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Mapping agricultural business models to foster socioeconomic opportunities: Insights from Europe

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Abstract

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Enhancing social capital, improving market connections for healthy goods and services, and increasing business and technical management capacities can help farmers adopt more sustainable and profitable business models. The aim of the study was to map the business models used by farmers in three agricultural systems (tree crops, cereal-based rotations, and pastures) across European countries. The study used a simplified Business Model Canvas to define the elements of the business model. Then, a two-step cluster analysis was applied to identify the characteristics that define each business model. As a result, four business models were described. A comparative analysis was then made between them. Based on these analyses, conclusions were drawn about the socioeconomic opportunities for their further development.

Keywords: farm types; business models in agriculture; mapping

1. Introduction

This research described the investigation of existing business models of the different EU farm types. It also present the results from analysis and options for creating new socio-economic opportunities by implementing soil restoration strategies. The main reason to investigate new business opportunities including digitalization was to increase farmers' ability to achieve better market connections for healthy goods and services, to improve social capital and to increase business and technical management capacities. The conventional method of cluster analysis (CA) has been used to identify business models.

The concept of the business model is relatively new. Academics, researchers and the business world started to use the term in the late 1990s (Latora et al., 2018; Zott et al.,

2011; George and Bock, 2011). The evolutionary review of publications about concepts, definitions and frameworks of business models by Latora et al. (2018) shows considerable variety.

Chesbrough and Rosenbloom (2002) explored the role of the business model in capturing value from technology. They state that the ultimate role of the business model in an innovative solution is to ensure that the technological core of the innovation is embedded in an economically viable enterprise. Their framework is based on market, value proposition, value chain, cost and profit, value network and competitive strategy.

Starting from the numerous business failures related to the internet boom, Magretta (2002) argues that a good business model is essential for each successful organization. According to him, business models are stories that explain how enterprises work and describe how, as a system, the pieces of a business fit together. He detects only three components of the business model framework, which include value proposition, customers and revenue sources.

Hedman and Kalling (2003) extended the components of the business model framework to six: value proposition, customers, resources, network and architecture, and structure. Morris et al. (2005) discussed other business model components such as value proposition, customer, internal processes and skills, external positioning, economic model, and personal and investor factors.

To determine whether a firm should modify its business model, Johnson et al. (2008) identified the following steps: articulate what makes an existing model successful, watch for signals that the model needs changing and decide whether reinventing the model is worth the effort. Following this approach, they propose a framework with the following four components: customer value proposition, profit formula, key resources and key processes.

Zott and Amit (2010) examined the fit between a firm's product market strategy and its business model and developed a formal model to analyse the effects of product market strategy. The business model choices on the firm's performance and concludes that the business model and product market strategy are complementary to each other, not substitutes. According to this model, two latent variables – novelty and efficiency – characterize the design themes of a business model and the other three – differentiation, cost leadership and timing of entry – characterize the product market positioning of the firm.

Doganova and Marie Eyquem-Renault (2009) investigate the role played by business models in the innovation process. They adopt a pragmatic approach to business models, examining them as market devices and focusing on their materiality, use and dynamics. They show that the business model is a narrative and calculative device that allows entrepreneurs to explore a market and plays a performativity role by contributing to the techno-economic network construction of innovation. Key components of business models are product, customer, partners, value, profits and costs.

The framework presented by Casadesus-Masanell and Ricart (2010) allows a simple integration of the notions of strategy, business model and tactics. In their formulation, strategy and business model, though related, are different concepts. A business model is the direct result of strategy but is not itself a strategy. They consider a three-component business model framework that includes resources and competencies, internal and external organization, and value propositions.

According to Teece (2010), a business model is important for its connections with business strategy, innovation management and economic theory. He developed a business model framework, which includes technologies and features of the product or service, customer benefit, market segment, revenue stream and mechanisms to capture value. Johnson (2010) identifies four fundamental building blocks by which a business model works: the customer value proposition that meets a real customer's needs, the profit formula that lays out how a company makes money delivering the value proposition, the key resources required by the value proposition, and the key processes needed to deliver it.

These are a subset of the nine components proposed by Osterwalder and Pigneur (2010), who provide a tool for describing, analyzing and designing business models; customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure. They proposed the Business Model Canvas (BMC) tool to support designing business models according to their framework. The concept is simple but does not oversimplify the model of value creation. According to the BMC, any business model can best be described through nine basic building blocks that show the logic of how a company intends to make money.

Digitalisation is causing radical changes and transformations in everyday life (Yoo, 2010) and business processes in agriculture and related food value and supply chains and bioenergy (Poppe et al., 2013; Smith, 2018). It provides technical optimization of agricultural production systems, value and food. It can also help address societal issues surrounding agriculture, including food provenance and traceability (Dawkins, 2017), animal welfare in livestock industries (Yeates, 2017), and the environmental impact of various agricultural practices (Balafoutis et al., 2017). Digitisation improves knowledge exchange and learning by leveraging ubiquitous data (Eichler Inwood and Dale, 2019), and it

improves monitoring of crises and conflicts in agricultural chains and sectors (Stevens et al., 2016).

Another group of studies examines the value chain from the standpoint of political or institutional economy, highlighting the potential drawbacks of vertically integrated systems and new business models. In such models, multinational corporations offer large 'digital package deals' to farmers (Bronson, 2019; Carolan, 2018). These deals tend to tip the balance of power in favour of chemical-intensive agriculture models. Innovative business models can provide new opportunities to reshape value chains. For example, the idea of a 'circular economy' aims to find ways to transform traditional waste streams into diverse value-added products through on-farm processing (Geissdoerfer et al., 2017), or startups launching platform technologies aimed at preventing food waste (Miles and Smith, 2015).

Business models also play a key role in the successful market performance of modern agricultural producers. Building business models can be based on principles such as cooperation, joint investment and knowledge sharing between producers, suppliers, processors and retailers to achieve farmers' goals in terms of produce quality, product safety and workflow, security for users, reliability of supply, lower prices and sustainability. The degree of cooperation and joint investment depends on many factors, among which are the nature of the product (perishable, differentiated or branded products or bulk goods), the organisation of production and delivery and the type of end buyer (brand, wholesale, etc.). With the advent of technology, collaboration between the various participants in the process of production, delivery and placement is becoming increasingly accessible and important for the successful implementation of various business models. Nikolov and Kostenarov (2021) and Nikolov et al. (2022) suggest the following five business models for the implementation of digitalisation in agriculture: (1) subscription model; (2) exploitative business model; (3) resulting business model; (4) collaborative business model; and (5) perspective business model.

An important line of research is the one which deals with the economic impact of digital business models on markets. These studies mainly use theoretical and methodological tools based on microeconomics, modelling and quantitative and qualitative econometrics investigating the effect of digital information on the relationship between supply and demand. In modern agriculture, there is research related to the development of information systems to assist farmers in risk management, whether it is climate or financial risks. The business models associated with these services are often linked to new forms of insurance for farmers, such as index-based climate insurance systems. However, empirical research on digital farming business models remains rare and typologies are often limited to novel direct marketing solutions between farmers and consumers (Andreopoulou et al., 2008).

