

<https://doi.org/10.48047/AFJBS.6.15.2024.8523-8532>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

## Management of potato waste reduction and presentation of its sustainable production model in Bahar Hamadan

Ali Akbar Nazemi<sup>1</sup>, Abdolhamid Papzan<sup>1\*</sup>

<sup>1</sup>Department of Agricultural Development and Extension, Razi University, Kermanshah, Ira

Volume 6, Issue 15, Sep 2024

Received: 15 July 2024

Accepted: 25 Aug 2024

Published: 05 Sep 2024

*doi: 10.48047/AFJBS.6.15.2024.8523-8532*

### Abstract

In this study, considering the significant amount of potato cultivation and production in Hamedan province and Bahar county and the high amount of its waste and the economic, social and environmental importance of waste, relying on the concepts and opinions of farmers, experts and elites in the field of potatoes, an explanation of potato waste reduction management and its sustainable production model in this region provided. The methodology of this research is qualitative and in the discussion of the method, the theory grounded has been used. The studied population were farmers, managers and experts related to potato crop in Bahar Hamadan city. The results showed that Important factors that cause potato waste include six economic, technical, natural, biological, knowledge and skill, political and social factors, which is considered the most effective economic factor. Also, the effective factors on potato waste reduction management include internal factors (farmers, drivers, workers, local organizations and syndicates and cooperatives) and external factors (government, market and companies). Finally, the sustainable production model of this product was presented based on actions before cultivation, during cultivation, timing harvest and post-harvest.

**Keywords:** Bahar county, Potato, Sustainable production, Waste

### Introduction

Potato is one of the products that has played a significant role in the diet of households in recent years, and it has been proposed as the dominant crop in different regions and is in the center of attention of farmers. The waste of this product due to its deep and serious effects on water and soil resources and capital, poverty, supply and demand of agricultural products, food security and .... is always in the focus of national and international political,

economic, ecological and social. The increasing trend of agricultural product waste is one of the challenges facing most countries, especially developing countries (Asadi et al., 2011). The amount of potato waste in the production and post-harvest stages in our country is reported to be about 25 percent. In case of planning, organizing, directing, controlling and evaluating production resources on a correct basis, our country can choose different strategies in sustainable potato production according to its conditions, priorities and characteristics and reduce the quantitative and qualitative waste of their products and ultimately the economic, social and environmental risk. Potato is one of the most important agricultural products in the world, which ranks third in terms of importance among agricultural products, after wheat and rice, and its annual production is about 376 million tons in the world and about 5 million ton in Iran (FAOSTAT 2016 and Agricultural Statistics, 2015). Hamadan province has been ranked first in the country by producing one million tons of potatoes. Bahar city has also produced more than 260 thousand tons of potato products. The amount of potato waste in different stages of harvesting and after harvesting is about 25-30 percent, of which about 15% is related to post-harvest conditions (Tajeddin, 2014). The quantitative and qualitative waste of this product every year is considered as one of the challenges that significant amount of the product in the production process and after harvesting loss and causes loss of income, loss of water and soil resources, energy, food security and .... Providing solutions to reduce potato waste in Hamadan province, which is the hub of its production in the country, will have an increasing impact on the sustainable production of potatoes and ultimately improve the economic, social and environmental indicators. Sustainable production of potatoes and achieving sustainable agriculture means adopting a method to produce more of this product in less land and wise use of limited natural resources and providing healthy and resistant products with the least use of poisons, fertilizers and pesticides, which balance Keep in mind the supply and demand of this product.

### **Materials and methods**

The methodology of this research is qualitative and the Grounded theory will be used in the method discussion. The participants in this research include farmers, managers and experts who provided us with the most information. The data was collected through semi-structured interviews, photos, videos, documents and according to the theoretical foundations of qualitative research, the results were in the form of three stages of open, central and selective coding of the Grounded theory and content analysis technique were investigated. The validity of the research was also confirmed by agricultural experts.

### **Finding**

In order to manage the reduction of waste and provide a model of sustainable potato production, a clear picture of the current situation, which is caused by past actions, activities, trends, methods and policies, is necessary.

Out of the country's five million tons of potatoes produced annually, more than 400 thousand ton are surplus for consumption in the domestic market (food and seeds), also due to the lack of proper infrastructure, only about 500 thousand ton are exported and 350

thousand ton are consumed in processing industries. Due to non-standard warehouses and conditions of loading and storage, equivalent to 15-25 percent (at least about 600 thousand to one million ton) turns into waste and disappears in the stage after harvesting and storage (Hamadan province agricultural statistics, 2018).

