STOWARZYSZENIE EKONOMISTÓW ROLNICTWA I AGROBIZNESU
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INNOVATION FOR FOOD SAFETY[1]

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Słowa kluczowe: przystosowanie, naśladowanie, kapitał ludzki, analizy przypadków
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Abstract. Safe food production and establishing food security are tasks which all actors in the food chain are actively involved in and can only be met if the participants are willing to constantly adopt to ever more varied and stringent requirements. The study, using examples from Hungary, reveals that agricultural food companies can create and apply solutions through imitation, adaptive innovation and by responding, in real-time, to market situations, thus leading to resource efficiency and competitiveness. To attain the aforementioned, all the presented case study reports require the acquisition of information, an open-minded approach and sound managerial skills. Primarily, there is a need for cooperation among the food chain participants, especially from the side of small and medium farms.

Introduction

One of the important pillars of technical development of agriculture, besides mechanization, breeding and chemicalization, is human capital. Successful development as well as innovation at all levels of the food chain require appropriate knowledge, attitude, existence of management skills, as well as an approach intended to help rapidly spread new applications. One of the drivers of ongoing agricultural innovation is not only safe food production, but also food safety compliance.

What is meant by food safety is the concept of dealing with the issue of chemicals that are applied in agricultural production. Chemicals enable a combination of production factors that result in an increase in the amount of food produced, to meet growing food and industrial needs. Artificial nutrients as well as the use of synthetic pesticides have contributed to an increased utilization of biological potential through plant breeding. These (could) involve a significant environmental load. To resolve the matter at hand, a few solutions may be adopted: through the direct or indirect restriction of production to more extensive solutions (i.e. organic) by means of moving production within the framework of applying more advanced technologies.

Traceability guarantees food safety from farm to fork. Material and product flow must be linked with professional information flow along the entire chain and they must all move together in the same direction. This enables potential problem-solving, boosts individual responsibility, and leads to preventive safety at the same time. [Regulation 178/2002 EU] The basis of the process constitutes unique identification, data recording and transmission, sufficient data connection provisions and transmission. The type of food traceability system implemented may vary from business to business; however, the overall aim is to incorporate both legal and voluntary requirements (i.e. internal traceability). Many public studies, and recommendations suggest that actors who cannot meet requirements based on food security, may drop out of the market. Although several systems of traceability and recall exist in practice (many of them are based on recording batch codes of ingredients at each stage of production or are as sophisticated as being based on computerized bar-coding to track and control the movement of ingredients and finished goods), they must continually develop and improve with advances in technology such as QR-coding, radio frequency identification, global data synchronization and authenticity testing of foods. From the farmers' point of view, precision agriculture can form a strong

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basis for enabling data gathering, recognizing, and provisions. The adoption of new technologies and innovation in agriculture is a continuing process, which can help to identify the critical points and isolate unsafe foodstuff, thus meeting the requirements of food safety [EUFIC 2014].

The Hungarian food chain security strategy was formulated in 2013. Some of the main goals are to enhance food chain safety, the security of knowledge management (to build and oversea the proper functioning of knowledge centers, introduce unified information management and transparent risk analysis as well as reorganize the laboratory system) and the form and operation of knowledge network (modern education, training, partnership in research, innovation, vigorous public relations). Other main objectives are food chain risk management and confirmation of known risk supervision (broad risk reduction, infrastructure of trustworthy and strong authority, preparation for the treatment of unknown hazards and unacceptable levels of risk as well as the protection of critical infrastructure). The central element of the European Union's mid-term strategy is the enhancement of Europe's competitiveness. The most important tools for the realization of this goal and enhancing food chain safety are innovation and economic development. The state (authorities), research institutions and businesses can get the major part of available EU funds through joint research and innovation partnership programs [*Food Chain*... 2013] The importance of the abovementioned issues are apparent when observing the globalization of food trade. Ercsey et al. [2012] in their study underscore that seven countries (5 EU countries, the US and China), constitute the agricultural and food trade center. Not only do they have direct commercial relationships with more than 75% of other countries worldwide, every second food product falls into the hands of a consumer from outside these 7 countries [Ertsey et al. 2012].