This study aims to map agricultural business models currently applied in EU countries based on empirical data using cluster analysis. This mapping will provide valuable insights into the existing business models in agriculture and can be used to inform future research and policy development in this field.

2. Methods

2.1. Data collection

The farms' characteristics were analyzed across three agricultural systems (tree crops, cereal-based rotation and pasture) in six European countries – UK, Spain, Bulgaria, Hungary, Austria and the Czech Republic.

The data was gathered by a survey conducted between September 2021 and February 2022 (Nikolov et al., 2022), using a variety of methods such as face-to-face (Bulgaria), online (Hungary) and mixed (other participants) due to the COVID-19 restrictions. A 'judgment sampling' approach was applied and division was performed based on economic size and crop systems according to their country representation.

The business model mapping uses 416 observations from the six EU countries. The analysis is based on the farm types defined by Nikolov et al. (2022) – large and medium farms with cereal-based rotation, small grassland farms, and small tree farms.

In addition, some of the business models' characteristics were determined by a focus group expert evaluation using expert consensus opinion.

2.2. Business model evaluation framework

To define the business models, the Business Model Canvas (BMC) was adopted. BMC describes the business model of an entity using nine basic blocks that show the logic of how the entity makes money. The nine blocks cover the four main areas of a business: customers, offer, infrastructure and financial liability (Osterwalder and Pigneur, 2010). They were initially defined by Osterwalder and Pigneur as customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships and cost structure. For analysis purposes for defining soil health business models, the nine canvas building blocks were merged into five: customer value proposition; channels and partnerships; revenue and cost structure; key resources and key activities. Figure 1 presents the transition between BMC building blocks and applied building

blocks. The building blocks' content remains unchanged. Only the number of building blocks is reduced to achieve greater clarity of the performed analysis.

2.3. Cluster analysis

Cluster analysis (CA) was used to define the components of the business models. This is an appropriate method for the determination of the business models used by farmers (Anderberg, 1973). The data set consists of mainly binary (yes-no) questions and categorical data. For this reason, a two-step CA was suitable for defining clusters in the data. It describes the most used characteristics of the farms and can be interpreted as a business model description.

The procedure is an exploratory tool designed to reveal clusters in a data set based on both categorical and continuous variables. SPSS statistic software was used for the two-step CA. It applied the log-likelihood method for distance measure because the data were mixed: binary, three or five-step scales.

The results from the CA grouped the farms according to the set criteria or BM characteristics. Each cluster represents a separate business model, whose descriptive characteristics represent the individual elements of the business model.

3. Results

3.1. Defining soil health business models

To perform the mapping of the existing business models, it was used simplified BMC framework. The elements of each building block are presented in Figure 2.