In order to prevent potato waste, first of all, the effective factors in its spoilage should be identified and then waste reduction management methods should be applied. The important factors that cause potato waste in this city are summarized in six economic, technical, natural and biological, knowledge and skills, political and social factors, which we will continue to analyze.

#### 1. Economic factor

One of the important factors of potato product waste can be considered as an economic factor that most farmers and experts mentioned and emphasized in interviews, notes and field visits. This factor can affect other factors as well. Among the economic factors affecting other sectors, we can mention inflation rate, exchange cost, exchange rate, input price and ....

#### 2. Technical factor

Among the factors affecting potato waste are factors such as the activity of processing units and conversion and finishing industries, the weakness of the processing industry, technical warehouses and equipped cold storages, determination of quality indicators and standards and product grading, appropriate services consulting, technical, service and support companies, irrigation system and method, technological weakness and technology of planting, harvesting and storage, the lack of compliance with the cultivation pattern, the density of cultivation, that are suitable for the conditions of the region, the means of cultivation and harvesting, and the technical, civil and agricultural mechanization infrastructures in the county.

#### 3. Natural and biological factor

Based on interviews conducted with informants and experts as well as field observations, among the most important causes of potato waste are things like the short life of potatoe and non-observance of crop rotation and the spread of common diseases and pests, non-compliance with the conditions of withdrawal and loading excessive irrigation and the creation of alkaline properties in the soil.

#### 4. Educational and skill factor

The level of education and knowledge of farmers about the method, time and place of planting and harvesting potatoes is important. Agricultural knowledge and the farmer's education level are effective on the use of waste management operations (Peykarporsan et al., 2013). Based on the findings of the research, the educational and skill factor is considered one of the important software factors in waste management.

#### 5. Political factor

Another factor in the creation of potato waste can be attributed to political factors, such as the lack of comprehensive, coordinated and coherent waste management planning, implementation guarantees of programs, memorandums and instructions issued for healthy

potato cultivation. , storage and export of this product, political and currency stability, unclear policy of the government in exporting and importing products and supporting farmers, providing production and export incentives from the government to produce healthy products and ... .

#### 6. Social factor

The social factor is one of the other factors affecting potato waste, which includes the average consumption of this product, farmers' lack of trust in the government's support policies and strategies, the market's and people's lack of trust in processed products, the farmer's belief and negative attitude. It is due to the sustainable production of potatoes and the non-compliance with ethical and professional issues in the use of fertilizers and poisons and the supply of healthy products and the low participation of beneficiaries in educational and promotion courses as well as the management of waste reduction.

Reviewing and analyzing the content of the interviews and field notes and classifying the obtained concepts, in the form of three stages of open, central and selective coding, showed us that the important problems and challenges caused by the creation of potato waste In this county, it is summarized in three dimensions: economic, environmental and social, which can affect each other. We will analyze them further.

##### 1. Economic problems

Among the most important problems and challenges caused by potato waste, we can mention economic problems. This dimension, which was emphasized by most of the interviewees, includes important things such as the reduction of the yield and efficiency of the cultivation of this product in this region, the reduction of annual income, the loss of a reliable market for this product, the reduction of employment, the loss of The opportunity cost for growing potatoes in the city is disruption in the chain of production factors, disruption in the food value chain and disruption in the marketing network and ... .

##### 2. Environmental problems

Examining the opinions of the interviewees about the environmental problems caused by potato waste showed that inappropriate and unstable use of water and soil resources, dumping of waste on the side of the roads and streets, the spread of diseases, the spread and spread of pests and diseases to The reason for dumping waste on the side of roads and fields, creating soil alkalinity, contamination of surface and underground water resources by fertilizers and pesticides, quantitative and qualitative decline of underground water resources, drying of springs and aqueducts, and increase in the cost of water extraction. And water salinity, the loss of surface living soil and soil erosion, land subsidence and the creation of cracks and sinkholes and the aggravation of natural resources and environmental problems are among the problems that originate from the creation of waste. Picture number 1 shows the sinkholes created in the villages of Hamedan province and picture number 2 shows the amount of water stored in Ekbatan Dam in Hamedan in April 2020.



Picture 1. Sinkholes created in the villages of Hamadan province



Picture 2. The amount of water stored in Ekbatan Dam in April 2020

### 3. Social problems

Most of the problems caused by potato waste, such as income reduction, migration and marginalization, food safety, spread of diseases, non-participation of stakeholders in preventing the destruction of water and soil resources, reducing the average per capita consumption of this product, The decrease in consumer satisfaction and the decrease in farmers' trust in government policies are all consequences of some social anomalies.

