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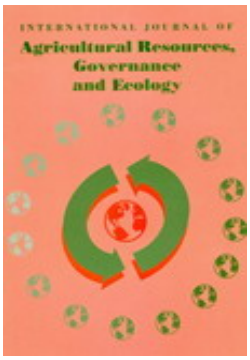

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Innovative tools for the agricultural information system: a conceptual framework

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Abstract: Information about the operations and production capacity of agricultural producers, on the one hand, and knowledge of how to integrate existing databases related to this sector at the micro and macro levels, on the other, can influence agribusiness policy adjustments and the creation of policies that will have the intended effects. Information exchange among government agencies, institutions, farmers, and other agricultural sector participants fosters greater understanding and expedites the settlement of issues impacting agricultural producers themselves. A conceptual framework for the agricultural industry's information system is presented in this article. Through the analysis of farm operations and based on expertise framework, the agricultural sector aims to promote the industry's expansion in a comprehensive and encompassing manner. This indicates that since they are the fundamental building blocks for creating a sizable database in this field, any organisations with information access ought to be included. When information from agricultural holding activities is combined with data from other sources, it gives agricultural producers a strong foundation for decision-making.

Keywords: agriculture; farm; sustainability; innovation; information system; farmers associations; framework.

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1 Introduction

Farmers' associations are important organisations that uphold professional standards. Farmers, friends' farms, and nearby farms make up the informal environment. Particular characteristics that are distinguished and included in professional group contexts impact farmer-to-member communication and cooperation. The size of the farm has an impact on how well individuals get along and work together. The age and level of education of those in charge of the farm's agricultural operations impact on how these two environments interact and how farmers make decisions (Semenova et al., 2023). According to Reddy et al. (2021) and Figurek et al. (2023), youths should continue to reside in rural regions and work in agriculture in order to maintain output and guarantee the sustainability of agriculture and food production. To help landowners move from a multifaceted approach that takes into account the relationships between input, output, and outcomes to one that concentrates on evaluating the relationship between input and output, a variety of communication tools are available (Bebbington and Unerman, 2020).

The classification of innovation in the food business was studied by Bigliardi and Galanakis (2020). They focused on instances of sustainable food innovation while highlighting specific food business models, such as packaging materials and food waste

recovery. Organisations must leverage open innovation to increase their competitive edge when incorporating sustainability into their business plans and models (Venturelli et al., 2020). In an attempt to address this research problem, namely in the food business, Bogers et al. (2020) adopted an integrated point of view.

A range of solutions are available for agricultural producers and associations to manage their activities in a sustainable manner. It might be challenging to identify food business companies that engage in social responsibility (Ehgartner, 2020). According to Barth et al. (2017), the agricultural sustainable business model innovation (BMI) needs to take into account the complexity of sustainability in both theoretical and practical contexts. The primary barriers to resuming innovation-related activities are as follows:

- Innovation is not considered the primary development vector, even though it is an essential element of a plan's success.
- The farm holding approaches its financial and economic issues with conventional techniques rather than systematically looking for new opportunities for business expansion.
- New methods for managing investment portfolios and certain creative activities are rarely used; the agriculture industry's uncertain external environment prevents the full application of new tools for innovation management.
- There is a significant manpower shortage, agricultural firms receive inadequate financial, material, and technical support, and the organisational structure makes it difficult to integrate new procedures into ongoing operational activity.
- Innovations are not guaranteed by the existing incentive system, the corporate culture of agricultural companies, or the adoption of an innovative approach to decision-making as the primary objective. Farmers are forced to make more cautious decisions that are unrelated to innovation because of the higher risk involved in the agriculture sector.

According to studies by Ribeiro-Navarrete et al. (2021), Heredia et al. (2022), and Zhai et al. (2022), innovations result in lower costs and more effective use of resources. Capital requirements have decreased and resource utilisation has improved as a result of fewer inventories and increased equipment use. Through digital transformation, companies can reduce unnecessary wastes of time, people, and resources while achieving more efficient internal delivery, production, organisation, and docking.