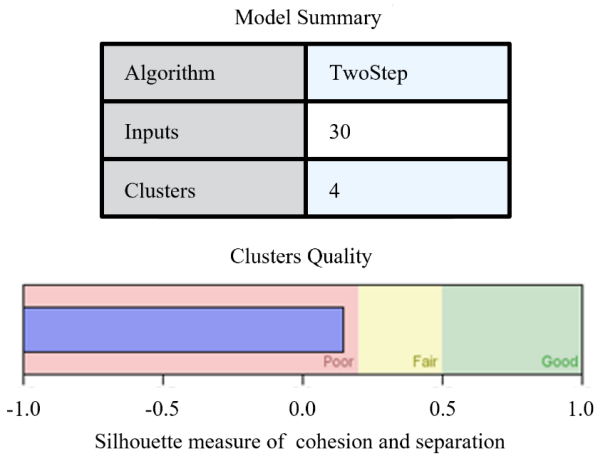

Fig. 2. Cluster analysis model summary
Source: Authors' calculations

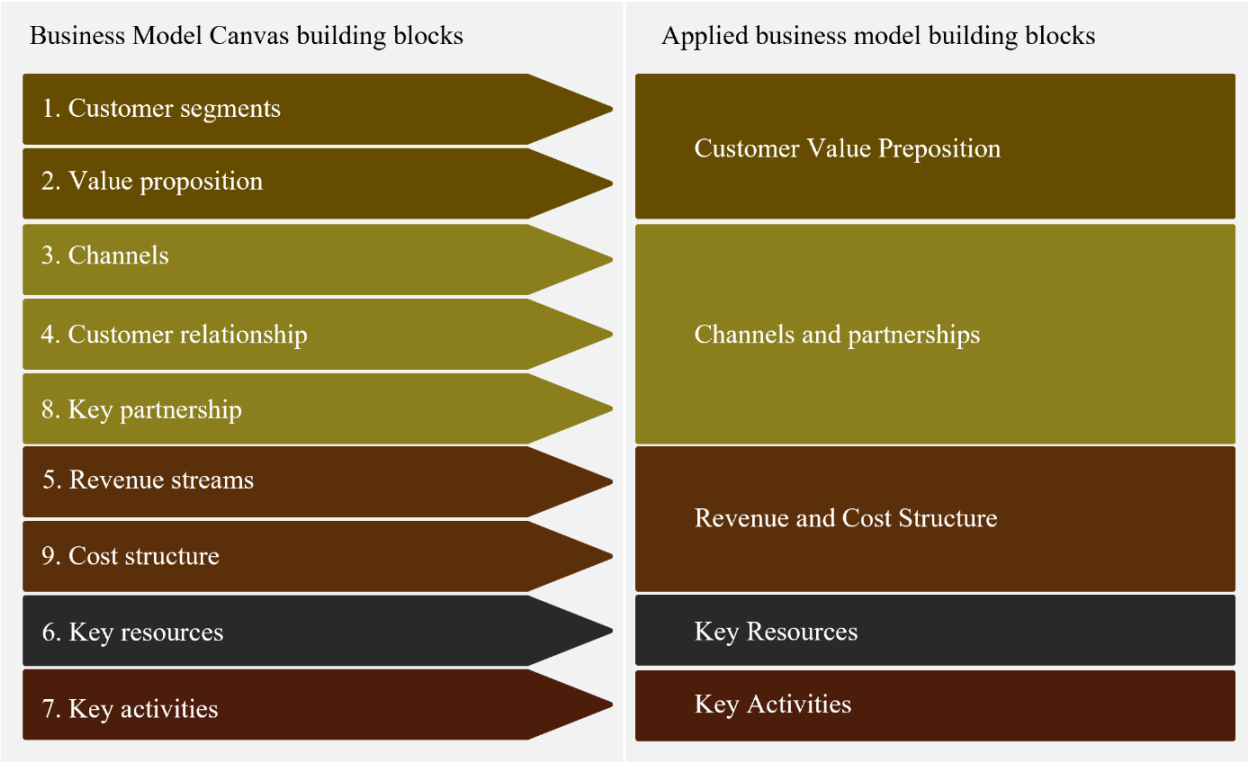

Fig. 1. BMC to applied building blocks
Source: Authors' calculations

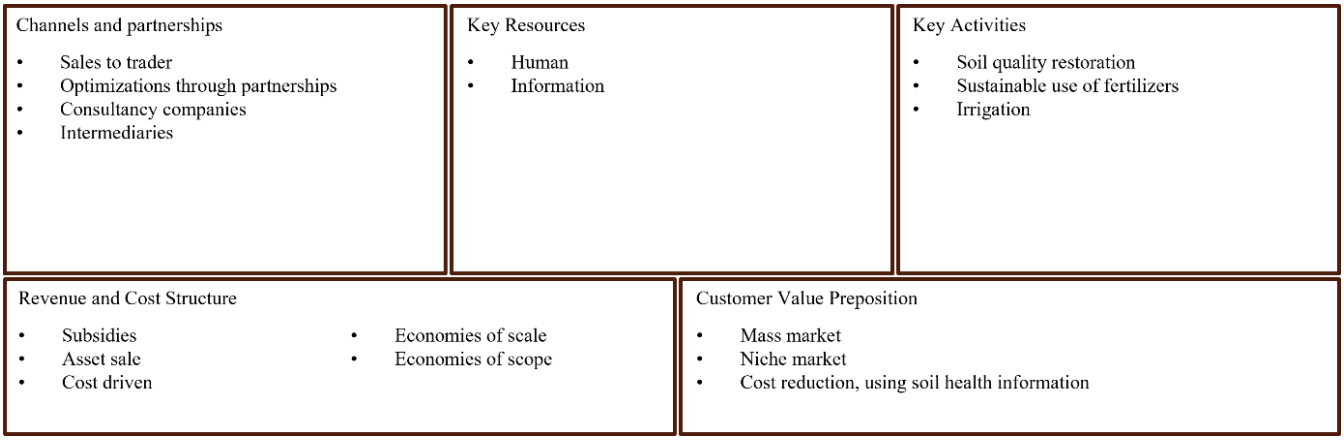

Fig. 3. Elements in each building block describing the business model sustainable use of fertilizers
Source: Authors' calculations

After the application of the two-step CA procedure, four clusters were identified. There are 30 input variables which represent the elements of building blocks. The silhouette measure of cohesion and separation is positive, which means it can be accepted as a valid model (Figure 3).

Table 1 shows the relative and absolute sizes of the clusters. The first cluster is the largest and the other three are relatively equal in number of farms. Cluster 1 consisted of 171 farms, representing 41.1% of the sample. The second largest was cluster 4, consisting of 89 farms, or 21.4% of the sample. Third was cluster 3, which consisted of 83 farms or 19.95% of the sample. The smallest was cluster 4, which included 73 farms or 17.5% of the sample. The next step of the analysis was to determine the characteristics of the clusters to describe them and give appropriate names to the clusters.

Table 1. Number and structure of clusters

Cluster	Percent	Values
1	41.11	171
2	17.55	73
3	19.95	83
4	21.39	89
Total	*100.00*	*416*

Source: Authors' own elaboration

Annex1 presents the results of the analysis in detail. The columns represent the four clusters. In Part 1 of the table, the most influential elements are listed. Part 2 contains the elements that have less influence. The graphs show the relative distributions of the elements in each cluster based on the answers of the farmers. The table can be used for visual validation of the clusters. The relative distribution is different for the clusters in one element of the business models. For example, the first element – cropping system – has a very different shape to the distributions in each cluster. The order of elements can also be used to estimate those that have the most significant influence on the clusters' formation. From that point of view, the cropping system, niche market, direct sales to customers and mass market are the most important.

Table 2 presents the average values for each variable included in the analysis for every business model. Most of the estimations were made with binary questions while the rest of the estimations were made with categorical data. Out of 34 variables, 27 – using the information from the survey and 7 additional variables. With yes or no answers, a lower average figure compared to the total average means a better result.

Table 2 allows the determination of the characteristics of the business models. When a binary question is examined, for example in row 3 cost reduction, then the average sustainable use of fertilizers (1.67) is compared with the total average (1.77). Cost reduction is determined as a characteristic of sustainable use of fertilizers business model because its value is smaller than the total average. Cost reduction is not a characteristic of the diversification business model, because its value (1.79) is larger than the total average (1.77). Using the same logic cost reduction is not a characteristic of the risk reduction and value-driven business models. When the variable generates categorical data – for example, row 4 risk reduction – it is a characteristic of the business model if the variable is above the total average. Following that logic, the risk reduction variable is a characteristic of the risk reduction business model and is not of sustainable use of fertilizers, diversification or value-driven business models.

Table 2. Building blocks elements' average values

Elements per building blocks		Answer	Total average	Sustainable use of fertilizers	Diversification	Risk reduction	Value-driven
1 Customer value preposition							
1	Mass market*	1 yes/ 2 no	1.19	1.00	1.99	1.08	1.00
2	Niche market*	1 yes/ 2 no	1.21	1.00	1.00	1.00	2.00
3	Cost reduction	1 yes/ 2 no	1.77	1.67	1.79	1.88	1.85
4	Risk reduction	5-step scale – higher better	2.46	2.28	2.29	3.12	2.35
5	Usability	5-step scale – higher better	2.74	2.67	2.51	3.25	2.57
2 Channels and partnerships							
6	Direct sales to the customers*	1 yes/ 2 no	1.60	2.00	1.01	1.92	1.00
7	Sales to trader*	1 yes/ 2 no	1.00	1.00	1.00	1.00	1.00
8	Communities	5-step scale – higher better	2.85	2.54	2.63	3.61	2.93
9	Optimisations through partnerships	3-step scale – higher better	1.99	2.04	1.78	2.06	2.01
10	Uncertainty	3-step scale – higher better	2.67	2.51	2.58	3.16	2.61
11	Acquisition of resources and activities	3-step scale – higher better	1.93	1.89	1.62	2.07	2.13
12	Government institutions	3-step scale – higher better	1.47	1.46	1.41	1.41	1.58
13	Consultancy companies	3-step scale – higher better	1.95	2.04	1.97	1.54	2.16
14	Intermediaries	3-step scale – higher better	1.46	1.52	1.36	1.36	1.52
15	Associations	3-step scale – higher better	1.80	1.79	1.77	1.90	1.76
3 Revenue and cost structure							
16	Subsidies*	1 yes/ 2 no	1.00	1.00	1.00	1.00	1.00
17	Asset sale*	1 yes/ 2 no	1.00	1.00	1.00	1.00	1.00
18	Cost-driven*	1 yes/ 2 no	1.00	1.00	1.00	1.00	1.00
19	Value-driven			86% Conventional	62% Conventional 34% Biological	76% Conventional 20% Biological	69% Conventional 19% Biological 12% Agroecological
20	Economies of scale	1 yes/ 2 no	1.73	1.55	1.96	1.78	1.83
21	Economies of scope			43% Large 30% Small	55% Small	47% Small 27% Medium	48% Small
4 Key Resources							
22	Physical	5-step scale – higher better	2.36	2.27	2.08	2.95	2.22
23	Intellectual	5-step scale – higher better	2.84	2.73	2.79	3.35	2.63
24	Human	5-step scale – higher better	2.87	2.90	2.81	2.64	3.06
25	Financial	5-step scale – higher better	2.17	1.99	1.90	3.00	1.98
26	Biologically active soil	5-step scale – higher better	3.08	2.95	3.22	3.35	2.99
27	Information	1 yes/ 2 no	1.60	1.52	1.68	1.60	1.69
5 Key Activities							
28	Production- diversification	1 yes/ 2 no	1.60	1.63	1.19	1.69	1.79
29	Platform/ Network			61% Specialised literature 30% Other	45% Specialised literature 44% Other	30% Specialised literature 61% Other	57% Specialised literature 61% Other
30	Soil quality restoration	1 yes/ 2 no	1.42	1.27	1.47	1.58	1.49
31	Sustainable use of fertilisers	1 yes/ 2 no	1.63	1.49	1.74	1.84	1.61
32	Irrigation	1 yes/ 2 no	1.69	1.67	1.78	1.72	1.64
33	Political awareness	5-step scale – higher better	2.34	2.17	2.12	2.99	2.25