### Background Research

The current research begins with a detailed study of the theoretical foundations and previous similar studies. Studying the theoretical foundations and background of the research

is not for the purpose of using the variables and their concepts, but for the purpose of becoming more familiar with the scope and range of concepts that can appear in the research. Naderi Mahdie et al.(1393) in a research came to the conclusion that changing the pattern of crop cultivation including potatoes in Bahar Hamedan county based on reducing the use of scarce water resources, teaching scientific and basic agricultural production methods to achieve sustainable agriculture and reduce the consumption of chemical fertilizers and poisons, it leads to optimal and appropriate use of the available agricultural land and increases the income of farmers. Bagheri et al.(2016) in a research on the factors affecting the knowledge of waste management of potato growers in Razan county came to the conclusion that the level of knowledge of potato growers in the five factors of storage, transportation, and planting was And the harvest is at a medium and high level. But the level of knowledge in marketing, packaging and conversion industries is low. Godarzi (2018) in an article titled "Increasing the storage capacity and improving the quality characteristics of potatoes by managing the use of nitrogen fertilizers" concluded that the increase in the use of nitrogen fertilizers in potato cultivation causes product contamination and reduced storage capacity and the increase of its waste. Waters and Evan (2018) in their article on Canadian potato production concluded that in order to manage potato waste, in addition to the government developing policies to support the production and export of the product Potatoes have been processed and product quality indicators and standards have been determined, private companies and agencies should be activated in advertising, marketing and quality control and grading of this product based on standards. Galford et al. (2020) in a study examining 13 supply chain projects of agricultural products including potatoes and their amount of waste in Africa, Asia and Latin America with a consolidated method, concluded that the management of waste reduction In addition to improving the productivity of natural resources and material capitals and increasing the food security of communities, the potato product leads to increasing the farmer's income, reducing poverty and creating added value in the agricultural sector, it also reduces the environmental effects and emissions of gases. It will become a greenhouse, which is one of the great goals of sustainable agricultural development.

## Results

Simultaneously with the data collection, the text of the interviews was implemented and analyzed by line by line, paragraph by paragraph and sentence by sentence content analysis in the form of three stages of open, central and selective coding. Targeted questions were raised in the form of a paradigmatic model. Finally, in the narrative sessions of the dissertation, experts and professors, in addition to confirming the things obtained in the research, added other things that completed the concepts and the conceptual model of the research. These concepts were arranged in six categories: causal conditions, contextual conditions, phenomena, intervention conditions, solutions and consequences.

### 1. Phenomenon:

The meaning of the phenomenon is the same potato waste that was investigated from several aspects. The existing state of waste of this product, the factors affecting its creation,

the problems and challenges caused by the creation of waste and the control and management strategies to reduce potato waste were investigated in the heart of the main phenomenon.

#### 2. Causal conditions:

The concepts extracted in the form of six main categories were identified as the causal conditions of potato waste in Bahar city of Hamadan province, including economic, knowledge and skill, technical, political, social and environmental causes. From the point of view of the participants in this research, the economic causes are considered one of the most important factors in creating waste of this product, the most prominent of these factors include excessive use of chemical fertilizers and poisons, lack of cold storage facilities and lack of access to It was marketing and... .

#### 3. Background conditions:

These conditions show the background of potato waste in terms of time and place. Such as cultivation location, economic conditions, export and import conditions, weather conditions, correct food and agriculture policy and stability in it, use of healthy water and soil resources for sustainable production of products and ... .

#### 4. Intervenor:

The conditions that shape the effective and intermediate factors and actions in the phenomenon and strengthen or weaken or adjust the studied phenomenon. These conditions can be divided into macro-national and micro-regional factors. Macro-national factors include government decisions and support, rules and regulations for healthy and safe production, motivation, confidence building, export incentives, organic potato production incentives, timely and agreed determination of product price and product insurance.

Micro-regional factors also include the activities of technical consulting companies and farmers' access to these services, providing banks' facilities to farmers, standards and indicators, training, efficient management, technical and technological infrastructure, input prices, the wear and tear of machinery, the low level of technical knowledge and education of farmers and ... .

#### 5. Solutions:

These are measures that are used to deal with the main phenomenon. These strategies include things like using other people's experiences, communicating and interacting with other farmers, using high-quality and resistant seeds, integrating local and specialized knowledge and improving the literacy of farmers, improving marketing, using consultants, developing a comprehensive plan and ... .