Zakrzewska and Nowak (2022) asserted that variations exist amongst agricultural resources and in the interrelationships amongst elements of production. Sustainable agriculture, environmental performance, food security, and food policy are amongst the more complex topics that Coca et al. (2020) addressed. Agricultural performance cannot be described in isolation from the broader framework of which it is a part, as noted by Andrejovská and Glova (2022). The agriculture sector faces challenges with regard to food security and safety, environmental sustainability, rising consumer demand, and heightened rivalry, according to Della Corte et al. (2018).

New knowledge cannot be created without information being exchanged between entities (McGahan et al., 2021). According to Thrassou et al. (2023), digital technology encourages understanding and participation in the creation of new information. Network inclusivity, which encompasses value chain coverage and digital adoption, can maximise the benefits of an integrator network for digital services in agriculture (Kieti et al., 2021).

Digital technologies can help people make better decisions (Amoako et al., 2021). According to Syam and Sharma (2018) and Hemamalini et al. (2022), digitalisation is the crucial component of using a variety of tools and systems that are equipped with essential human intellectual processes, such as the ability to perform tasks, generate dashboards and reports, and extract and analyse data. Making well-informed decisions is therefore aided by the information. The agro-industrial complex must accomplish the following tasks to adopt digitalisation:

- The state's digital agriculture policy should be developed and implemented with the assistance of industry groups, self-regulatory organisations, and unions.
- The entire agro-industrial complex management system should focus on accelerating its digital transformation in order to improve the financial sustainability of farmers and the social development of rural areas (Krupina et al., 2020).
- IT professionals need to be hired and trained for the agro-industrial complex; departmental oversight of the sector's digitisation processes needs to be improved; and state-of-the-art technology should be integrated into the public administration of the agriculture sector.

Since it generates the majority of food consumed worldwide, the agricultural sector needs to be sustainable (Kamali et al., 2006). Because a country's agri-food sector serves to meet basic human needs, its strength determines its capacity to prosper sustainably. Sustainability is believed to require innovation. Because innovation gives the agri-food industry a competitive edge and enhances the food supply chain, it has turned into a profitable opportunity for managers. Innovation may be able to help farmers overcome a number of obstacles with its measurable benefits for sustainability. Bartolacci et al. (2019) offered a knowledge map of the conceptual architecture of sustainability and financial performances in agriculture. The sustainability obstacles were categorised by Jaramillo et al. (2019) under 'sector', 'sustainable tool', and 'internal/external'.

Despite differences in definitions, exposure, sensitivity, and adaptation are always essential elements of agricultural vulnerability. According to Khan et al. (2021), vulnerability is the extent to which a system is vulnerable to alterations in the climate. One's ability to adjust risk exposure, to take on risk, and to recover from exposure-related losses are all impacted by the individual's capacity to adapt. The propensity to sustain harm is another way to define adaptive capability.

In order to reduce farmers' vulnerability to stress, it is essential to maximise their capacity to adapt and decrease their sensitivity to stresses (Semenova et al., 2023). According to Nobre et al. (2023), the social, political, economic, and structural elements of society, as well as health, education, technology, and cognitive traits, are all strongly related to the capacity to adapt to various situations and capacities.

Because the goods in the agriculture sector are edible, judgements must be made quickly. Innovations could aid managers in monitoring the flow of commodities, resulting in an improved harvest that would benefit final consumers (Jarek and Mazurek, 2019). Since digital technologies facilitate the adoption of new technologies produced elsewhere and foster the generation of new knowledge, they can result in more successful international collaborations. Knowledge plays an important role in economic activities.

Chege et al. (2020) suggested that companies may find it easier to manage risks, learn new skills, and investigate unexplored business potential when external information sources are integrated. Access to pertinent information may also be necessary for

businesses that are prone to fail in implementing turnaround initiatives effectively (Wang and Bai, 2021). Organisational, situational, technological, and individual factors have affected the use of digital technologies for sustainability goals, when moderated by leadership support and technological improvements (Chaudhuri et al., 2022; Drejerska, 2024).