Table 2. Continued

Elements per building blocks		Answer	Total average	Sustainable use of fertilizers	Diversification	Risk reduction	Value-driven
34	Cropping system			100% cereal-based rotation	98.6% grassland	91.6% cereal-based rotation	100% tree crops

Source: Authors' calculations
Note: *Variables, evaluated by focus group

Based on the results, four business models were defined:

- **Sustainable use of fertilizers** – This business model is applied by large and medium farms which produce cereal-based rotation.
- **Diversification** – This business model is applied by small grassland farms.
- **Risk reduction** – This business model is applied by small and medium cereal-based rotation farms.
- **Value-driven** – This is the business model of the farms which choose tree or grassland cropping system and Tree Small Farms.

3.1.1. Business model – Sustainable use of fertilizers

This business model is applied by large and medium farms that produce cereal-based rotation. According to the farm typology, two farm types use it – *Intensive Large Farms* and *Cereal Diversified Farms*. This business model works for farms of different sizes. Figure 4 presents the elements of each building block describing the business model sustainable use of fertilisers. The advantages of this model are key activities and revenue and cost structure.

- ***Customer value proposition***

The farms operate in both mass and niche markets. They also make a cost reduction using soil quality information to reduce costs of practices that overcome problems of degradation.

- ***Channels and partnerships***

They realise their production by selling to wholesale traders. They also interact with neighbours and colleagues about analysis of the soil health and implementation of this information in farm management. In addition, they cooperate with consultancy companies and intermediaries to implement soil health analysis and use it as a management tool.

- ***Revenue and cost structure***

They receive cash flow from both the realisation of their production and subsidies from the government. They earn a cost advantage using precision farming. They aim to minimise cost whenever possible, most often using economies of scale and scope. They have a cost advantage because of the larger scope of operations.

- ***Key resources***

Human capital is highly educated. Soil health is a priority and they collect information concerning soil quality parameters in their fields. They take into consideration information regarding soil quality parameters when they make managerial decisions.

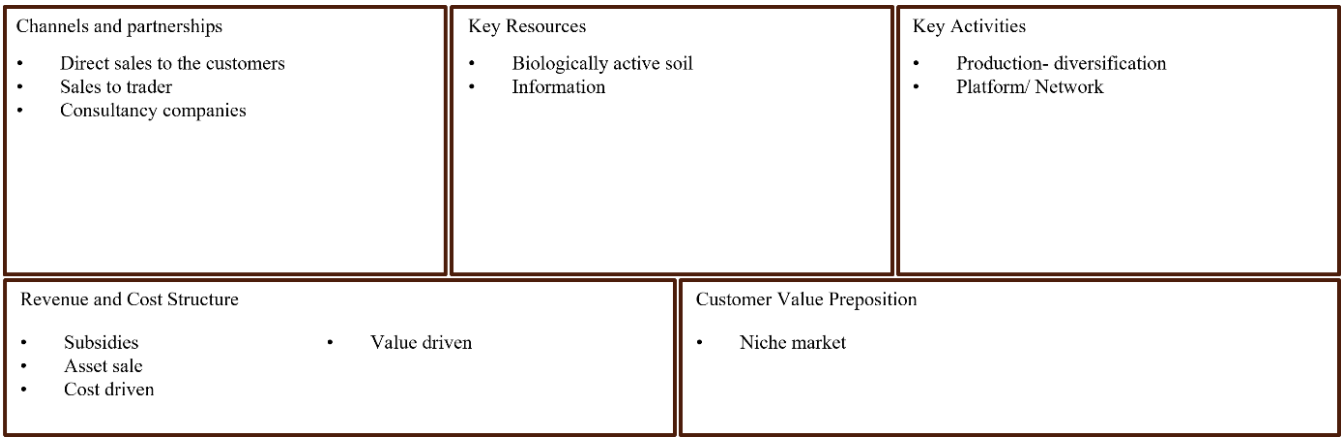

Fig. 4. Elements in each building block describing the business model diversification
Source: Authors' calculations

- ***Key activities***

This building block characterises the focus of the business model. They apply the sustainable use of fertilizers. In addition, they apply nutrient management plans and irrigation.

3.1.2 Business Model – Diversification

This business model is applied by small grassland farms. According to the farm typology, it is used by the *Grassland Small Farms*. Figure 5 presents the elements of each building block describing the *diversification* business model. This is well-developed in terms of revenue and cost structure.

- ***Customer segments and value preposition***

These farms are focused on the niche market.

- ***Channels, customer relationships and key partnerships***

They use direct sales to customers but also sales to traders. To some extent, they use consultancy companies to inform themselves how to analyse soil health and implement the results in the farm management process.

- ***Revenue stream and cost structure***

As in all other business models, the cash inflow is generated by the realisation of the production and government subsidies. These farms are value-driven and apply also biological types of agriculture.

- ***Key resources***

Their arable soils have high biological activity. They also diversify their production by having livestock.

- ***Key activities***

Networks are key activities because of the information importance in this business model. The work-related information they collect comes from specialised literature and other sources different from social networks and online forums.

3.1.3 Business model – Risk reduction

This business model is applied by small and medium cereal-based rotation farms. A significant part of *Cereal Diversified Farms* as farm typology adopts it. Figure 6 presents the elements of each building block describing the business model *risk diversification*. This business model is applicable in different farm sizes, mainly medium-sized. It is very well-developed in terms of the majority of the characteristics included in the five building blocks.

- ***Customer segments and value preposition***

The farms' production is focused on both mass and niche markets. The supply chain and certainty of demand for farm products are secure. This business model is characterised by a significant level of technological implementation.

