THE MARKET-ORIENTED PRODUCTION SYSTEM AS A PART OF AGRICULTURAL INNOVATION

SYSTEM PRODUKCJI ZORIENTOWANEJ NA RYNEK JAKO ELEMENT INNOWACJI W ROLNICTWIE

Key words: farmers, information, marketplace
Słowa kluczowe: rolnicy, informacja, targowisko

Abstract. The paper aims to analyse the innovation process in the economy with the focus on agriculture and food production in Hungary. There was presented a model of production with the market-focused technology development system. The authors argue that the objectives of the system are as follows: inducing competition between input suppliers, increasing supply, loosening rigid trading structures, fostering the optimisation of mechanisation and ensuring the possibility of appropriate technology development. Harmonizing the subsidizing systems, optimizing their different incentive factors will become more precise and professionally more established and all these can contribute to optimizing the growth of innovations. In my work, I would like to develop the concept of a marketplace that is a marketplace and an innovation space at the same time, which can improve the conditions for the purchase of European agriculture, given the chance to expand production by improving profitability.

Introduction

Challenges and opportunities have always been the drive to create an agrarian production system that is able to develop in the agrarian market. Because of the pressure of the market a proper production system was successfully created in Hungary. The core of the system was the production system based on system operators along product paths. This system played a significant role not only in providing inputs and professional counselling based on the continuous learning process but also in the processing industry. The system operators provided the inputs, processed the production experiences, a self-teaching system came to light, which also took into account the market demand in the middle of the 20th century. At the beginning of the 21st century the production structure transformed. Nowadays the great multitude of agricultural producers and companies is typical of nearly every country in the world. In the case of precision crop production Takács-György [2012] has examined the economic relations between potential savings in chemicals at EU level. The economic role of small and medium-sized enterprises is clear. Several authors deal with the domestic situation of SMEs [Vágány et al. 2013]. At the moment there are great market potentials and even greater threats. Due to the loss of scope in the domestic market and the profit optimization for a given time agriculture is still profitable but more fragile as well.

Nowadays the position of the producers and the providers of inputs are determined in space that means the input-users are tightly controlled by the agency network of producers and traders and their relationship is determined by the traders’ endeavour to maximize their profit. On the one hand, in this system of relations the producers have few opportunities to make a comparison of the full range supply portfolio and to enforce the best possible bids (for example to reach the lowest purchase prices, best quality, etc.) offered by the widest possible range of suppliers. On the other hand, the profitability factor of the use of the funds is important and the producers do not have up-to-date production information. It is important to improve the position of the producers in input trading, in agribusiness and also to take advantage of the opportunities in the field of output sales.
Relying on the historical scope introduced above and extrapolated it to the present situation it is necessary to create a suitable, self-teaching production system. Consequently there is a need for such a system that can maintain close connections with producers and can solve the problem of effective lobbying and also that can increase innovation activities.

To meet the strict requirements (the level of process, quality, etc.) of the world market our system has three elements: a market-conscious production system, measurement of inputs in space and time, and self-teaching information technology. The system relies on the experiences of the previous agricultural production systems, takes into account the country-specific conditions and offers a possible solution to pursue the Europe 2020 aim.

**Material and methodology**

The central element of the marketplace is the network of contacts, which would include all of the users. The system focuses on the cost-effective support of sub-processes between the farmers and input producers, so the path between the user and seller should reduce as far as possible. The main target groups: producers, input producers and partners. The target groups and partners should provide input and activities or achieve the output data and activities after joining the network. The system is applicable to a wide range of product areas. In the case of products that can be recorded is important to act as both integrated and developed further, and to ensure the critical mass needed to operate the marketplace.