Advancements in production methods and technology have introduced new demands for accuracy and for the planning and management of the production activities to be integrated into the agricultural sector (Thrassou et al., 2023).

The following research questions emerged as a result of the study:

- What are the essential elements of a theoretical framework for incorporating cutting-edge instruments into agricultural information systems?
- What are the main information requirements of stakeholders, including farmers and policymakers, and how might these needs be met by novel tools?
- What effects do new tools have on agricultural decision-making processes?

2 Methodology

To create a comprehensive knowledge-based framework for the agriculture industry, a methodical approach and appropriate methodological techniques are needed. The framework was built by looking into fresh conceptual and methodological approaches using the comparative analysis and synthesis procedures. By enhancing knowledge of the interdependencies between the key elements of agricultural systems of various sizes, a system approach prevents the neglect of constraints and possible synergies.

The synthesising process was divided into two phases. In the first phase, the conditions, qualities, and other aspects required to establish a record system were examined. Then, the pertinent data were gathered using the analytical technique to investigate the requirements and features needed to build a record-keeping system inside the integrated framework for sustainable growth in the agriculture sector.

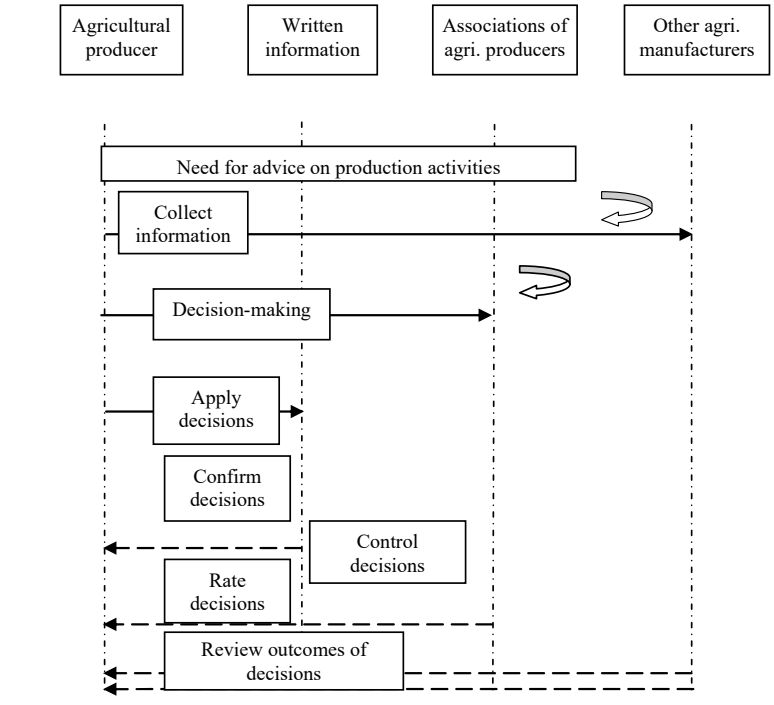
The latter focused on examining connections and combining pertinent data into a coherent whole, from which significant components were gleaned that significantly influenced the development of an all-encompassing agricultural framework. for the development of a knowledge-based framework.

It was feasible to break the system down into its components and observe how each one impacted the system by using methodical processes and system analysis. A logical whole was created by integrating pertinent data and analysing relationships. This way, we eventually developed the knowledge-based framework with the components that are crucial to agriculture.

2.1 Variables affecting the agricultural sector's decision-making

Compiling data on the farm's past, present, and future conditions is necessary for planning and executing agricultural activities. Vigilantly monitoring the farm's distinctive operations and production processes, together with the costs driving those activities, can help with farm management and control. Decisions made on the farm must be based on plans of action for the future in order to plan and manage agricultural activities.