This paper is not intended to touch upon how this will contribute to the environmental load or growth of costs. However, along the non-growth paradigm, a shift is necessary to think on the issue through when it comes to such matters, too.

According to Schumpeter's interpretation and the Oslo manual, classic innovation is less visible among farm operators than food processing operators. Their innovation process models that are based on R&D may not resemble the imitation, innovation and adaptation that is frequently seen in the utilization of good ideas achieved elsewhere. [Lee at al. 2010, Takács-György, Toyserkani 2014, Lencsés et al., 2014, Husti, Béres 2015] Several authors have underlined the importance of open innovation, the accelerating deployment of open collaboration, innovation, the advantage of cost reduction of technology development beside the strengthening of socio-economic relations and the improvement of competitiveness of individual players [Chesbrough et al. 2009, Abulrub, Lee 2012, Maciejczak 2012, Dries et al. 2014].

The goal of the study is to give an overview of innovation activities of the Hungarian food chain in terms of food security, particularly with regard to the options of supplying data of crop production for the support of technical development.

Material and methods

The research puts emphases on the introduction of good practices, primarily based on secondary sources. Some of the case studies were reported at the "Examples of innovation in practice of the agricultural sector" conference that was held by the Gazdálkodás, Scientific Journal on Agricultural Economics. The study shall also present earlier experiences of the author from the area of crop production practices.

Research results

The article primarily highlights the adaptation of technology and innovation among innovation activities of Hungarian agriculture, and does not deal with species breeding, chemical innovation vor mechanization, such as the basics of technical development. Most farmers can apply innovation through imitation and adaptation depending on farm size, production structure, and/or the lack of other resources available.

Typically, the vast majority of innovation activities in food business occur in product development especially when dealing with the growing need for health-conscious products. This often

goes hand-in-hand with medical and dietary science. Packaging development, as a marketing tool, is significant where unique distinctive strategies can be implemented. The majority of small and medium businesses fails to have an R&D department, and does not employ at least part-time professionals. (This is typically a central European phenomenon and is significantly different from the old EU Member States, where 60-65% of companies have their own R&D department, at least with employees responsible for it.) The large international and foreign-owned companies operate their R&D departments abroad and currently none or very few carry out R&D activities in Hungary.

The practice of technological innovation in plant production

Nowadays, precision farming (PF) is gaining more and more importance in the reduction of environmental load. However, site-specific crop production as a part of PF, though adapting some elements of reduction in practice, still has a low impact on environmental load reduction in comparison to initial expectations. Many elements of site-specific crop production are not applied in practice in spite of their proven environmental and economic benefits. Previous researches highlighted that the influence of the spread of innovation and the application of technology is highly dependent on manager (owners, farmers) attitudes and frequently a lack of skills and/or willingness to cooperate is the prime reason for a lack of such innovation, the only exception being economies of scale [Reichardt, Jürgens 2009, Lawson et al. 2010, Lens et al. 2014, Lőwenberg-DeBoer 2015, Takácsné-György 2015]. It should be added that the development of the right machinery is needed and is supported. In recent years the site-specific technology toolkit has become a part of standard equipment of the major engine categories sold. Ensuring in-depth information for the actors of the value chain, confidence in technology and actors and increasing the willingness to cooperate are all necessary for mass transition [Baranayai et al. 2011]. The integrators have a significant role in triggering the dissemination of information, personal familiarization and persuasion.

Zone cultivation technology, process innovation, not a novelty in its own right, but as a complex system of soil conservation, energy and cost saving of seed-bed preparation and cultivation provide the basis for reducing the expenditures of wide row spacing. In relation to plant protection activities, higher yields can be achieved by sowing which is completed in one pass cultivation and zone spraying crops, which may be supplemented by cultivation. Its application requires more skills, better work discipline, however does not require special investment in equipment. The assemblies can be formed and fitted to a tractor or working machine tools (drill, cultivator) as an adapter in a moderately-equipped workshop. Its application requires first and foremost the relevant skills and only next come managerial activities, employee commitment and precision. [Széll et al. 2006, Takács-György, Toyserkani 2014, Husti, Beres 2015].

