structural model and effective factors obtained from open, axial and selective coding of Strauss and Corbin using MAXQDA software.

Ref	Construct	Category	Affecting factors
1	**Causing waste**	Education	1. No education and extension classes for teaching agricultural waste reduction 2. No participation in extension and education courses 3. No access to the information sources as (extension journal and publication, radio, TV, etc.) 4. No training courses (lecture, group discussion, concluding demonstration, etc.) 5. No trusted the experts 6. The existence of non-professional agricultural experts in the region to present useful recommendations 7. The training courses content not matching the subject 8. No participation in formulating the education-extension programs.
		Farming	1. Late-harvest operations 2. Being unaware of the optimal use and proper concentration of fertilizer and poison 3. Not paying attention to crop alternating 4. Using worn-out and low-technology based machines 5. Not paying attention to pasture 6. Not observing the consumed seed level 7. Uneven seeds 8. Untimely pre-harvest 9. Inappropriate irrigation time 10. Traditional farming in the region 11. Not using the proper seeding depth 12. Improper irrigation practices 13. Inadequate soil quality 14. Inappropriate seeding method 15. Cultivating unsuitable varieties.
		Marketing	1. Inappropriate means of transporting the product to the market 2. Not being precise about transfer 3. Untimely transfer of the product to the market 4. Lack of information on product rates to harvest 5. Distance from the target sale market 6. Delayed selling the product 7. Not being aware of the product production level 8. Inappropriate time to sell the product to the market 9. How to sell the produce 10. Not having information about the demand level for the product in the country.

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Continued of Table 3. Identification of structural model and effective factors obtained from open, axial and selective coding of Strauss and Corbin using MAXQDA software.

Ref	Construct	Category	Affecting factors
1	**Causing waste**	Conversion	1. Lack of cold storage and silo, and appropriate storage in the region 2. Lack of cold storage and silo and sufficient storage in the area 3. Absence of the technology used for conversion, 4. Lack of access to superior conversion technologies 5. Lack of suitable techniques and profitability to reducing the waste 6. Not processing the product 7. Lack of processing plants 8. No use of product rating devices.
		Climate	1. The outbreak of pests and diseases 2. Lack of sufficient information about the weather conditions in the region 3. Types of natural disasters (blast, frost) 4. Not preventing the natural diseases' damage 5. Various changes under biologic conditions of the plant (temperature, water, light, etc.).
		Government support	1. Lack of guaranteed purchasing of the produced products 2. The government's lack of interfering in the product pricing 3. Lack of control of agricultural imports by the state 4. Insufficient combines for timely harvest 5. Not being a member of the production cooperative 6. Imported product 7. The producer not being financially capable 8. Not utilizing the governmental facilities 9. Lack of the government monitoring the product price.
2	Effective factors in extension of agricultural waste reduction management	Strategies to prevent waste	1. Participating in waste-based education and extension classes 2. Developing and expanding conversion industries 3. Informing and public knowledge about the waste 4. Training the right practice of cultivation pre-harvest and harvest to the workers 5. Participating in training workshops 6. Visiting the standard storages and cold storage units 7. Training the producers and consumers 8. Listening to radio broadcasting agricultural programs 9. Participating in group debates 10. Transferring the up-to-date waste-reducing technologies 11. Contacting the governmental extension agents and experts 12. Eliminating or reducing the subsidy of some agricultural produce.

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Continued of Table 3. Identification of structural model and effective factors obtained from open, axial and selective coding of Strauss and Corbin using MAXQDA software.

Ref	Construct	Category	Affecting factors
3.	Inadequate training in	Waste at the various stages	1. Post-harvest 2. Harvest 3. Pre-harvest.
4	Extension of agricultural waste reduction management	Principals of extension	13. Organization (enterprise, management, facilities, and budget) 14. Content of extension activities area 15. Executive agents 16. The philosophical basis, the fundamental theoretical goals, and principles of extension 17. Consumers, learners, addressees or the target groups 18. Action practice and spread technology 19. Peripheral factors influencing the extension (Organizational, Economic, Social, and Cultural Policies).
5	**Agricultural development**	Economical	1. Promoting productivity of production unit 2. The use of superior technology to optimize conversion and supply technologies 3. Increased cultivation area 4. Increase product performance 5. Improve product quality 6. Increase product quantity 7. Reduction in costs.
		Environmental	1. Conservation of environmental resources 2. Maintaining resources (sustainability) of water, soil, air.
		Knowledge	1. Collaborate with researchers 2. The number of referrals for guidance.