Figure 1 Traditional and innovative methods of obtaining information in the agricultural sector



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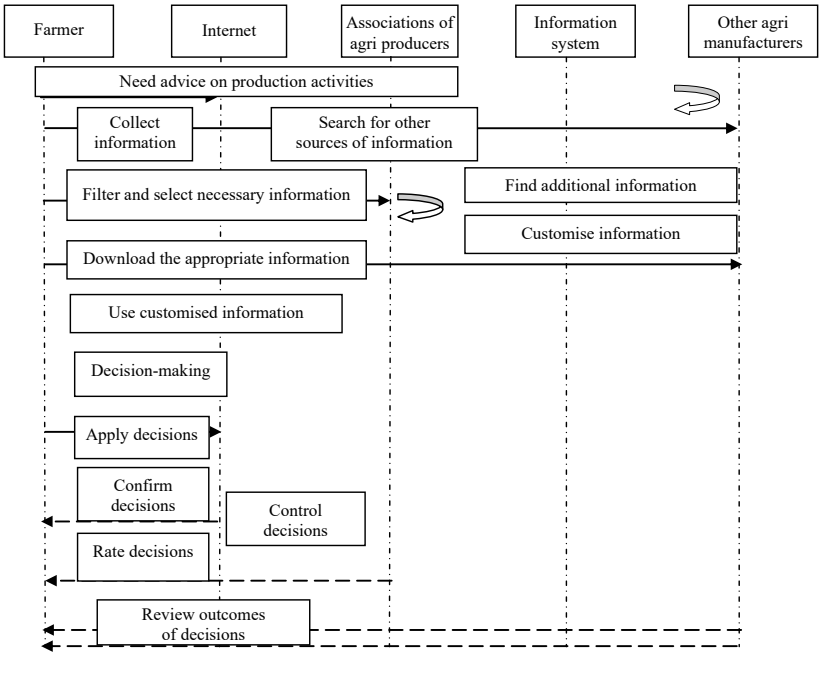


(b)

Source: Armstrong and Diepeveen (2008)

While any relationship to the environment influences decision-making challenges, it also offers fresh insights that, when used promptly and judiciously, could help farmers better manage their businesses. The advantage of this strategy is that each farm can customise production procedures, which can significantly improve decision-making. To better comprehend the collected data, it must be processed. When information is collected, handled, and examined according to its intended use, it is said to have acquired its true meaning.

Two farmer types – traditional and innovative – accept and collect new information differently, as illustrated in Figure 1. Traditional farmers utilise written material, such as brochures or booklets, for information on improving specific agricultural produce (such as crop production that requires sowing) and production activities. In addition to their low online skills, many farmers find it difficult to connect in person with agricultural associations, consultants, and other farmers. Ingenious farmers start collecting information from different fields. They can use computers with appropriate software and the internet to help them make decisions.

In comparing traditional and innovative approaches to information gathering for agricultural producers, it is clear that farmers using the traditional approach have less information than farmers using the innovative approach, based on the amount and quality of information they get from publications and the frequency of their interactions with advisors. Selecting appropriate and timely decisions is less likely when there are few sources available, which adds to the complexity of the decision-making process. Choosing the best possibilities will be made easier by splitting up the information flow and decision-making processes. Using this approach will ensure that misleading information is not considered when choosing solutions.

Innovative farmers work to gather more information from other sources. In comparison to farmers that employ a traditional approach, they can contact farmers' associations and governmental bodies more efficiently, resulting in increased information sharing.

