Food safety: The farmer first health paradigm

Abdolmotalleb Rezaei

Department of Agricultural Extension and Education, College of Agricultural Economics and Development, University of Tehran, Karaj, Iran

ABSTRACT

International and national organizations responsible for healthy food production and food consumers have too often neglected farmers, who are the producers in this cycle and are directly involved in environmental issues, integrating resources with their skills and producing agricultural crops to offer to civil society. Moreover, the health of farmers has also been neglected, when attending to their health would likely ensure a healthy environment and safe foods. Thus, the Farmer First Health Paradigm is seeking to address the fact that if international community expects a healthy environment and safe foods for future generations, then basic principles for producing healthy food in different countries should be considered and applied in their strategic plans. These principles are presented and discussed in this paper.

1. Introduction

Food safety means ensuring that the food people consume is completely safe and free of any kind of contamination, including microbial, parasitic or chemical contamination [1]. Scientific studies have shown that in recent decades, with the development of technology and the increasing use of additives, pesticides, antibiotics, and hormones in food production processes, there have been undeniable effects on the health of people living in developing countries. Resulting diseases and contaminants include congenital abnormalities and cancers, particularly in children [2,3]. Obviously, it should be noted that about 50–70% of reported foodborne illnesses and conditions originate from companies producing and handling foodstuffs in developed countries such as the United States, England, the Netherlands, and Korea [4]. Moreover, numerous sources have highlighted the fact that one of the main reasons for increased prevalence of certain illnesses in the United States has been the use of fresh agricultural products at the national level. Likewise, 1 in 6 individuals is diagnosed with foodborne illnesses and conditions in the United States each year [5–7]. According to the statistics, the incidence of food poisoning related to pollution in developing countries is 13% higher than in industrialized countries [8]. Many of the diseases prevalent among food consumers result from a lack of food safety in the production, supply, and marketing of agricultural products. In general, it is believed that if the principles of food safety are observed throughout the chain of agricultural production, most food borne illness can be prevented.15 According to previous studies, many agricultural products are the source and origin of different disease outbreaks. Contaminated with chemical and biological agents are a major problem for people health [6,9,10].

An investigation conducted in China in 2011 showed that about 10% of all rice produced in the country is contaminated with cadmium, which is a heavy metal and originates from the wastewater of the mines discharged into fields. Other heavy metals, such as copper and zinc, which are observed in products such as rice and vegetables, have led to risks in rural and urban populations. One known carcinogen and contaminating material is aflatoxin, which increases the risk of hepatocellular cancers. Contamination is observed in products such as pistachio, date, and the grains of other products. High temperature and humidity, water stress, infection with pests and insects, and not observing harvest principles all increase the risk of aflatoxin contamination [9]. Aquaculture productions, which are known as one of the most contaminating products among other agricultural products due to the overuse of N-nitros, increase the risk of nasopharyngeal cancer [11]. The uncontrolled and illegal use of pesticides and growth hormones in the production of agricultural products, as well as the use of chemical preservative materials in the warehousing stages, increases the risk of agricultural food contamination. In a study conducted by Goss et al. [12] on challenges to effective cancer control in China, India, and Russia, the term cancer villages was introduced. According to the findings of the study, these villages are located near environmental pollution, a high percentage of which is due to water pollution. Respiratory cancers such as liver, lung, and esophageal and stomach cancers have been reported. This case can be extended to the northern provinces of Iran (i.e., Mazandaran, Gillan, and Golestan), which have the highest frequencies of cancer in the country due to their adjacency to contaminated water [13–15]. In 2012, which was referred to as the cancer tsunami year by the Iranian media, unhealthy agricultural foods were mentioned as one of the main reasons for the high rate of cancer in
these provinces.

