

Business model for cooperation between agricultural holdings and scientific institutes – methodological aspects

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Abstract

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In modern conditions a new type of business plan is necessary to accommodate all of the factors and a defined aim is the first part of understanding the agricultural holdings needs.

Based on a critical review of the concept of business models in the method of the aspect developed a model for cooperation between science and business, which includes units in the chain of research institutes – companies offering names – manufacturers – consumers, the main focus is on production, where the effects of agricultural holdings.

The following methods are used in the development and implementation of the model: analysis of causal relationships, descriptive analysis, comparative analysis, constructive calculation method, expert evaluation, survey method, in-depth study, partial replacement budget, profit matrix and others. This business model combines 10 components in its framework and has the aim to foster and evaluate cooperation between agricultural holdings and scientific institutes. As a result of the changing nature of competition, new approaches based on innovation must be implemented.

Keywords: Business model, agricultural holdings, scientific institutes

The Need to Develop a Comprehensive Business Model

In modern conditions, the previously used competitive advantages such as cheap labor, cost reduction, specific tax breaks and more are of a transient nature and lose their significance. As a result of the changing nature of competition, new management approaches based on knowledge and innovation must be sought to achieve long-term competitive advantages. One of the directions is to strengthen cooperation and build partnerships between agricultural holdings and research institutes conducting studies on the field of agricultural science.

There is a need for developments that meet the specifics of agricultural production, based on scientific advances that can be applied to farms to achieve sustainable and smart growth.

In recent years, business models are increasingly used as a new tool for designing, planning and managing business processes.

In this regard, the aim of the study is to develop: 1/ the framework and key features of a business model for cooperation for the implementation of agricultural varieties developed by agricultural institutes in the country, adapted to local conditions and climate change to ensure sustainable resource base; 2/ the methodological tools for assessment of the economic effects on the agricultural holdings.

Business Models as a Concept

The development of business models is a relatively new tool that is considered in scientific theory and practice. There are still lively discussions, different opinions are expressed and there is no generally accepted opinion when defining

Table 1. Definitions and components of business models (BM)

Year	Author	Title	Definition of the business model	Framework components of BM
1998	Timmers	Business models for electronic markets	“Product structure, service and information flows, including a description of the different business actors and their roles; description of the potential benefits for the different business participants; description of sources of revenue “	<ul style="list-style-type: none"> • Architecture • Value proposition • Business actors and roles • Sources of income
2001	Amit and Zott	Value creation in e-business	“The content, structure and management of operations designed to create value through the use of business opportunities”	<ul style="list-style-type: none"> • Supplementation • Lock • Efficiency • News
2002	Chesbrough and Rosenbloom	The role of the business model in capturing value from elevation: Evidence from Xerox corporation’s technology spinoff companies	“A coherence framework that accepts technological characteristics and technological potential as input variables and transforms them through customers and markets into economic variables”	<ul style="list-style-type: none"> • Market • Value proposition • Value chain • Cost and profit • Value chain • Competitiveness • Strategy
2002	Magretta	Why business models matter	A description that explains how the business works. A good business model answers the questions: Who is the customer? What does the customer value? How do we make money with this business? What is the economic logic that explains how we can deliver value to customers at the right price?	<ul style="list-style-type: none"> • Value proposition • Customers • Sources of income
2003	Hedman and Kalling	The business model concept: theoretical underpinnings and empirical illustrations	A term often used to describe the main components of a business. These are customers, competitors, activities and organization, resources, supply of production resources that meet the requirements of the business over time.	<ul style="list-style-type: none"> • Resources • Customers • Value proposition • Network • Architecture • Structure
2005	Morris et al.	The entrepreneur’s business model: toward a unified perspective	Brief presentation of how a set of solutions in strategy, architecture and economics have been used to create a competitive advantage in certain markets.	<ul style="list-style-type: none"> • Value proposition • Client • Internal processes / skills • External positioning • Economic model • Personal / investment factors
2008	Johnson et al.	Reinventing your business model	It consists of four interrelated elements (customer value, profit formula, key resources and key processes) that together create value.	<ul style="list-style-type: none"> • Value proposal for the client • Profit formula • Key resources • Key processes
2008	Zott and Amit	The fit between product market strategy and business model: implications for firm performance	Structural framework of the way companies trade with customers, partners and sponsors; also how it chooses to connect with factor and product markets.	<ul style="list-style-type: none"> • New practices • Efficiency • Differentiation • Cost management • Incoming timing
2009	Baietti	How open source strengthens business models	Description and expected revenues and expenses that determine: the importance of the work performed, problem solving, customer satisfaction, value delivered to customers, the company and other key stakeholders, control over key resources and processes required to deliver value.	<ul style="list-style-type: none"> • Significance • Customer value • Value of the partner • Profit • Leverage • Intellectual Property