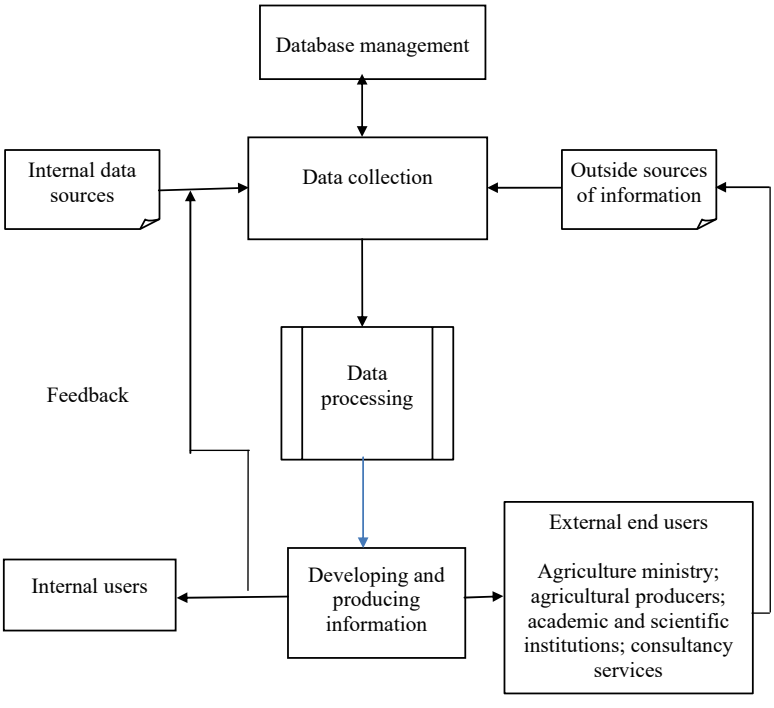
There are several ways of improving the farmer's way of working on the farm while incorporating an innovative approach:

- To implement precision agricultural technology for a more effective and profitable use of resources, including drones, GPS mapping, and Internet of objects sensors (Gebbers and Adamchuk, 2010). The data-intensive techniques used in targeted farming greatly benefit from farm systems of information.
- To adopt climate-smart agriculture (CSA) to increase environmental resilience by using real-time data to enhance making decisions (Lipper et al., 2014). CSA is an essential area for developing agricultural techniques because it integrates production, adaptability, and prevention.
- To put into use mixed farming practices, which incorporate aquaculture, livestock, and crops (Herrero et al., 2010). Integrated agricultural information systems can be used to better manage diverse farming practices, which improves resilience and utilisation of resources.
- To promote organic farming, crop rotation, and agroforestry as examples of sustainable and regenerative farming methods (Lal, 2020). These techniques emphasise ecosystems, soil health, and less dependency on inputs, all of which can be maximised with the use of decision-support systems.

2.2 Conceptual representation of the agricultural farm's information system

Implementing an operational production plan depends on the quality of information used and its prompt and continual delivery. Outside sources can provide information about standards for the type of agricultural production, information about regulations as stated in laws and bylaws, and guidelines published by agricultural advisory services for carrying out particular production activities. The decision-making and planning processes that agricultural producers engage in are influenced by a multitude of factors, such as experience, preferences, and the social environment in which they operate. Numerous environmental elements impact the financial outcome and decision-making process of agricultural producers.

Figure 2 A conceptual model of an agricultural farm's information system (see online version for colours)



Slijper et al. (2022) examined the broad trends that demonstrate how agriculture reacts to risk, uncertainty, and change. They also looked at the business resilience of different types of farms and European countries to see if a farm's characteristics affect resilience, adaptability, and change. Adaptation is the capacity of a producer to change production methods, whereas transformation is a significant change in a company's main goal (Darnhofer, 2014). Dantsis et al. (2010), Van Passel and Meul (2012), and Sauvenier et al. (2005) employed one of the most adequate approaches in agricultural sustainability research, which was based on sustainability indicators.

Knippenberg et al. (2019) argued that the different techniques emphasise complimentary aspects of the relationship between variability and well-being using a high-frequency data collection platform. Data analysis, lower communication costs,

lower entry barriers, and organisational reforms are the four primary ways that a company's digitisation activities impact its operations. These modifications, according to Jung and Gómez-Bengoechea (2022), are linked to improved business performance in terms of innovation in company ideas and productivity improvements, cost savings, and new revenue prospects. Fernández-Portillo et al. (2020) stated that the main benefits of adopting new technology are improved economic efficiency, corporate growth, and advancement. Digitalisation and technology innovation have brought about major changes in the workplace (Thrassou et al., 2022).