- ***Channels, customer relationships and key partnerships***

As a main channel, it uses sales to traders. Their environment is favourable considering the high level of demand for environmentally friendly products. They make partnerships aiming at optimisation and economy of scale. Key partners are associations which provide information on how to analyse and how to use it in farm management. They also acquire specific resources and activities to improve performance. The applied approach ensures risk reduction and consequently makes the farmers' income more secure.

- ***Revenue stream and cost structure***

The generated incoming cash flow is based on sales and

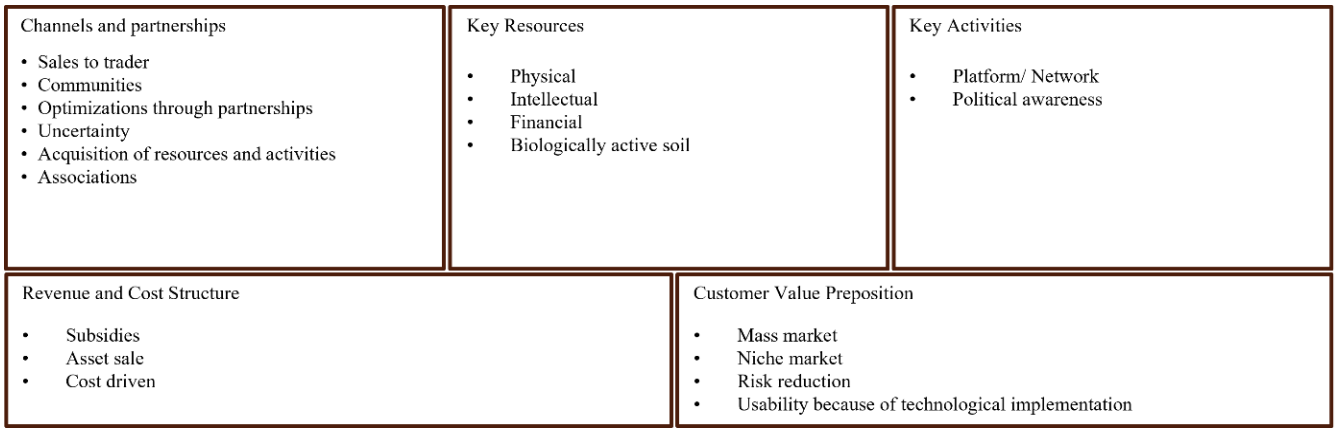

Fig. 5. Elements in each building block describing the business model risk reduction

Source: Authors' calculations

subsidies from the government. In terms of expenses, they are cost-driven.

- ***Key resources***

In terms of soil restoration practices, this business model is very well-developed. The farms are interested in soil health and invest in specific training and equipment. In addition, they have access to finance the implement soil restoration practices. Their soil is biologically active.

- ***Key activities***

Networks are a key element of the business model because they ensure access to important soil health information. They also have strong political support in terms of environmental goods and service deliveries.

Figure 6:

3.1.4. Business model – Value-driven

This is the business model of the farms which choose the tree cropping system. It is applied by the farmers in *Tree Small Farms* and *Grassland Small Farms* according to the farm typology. Figure 7 presents the elements of each building block describing the *value-driven* business model. This is well-developed in terms of both channels and partnerships and revenue and cost structure.

- ***Customer segments and value preposition***

The target of the farms is the mass market.

- ***Channels, customer relationships and key partnerships***

This business model is focused on relationships with clients and cooperation with third parties. To supply their products to the customers, they use both direct sales and sales to traders. They also work in an environment with a high level of interest and demand for environmentally friendly products. The networking related to soil health awareness is very important and well-developed. They cooperate with colleagues and neighbours to optimise the resources and realise economies of scale. In addition, they make some acquisitions of resources and activities. They successfully cooperate with government institutions, consultancy companies and intermediaries to develop soil health knowledge and its implementation in farm management.

- ***Revenue stream and cost structure***

Their income comes from sales and government subsidies. The cost structure shows that they are value-driven applying also both agroecological and biological types of agriculture.

- ***Key resources***

This business model relies on education, human skills and knowledge needed to create value.

- ***Key activities***

They use nutrient management planning and have irrigation.

Figure 7:

3.2. Comparative analysis of the defined business models

In this part of the research, a comparative analysis of the four identified business models will be made: (i) Sustainable use of fertilizers; (ii) Diversification; (iii) Risk reduction; and (iv) Value-driven.

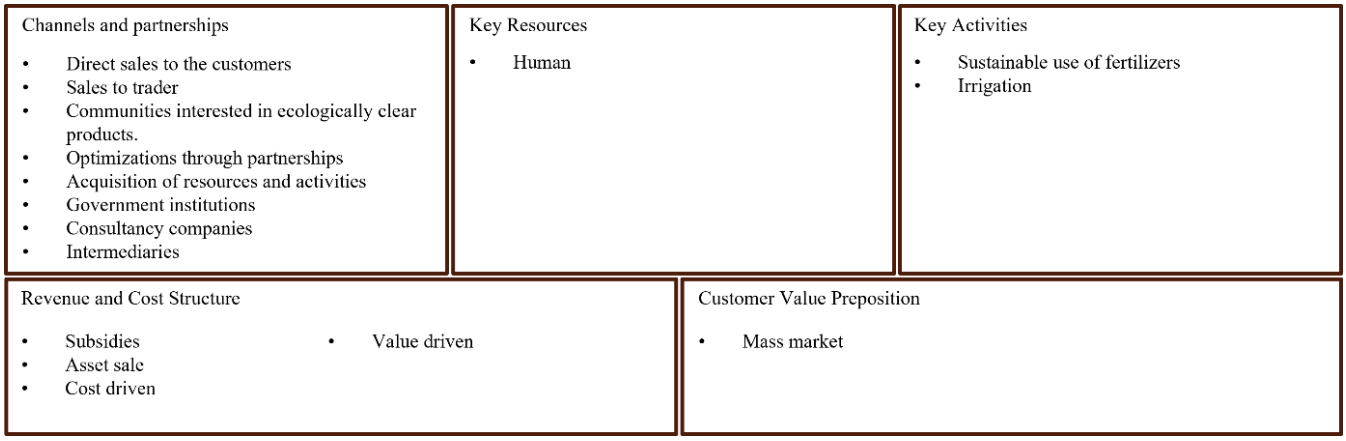

Fig. 6. Elements in each building block describing the business model value driven

Source: Authors' calculations

The farms' business models have some similar characteristics. First, all farms defining the business models rely on sales to traders. In addition, they receive subsidies. Most of the farms aim to be effective and efficient and to optimise their costs. Their main income comes from the realisation of their production.

The comparative analysis will continue with the identification of the differences between the business models in each building block.

3.2.1. Building block 1 – Customer value preposition

The elements included in this building block are focused on the market and the customer value generated through customers' cost and risk reduction and usability (Table 4).

Sustainable use of fertilizers uses cost reduction using soil quality information to reduce costs of practices that overcome problems of degradation.