1.1. Barriers to achieving sustainable food safety

Food security is considered as one of the macro-goals within socioeconomic development programs in each country and it is also among the important dimensions of sustainable agricultural development. Given the ever more growing world population and decreased level of agricultural lands, provision of food security has been converted into one of the complicated puzzles. Today, nearly one billion of people across the world are suffering from hunger and it is expected that the given number will reach to two billion in 2050. To meet food needs in the future for this growing population, agricultural production systems are obliged to increase their products in a stable manner employing less land through more efficient use of natural resources with the minimum effect on the environment specially within developing countries with the highest population growth [16,17]. Therefore, the amount of manufacturing agricultural products to keep pace with population growth and changes in diets until 2050 must increase about 70% which requires conserving natural resources and moderating agricultural vulnerability to climatic changes [18]. According to the definitions raised in this domain, food safety is taken into account as one of the essential components of food security; moreover, supplying foodstuffs in the world is increasingly growing and requires more and more attention to food safety systems among countries. That is why the World Health Organization (WHO) used its slogan in 2015 targeting improved food safety from farm to table (always and everywhere) [19].

There are lots of barriers to implementing food safety programs which have been underscored by some researchers [20]. For example, [21–23] accounted for the barriers to implementing food safety in food businesses as low knowledge of managers and the staff in relation to food safety and Hazard Analysis and Critical Control Points (HACCP) as well as absence of training programs and infrastructure and physical facilitating conditions. In the agricultural sector and within the domain of producers and consumers; insufficient knowledge about foodborne illnesses and conditions as well as lack understanding of them is among barriers that make it difficult to implement educational and Training programs [5,24,25]. Additionally, some investigations have highlighted some barriers such as time, cost, and lack of markets where their products are distinguished from normal products and accordingly priced [26–29]. As well, studies showed different monitoring structures in various countries and regions to guarantee food safety [6,30,31]. This structure is totally independent and it is sometimes affiliated with ministries of health or agriculture in some countries. In some cases, monitoring is divided between several organizations. In the past two decades and especially in the last decade, food laws and, as a result, monitoring structure has dramatically changed in most countries for example, although it is said that monitoring system for food products in the United States is incredibly efficient, there has been much criticism on the performance of this system in the last decade. This issue also caused reforms in food safety laws in the United States Congress in 2011 and it was promulgated in 2013. According to these laws; all stakeholders including policymakers, researchers, manufacturers, farmers and foodstuff suppliers are in charge of determining and implementing effective standards in order to increase healthy and hygienic products and reduce microbial contaminations available to consumers. In this respect, public and private sectors are increasingly seeking to augment the percentage of compatibility of their food safety activities on the farm by manufacturers in order to adapt to Good Agricultural Practices (GAP) [32–34]. Currently, due to the importance of food safety in different countries as well as attention to it in the form of a food chain and barriers in the domain of lack of desirable standards, existing problems in farms, production, and institutional problems in this domain, status of existing institutions and rules including inappropriate policies, weaknesses in education and extension, drawbacks in legislations and monitoring, as well as flaws in food distribution companies, barriers to issuance of food safety permits, and those to implementation of food safety will inevitably lead countries to establish mechanisms to resolve this issue. One of the strategies that can fix this situation is capacity building in the form of Food Safety: Farmers First Health Paradigm.

2. Why the farmer first health paradigm?

The Farmer First Health Paradigm seeks to develop the notion “an ounce of prevention is worth a pound of cure” in practice to minimize disease resulting from agricultural crops. This paradigm systematically embarks on monitoring activities related to agricultural areas, including the preparation and consumption of agricultural inputs, harvest, post-harvest, and processing and marketing of agricultural products in the form of a food safety cycle with a focus on farmers.

The main idea of the Farmer First Health Paradigm was taken from the Farmer First Approach by Chambers [35]. The basic principle in this approach is that the majority of constraints to research and extension about conventional agriculture (institutional challenges) is in the processes of creation and technology transfer and the largest part of solutions is hidden in capabilities and priorities of farmers. The given approach brought about a revolution in agricultural science in the 1980s and subsequently criticized conventional approaches to agricultural research and extension resulting in the need to involve local people and farmers as active partners in all dimensions of the process of research and extension of agricultural activities carried out by policy-makers, planners, universities, and executive and non-governmental organizations. Later in 1994, Scoones and Thompson [36] proposed refinements to Chambers’ approach and presented it as Beyond Farmer First Approach: Rural People’s Knowledge, Agricultural Research and Extension Practice; which introduced agriculture is a complex social process not only a technical process.