#### 6. Consequences:

The conditions affecting the phenomenon of waste include background, causal and intervention conditions that will cause consequences. The results show what problems there are and how it can be fixed considering other elements of the paradigm(Papzan et al 1389).

The story line also leads to the six elements of the paradigm and forms the main format of our conceptual model. In the last stage, the researcher drew the conceptual model of the research by linking the classes and categories resulting from the discussions of farmers,

experts and managers, and by identifying the central class, and confirming the opinions of farmers and experts also made the final model valid.

### Conclusions

The conceptual model obtained from the research shows that in order to succeed in waste management, one should pay attention to a set of factors and elements, both main factors and peripheral factors, with systemic thinking, and also accept that neglecting each of the components of the system can have risks involved. Therefore, all causal, intervening and contextual elements and components of waste, including the personality and culture of people in society, the role of the government and managers, management factors, economy, technology and ... must be compatible with each other.

Based on the results of this study, the effective factors on potato waste reduction management can be classified as internal factors (farmers, cold store owners, drivers, workers, local organizations and organizations and cooperatives) and external factors (government, market and companies) enumerated.

The duty and role of the farmer in managing waste reduction and sustainable potato production can be classified into four stages:

A) Pre-planting measures: observing the right time of plowing, choosing the right land, accessing and choosing high-quality and resistant seeds, appropriate technology and mechanization, observing crop rotation, observing the cultivation pattern, participating in training courses and improving the level of technical knowledge, training Negotiation skill and technique, appropriate and sufficient use of technical consultants and product insurance.

b) Measures during cultivation: observing the date of planting, observing the density of planting, observing the method, method and time of irrigation, observing ethical and professional issues in the use of poisons and chemical fertilizers, correct management of weed control and disease and pest control and Believing participation in exploitation and protection of resources.

c) During harvesting: observing the right time for harvesting, separating healthy and unhealthy products and correct grading, using new sacks and nets, using the right tools, loading at the right time and disinfecting the tools.

d) Post-harvest measures: Disinfecting the warehouse, cooling, complying with storage principles, proper packaging, using new sales methods, efficient marketing, not dumping waste on the side of farms and measuring customer satisfaction.

According to the proposed model, post-harvest measures are the most important management measures to reduce potato waste in all stages of sustainable potato production, because the largest amount of waste occurs in this stage. The proposed model of this research has the ability to generalize to most regions of Iran that start potato cultivation and have similar economic, social and environmental conditions.

At the end, a simple and logical model was developed and presented as the main framework for solving the problem for farmers in different stages, which can be seen in Figure 3.