Table 1. Continued

2009	Doganova and Eyquem-Renault	What do business models do? Innovation devices in technology entrepreneurship	Description and calculations that allow entrepreneurs to exploit the market and play a role by contributing to the construction of a techno-economic network of an innovation.	<ul style="list-style-type: none"> • Product • Client • Partners • Value • Profits • Costs
2010	Casadesus – Masanell and Ricart	From strategy to business models and onto tactics	Reflection of the implemented company strategy	<ul style="list-style-type: none"> • Resources and competencies • Internal/external organization • Value proposition
2010	A. G. Lafley Mark W. Johnson	Seizing the white space	The way the company delivers value to its customers while making a profit	<ul style="list-style-type: none"> • Value proposal for the client • Profit formula • Key resources • Key processes
2010	Osterwalder and Pigneur	Business model generation: a handbook for visionaries, game changes, and challengers	Rationale of how the organization creates, provides and receives values	<ul style="list-style-type: none"> • Customer segments • Customer segments • Value proposals • Channels • Customer relationships • Revenue flows • Key resources • Key activities • Key partnerships • Cost structure • Value proposals • Channels • Customer relationships • Revenue flows • Key resources • Key activities • Key partnerships • Cost structure
2010	Teece	Business models, business strategy and innovation	The way the company delivers value to the customer entices customers to pay for value and turns those payments into profits.	<ul style="list-style-type: none"> • Technologies and characteristics of the product / service • Customer benefit • Market segment • Revenue flow • Value capture mechanism
2010	Zott and Amit	The business model: recent development and future research	A system of interdependent activities that transcend the company and expand its boundaries.	<ul style="list-style-type: none"> • Creating value • Achievements • Competitive advantages
2011	George and Bock	The business model in practice and its implications for entrepreneurship research	Describes in general terms and reflects the design of the organization, its resources, the nature of innovation, its capabilities and structure	<ul style="list-style-type: none"> • Resource structure • Organizational design • Transactive structure • Value structure
2012	Muege	Business model discovery by technology entrepreneurs	Explanation of the provision of value by the business to a set of customers with attractive profits	<ul style="list-style-type: none"> • Significance • Value proposals of stakeholders • Profit formula • Abilities
2013	Baden-Fuller and Haefliger	Business Models and Technological Innovation	A system that somehow solves the problem of identifying something to the customer, hires all the technical needs, delivers satisfaction and provides value for money.	<ul style="list-style-type: none"> • Client • Commitment to the client • Value delivery and connectivity • Revenue generation

