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The food supply system Part 2 - domestic challenges, possible solutions

KEYWORDS: FIT4FOOD2030; UN Sustainable Development Goals (SDG), National Biodiversity Strategy, food supply system; food waste; research, development and innovation; action plan

1. SUMMARY

Social, economic and environmental changes pose a serious challenge to the complex Hungarian food supply system with many stakeholders, the elements of which have a significant impact on each other as well. In order for the system to respond flexibly and adapt to change, and to ensure its stability in the future, it is necessary to have a thorough understanding of the current situation and to anticipate future challenges.

In the course of the present work, the challenges facing the Hungarian food supply system, the answers to them and possible solutions were examined during a series of workshops consisting of three events, within the framework of the Policy Lab work of the FIT4FOOD2030 project.

Based on the results of the work, it can be stated that the Hungarian food supply system has strong foundations, but in order to adapt to the challenges of the coming years successfully, significant changes must be made. Production based on innovative solutions that respect natural conditions is of paramount importance, taking into account the expectations and safety of consumers, as well as the needs of the stakeholders of the supply system. Cooperation of the stakeholders is essential for this process, increasing their openness, improving their responsiveness, as well as thinking in a system, while focusing on the problems of the given sector. In addition, policy measures are needed that support the complex use of research, development and innovation related to food supply systems, and involve a wide range of stakeholders in the building of innovative and integrated value chains with regard to sustainable management systems, environmental challenges and human health.

2. Introduction

2.1. Challenges of the Hungarian food supply system

Similarly to international practice, the food supply system of Hungary is also facing a number of social, economic and environmental changes and challenges. Preparing for these effects in a timely manner and identifying the points that require flexibility can be of key importance in maintaining system stability.

The world's population is growing, but at the same time, the population of Hungary is constantly

declining. On January 1, 2019, the population of Hungary was 9,773,000. According to the data of the Hungarian Central Statistical Office, the population of Hungary was the highest in 1980 (10,709,000), and it has been declining since then. The year 2010 can be considered another milestone, because that was the last time that the number of our countrymen exceeded 10 million (by 14,000) [1]. Life expectancy at birth was 75.94 years on average in 2019, which can be considered higher than the forecasts in recent years. Women make up more than half of Hungarian society, and their life expectancy is higher than that of men, in 2019 by almost 7 years. Nevertheless, the average age is constantly increasing (42.7 years in

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2019), i.e., the Hungarian population is declining and aging. The food supply system must also reflect this social change, that is, it has to be prepared to meet the needs of an aging society [2].

Lifestyle-related non-communicable diseases are among the leading causes of death in Hungary [2]. Unfortunately, Hungary is ranked high in statistics related to overweight and obesity year after year. According to the 2016 data of the World Health Organization (WHO), 61.6% of the Hungarian adult population over the age of 18 can be considered obese [3]. Based on the results of the most recent, 2014 representative National Diet and Nutrition Status Survey (OTÁP), two out of three adults in Hungary are overweight or obese. 28.2% of men and 31.5% of women are obese [4]. The eating habits of Hungarians do not comply with the recommendations for healthy eating. Our countrymen consume more fat than recommended, mainly of animal origin, little whole grain, and their consumption of fruits and vegetables cannot be considered satisfactory either [5]. In addition to food losses at certain stages of the food chain (raw material production, processing, trade, hospitality), some of the food is discarded by consumers, while still in the consumable state: in 2016, Hungarian households wasted 68 kg of food per capita [6]. The social damage and negative economic impact of food waste and loss formation is clear, meaning the unnecessary commitment and waste of resources used in food production. In addition, the appearance of unconsumed food as waste also has a significant impact on the environment [7].