Diversification is focused on the niche market.

Risk reduction applies risk reduction and usability, implementing technology on a significant level.

Value-driven is focused only on the mass market.

3.2.2. Building block 2 – Channels and partnerships

This building block analyses the channels through which the customer is reached and the key partnerships that support the successful development of the farms (Table 5).

Sustainable use of fertilizers is focused on sales to traders. The farmers applying it cooperate with neighbours and colleagues, consultancy companies and intermediaries to collect information.

Diversification is based mainly on direct sales to customers and sales to traders.

For the following two business models, the channels and partnerships building block is very important.

Risk reduction farms reach customers through sales to traders and create value using cooperation with different third parties.

Value-driven business model uses direct and indirect channels to the customers. Third parties play a significant role in the development of the farms.

3.2.3. Building block 3 – Revenue and cost structure

This building block is focused on the income and the cost structure of farms (Table 6). There is no significant difference between the business models in terms of income. The main difference comes from the expenditure of the farms.

Sustainable use of fertilizers is characterised by economy of both scale and scope.

Table 3. Elements in the customer value preposition building block

Elements \ Business Model	Sustainable use of fertilizers	Diversification	Risk reduction	Value-driven
Mass market	✓		✓	✓
Niche market	✓	✓	✓	
Cost reduction	✓			
Risk reduction			✓	
Usability			✓	

Source: Authors' calculations

Table 4. Elements in channels and partnerships building block

Elements \ Business Model	Sustainable use of fertilizers	Diversification	Risk reduction	Value-driven
Direct sales to the customers		✓		✓
Sales to trader	✓	✓	✓	✓
Communities			✓	✓
Optimisations through partnerships	✓		✓	✓
Uncertainty			✓	
Acquisition of resources and activities			✓	✓
Government institutions				✓
Consultancy companies	✓		✓	✓
Intermediaries	✓			✓
Associations			✓	

Source: Authors' calculations

Diversification and **Value-driven** rely on value creation.

Risk reduction has not got a cost structure which creates a recognisable advantage.

3.2.4. Building Block 4 – Key resources

This building block analyses the key resources of the farm – physical, financial and human capital, information and biological activity of the soil (Table 7).

Sustainable use of fertilizers relies on human capital and information.

Diversification's key resource is biologically active soil.

For **Risk reduction,** this is the other key building block (and channel and partnership). Physical, intellectual and financial resources have a significant effect. Biologically active soil also plays a key role.

Value-driven business model is built on human capital.

3.2.5. Building Block 5 – Key activities

This building block incorporates the key activities which define the business model (Table 8). In terms of soil health. Additional elements were added such as sustainable use of fertilizers, irrigation and political awareness.

This building block is crucial for the **sustainable use of fertilizer's** business model. The farms apply soil quality restoration activities, sustainable use of fertilizers and irrigation.

Diversification relies on production diversification and network development as key activities.

Risk reduction is affected by the political awareness of the soil health problems and supports the network development and access to important soil health information.

Value-driven is focused on activities such as sustainable use of fertilizers and irrigation.

Table 5. Elements in revenue and cost structure building block

Business Model / Elements	Sustainable use of fertilizers	Diversification	Risk reduction	Value-driven
Subsidies	✓	✓	✓	✓
Asset sale	✓	✓	✓	✓
Cost-driven	✓	✓	✓	✓
Value-driven		✓		✓
Economies of scale	✓			
Economies of scope	✓			

Source: Authors' calculations

Table 6. Elements in key resources building block

Business Model / Elements	Sustainable use of fertilizers	Diversification	Risk reduction	Value-driven
Physical			✓	
Intellectual			✓	
Human	✓			✓
Financial			✓	
Biologically active soil		✓	✓	
Information	✓			

Source: Authors' calculations

Table 7. Elements in key activities building block

Business Model / Elements	Sustainable use of fertilizers	Diversification	Risk reduction	Value-driven
Production- diversification		✓		
Platform/ Network		✓	✓	
Soil quality restoration	✓			
Sustainable use of fertilisers	✓			✓
Irrigation	✓			✓
Political awareness			✓	

Source: Authors' calculations

4. Conclusions

The analysis is focused on the elements of the five building blocks constructed to evaluate EU farms' business models.

- ***Business model – sustainable use of fertilizers***

The Sustainable use of fertilizers business model is used by large farms but also by small and medium-sized ones. The opportunities that could be exploited are related to widening the cooperation with third parties such as government institutions and associations. Public-private partnerships and landscape alliances could help achieve this. The cooperation would be beneficial in terms of soil health awareness and implementation of soil health analysis and information in the decision-making process.

Investing in soils is a long-term endeavor, and is unlikely to yield immediate returns as soils can take decades to recover. Yet, short-term investments can deliver long-term returns. The key resources of the farms could be enlarged. Large farms could expand their financial and intellectual resources related to soil health.

- ***Business model – diversification***

Taking into consideration that this business model is mainly applied by small grassland farms, there is room for development. In terms of soil health, different soil restoration strategies could be implemented. More soil health information could be used to reduce the costs of practices that overcome problems of degradation. More could be done about the implementation of technology, which would increase the value for customers. In addition, these steps could secure a higher demand.

The farms in this business model could develop their network with third parties, which would help them to implement soil health focus in their day-to-day activities. This might make their income more certain and predictable. For example, it could be done using supply chain cooperation or public-private partnerships.

The list of information sources related to soil health could be widened. Access to information is very important to effectively implement soil health activities in the operational activities of a farm.

Another opportunity which might be considered is the implementation of soil health activities and strategies as a key activity in the farms. The existing soil health awareness could be developed, taking into consideration the soil quality information in soil management or the application of a soil nutrition plan.

- ***Business model – risk reduction***

Risk reduction is a business model with very well-developed elements included in the five building blocks. Several reviews of successful farmer-owned rural businesses, farmer-market links and farm-agribusiness links point to the importance of skills development for market links for goods and services, internal and bridging social capital and professional business and technical management capacities. Developing these skills requires access to effective support, and financial services, alliances with other chain actors and an enabling environment (Shepherd, 2007).

There is an opportunity to develop activities related to the implementation of soil health strategies and activities such as the use of soil quality information to decide on soil management, the use of a soil nutrition plan and irrigation.

- ***Business model – value-driven***

Like the **diversification** business model, **value-driven** could develop the customer relationship and value proposition. These farms could develop soil health awareness. This step will reduce the costs related to degradation practices. Technologies could also be implemented at different levels to increase the value proposition and straighten the demand for farm food. Farmers and land managers face barriers to changing practices, such as perceived risk or initial costs. Short-term investments that share risks and costs or provide innovative finance options to help overcome those barriers lead to longer-term returns.

This is the other business model, which could diversify the soil health information sources to support the development of soil health awareness. In terms of soil health activities/ strategies, these companies could focus more on soil restoration practices.