Table 1. Continued

2015	Nicolai J Foss and Tina Saebi	Business Model Innovation: The Organizational Dimension	This book discusses why it is important to link business models and business model innovation to the “organizational dimension,” and discusses the role of organization as an antecedent and moderator of business model	<ul style="list-style-type: none"> organizational design, informal organization, leadership
2016	Tim Weikiens, Christian Weiss, Andrea Grass, Kim Nena Duggen	OCEB 2 Certification Guide: Business Process Management – Fundamental Level	A descriptive model of a whole enterprise consists of vision, mission statements, goals, strategies, and realizing tactics, among other things. The OMG business motivation model (BMM) provides a structure by means of which those terms can be kept apart. Hence it ensures clarity in creating an enterprise model. This chapter explains the main features of the BMM.	<ul style="list-style-type: none"> Business motivation model BMM Vision and mission Strategy and Tactic Business rules Business policy
2017	P.Rana, Samuel William, Steve Evans, Maria Holgado	Business Models and Business Modelling: State of the Art	Sustainability is increasingly recognized as a pressing problem facing the modern world. Climate change, resource depletion, social responsibilities of companies—working conditions and practices, community relations, increasing inequality, and persistent poverty and health issues in many parts of the developing world and other growing environmental and social problems illustrate the unsustainable nature of production and consumption across the world.	<ul style="list-style-type: none"> business model innovation business modelling frameworks stakeholders and value network
2017	Jeffrey Taylor	Business models: For-profit, nonprofit, government-supported, and others	Legally incorporated models for-profit, nonprofit, government-supported, and others	<ul style="list-style-type: none"> Legally incorporated models
2018	Roberta De Angelis	Business Models and Circular Business Models	This chapter presents a set of propositions leading to a preliminary conceptualization of the circular business model by merging themes from the business model literature with the implications for business models.	<ul style="list-style-type: none"> Business models Circular business models Value proposition Value creation and delivery Value capture
2021	Olaf Drusche Stefanie Krause Jürgen Kretschmann Helmut Mischo Anna Luiza M. Ayres da Silva	Business Models for Sustainability	How can sustainability-oriented business model innovations redefine the raw materials sector and improve the sustainability performance is the main focus of this research.	<ul style="list-style-type: none"> Sustainable business model
2021	Yuran Jin, Shoufeng Ji, Li Liu, Wei Wang	Business model innovation canvas: a visual business model innovation model	BMIC composed of three levels and seven modules is successfully developed. 145 business model innovation options are designed in BMIC.	<ul style="list-style-type: none"> BMITM business model innovation
2021	Peter Lindgren, Niklas Stoyan, Hornbæk Knøth, Sukanthan Sureshkumar, Mathilde Fogh Friedrich & Rita Adomaityte	“Green Multi Business Models” How to Measure Green Business Models and Green Business Model Innovation?	Ever since the branching of the sustainable and circular literature on business models of the late 2000s and early 2010’s, academia’s, businesses and societies have been experimenting with how to measure green business models.	<ul style="list-style-type: none"> Green Business Model design— TO BE Business Models, Business Model Reconfiguration—focusing on changing AS IS Business Models

Table 1. Continued

2022	James A. Euchner	Introducing a New Business Model: The Business Model Pyramid	There is a strong tendency for companies to bring a new venture to market using their existing business model or some variant of it. The digital age has spawned a Cambrian explosion of new business models	hyper-targeted advertising, Direct-to-Consumer (D2C) businesses shared economy multi-sided platforms predictive selling
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Source: quoted in Kr. Kostenarov and team (2021), Models for increasing the competitiveness of agricultural holdings, 126-129; In: Competitiveness of Agricultural Holdings in Bulgaria and Models for Their Increase, ed. Avangard Prima, S.

business models and their design. Table 1 systematizes the opinions of scientists, arranged in chronological order.