The diverse ecological factors of Hungary are conducive to biodiversity. However, in Hungary as well, in several cases, short-term economic interests endangering the survival of biological diversity prevail instead of environmental, social and economic interests: farming in accordance with natural conditions and environmental sensitivity is not universal. Excessive use of natural resources, the emergence and spread of invasive alien species, unprofessional agrotechniques that ignore environmental aspects and the effects of climate change, the lack of environmentally conscious farming, intensive farming and the abandonment of cultivation can lead to a loss of biodiversity and the disappearance of mosaic landscape structure. In accordance with the provisions of the UN Convention of Biological Diversity, a National Biodiversity Strategy for the period 2015-2020 has also been developed in Hungary, which emphasized the conservation of biodiversity in agriculture, among other things [8]. According to the semiannual evaluation of the Strategy, positive results with regard to agriculture are that the number of items held in gene bank collections and the number of items made available by gene banks has increased significantly, and the fact that both pillars of the Common Agricultural Policy (KAP) make it compulsory for member states to provide support for climate- and environmentally friendly practices [9].

Since 1997, the National Environmental Protection Programs (NKP) have provided a comprehensive framework for Hungary's environmental policy goals and measures. The latest six-year national strategic plan for environmental and nature protection was published in 2015. The overall objective of the program is to contribute to ensuring the environmental conditions for sustainable development along three strategic objectives: improving the quality of life and the environmental conditions of human health; protection and sustainable use of natural values and resources; and improving resource saving and efficiency, making the economy greener. Issues that are related to all three objectives are improving the capacity to adapt to climate change and environmental safety, and a horizontal expectation is to increase the environmental awareness of society. The Program is implemented through the realization of a wide-ranging partnership, including social participation [10].

The foundations of Hungary's sustainable development are contained in the National Framework Strategy on Sustainable Development (NFFS) for the period 2012-2024. Taking into account domestic and global processes (such as UN Sustainable Development Goals – SDG), the strategy outlines a set of instruments and reforms for all social, economic and environmental areas in line with a sustainable vision. According to Parliament Resolution 18/2013. (III. 28.) [11], the state of national resources must be monitored and the Parliament must be informed about it every two years. A number of stakeholders, such as the National Council for Sustainable Development (NFFT), ministries, NGOs and other stakeholders are involved in drafting the progress reports [12]. The third report on the strategy covers the period 2017-2018 and, based on it, it can be stated that despite some positive results (growth of economic capital and certain economic indicators) the sustainability state of Hungary still cannot be considered satisfactory.

2.2. Relevant strategies of the European Green Deal

The official communication of the Biodiversity Strategy for the protection of biological diversity, which is part of the European Green Deal that supports climate neutrality and the transition to a sustainable economy, which also has a major impact on the planning of Hungary's agricultural subsidies, was published on May 20, 2020. The goal of the strategy that extends to 2030 is to restore the biodiversity of the continent. According to the document, in the restoration of the ecosystem, major roles are to be played by increasing the proportion of organic farming, biodiversity-rich areas and landscape elements on agricultural land, by halting and reducing the extinction of pollinating insects, as well as by reducing the amount of pesticides used, among other things [13].

The Farm to Fork strategy, which is also part of the European Green Deal, aims to move towards a sustainable food chain, an essential part of which is the transformation of the way foods are currently produced, distributed and consumed. According to the strategy, all of the stakeholders of the food chain must be involved in achieving sustainability. To this end, it is essential to change production methods, and to use solutions based on natural, technological, digital and satellite connections effectively. According to the document, current eating habits are unsustainable from both a health and an environmental point of view, thus it emphasizes the importance of a diet that is in line with the recommendations (e.g., limiting the promotion of foods high in fat, salt and sugar) and aimed at curbing diseases of civilization (e.g., obesity, cardiovascular diseases and cancer), the need to reduce food waste, the importance of considering a plant-based diet, innovative and sustainable packaging solutions, and a uniform, easy-to-understand nutrition label on the front of the packaging. In addition, the Commission will create a level playing field for all market stakeholders in order to enhance food safety and to combat unfair commercial practices and food counterfeiting.