**Market-oriented production system**

Phillips [2001], Kok et al. [2003], Dimény et al. [2004], Zheng Zhou et al. [2005], and Fenyesi et al. [2004] have already discussed the analysis of market-based production and market-oriented product development. Nowadays my results give the basis for other research [Birovljev et al. 2013]. In my concept research (basic and applied), development, production and the market all together compose the agricultural production system. The core of my method during research and development is not to put emphasis on activity in a certain field but on the product or service itself. The aim of my system is to provide the basis for competitive production. The gap between basic research and production can be bridged by sector-specific research institutes operating in individual countries. In order to solve the occurring hypothesis, not only basic research centres but production companies executing experimental research results play a significant role as well. The task of sector-specific research is, consequently, to boost the marketability of production and to increase added value. During the production process the institutions performing applied research in the specialist fields involved perform (and complete) such research tasks which can boost the success rate on the market. In other words in the case of each product path the organisation of the production system consists of a vertical consortium of institutes in applied research and the basic research organisations as well as experimental and practice-oriented organisations (Fig. 1).

The most important consideration in the field of agricultural innovation is not restricted to research but it also involves the task of making the end product more successful through the cooperation of various professional fields. This model incorporates a research and production management system as well. It takes into account the complexity of agricultural production: the different usage value of inputs in different fields, the characteristics of biological processes, the necessary cooperation of more and different fields and the dynamics of the food market.

In the case of a production management system horizontal development directions are created spontaneously. In the case of product path, development alongside activity, more elements can be identical and their treatment can be similar as well. The research result completed with the producer guarantees the usefulness and good orientation of research and development. The system created this way will define the starting goals and tasks and later on these are continuously revised and modified. As a result a „self-teaching”, continuously iterating structure orientating in the direction of available optimal results will be created.
Measurement of inputs in space and time

Agriculture is part of agribusiness. The five main areas in agribusiness are: manufacturing of agricultural inputs, machinery and equipment; agricultural production; processing of food and non-food products; trading; and food. Input used in agriculture comprises: technical systems, chemical materials and biological products. This includes improvement in the efficiency of production facilities, such as the agricultural education, research, financial services, agricultural insurance, etc.

Agricultural machinery are present in all areas of agricultural production forming machine systems. The EU Member States or associated countries are seeking opportunities for the use of the funds available under the catch-up. In Hungary, a machine catalog-based funding system was created. However, choosing the right machine is not simple. The selection of the machine (in my opinion) can not be solved by a completely deterministic program, so to build a self-learning/teaching system is needed.

However, to maintain the efficiency of the production cost need to be recognized usage value of inputs, as they change in the production and utilization circumstances. If we know the multi-dimensional usage value, we are able to select the most favourable input and to optimize the usage. The possible yield can be even higher if we take advantage of the „pulling” market effect, and the „pushing” research opportunities in innovation.
Self-teaching information system

Rapidly changing socio-economic world of today put on a new dimension in the innovation process. Innovation requires extensive interaction between the different stakeholders, and feedback between science, development, manufacturing and marketing. The past few years, the growth-oriented companies began to get to know the potential benefits of networked economy. Along the regional science has become more accepted into the application of methods to underpin the economic benefits of the networking and fulfilling the innovation chain, collaboration, networking circle [Maciejczak 2012, Bigliardi, Galati 2013].

The information system substituting the „plantation effect” is provided by the self-teaching structure. In agriculture the market-conscious technological development and the R+D targets are defined through the vertical cooperation of professional groups defining the given product path. The specialist field related horizontal research and developments are part of agricultural production. The scientific results are incorporated into the inputs, the process is repeated and the system continuously optimizes itself via a self-teaching method, through iteration over a period of time.

An essential part of the optimal operation of the system is self-teaching information technology development, which consists of traditional elements (for example education, knowledge transfer, publications, etc.) and electronic solutions. The central piece of the development is to create a new, information digital database, which is based on an electronic marketplace (Fig. 2). At present this research is in process. The database can be treated as a trading and commercial system in agriculture and its targets take into account the following four criteria. The producer is regarded to be an autonomous and equal person or organisation, that must be put in the best decision making position and whose production decisions are not constrained. The market positions are determining, consequently activity and production must meet the requirements of the conditions defined by the market. The system must satisfy – apart from the defining market – all the conditions occurring during the operation (e.g. environmental requirements, subsidies). These boundary conditions define the conditions of operation and not the system of operation. The system has to think as if it was the „head” of the producer, to offer better chances for the producer to have more successful production and not to give constraints. This effort should be made to reach market advantages in every aspect of agricultural production (irrespectively of farm sizes, production system, etc.).