Figure 2 illustrates the conceptual model of a farm's information system. Operational data gathered in the field serve as the foundation for this information, which is sourced internally in this instance. The owner of the agricultural holding selects and filters information from both internal and external sources in order to carry out production activities. These activities should be scheduled ahead of time, with planning starting before the designated tasks are finished. In essence, the conceptual model is divided into four subsystems:

1 gathering information from both internal and external sources

2 planning production activities using the operational plan subsystem

3 creating the final report

4 managing production activities.

Data collection and processing is an automated method of keeping an eye on production activities, but reporting and planning are dependent upon farmers. For instance, producers should align their production schedules with recommendations from their ministry of agriculture in order to be eligible for incentives for the appropriate type of agricultural production (as represented by a specific producer). In order to increase the quality of production, particularly the process of manufacturing final commodities, farmers must take into account specific demands made by the relevant ministry of agriculture while developing their own plans. Under the purview of these strategies, the farmer will apply best practices that are derived from historical performance (given that the experience produced positive and profitable business results), which also direct the scheduling and execution of processes in the production system. The agricultural producers' organisational skills, techniques, and use of technology will influence the outcome of their activities. The advancement and enhancement of techniques and technology requires the agricultural industry to strive for accuracy and to integrate planning and production control.

It is essential to consider the elements that could lower the anticipated output, such as operational outcomes (verifying the correctness of mechanisation, biological and meteorological conditions, etc.), prior to starting the suggested production activities. Acquiring daily information on the amount of money invested in each cycle of production and the outcomes of business operations is necessary because agricultural producers must make decisions about their productive effort. Watching production processes, or specific farm operations, and the expenses related to them can help with control or farm management.

Controlling and planning production activity are greatly impacted by decisions made later in the field. They ought to be made after careful consideration of well-thought-out long-term goals. The conceptual model makes it possible to analyse functional

components that assist making wise management decisions, in addition to reporting and applying pertinent recommendations for controlling production activities and managing the farm system.

Several sub-systems comprise the conceptual model: an internal system for gathering data; an external system for gathering data; and operational plans for the subsystem responsible for producing the final report, planning and executing production activities. Only agricultural producers can use the automated system to plan and generate reports on production operations from data they have gathered and processed. Agricultural producers should align their plans with manufacturing processes and recommendations made by their ministry of agriculture in order to get incentives for a specific type of agricultural produce that is typical among some agricultural producers. Hence, when developing their own strategies, farmers must take into account certain guidelines established by the ministry in order to enhance the quality of production, particularly the process of manufacturing the final product.

A farmer will employ techniques within the parameters of the strategies that had resulted in a successful enterprise before. The strategies also include the planning and execution of protocols and operations inside the production system. The results of the activities are influenced by the farmers' organisational skills and prficiency with technology. The agriculture sector is now under pressure to integrate more precice planning and control over production activities as a result of technological advancements.

Before starting the planned production activities, it is important to verify mechanisation, biological and meteorological conditions, and other aspects that may lower the predicted yield or results of operations. However, as farmers must make decisions regarding their production activities, it is crucial to have daily data on the amount of money invested in each cycle of production and commercial accomplishments. Keeping an eye on the production processes, particular farm activities, and the expenses that arise from such operations can help with the management of the farm. Agricultural operations planning and management are greatly impacted by decisions made later on in the farming process. Responsible handling of activities and well-considered future planning should be the foundation for these judgements.

This concept includes an extensive information modelling technique that enables the generation of valuable data to serve as the basis for macro and micro decision-making. It is imperative that farmers exhibit a readiness to embrace novel work practices, like consistently documenting the outcomes of their productive endeavours. If required, they should complete a training programme to gain fresh insights. This will establish a repository of sufficient data and facilitate the smooth transfer of essential information for the successful execution of manufacturing procedures on their farms. A focus on lowering production costs and raising revenue can be applied in this case. As a result, farmers will be less likely to encounter difficult situations and needless expenses resulting from the improper and irrational use of natural resources.