Emphasizing the importance of the strategy, it discusses the role of research and development in the transition to a sustainable supply system in a separate subchapter. In the research framework project Horizon 2020, the Commission plans to make a € 1 billion budget available for the Green Deal, which will increase to € 10 billion in Horizon Europe, the successor to the program. In addition, the document lists 27 measures based on measurable criteria, such as a 50% reduction in the use of pesticides and fertilizers, a 50% reduction in the sales of veterinary antimicrobial agents, and the use of 25% of arable land for organic farming. In parallel, the Commission is taking steps to promote a healthy diet and sustainable consumption, while also proposing animal welfare food anti-counterfeiting measures [14].

3. Materials and methods

Our research work was carried out during the coordination of the Hungarian Policy Lab of the FIT4FOOD2030 project, the main objective of which was to map the national food supply system, to designate action points and to develop a proposal to support the transformation, taking into account the priorities of FOOD 2030 [15] and involving the stakeholders [16].

We examined the challenges facing the Hungarian food supply system¹, the potential answers to them and the proposed solutions during a series of workshops consisting of three occasions. The three workshops spanned a period of more than one

year. The first workshop was held on September 12, 2018, the second on March 19, 2019, and the third on November 6, 2019. The methodology of each event was compiled based on the recommendations developed by the Fit4Food2030 project, in such a way that experts from different fields could discuss issues related to the food supply system in small groups, based on a guided methodology (focus groups). The results of the different groups were compared, and commonly accepted results of the given workshop were obtained this way. The topics and tasks covered by the three workshops were built on each other, so the partial results of each event became final only after the feedback from the participants.

This article presents the process and results of the work of the „Policy Labs” in Hungary. The objective of the events was to achieve the following outputs:

- Establishment and operation of a network of experts concerning the Hungarian food supply system;
- Creating a vision for the Hungarian food supply system for 2030;
- Exploring the research, development and innovation (RD&I) elements that either hinder or support the vision for the Hungarian food supply system for 2030;
- Developing action plans to help realize the vision for the Hungarian food supply system for 2030.

In order to achieve our objectives, focus group studies were conducted, which, according to Vicsek [18], „means a research method in which data are generated in such a way that research subjects communicate in a group about a particular topic”. In the course of this method, participants are not taught or informed, but information is gathered about their views [19]. The main objective of the focus group is to gain insight into an issue important to us during the conversation with the participants, and the value of the technique is increased by the unexpected results of free group discussions [20].

Focus group discussions were conducted on all three occasions in two groups with a semi-structured study where the main line of the discussion was pre-designed. During the conversations, participants performed a variety of interactive tasks that facilitated the interchange of professional opinions under less formal conditions. Data analysis was performed using a rapid method based on interview notes. At the end of the interviews, they were briefly evaluated by the moderator and the organizer (debriefing) [18], and this was taken into account during the analysis. Conversations were analyzed by qualitative content

¹ The main elements of the food supply system are: production, logistics, processing, packaging/marketing, distribution, consumption, waste/resources [17].

analysis, while in the case of word associations, frequencies were examined.

The primary goal of the Policy Labs operating at the national level is to create a network to help the transformation of the Hungarian food supply system with the widest spectrum of participants. The domestic network brings together a number of stakeholders of the sector, such as decision-makers and NGOs, representatives of research, professional and interprofessional organizations, as well as participants of various international working groups (e.g., SCAR – Standing Committee on Agricultural Research, COPA-COGECA – Committee of Professional Agricultural Organisations-General Confederation of Agricultural Cooperatives) in order to include EU directions and an international perspective in our planning. The network which has been expanding constantly during the events currently consists of 62 people. Despite the fact that they did not appear in person at the workshops, all members were provided with the opportunity at all times to comment on and supplement the summary reports on each event.

4. Results and conclusions

The topics of the workshops were based on the previous one's results, so in order to present the process, the work and results of the events are presented one by one.