Other concepts contributing to the formation of the Farmer First Health Paradigm was Food Safety Approach from farm to table which was a global one concerning improvement in food safety. As mentioned before, the WHO called its slogan by this name in 2015. In this regard, the Food and Agriculture Organization of the United Nations introduced a new approach to ensure farmers health through the Food Chain Approach from pre-production to consumption of agricultural products (from the health of farmers to the correct use of products by consumers) to reduce the perceived risks using desirable agricultural methods. According to Food Chain Approach, improving agricultural methods can prevent the crisis of illnesses and conditions caused by agricultural products and also stop them from curing them [19].

Another approach contributing to the formation of the Farmer First Health Paradigm was the One Health Approach. This is considered as a comprehensive one seeking to design and implement programs, policies, legislations, and research in a cross-sectional and collaborative framework to achieve public health. The given approach, in the framework of interactions among the components of social and ecological systems, examines interactions of human health with the environment and animals and vice versa, with a focus on food safety [37]. Given the concepts outlined in the mentioned approaches, the principles considered in this paradigm are described below:

2.1. Principle 1: a healthy farmer equals healthy food

In developing countries, many farmers are affected by cancer and other incurable diseases because they do not observe safety principles while using pesticides and chemical toxins. In Iran, for example, greenhouse workers represent one group that has a high risk of being affected by these kinds of diseases. The first principle to be implemented in this paradigm is this that farmers and urban business owners need to receive health certificates and have health insurance coverage; moreover, due to their high health risks, they should be monitored annually.
2.2. Principle 2: monitoring inputs

In industry, for manufacturing of each new product, the quality of inputs should be controlled and evaluated according to particular standards; however, no attention is paid to the inputs used to produce agricultural crops. As mentioned in the introduction, one of the main reasons for producing these unhealthy crops is the use of water contaminated by sewage and other pollutants, making it extremely important to pay more attention to this principle.

2.3. Principle 3: taking into account added value for farmers

When farmers incur more costs to comply with production standards and try to produce healthy crops for civil society, one of the principles that can keep them motivated to maintain the cycle of food safety is observing the value they add to the production to consumption process.

2.4. Principle 4: the traceability of agricultural products

Another important principle of the Farmer First Health Paradigm is the traceability of agricultural products during the production process or food safety cycle [38]. According to the Farmer First Health Paradigm, it is an inalienable right of the customers to know where the products they are using come from and according to what principles they are produced.

2.5. Principle 5: collective action

When the above mentioned principles have been implemented, we can gather farmers in the form of organizations with the aim of producing a healthy product. Many of the activities listed above will be more easily achieved through developing social capital in the form of farmers’ organizations [39,40]. In this regard, providing ranking certificates for agricultural organizations according to the health of their farmers, delivered foods, and economic activities can be considered.

3. Different stages in implementing the farmer first health paradigm

In this section, different stages for implementing the Farmer First Health Paradigm are discussed via a systemic approach according to the five principles presented in the previous section. These stages are as follows:

- Stage 1: Identifying the potential implementation of the Farmer First Health Paradigm in the target area for by agricultural experts and other actors that can interact with them. This stage includes the process of identifying products, natural resources and base agricultural resources, agricultural inputs, the number of farmers and their characteristics, organizations involved in agricultural development according to food safety and farmers’ health, infrastructures needed for agricultural development, and the functions of these organizations.

- Stage 2: Creating a research-extension team with respect to the main actors. At this stage, after identifying the agricultural potential of the region and the actors involved, a research and extension team will be created, which will include actors identified as effective in developing agricultural food safety by focusing on farmers’ health.

- Stage 3: Identification and development of agricultural products and their production cycle according to the principles of food safety and farmer health and providing a strategic plan to this end. At this stage, products will be identified through expert assessment by the research and extension team and according to the information gathered from stage 1. Then, a strategic plan will be devised to achieve food safety and its development process.