Renewal along the product chain – large-scale livestock farm

One of the leading large-scale livestock farms in Hungary is the Szerencsi Inc. They produce eggs for food, liquid egg, milk, pork and beef and other meat products. Animal product processing is done in the plants owned by the company. Their product processing activities provide added value on the market and give stable employment. The company is characterized by constant innovation and adaptation. Egg packaging and processing are among their new ideas and technological solutions. They are a supplier of separated egg whites and yellow products (egg) in an international food trade supply chain thanks to which residential and public packing is produced. The farm's motto: "Each Bite is Hungarian," as well as food safety and traceability characterize their activities. The plant took part in the Pannonian wheat varieties and variety candidates breeding program for the development of production and food industrial processing systems. Cooperation is facilitated through Knowledge Centre - a company which shortens the time of spreading innovative solutions.

KITE Agricultural Service and Trade Inc, ABO MILL Inc., Gyermely Inc., MTA Agricultural Research Institute and the Applied Biotechnology and the Food Science Department of Budapest University were among their cooperating partners. This is a large corporate example in Hungary

that is characterized by a diversified production structure along the product chain and confirms that farming can be both profitable and fitted to the requirements of animal welfare and food security through conscious, strategic innovation and adaptation. [Osvay, 2015]

Renewal of exploiting opportunities of cooperation – medium-scale potato plant

Solum Inc. farms on approx. 1500 hectares of rented land. It has a dairy farm and their main activity concerns the potato industry, with grain storage and advanced packaging. They produce potatoes within the framework of integrated production technology. They have developed integrated pest management technology based on forecasting potato blight in cooperation with the Potato Research Centre of Pannon University, the Budapest Central Food Research Institute and Corvinus University jointly. The size of their production and the development of storage-processing have enabled it to become a supplier for major food retail chains.

The management highlights the personnel, human factors, the development of a long-term incentive scheme, maintaining an inspiring, creative atmosphere and an approach which considers the value of knowledge.

Concept changes and information technology within food production – pasta manufacturing plant

Implementation of a learned and adopted concept contributing to the "customization" of a given sector, strong competition and appropriate marketing activities can form the basis of successful renewal. The concentration of trade and the strengthening of competitors motivated the small-scale company Soós Dough Ltd., to apply a higher level of IT to aid automation, control "big data" in production appropriately, stockpile, distribution and also gain insight into customer habits and learn about new trends. The result is increased efficiency as well as the proper provision of necessary research and development data in real time. The "mobile kitchen" in the Soos Pasta Bus implements direct sales, and it is the advertising surface of the brand-name as well. [Soós, 2015]

Conclusions

Sustainable development requires the participation of all actors in the agriculture sector, with a focus on unique situations and circumstances, to adopt to the changing environment. This is one of the keys to effectiveness and competitiveness. The above mentioned examples clearly show that nowadays renewable capacity, openness and thinking along the lines of the product chain and co-operation may result in stability and can contribute to the production of suitable products that fit food requirements. At all levels of the food chain, it is important to have the proper knowledge, attitude, managerial skills, as well as the existence of attitudes from human capital that support the rapid spread of new applications, and strategic partnership. There is however, a need for competitor cooperation. Good examples, best practices coming from food chain can help the small and medium farms to find their future ways, by following them, by imitation or by taking part in open innovation.

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Streszczenie

Bezpieczeństwo i jakość żywności zarówno na etapie produkcji, jak i później jest zadaniem angażującym wszystkie podmioty łańcucha żywnościowego, które jedynie dzięki ciągłej modernizacji mogą sprostać zróżnicowanym i coraz bardziej restrykcyjnym wymaganiom. Badanie pokazuje na przykładach węgierskich firm, że producenci rolni i firmy spożywcze mogą tworzyć i wprowadzać nowe rozwiązania przez naśladowanie i innowacje oraz mogą na bieżąco odpowiadać na sytuację rynkową, co prowadzi do lepszego wykorzystania zasobów i większej konkurencyjności. Wszystkie zaprezentowane analizy przypadków pokazują, że aby osiągnąć te cele niezbędna jest wiedza, otwartość i zdolności menedżerskie. Potrzebna jest także współpraca z innymi podmiotami w branży.

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