4.1. Results of the first workshop

The first workshop was attended by 16 stakeholders from professional organizations (9 people), government institutions (3 people), research sites (3 people) and the business community (1 person). The professional organizations represented the areas of agricultural production, food processing, packaging material production, nutrition science, health maintenance and food waste reduction. Focus group interviews were conducted by dividing the participants into two groups. In the case of both groups, we focused on the following topics:

- Strengths and weaknesses of the current Hungarian food supply system;
- Challenges (economic, social, environmental, etc.) facing the food supply system until 2030;
- The role and opportunities of research, development and innovation in supporting new solutions and changes;
- Characteristics of the ideal Hungarian food supply system.

For each topic area, each participant was allowed to formulate 4 or 5 keywords with justification, concerning the food supply system as a whole and

and its main elements, so that all participants were able to contribute equally to the joint thinking.

4.1.1. Strengths and weaknesses of the current Hungarian food supply system

According to the participants of the workshop, the traditions of food production and processing provide a good basis for the operation of the Hungarian food supply system, which is accompanied by a supporting authority structure (e.g., NÉBIH). At the same time, the Hungarian food supply system, which is struggling with capacity constraints and efficiency and competitiveness problems, is characterized by a lack of cooperation of industry stakeholders, a barely transparent regulatory environment, a lack of skilled labor, a significant proportion of hidden economy and consumer resentment towards processed foods. In addition, the whole system is characterized by a limited flow of information and knowledge and the limited exploitation of RD&I (research, development, innovation) opportunities.

4.1.2. Challenges facing the Hungarian food supply system

The Hungarian food supply system, subject to both domestic and international influences, will face complex challenges in the future. The domestic food supply system needs to be prepared for changes in the global market, which will make it even more difficult to remain competitive. The food supply system must adapt to social changes (e.g., significant differences in purchasing power, aging society, diseases of civilization, animal welfare expectations) and must face a serious shortage of skilled labor. Supplying consumers cannot be achieved without large-scale producers, so the social acceptance of these enterprises must be improved. Important elements in moving the Hungarian system towards sustainability are the enhancement of RD&I activities, the improvement of cooperation, both horizontally and vertically, and the exploitation of opportunities inherent in digitalization. From a food safety perspective, the domestic system needs to be prepared for rapid and effective responses to cross-border crises and possible intentional infringements (e.g., bioterrorism).

4.1.3. The role and opportunities of research, development and innovation in supporting new solutions and changes

RD&I activities must become an active, meaningful complement to the work of all stakeholders, but this requires the development of a supported RD&I system based on cooperation and the elimination of duplications, where the flow of information between the elements of the system is ensured. System-wide provision of information, including education-based consumer awareness-raising from childhood, and the development of integrated tracing systems are

of key importance. To achieve all these goals, it is essential to change the basic approach across the entire system.

The characteristics and vision of the ideal Hungarian food supply system are presented in the results of the second workshop, as the vision was finalized at that workshop.

4.2. Results of the second workshop

The second workshop was attended by 12 stakeholders from professional organizations (5 people), government institutions (3 people), research sites (4 people), while 4 participants (3 people from professional organizations and 1 person from a government institution) submitted their proposals in writing during the presentation of the workshop results. The professional organizations represented the fields of agricultural production, food processing, nutrition science and food waste reduction.

The workshop formulated two basic goals:

- Finalization of the vision for the Hungarian food supply system for 2030;
- exploration of the elements of research, development and innovation that hinder and support the realization of the vision.

4.2.1 The vision for the Hungarian food supply system for 2030

The results of the first workshop provided the basis for creating the vision diagram, which was then supplemented and strengthened at the second session. To finalize the vision, 60 so-called trend cards developed by the FIT4FOOD2030 project were used [21]. Participants had to select from the cards related to the seven topics (general trends; agricultural production; food processing; consumer trends; market economy, trade and logistics; packaging and waste; political and other trends) the three elements they considered most relevant for the Hungarian food supply system. The elements most frequently selected by the experts were the strengthening of health and food awareness (5 times), the increase in the incidence of non-communicable diseases and the emergence of alternative protein sources (4 times each). After summarizing the results, the diagram presenting the vision for the Hungarian food supply system was finalized, in which the main elements of the system (production, logistics, processing, packaging/marketing, distribution, consumption, waste/resources) are surrounded by the aspects highlighted by the experts (**Figure 1**). The gray circle surrounding the figure shows the general factors related to the whole system, and in the whole figure the elements considered by the experts to be the ones to be most emphasized are highlighted in bold.