- Stage 4: identifying farmers’ interests, opportunities, and barriers, as well as market opportunities in this area. After identifying the products and developing strategic programs, market needs and farmers’ interests regarding product methods should be considered and applied to strategic plans to achieve the final goals.

- Stage 5: Identifying strategies for organizing or reorganizing farmers in their available organizations. Some farmers are members of agricultural cooperatives or other agricultural organizations, although most of them are inactive members. Moreover, the structure of agricultural organizations should change according to the principles of food safety and farmers’ health.

- Stage 6: Providing technical aid for produced crops, ordering and supplying them with the help of the organizations in charge. This stage includes planting, growing, and harvesting machinery, grains and other inputs needed for producing, and processing and packaging products with appropriate standards.

- Stage 7: Presenting the initial plan to the organizations in charge and related actors to be modified and amended. At this point, all related organizations will be asked to perform needed amendments to the final plan and return it to the agricultural organization of the region.

- Stage 8: Designing an administrative plan and requesting a budget to implement it along with other actors. At this stage, the amount of executive budget, how farmers should participate in the budget, and needed contracts between different actors and agricultural organization to implement the plan will be formulated.

- Stages 9 and 10: Implementation, evaluation and monitoring activities to keep things on track according to a scientific framework and the interests of all actors.

In the following, an appropriate organizational structure is suggested to implement the Farmer First Health Paradigm. As mentioned in previous section, one of the necessary principles for implementing this paradigm is paying attention to different actors and decentralized the structure to implement the plan. According to management theories, a decentralized structure results in closer ties among actors and leads to their cooperation. Since this represents real cooperation, it will be accompanied with accountability and responsibility of the actors. This will also increase transparency, efficiency, and effectiveness in activities, consequently leading to better services and attracting consumers [41]. Therefore, to answer the question of the appropriate organizational structure to implement the Farmer First Health Paradigm, the structure presented in Fig. 1 is depicted. According to this figure, a research-extension team or network interacts with the research and education, advocacy, policymaking, and legislation networks to implement the paradigm. These networks are connected to the organizations that were identified in stage 1. In contrast, this network/team is connected to interacting network of farms–farmers–market–consumers in the form of an interactive process. This network is connected to broader networks at the provincial and national level and comprises a national network.

4. Conclusions

The slogans and paradigms presented by national and global organizations, while they sometimes touch on producing safe foods and environment and community health, have always neglected Farmers as producers of this cycle and as people who are directly involved in environmental issues, integrating resources with skills and producing agricultural crops to offer to civil society. They also neglect an understanding of the fact that the health of these people ensures a healthy environment and safe foods. Thus, the Farmer First Health Paradigm is seeking to show that if the international community expects a healthy environment and safe foods for future generations, then it should institutionalize basic principles for producing healthy food in different countries. Researchers, academics, policymakers, planners, and
legislators should revise principles of agricultural development in their countries according to these principles. Moreover, they should do their best to implement these principles according to their social, economic, and ecological conditions. Implementing this paradigm requires the close cooperation of actors, including policymakers, legislators, supportive networks, and interactive networks of farms, farmers, markets, consumers, and researchers.

To achieve food safety and healthy farmers, the four following elements are important:

- Developing social and human resources, include teaching proper methods of planting, growing and harvesting, processing the resulting products, the appropriate use of technologies, observing environmental principles, and engaging in the sustainable use of natural resources.
- Training agricultural extension experts to develop healthy products in the form of counseling and professional training on developing businesses and establishing contracts between farmers and markets will help to improve food safety. In this sector, research and education networks play key roles in both the public and private sectors. In addition, this element involves organizing farmers and training them to create their organizations, fostering collaboration, and using their capabilities appropriately to share costs and resources among smallholder farmers and develop social capital.
- Considering market needs and the standards formulated by policy-makers and regulatory agencies.
- Considering a decentralized and networking structure for developing the Farmer First Health Paradigm.
- Regulating the Farmer First Health Paradigm in the form of food safety rules and farmers’ health to implement this paradigm sooner and better by the organizations in charge.

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