We believe that some of the definitions are too general and do not reflect the essential characteristics of the category “business model” and the purpose of its development (Zott & Amit, 2010; George & Bock, 2011). In their compressed definition, presented by Casadesus-Masanell & Ricart (2010), they link the business model to strategy. According to their statement, it can be noted that the business model is a direct result of the strategy, but not the strategy itself. To make the distinction even clearer, it should be noted that strategy and business model, although related, are different concepts. Here we can refer to the concept of a group of authors (Morris et al., 2005), which is an integration of the concepts of strategy, business model and tactics. Another group of authors (Hedman & Kalling, 2003; Johnson et al., 2008) try to formulate the business model through its components, which is a one-sided view of the category. Based on the statement that in general the model is a logical description of the behavior of a system or process, we share the views of the authors who define the category “business model” with varying degrees of detail, as a system of activities to “value” of customers in order to make a profit. (Timmers, 1998; Amit & Zott, 2001; Bailetti, 2009; Teece, 2010; Osterwalder & Pigneur, 2010; Johnson, 2010; Muege, 2012; Baden-Fuller & Haeflienger, 2013). The further in time we go, the business model is specialized towards technological approaches and completing goal towards sustainability. Because of this we have added additional components to our model (Peter Lindgren et al., 2021; Euchner, 2022). There is a great variety of opinions of the authors about the design of business models – the number of elements and the components themselves. Some authors argue that business models are three-component (Magretta, 2002; Casadesus – Masanell & Ricart, 2010; Zott & Amit, 2010). The other authors adhere to multicomponent models. With constant change of the environment the components and verity of mixes used to complete the company’s objective is needed. A more comprehensive and fuller model is more likely to use a multicomponent frame.

We believe that the most complete framework is the business model proposed by Osterwalder and Pigneur (2010), which includes nine components (blocks) that provide tools for description, analysis, and design but we add two more (the number of components used is 11): key resources (CoR), key activities (CS), key partners (KP), institutional norm (IN) cost structure (CR), research and innovation implementation (RI) value proposition (SP), channels (K), customer segments (CS), revenue sources (K), customer relationships (Q). In our study we adhere to this model, as the essential characteristics of the individual components are discussed below but we have implemented some changes and we have added additional two categories. We are commenting on the components and the synergy between the components. The added institutional norm and research and innovation on the bases of the change in business environment and movement towards greener and innovative models that use all of the advantages that modern research and innovation present, plus conciseness towards sustainability and environmental protection that is currently taking crucial part of the institutional norm and synergy with biasness model creation.

- **Offered value** – gives a complete picture of the package of products and services of the organization. The value proposition is the reason the farm exists – what customer needs it meets and to what extent. The value proposition answers the question of what the farm offers compared to the competition in terms of indicators such as varieties, quality, price, delivery times, etc. The product should be crated based on possible conversion channels and new technologies and methods available.
- **Customer (consumer)** segments are the different target groups with customers that the farm serves. By identifying specific needs and desires for each consumer segment, the farm better understands its customers and exactly what products to offer them, which leads to higher customer satisfaction. Here the question is answered to whom the produced production is directed, as the farm can serve one or several

customer segments and can we target new segment by implementing institutional norms and productions that stimulate greener environment.

- **Channels** are the ways in which the value of the respective consumer segments is provided. This includes direct sales, online sales, own stores, affiliate stores, wholesalers and more. The question of how the offered value is delivered to the customers through communication, distribution and sales channels is answered.
- **Relationships with customers (consumers)**. The relationship of the organization with each customer segment. The more extensive the customer base, the more important it is to be divided into different target groups. Each target user group has specific needs and desires. This answers the question why, because anticipating and meeting these needs and desires creates good and stable relationships with consumers
- **Key resources** are the resources (land, labor and capital) that the economy needs the most to realize its business model. Key resources can be own, rented or used in agreement with key partners. Answers the question of what are the assets that are needed to deliver the value offered.
- **Key activities** are the most important business processes that will be implemented in order for the economy to be successful. These are things like product design, product manufacturing, product delivery, problem solving and decision making, marketing strategy. The key activities are determined by the value that the organization gives to the target customers. It answers the question of what are the main activities without which the offered value cannot be delivered. They are implemented through key resources.
- **Key partnerships** – are the network of partners, suppliers and other stakeholders that the farm relies on to operate. Partnerships are often useful in order to achieve savings, reduce risk or access specific resources and competencies. Here is the answer to the question of who the farm will work with, describing current and potential (future) partners.
- **Institutional norm** – The effect that national law and European policy have and the synergy between policy and cost structures, conversion channels, revenue sources.
- **Cost structure** is all operating (fixed and variable) costs that arise as part of the business model. Provided that key resources, key activities, and key partnerships are identified, the cost structure can be determined relatively easily. The question is how much

(from each group) costs are needed to deliver value.