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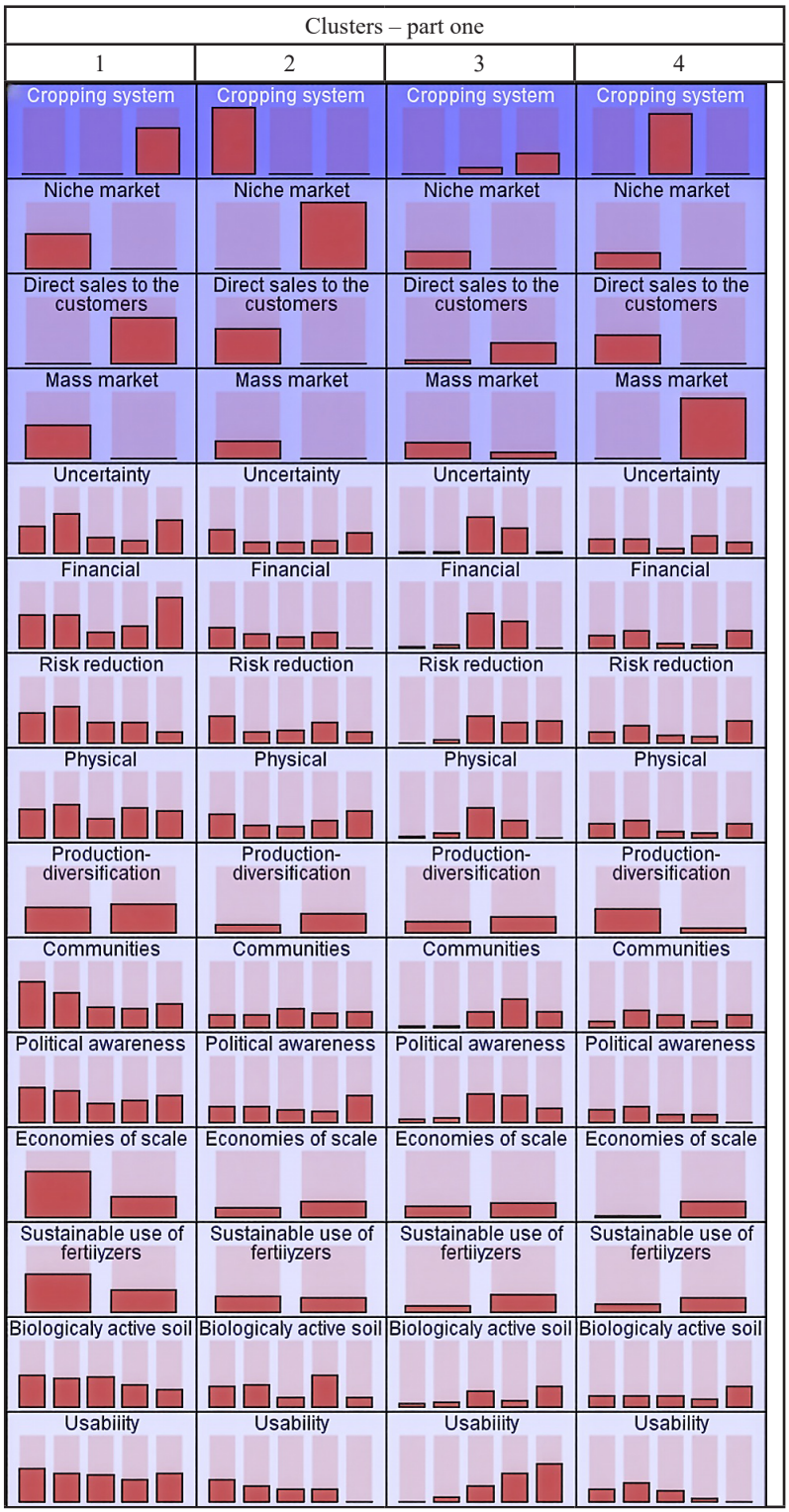
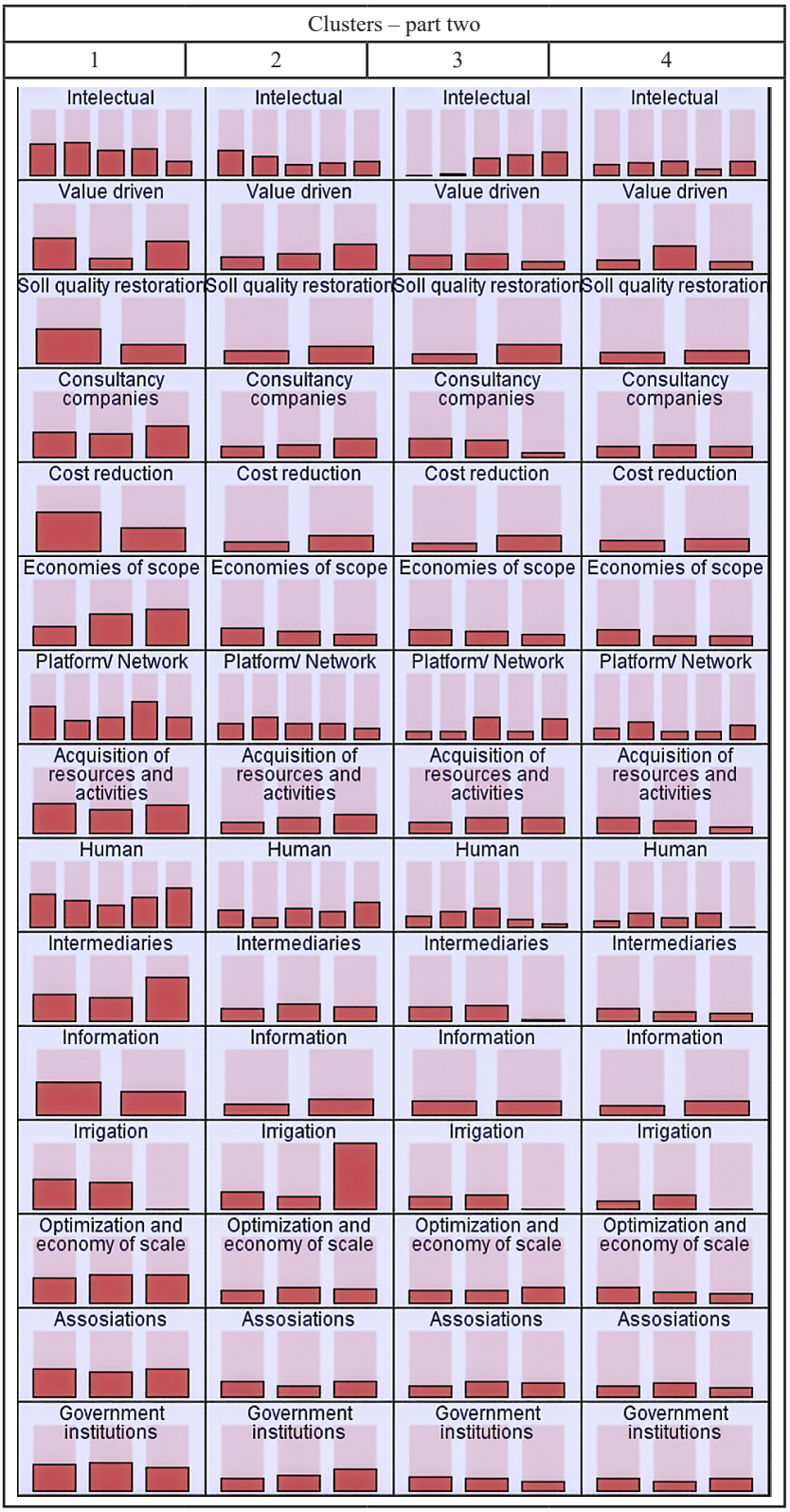
Annex 1. The elements of the business models and their relative distribution ordered by their relative importance in the CA