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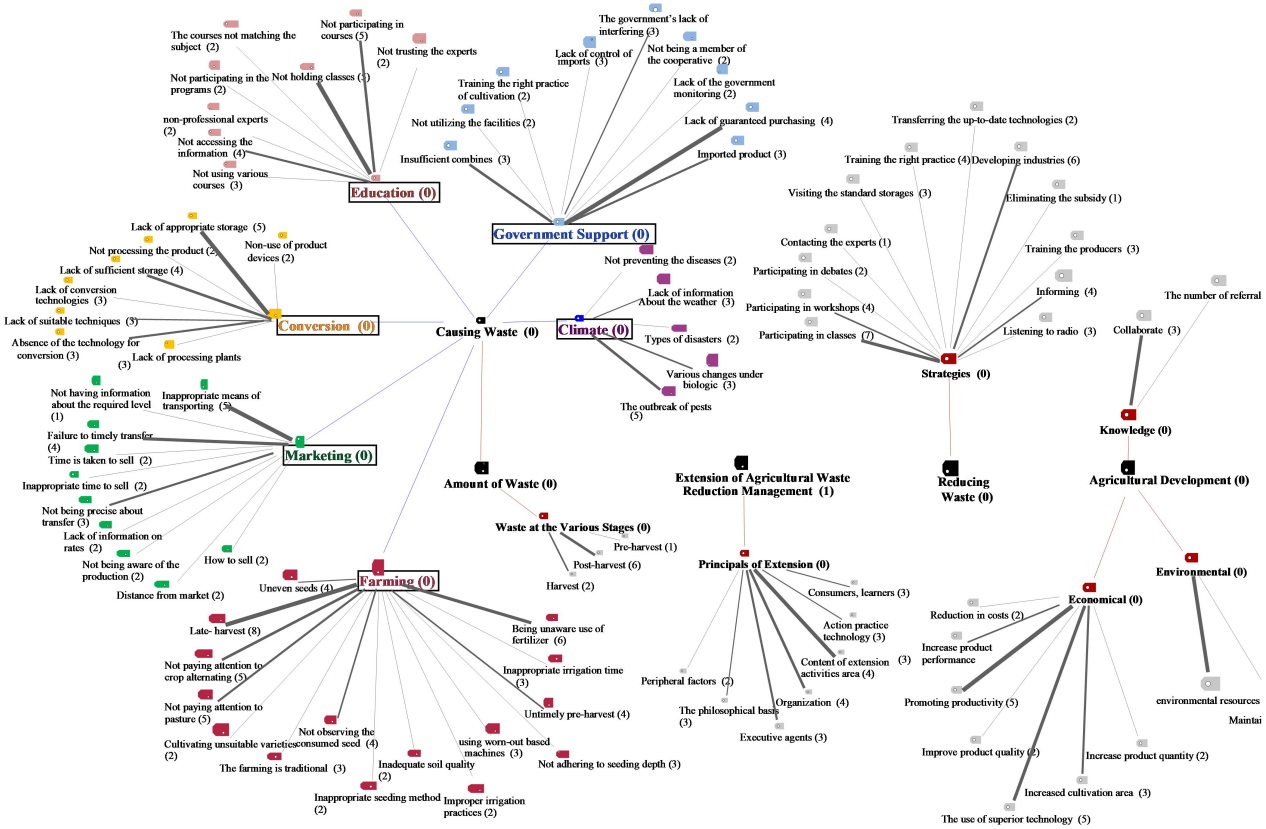

Figure 2. Paradigm Model of the qualitative analysis of the agricultural waste management extension education (Obtained from MAXQDA$_{12}$ software).

agents, respectively.

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مدل نظری ترویج و آموزش کاهش ضایعات کشاورزی برای تامین توسعه کشاورزی مازندران

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چکیده

این تحقیق باهدف طراحی مدل نظری راهبردی ترویج و آموزش مدیریت ضایعات برای تامین توسعه کشاورزی استان مازندران انجام شده است. جامعه آماری تحقیق شامل کارشناسان، باغ داران و کشتکاران در این استان بودند که از بین آن ها، ۳۰ تن با استفاده از روش نمونه گیری هدفمند و فن گلوله برفی انتخاب شدند. برای گردآوری داده های تحقیق از مصاحبه نیمه ساختارمند تا دست یابی به حد اشباع نظری استفاده شد. پردازش داده های کیفی تحقیق با استفاده از نرم افزار کیفی پرداز مکس کیودا نسخه۱۲ MAXQDA) (12انجام گرفت. یافته ها نشان دادند که اصلی ترین بعد موثر در ترویج و آموزش مدیریت ضایعات برای توسعه کشاورزی شامل عامل های ایجاد کننده ضایعات (شامل عامل های آموزشی، زراعی، بازاری، تبدیلی،اقلیمی و حمایتی) وعوامل کاهش دهنده ضایعات (شامل راهبردهای جلوگیری عامل های ایجاد ضایعات)و ترویج مدیریت کاهش ضایعات (شامل اصول ترویج) و مقدار ضایعات (در مراحل مختلف) و عوامل توسعه کشاورزی (شامل عوامل اقتصادی، دانشی و محیط زیستی) بودند.

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