- **Sources of income** are the cash flows that each individual consumer segment generates. Here the result of the successful delivery of value to consumers is indicated and the question of how much is the income is answered.
- **Research and Innovation** implementation have become more and more crucial for a working and successful business plan. Most new companies venture towards new ways to make their business model profitable and sustainable in the long run. Taking into an account the attitude of the consumers towards environmentally conscious products that are in line with new policy, we think that business model should have this to components.

From the brief critical review, we can conclude that the business model presents a holistic picture of the management of business organizations. In the process of building the model, a comprehensive and in-depth analysis must be made and the most relevant for the organization characteristics in the individual blocks must be derived. The business model is a reflection of the strategic and operational intentions of business organizations. It schematically describes the source of added value for the manufacturer, the way it is created and reaches consumers and what resources and partners the organization will use in its business.

Business Model for Cooperation between Research Institutes and Agricultural Holdings

The business model of cooperation is developed from the point of view of providing a sustainable resource base to our agriculture at regional and national level with the application of crop varieties resistant to climate change and suitable for our natural conditions, developed by scientific institutes to achieve more high added value, efficiency and competitive advantages for agricultural holdings and in line with new European policies and modern technologies. Many of the young people continue the business model they have learned and the established export models in the family and rely on the established business relationships of their parents (Tsvyatko-va, 2021). A new business model can further and strengthen the agriculture standing on the market and help for its development. In the business model we use the components that can be influenced by cooperation between agricultural holdings and the research institute (some won't be different when you use it for this specific aim but can be different if you use the business model for another aim). Here the specific model is adapted for cooperation with research institutes and has a specific aim (Figure 1).