Source: Authors' calculations




Clusters – part two
1
2
3
4
Intelectual
Value driven
Soll quality restoration
Consultancy companies
Cost reduction
Economies of scope
Platform/ Network
Acquisition of resources and activities
Human
Intermediaries
Information
Irrigation
Optimization and economy of scale
Assosiations
Government institutions

6. References

Anderberg, M. R. (1973) Cluster Analysis for Applications. *Elsevier Inc.,* ISBN: 978-0-12- 057650-0.

Andreopoulou, Z., Tsekouropoulos, G., Koutroumanidis, T., Vlachopoulou, M. & Manos, B. (2008). Typology for e-business activities in the agricultural sector. *Int. J. Bus. Inf. Syst., 3,* 231. https://doi.org/10.1504/IJBIS.2008.01728

Balafoutis, A., Beck, B., Fountas, S., Vangeyte, J., Van Der Wal, T., Soto, I., Gomez-Barbero, M., Barnes, A. & Eory, V. (2017). Precision agriculture technologies positively contributing to ghg emissions mitigation, farm productivity and economics. *Sustainability (Switzerland), 9*(8), 1339.

Bronson, K. (2019). Looking through a responsible innovation lens at uneven engagements with digital farming. *Njas – Wageningen J. Life Sci*., 90, 100294. https://doi.org/10.1016/j.njas.2019.03.001

Carolan, M. (2018). The Politics of Big Data: Corporate Agri-food Governance Meets "weak" Resistance. *Agri-environmental Governance As an Assemblage: Multiplicity, Power, and Transformation*, 195 – 212.

Casadesus-Masanell, R. & Ricart, J. E. (2010). From strategy to business models and to tactics. *Long Range Planning, 43*, 195 – 215.

Chesbrough, H. W. & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spinoff companies. *Industrial and Corporate Change, 11*, 533 – 534.

Dawkins, M. S. (2017). Animal welfare and efficient farming: Is conflict inevitable? *Anim. Prod. Sci., 57*(2), 201 – 208. https://doi.org/10.1071/AN15383

Doganova, L. & Marie Eyquem-Renault, M. (2009). What do business models do? Innovation devices in technology entrepreneurship. *Research Policy, 38*(10), 1559 – 1570.

Eichler Inwood, S. E. & Dale, V. H., 2019. State of apps targeting management for sustainability of agricultural landscapes. A review. *Agron. Sustain. Dev*., *39*, 8.

Geissdoerfer, M., Savaget, P., Bocken, N. M. & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm*? J. Clean. Prod.*, *143*, 757 – 768.

George, G. & Bock, A. (2011). The Business Model in Practice and its Implications for Entrepreneurship. *Research Entrepreneurship: Theory and Practice, 35*(1), 83 – 111.

Hedman, J. & Kalling, T. (2003). The business model concept: theoretical underpinnings and empirical illustrations. *European Journal of Information Systems, 12*(1), 49 – 59. https://doi.org/10.1016/0377-2217(90)90057-I

Johnson, M. W. (2010). *Seizing the white space: Business Model innovation for growth and renewal*. Harvard Business Press.

Johnson, M. W., Christensen, C. C. & Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review, 86*(12), 50 – 59.

Latora, A., Compagno, L. & Trapani, N. (2018). A decision support tool for business models analysis. *International Journal of the Analytic Hierarchy Process, 10*(2).

Magretta, J. (2002). Why business models matter. *Harvard Business Review, 80*(5), 86 – 92.

Miles, C. & Smith, N. (2015). What grows in Silicon Valley? The emerging ideology of food technology. In: *Louise Davis, H., Pilgrim, Karyn, Sinha, Madhudaya (Eds.), Chapter 8 In. The Ecopolitics of Consumption: The Food Trade*. Lexington Books, Washington D.C.

Morris, M., Schindehutte, M. & Allen, J. (2005). The entrepreneur's business model: Toward a unified perspective. *Journal of Business Research, 58*, 726 – 735.

Nikolov, D., Boevsky, I., Kostenarov, Tzvetanova, E., Banov, M., Bakacsi, Z., Zhang, X., Zavattaro, L., Krasa, J., Dostal, T., Liebhard, G., Strauss, P., Hudek, C., Gomez, J. & Liu, J. (2024). Analysis of socioeconomic and environmental problems in farms applying soil health practices in EU. *Bulg. J. Agric. Sci.*, *30*(4), 568 – 579.

Nikolov, D. & Kostenarov, K. (2021). Selection of an optimal business model in agriculture using multicriteria analysis. Economics and Business in Post pandemic World, Sofia.

Osterwalder, A. & Pigneur, Y. (2010). Business Model Generation. Available at: http://www.businessmodelgeneration.com.

Poppe, K. J., Wolfert, S., Verdouw, C. & Verwaart, T. (2013). Information and communication technology as a driver for change in agri-food chains. *EuroChoices, 12*, 60 – 65.

Shepherd, A. (2007). Approaches to Linking Producers to Markets. *FAO Agricultural Support Systems Division*, Rome.

Smith, M. J. (2018). Getting value from artificial intelligence in agriculture. *Anim. Prod. Sci., 60*(1), 46 – 54. https://doi.org/10.1071/AN18522

Stevens, T. M., Aarts, N., Termeer, C. J. A. M. & Dewulf, A. (2016). Social media as a new playing field for the governance of agro-food sustainability. *Curr. Opin. Environ. Sustain., 18*, 99 – 106.

Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning, 43*, 172 – 194.

Yeates, J. W. (2017). How good? Ethical criteria for a 'Good Life' for farm animals. *J. Agric. Environ. Ethics, 30*(1), 23 – 35. https://doi.org/10.1007/s10806-017-9650-2

Yoo, **Y.** (2010). Computing in Everyday Life: A Call for Research on Experiential Computing. *MIS Quarterly,* 34.

Zott, C. & Amit, R. (2010). Designing your future business model: An activity system perspective. *Long Range Planning, 43*, 216 – 226.

Zott, C., Amit, R. & Massa, L. (2011). The Business Model: Recent Developments and Future Research. *Journal of Management, 37*(4), 1019 – 1042. https://doi.org/10.1177/0149206311406265

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