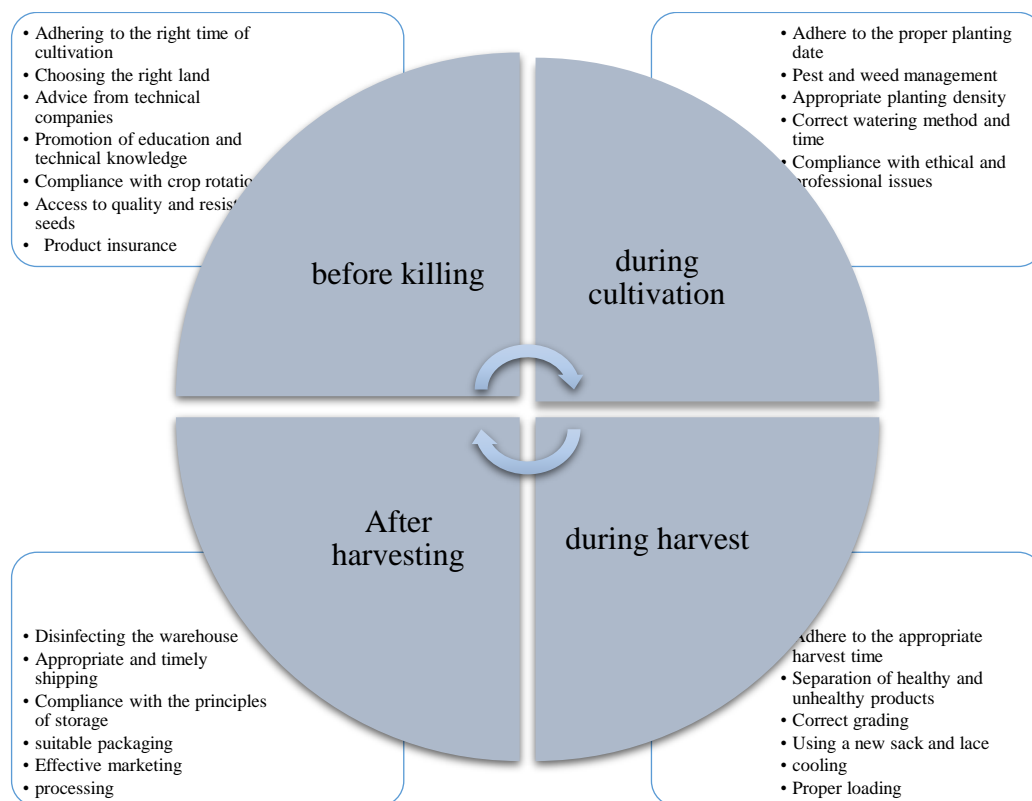


Figure 3. Waste reduction management model and its sustainable production (source: research findings)

### suggestions

In addition to using the proposed model of research in the management of waste reduction and sustainable potato production and according to the studies and results, the following important recommendations are also presented as suggestions to farmers, managers, planners and researchers, some of which The most important of them in the current situation of Iran are:

1- Planning, directing and supporting the development of grading, packaging, storage and processing industries and converting potato products using new technology.

2- Creating the necessary hardware and software infrastructures to determine the annual cultivation plan based on the needs of the country's market, as well as reform political, programmatic, technical, economic and social approaches.

### Refrence

Agricultural Statistics of Hamedan State, (2018) Statistics of agricultural crops of Hamedan Province, Office of Statistics and Information Technology of the General Directorate of Agricultural Jihad of Hamedan.

Agricultural Statistics of the Crop Year 2015-2016, Volume 1, Ahmadi, K., Ebadzadeh, H., Abdshah, H., Kazemian, A., Rafiei, M and Abbasi, M., Publications of the

Ministry of Jihad Agriculture, Planning and Economic Deputy, Information and Communication Technology Center - 2017

Asadi, A., Gholifar, E and Akbari, M. (2011). An Investigation of the Factors Affecting Apple Waste in Zanjan Province, Iran, *Journal of Economic Research and Agricultural Development of Iran*, (No. 43, Volume 2), pp. 281-292 DOI: [10.22059/IJAEDR.2012.30475](https://doi.org/10.22059/IJAEDR.2012.30475)

Bagheri, A., Ghafari, O., Shabanali, F. H. (2016). Factors affecting farmers' knowledge of potato waste management in the county of Razan - Hamedan, *Journal of Economic Research and Agricultural Development of Iran*, (No. 48, Volume 2), pp. 257-269 DOI: JR\_IJAEDR-48-2\_006

FAOSTAT. (2016). FAO statistical database available at: [www.fao.org](http://www.fao.org).

Galford, G. L., Peña, O., Sullivan, A. K., Nash, J., Gurwick, N., Pirolli, G., Richards, M., White, J. and Wollenberg, E. (2020). Agricultural development addresses food loss and waste while reducing greenhouse gas emissions. *Science of the Total Environment* 699 (2020) 134318]

Godarzi, F. (2018). Increasing the storability and improving the characteristics of potatoes by managing the consumption of nitrogen fertilizers. *Applied sciences of potato*. (Second Year No. 1). Spring and summer 2018.

Naderi, M. K., Motaghad, M., Shahbazi, G. H and Abdi, E. Investigating the optimal cultivation pattern in Bahar city. *Applied economic studies of Iran* (applied economic studies) [Internet]. 2013;3(12):165-182. <https://sid.ir/paper/226592/fa>

Handbook of Qualitative Research Methods in Entrepreneurship. Neergaard, H. and Ulhoi, J. P. (2021). Papzan, A., Pazhohan, A., Karamian, F., Kheiroallahi, M., Sabounchi, A. and Nazemi, A. A. (2003). *Razi University Press*

Peykarporsan, M., Shabanali, F. H, Daneshvar, A. Zh and Khodabakhshi, A. (2013). Influencing the Application of Waste Management Operations in Apple Production in Abhar County, *Iranian Journal of Economic Research and Agricultural Development*, (No. 44, Volume 2), pp. 329-341 DOI: [10.22059/IJAEDR.2013.36729](https://doi.org/10.22059/IJAEDR.2013.36729)

Tajeddin, B. (2014). production and evaluation of biological nanostructures for use in food packaging. *Scientific and Promotional Journal of Donyaye Nano, Iran Nano Association*, (No. 37).

Watters, A. and Mangino, E. Potatoes and Potato Products Annual 2018. GAIN Report Number: CA18054