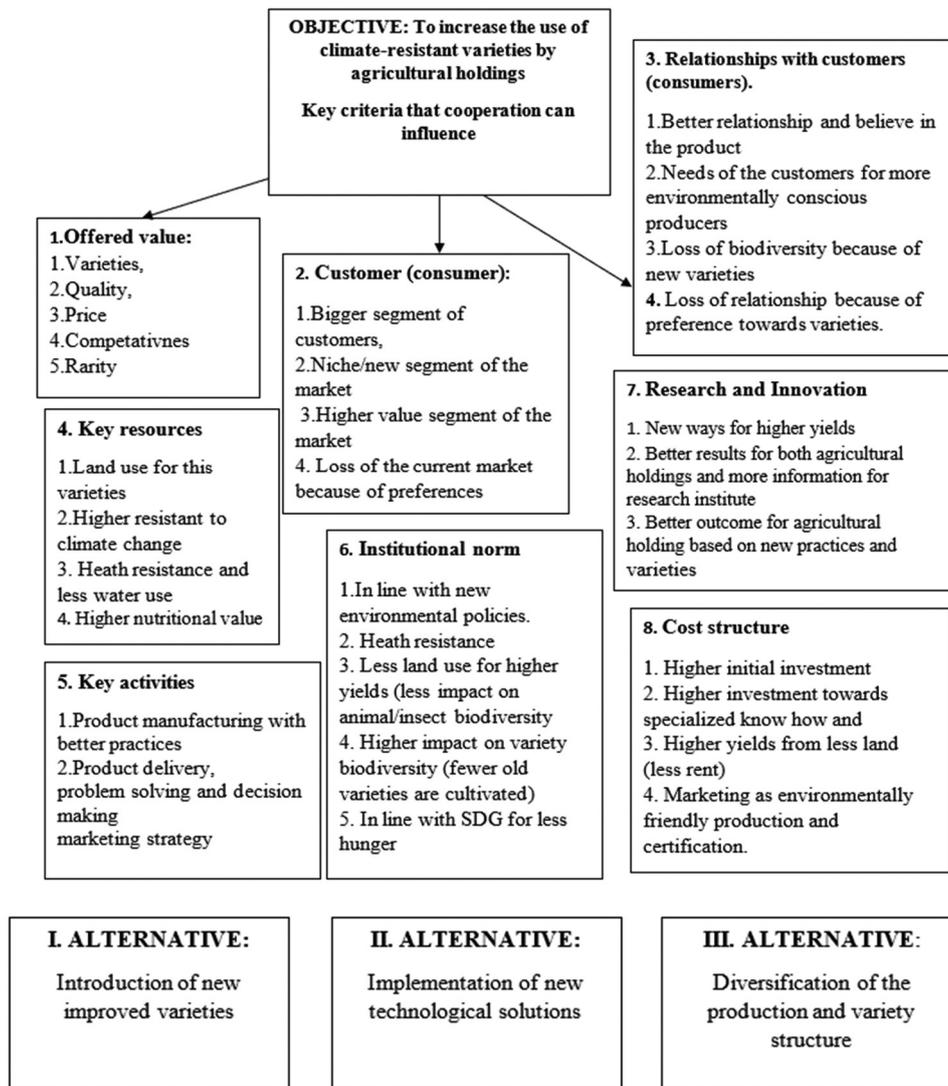


Fig. 1. Business model for cooperation between AH and research and development

Source: Crated by the authors

In order to be applicable in practice and to meet the needs of farmers, the model must meet the following main characteristics:

- Understandable – easy to understand and apply in decision making;
- Comprehensive – to reflect reality and include important elements of the problem we are modeling;
- Stable – it is difficult to get the wrong answer from the model;
- Consistent – the results must logically follow the basic principles of the modeled system (process);
- Flexible – to allow maintenance and updating of the

model upon receipt of new information.

The purpose of the developed business model for cooperation: Increasing the application by farmers of climate-resistant varieties of crops – developed by scientific institutes and local varieties suitable for our natural and climatic conditions.

The model is developed in two directions:

- **First direction “from science to business”;**
 - **Second direction “from producers to consumers”.**
- The model covers units in the chain of research institutes – companies offering seeds – producers – consumers, but the

main focus will be on production, where to outline the effects for farms from the application of the model. This model main aim is for the farmers to better understand how and where they can implement change that will have long lasting effect on their agricultural holdings. The following methods can be used in the development and implementation of the model: analysis of causal relationships, descriptive analysis, comparative analysis, constructive calculation method, evaluation based on scale from 1-5 on every of the models criteria, survey method, in-depth study, partial replacement budget, profit matrix, etc. The rating scale is 1-5 degrees. 1 – negative influence/no influence, 2 – weak influence, 3 – moderate influence, 4 – high influence, 5 – strong/positive influence. With a score above 54 points, it is good to introduce new varieties; there is no high enough score to implement new technological solutions. Technological solutions imply a higher rating due to higher investments. With a score of more than 87 points, it implies the introduction of new varieties, and a score of more than 100 suggests the possibility of diversification of production and varieties. The evaluation is based on the business model and the questions that need to be answered.

The criteria and alternatives have been developed within the model. The alternatives are, in practice, the various business strategies that farmers can implement after assessing what they need and don't need for their holding. The criteria that influence the choice of alternatives for the realization of the set goal should also be highlighted.

Accordingly, the following alternatives are possible:

- introduction of improved varieties;
- implementation of new technological solutions;
- diversification of the production and varietal structure of the holdings.

The set criteria and alternatives can highlight the motivating and demotivating factors for the application of the model by agricultural holdings. The main or part of the factors that can motivate farms to apply the model are the following:

– Production: obtaining higher yields, products of higher quality, or products with better taste, meeting consumer demand, etc.;

– Economic (financial): obtaining higher added value, realization of higher net income, sustainability of income, increasing the efficiency and competitiveness of agricultural holdings, adding market shares, getting additional support from CAP;

– Social: accumulated experience and traditions in the cultivation of local varieties of crops; reduction of labor input; raising the qualification in the cooperation with science, getting better certification and social standing because of new varieties;

– Environmentally friendly: less environmental pollution and nature conservation, improving biodiversity.