Overall it can be stated that, based on the findings of the experts, the ideal Hungarian food supply system will operate in the future in an environmentally conscious and sustainable manner, with minimal waste generation. It will be competitive, transparent and adaptable, and will be able to respond quickly to new challenges. Both horizontal and vertical collaborations between the stakeholders of the system will be established and operated. The stakeholders of the supply system will operate using advanced technologies, adapted to consumer needs. Open-minded, conscious consumers will make their purchases while in the possession of authentic information. Developments of the food supply system will be supported by a research background with a professionally trained staff focused on practical implementation. To achieve this, a supportive regulatory environment will be developed on the basis of broad professional and social consultation (**Figure 1**).

4.2.2. Exploring the RD&I elements that hinder and support the vision for the Hungarian food supply system for 2030

As part of group work, the experts had to select the three statements that most hinder the realization of the Hungarian vision in terms of research, development and innovation, and another three that could best support it, out of the 40 statements developed by the FIT4FOOD2030 project. In addition, participants were also allowed to formulate their own statements. The statements on the cards were grouped around four stakeholders: researchers; non-governmental organizations/population/consumers; public administration/political decision-makers and enterprises/industry (**Table 1**).

The participants of the workshop mentioned most often *Public administration/Political decision-makers* and *Researchers*. According to them, the elements that support the vision most are, based on the number of mentions, the creation of a regulatory environment suitable for innovation (Public administration/Political decision-makers, 6 mentions), the creation of a need for innovation (Non-governmental organizations/Population/Consumers, 5 mentions) and the coordination of stakeholders, encouraging cooperation (Public administration/Political decision-makers, 5 mentions). The most hindering factors are the lack of funding for basic research (Enterprises/Industry, 5 mentions) and for social science research (Enterprises/Industry), the lack of funding for technological innovation (Enterprises/Industry), and the fact that society has little or no say in which research has significance and impact on their lives (Non-governmental organizations/Population/Consumers, 4 mentions each). Supporting enterprises and industry to acquire the necessary knowledge (Researchers, 3 supporting and 3 opposing mentions), and encouraging researchers to work in multidisciplinary fields (Researchers, 2 supporting and 2 opposing mentions)

were the two most controversial elements in terms of support or hindrance.

After summarizing all the answers, the mind map of research, development and innovation of the Hungarian food supply system was developed. The pale green elements in **Figure 2** contain statements that support the realizations of the vision, the ones that hinder them are marked in red, while those that can perform both functions are marked in blue. The thickness of the lines connecting the statements indicates the frequency of mention.

As part of group work, based on **Figure 1** presenting the vision, each participant selected three factors which, in their view, the stakeholders of R&D should focus on the most. Based on the responses of the participants, within consumption, helping the conscious consumer clearly stood out (9 mentions), just as the most expected demand for research and development. Following this, the second most mentions (5) were given to the pursuit of a sustainable food supply system. Three mentions each were given to improving cooperation within the food supply system, the application of advanced technologies in production and generating minimal waste in the use of resources.

4.3. Results of the third workshop

The third workshop was attended by 20 stakeholders from professional organizations (12 people), government institutions (2 people), research sites (3 people) and the business sector (3 people). The professional organizations represented the areas of agricultural production, food processing, packaging material production, nutrition science, consumer protection and food waste reduction. As for the business sector, the representatives of two retail chains and a credit institution attended the event.

The objective of the workshop was to develop action plans to help realize the vision for the Hungarian food supply system for 2030, developed on the basis of the first two workshops, with special emphasis on the role of RD&I elements.