The new information technology collects offers for the users (producers) and also assists in composing purchase and sales tenders, consequently the suppliers and consumers will have to compete in. The number and people involved in the supply-side can be gradually increased as the system expects new entrants to the system, as a result the competition can be increased, and moreover the number of products and their quality can be increased on the supply side. The research, conducted this way in production, can guarantee the success of research in the market and the operating technology can stand as an example to other producers.

Through the information system, precise figures can be reached with reference to the use of the input, the features of the timeline, quality and quantity. Quality assurance and standardisation guarantees the use and sales of quality products. It provides the conditions for effective information flow through a complete network woven into the full spectrum of users. The coordination of the intensity of production can be fulfilled at a significantly higher, more comprehensive level with the incorporation of more producers. The information system fosters the cooperation of producers. The cooperation can be expanded to harmonize the use of technical devices as well as more effective access to financial means. Moreover, the technology to reach market information will continue to develop. Cooperation will be provided to use innovative systems, R&D&I management tasks will be performed mutually, at a bigger scale involving a bigger production structure.

The participants of supply and demand markets will receive benefits even though they will be competing with each other: This is because the supply and demand market of the input product will be more transparent and predictable, it will become simpler to define the market players and consequently the efficiency of trade will improve. Regarding the structure of producers they belong to different fields (crops growing, animal breeding and mixed industries/companies). With
Figure 2. A model of production with the market-focused technology development system

Source: own study

Advantages/Zalety

- Can be planned input demand, supply-demand balance
- More efficient trade

In management/W zarządzaniu

- Planability/Zdolność planowania
- Transparency/Przejrzystość
- Cost minimization/Minimalizacja kosztów
- Quality assurance and management, standardization (input, output)/Zapewnienie jakości i zarządzania (wkładów i wyników)
- Fast information/Szybka informacja

Encourage cooperation/Zachęcenie do współpracy

- Common cooperations/Kooperacje
- Technology development/Rozwój technologii
- More effective action (credit institutions, banks)/Bardziej efektywne działania (instytucje kredytowe, banki)
- Global market information/Informacja o rynku światowym

Concerned authorities, governments, experts/Zainteresowanie władz, rządu, ekspertów

- Development of an information system (area)/Rozwój systemu informatycznego (obszar)
- Exact details of the use of inputs (qualitative and quantitative characteristics, in time)/Dokładne dane dotyczące wykorzystania źródeł produkcji (cechy jakościowe i ilościowe, w czasie)
- Statistics for the support, market forecasts/Wsparcie statystyk i prognozy rynkowe
- Expenses, sales monitoring/Monitrowanie kosztów i sprzedaży
- Optimization of EU and national support/Optymalizacja UE i krajowe wsparcie

INPUT – supply/WKLAD – zaopatrzenie

- Technical systems/systemy techniczne
- Chemical materials/materiały chemiczne
- Biological products/produkt biologiczny

DATABASE/BANA DANYCH

- (INTERNET) MARKETPLACE/RYNEK

- Users/Użytkownicy

OUTPUT – demand/WYNIK – popyt

- Animal products/Produkty zwierzęce
- Plant products/Produkty rosnące
- Bio-product, biomass, biogas/Bio-produkt, biomasa, biogaz

More favorable conditions/Korzystniejsze warunki

More efficient trade/Bardziej efektywny rynek

Competition/Konkurencja

Offers/Oferby

New tenders/Nowe trendy
the help of the system, companies irrespective of their size and physical location can contact each other and they can apply their demand for input materials to be bought.

The system has been based on production models, its research results will be put into practice quickly. In order to achieve this, the system will generate Research and Development, the vertical and horizontal research will be optimized through the competition of R&D participants, every bit of information will be handed over to the other producers, who directly do not apply the research results, taking into account the specifications (e.g. size of property, location, conditions, etc.).