There are also a number of demotivating factors that can influence the decision of agricultural holdings to abandon the application of the model:

– Financial: lack of necessary financial resources; limited access to credit;

– Market: problems with the sale of products, insufficient marketing, ignorance of consumer attitudes, losing market shares for old varieties;

– Socio-psychological: unwillingness to take the risk of change; attachment to the old methods and means of production;

– Subjective: unbuilt lasting connections between science and practice; lack of information, lack of necessary qualifications and skills of producers.

In the process of building the model of cooperation, the characteristics in the separate blocks (elements) for the agricultural holding must be filled in (Table 2), these elements should be given a value on 1-5. This will help to evaluate the collaboration between research and agricultural holding and implementation of new varieties from the agricultural holdings

When filling in the blocks, the question is where to start and what sequence to follow. It is advisable to start by defining the consumer segments – who are the customers to whom the product of the farm will be sold. Then move on to the value proposition – how exactly the organization's product solves the problems of consumer segments and meets their needs better than the competition. Then move on to defining the channels that reach consumer segments. What follow is customer relations – how the farm will win and retain consumers. The right strategy should be defined in order to derive higher revenues from the respective consumer segments.

It is necessary to continue with the other blocks, which give greater clarity to the business model. Such a block is a "key resource" that will show what the farm needs to own and provide in order to deliver value to consumer segments. It is the turn of key partnerships – especially in defining tasks and activities for which external services will be used. Determining costs (the last ninth block) gives the final touch to the picture and compared with revenues will determine whether the business model is promising and sustainable.

When developing the framework, the group of indicators for assessing the economic effects on agricultural holdings from the application of the model should also be indicated. We consider it appropriate to distinguish two groups of evaluation indicators for each of the considered areas.

Indicators for the economic efficiency of the model in the first direction "from science to business"

Table 2. Filling in the blocks (elements) of the business model

Key partners <ul style="list-style-type: none"> • Who are the key partners? • Who are the key suppliers? • Which partnerships allow economies? • Which partnerships minimize risk and uncertainty? 	Key activities <ul style="list-style-type: none"> • What are the activities needed to offer a unique value proposition to consumers? • What are the necessary activities to build the desired distribution channels? • What are the activities needed to build the desired relationship with consumers? • What are the necessary activities to realize the desired revenue streams? 	Value proposals <ul style="list-style-type: none"> • What value does the farm provide to consumers? • What needs does it meet and what problems does it solve for consumers? • What products does it offer in the different target markets and segments? • How is the economy different from the competition? 	Customer relationships <ul style="list-style-type: none"> • The relationship of the farm with each customer segment? • How do they integrate with the rest of our business model? Opportunities for short supply chains?	Customer segment <ul style="list-style-type: none"> • Does a mass or niche market serve the farm? • What are the main consumer segments? • What are the criteria for segmentation – geographical, demographic, and behavioral? • Does the farm serve one or more customer segments? 	European policy and CAP <ul style="list-style-type: none"> • Are there policies that can help the implementation of new practices and varieties? • Are there policies that foster innovation? • Does any policy or law hinder the implementation of new varieties?
	Key resources <ul style="list-style-type: none"> • What are the resources to make a unique value proposition to consumers? • What are the resources to create the desired distribution channels, customer relationships, and revenue streams? • What are the key resources – human, financial, material? 		Channels <ul style="list-style-type: none"> • How does the farm inform consumers about its products? • What channels do customers prefer to use? • How does the farm help customers evaluate its value proposition? • Which ones work best? • Which ones are the most profitable? 		Research and Innovation <ul style="list-style-type: none"> • Do you have experience partnering with research institutions? • Have you ever implemented any innovations that have helped you agricultural holding? In long term would this give additional value to my AH?
Cost structure <ul style="list-style-type: none"> • What and how much is the fixed costs? • What and how much are the variable costs? • Are there economies? • Which key resources are the highest? • Which key activities are the most expensive? 	Sources of income <ul style="list-style-type: none"> • What is the price of each product offered on the market by the farm? • Structure of total revenues? 				