To develop the action plans, the pathway method recommended by the FIT4FOOD2030 project was used, based on which the given goal can be achieved by identifying those responsible and the means. To accomplish the task, the participants used thirteen responsible persons cards (farmer, food producer, consumer, NGO, researcher, expert, opinion leader/influencer, educational institution, decision-maker, interprofessional organization/public body/chamber, authority, municipal government, other) and ten tool cards (regulation, information, economic tools, research, education, campaign/program, development, blog/vlog, control, other) were used freely, in unlimited quantities.

The action plans were developed in a total of five groups, consisting of 5 or 6 people. The members of each group were selected in a way so that as many professional fields were covered within each group as possible. The twenty-one most important goals in the vision diagram were randomly distributed among the groups, from which they chose and developed two together. Thus, a total of ten action plans were developed and discussed. These are highlighted in gray in **Table 2**. Participants chose four general objectives, two were related to processing, two to consumption and also two to waste and resource management.

It is important to note that the routes developed only outlined one possible way to achieve the goals. since the presentation of the ten action plans would exceed the limits of this article, the similarities between the individual action plans were summarized on the basis of the keywords and statements of the action plans.

One such common feature is the enhancement of communication and cooperation initiatives, which need to be improved between the different areas (thinking in a system). One of the most critical elements in implementing the action plans is finding and involving stakeholders who are open to change and cooperation. Due to their differing interests, there is often no consensus on a given issue among the stakeholders of the food supply system, and there is also a lack of trust, which hampers transparency. Finding the right coordinating person/organization could help to overcome the problem, and stakeholders could be urged to meet the objectives in the action plans by using positive incentives.

Another key element is the strengthening of the supervisory role of authorities, so that they can provide feedback on the implementation and feasibility of regulatory means. Nonetheless, it is important that decision-makers base the development of their regulatory tools on the widest possible professional consultation, and that greater emphasis is placed in the development of professional positions on professional and interprofessional organizations, as well as chambers representing the interests of food chain stakeholders.

The participants emphasized the importance of using research as a tool, through which all the stakeholders in the product life can gain well-founded and credible knowledge and other information, helping the stakeholders to make their decisions. At the same time, it is not always easy to determine the exact position of research in different action plans. Ideally, research accompanies the whole process (design, execution, feedback).

The vision of the food supply system cannot be realized without conscious and responsible consumers who are open to innovation. In addition to education and information campaigns, the presence

of supportive family patterns may contribute to shaping consumer attitudes. Providing objective information to consumers is hampered by the emergence of new actors in the media (opinion leaders [influencers], bloggers, vloggers [video-bloggers]), whose credibility is often questionable. However, information from credible channels can be helpful in achieving the objectives outlined above.

5. Summary

In order to ensure the future of the food supply system, it is inevitable to rethink it and supplement it with certain elements. A thorough review of the system and an assessment of the situation are essential to be able to respond to the expected challenges and to adapt to domestic and EU strategies (e.g., Farm to Fork) and recommendations (e.g., UN Sustainable Development Goals). The FIT4FOOD2030 project provided an excellent opportunity to learn about the strengths of the system, on the basis of which changes should be made and weaknesses should be eliminated by the stakeholders in order to prepare the system for future challenges.

The Hungarian food supply system has many strengths on which to base the change, but is also has a number of weaknesses, the strengthening of which is a task for the coming years. For this process, the cooperation of the stakeholders is essential, as well as increasing their openness and improving their responsiveness. In addition to exploring the practical difficulties of the given sector, common thinking is also an essential condition for success. Multidisciplinary RD&I activities with the rational involvement of society can make a beneficial contribution to changing the system. Policy measures are needed that support the complex use of research, development and innovation related to the food supply system, and involve a wide range of stakeholders in building innovative and integrated value chains in terms of sustainable management systems, environmental challenges and human health.

The SARS-CoV-2 coronavirus pandemic that erupted after the conclusion of the workshop series also highlighted other sensitive points in the food supply system (e.g., importance of self-sufficiency, increasing storage capacities) that, understandably, our study could not cover. However, the temporary disruptions caused by the pandemic also indicate the need for food supply systems to be flexible, sustainable, innovative, adaptive and inclusive in order to successfully meet the demands of unexpected challenges.

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