The self-teaching information structure enables a detailed solution to put agriculture back on the track of an intensive developing course again. It will integrate the production trends created abroad in an international perspective. Today the theory of open innovation is a prevalent trend. The concept stems from large corporations, which can successfully integrate their own research with outside development ideas and technologies in order to achieve higher economic benefits [Chesborough et al. 2006]. However, several international survey reveals that the concept is well suited to small and medium-sized enterprises as well as those of SMEs can get the most benefit from open innovation, which regularly collaborate with their customers and the various institutions of higher education as well. The versions of open innovation strategies are: involvement technologies outside the enterprise, broadcast licensing, and the creation of spin-off companies. Open innovation is the use of purposeful inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation can be understood as the antithesis of the traditional vertical integration approach where internal R&D activities lead to internally developed products that are then distributed by the firm. There are two facets to open innovation. One is the “outside in” aspect, where external ideas and technologies are brought into the firm’s own innovation process. This is the most commonly recognized feature of open innovation. The other, less commonly recognized aspect is the “inside out” part, where un- and under-utilized ideas and technologies in the firm are allowed to go outside to be incorporated into others’ innovation processes. However, several organizations’ innovation system has already faced the following challenges: well-trained research departments operate in virtually isolation from the real world. Ideas come from basic research; they are evaluated, refined, and carefully introduced to the market. However, it was still difficult to ensure that the outcome of these processes have a product/service that best meets the needs of their customers. Why not turn the companies this whole process and forward the process in a context in which the end users will create new ideas, applications, products/services? One of the most common, and now becoming more and more fashionable appearance of the open innovation is the Living Lab collaboration. Many researchers dealt with examination of Living Lab in Europe [Röcker et al. 2004, Hoving 2003, Markopoulus 2001]. My system fits well with the concept of Living Lab, but optimize the research and implementation users. It includes the logical elements of integrated agricultural production (Silsoe) but the system is not strictly connected to one field, on the contrary it offers a suggestion that can be transformed geographically. The advantages of ecological production can easily be incorporated into the system with the environmental expansion of the modelling module. System can be joined to the „Agropark” (Wageningen) concept through the provision of raw materials. My system contains the logical elements of the integrated agricultural production concept but it does not limit the creation of the system to a single field. The system provides an unique solution which integrates the main international agricultural development trends.

**Summary and conclusion**

To conclude the objectives of the system are as follows: inducing competition between input suppliers, increasing supply, loosening rigid trading structures, fostering the optimisation of mechanisation and ensuring the possibility of appropriate technological development. Consequently, harmonizing the subsidizing systems, optimizing their different incentive factors will become more precise and professionally more established. With the help of the up-to-date information technology solution we will be able to make a better use of our unique agricultural opportunities to provide a competitive advantage to our agricultural production and the food industry, all these resulting
in having a favourable effect on domestic input production. The system contributes to economic
growth, efficiency and competitiveness as the operation of the system is traceable, the result can be
excellently measured and the production management system representing the information can be
well connected to other integrated management structures (e.g. logistic and sales organisations). The
system creates an unique solution integrating the main trends in agricultural development.

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Streszczenie

Celem artykułu była analiza procesu innowacji w gospodarce z naciskiem na rolnictwo i produkcję
żywności na Węgrzech. Zaprezentowano model produkcji z systemem technologii zorientowanych na rozwój
rynkow. Zdaniem autora system ten ma na celu m.in.: wywołanie konkurencji między dostawcami surowców,
zwiększenie podaży, rozluźnienie sytywnych struktur handlowych, wspieranie optymalizacji mechanizacji
oraz zapewnienie możliwości odpowiedniego rozwoju technologii. Harmonizacja mechanizmów wsparcia,
optymalizując ich różne czynniki motywacyjne, powinna stać się bardziej precyzyjna, co w efekcie stworzy
bardziej profesjonalnie warunki do rozwoju innowacji.

Correspondence address
Szilvia Készmárki-Gally Erdeiné PhD.
National Agricultural Research and Innovation Centre
H-2100 Gödöllő, Tessedik S. u. 4, Hungary
phone: +36-28-511-715
e-mail: galli.szilvia@gmgi.hu