Source: created by the author

- **Quality:**
 - better resistance and adaptability of the varieties to the local natural and climatic conditions;
- **Quantitative:**
 - productivity – average yield (t/ha);
 - products produced from varieties developed by scientific institutes and local varieties respectively (t);
 - share in the total production of the respective crop (%);
 - share of the areas on which the indicated varieties are

- grown from the area of the respective crop (%);
 - fixed costs – BGN/ha;
 - variable costs – BGN/ha

Indicators of average yield and costs are determined experimentally or by surveys of producers who have implemented the variety in practice. The parallel analysis of the results of the experiment and the practical application give a reliable assessment of the economic efficiency, as the degree of realization of the potential of the variety can be estab-

lished when spreading it outside experimental conditions.

The productivity of a variety is influenced by various factors such as fertilization rates, type of fertilizer used, irrigation and cultivation technology. The introduction of a new type of technique or processing changes the ratio and magnitude of costs, which determines the final result. Therefore, when evaluating the variety, an analysis of the sensitivity of the indicators to the change in the indicated factors is made. The change in the level of these indicators provides information about the ratio and trends in productivity, the variable and fixed costs that affect the efficiency of the 1st production.

Indicators for the economic efficiency of the model in the second direction “from producers to consumers”

- Quality indicators:
 - quality characteristics preferred by consumers (better consumer qualities), eg taste, lesser amount of seeds, long lasting, etc. qualities;
- Quantitative indicators:
 - price of the production of a given variety – BGN/kg;
 - gross production – BGN/ha,
 - gross margin – represents the gross output minus variable costs, BGN/ha
 - net income – gross output minus total costs (fixed and variable), BGN/ha,
 - rate of return – net income on production costs (fixed plus variable costs), %
 - Equilibrium (critical) point of production for crop varieties is achieved at such volume of production (ha, tons) at which the total costs are equal to the operating revenues.

Determining the equilibrium point for the production of a variety is a preliminary estimate of the minimum amount at which that production can take place. The introduction of a variety below the equilibrium point is economically unprofitable. The equilibrium point is in fact an indicator of resource efficiency and can be decisive in comparisons between varieties. The equilibrium point can be determined by the size of production and the average yield (average productivity).

The equilibrium point for the amount of production in ha (X_{ha}) is calculated by the following formula (Nikolov et al., 2018):

$$X_{ha} = \frac{\text{Fixed costs, total BGN}}{\text{Gross output, BGN / ha} - \text{Variable costs, BGN / ha}}, \quad (1)$$

where: H ha is the minimum amount of production at the equilibrium point above which the producer will benefit from the introduction of the variety. The fixed costs in the numerator reflect their average annual value and refer to the total amount of production (experiment). Gross output and variable costs in the denominator are on the 1st production volume (size).

The equilibrium point for average yield (HSRD) is calculated by the formula (Nikolov et al., 2018):

$$X_{\text{average}} = \frac{\text{Fixed costs, BGN/ha}}{\text{Price, BGN/kg} - \text{Variable costs, BGN/kg}}, \quad (2)$$

The price of the product of a given variety is an expression of its quality characteristics. Each of the factors – average yield, price, technology have a significant impact on the economic efficiency of the variety. Therefore, it is important when creating it to have a clearly defined goal – whether to look for a variety with high consumer qualities, which will have a higher price and revenue, or apply a sustainable variety of culture, where cost reduction will be a source of higher efficiency. In cases where the goal is to satisfy certain consumer niches (eg. organic products, vegetables with certain qualities – taste, etc.), the expectations are for lower efficiency compared to traditional production, which will be offset by the higher price. In a comparative economic evaluation of different varieties, a ranking is made according to the value of the main economic indicators.

Conclusions

In conclusion, business models are a new tool for designing, planning business processes aimed at finding the most effective solutions to achieve production, economic, social and environmental results. The developed methodological tools of the model, which covers the units in the chain of research institutes – companies offering seeds – producers – consumers, provide an opportunity to outline and assess the effects on farms from cooperation between science and business.

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