A comprehensive programme of data collection activities can increase the timeliness and effectiveness of statistical operations, depending on the reliability and consistency of the statistical data. The formulation of appropriate policies that will impact issues regarding the growth and stability of the agricultural sector requires high-quality information about the performance of productive endeavours, since statistical sources typically provide succinct quantitative data.

The system architecture, or the connections and coordination between its essential components, should assist agricultural producers in the decision-making process and to

organise their production activities better by using appropriate methodologies. It also provides the relevant ministry with enough data for decision-making at the macro level in this sector. Stakeholders, such as ministry of agriculture, advisory services, agricultural institutes, universities, agricultural cooperatives, farmer associations, chambers of commerce, statistics services, and the media aim to collaborate with other relevant organisations in this field. Collaborating with scientific educational institutes to study farmers' enterprises and create guidelines will help the agriculture industry to expand.

2.3 Structure of the conceptual framework of the agricultural sector's information system

Farms that are used for agriculture play a vital role in the knowledge-based framework. Information on the number of agricultural producers in a administrative district should be available from farmers associations, advisory services offices, and other local cooperative societies. Farms without the necessary workforce to record events on them (such as farms whose workers are elderly or lack the training to record the data) can ask advisors, their associations, or local self-government offices to handle accounting tasks. These entities play a crucial role in adequately recording business activities.

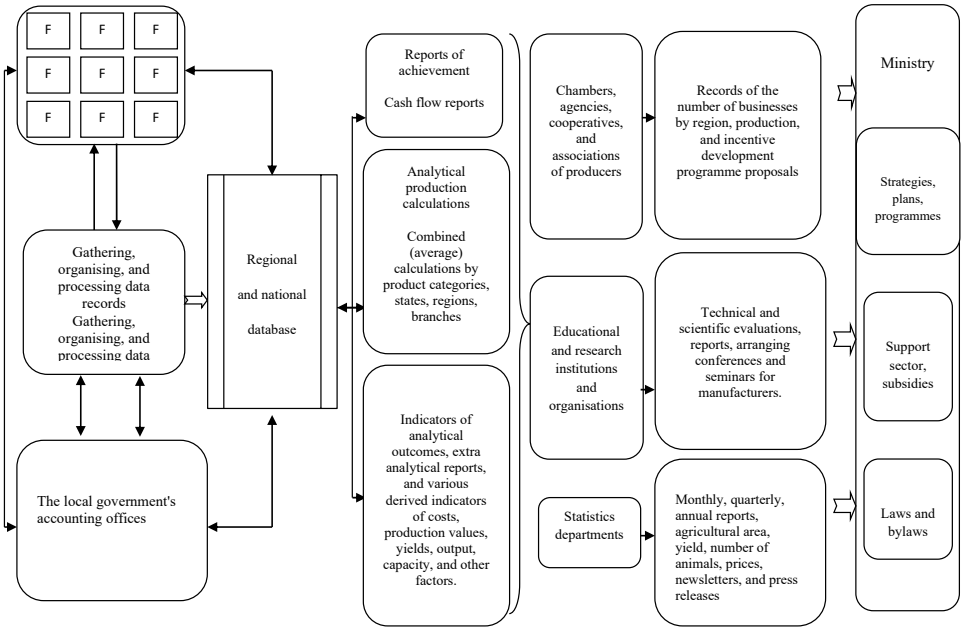
Additionally, their business activities determine how the collected data is processed and categorised according to elements such as kind of production, farm size, organisational structure, and geographic location. As part of the guidance offered, producers, offices, and organisational units collect data from agricultural farms to develop a single, comprehensive database of realised operations in the agricultural sector. Other organisations in this industry use the individual and collective analytical reports and indicators as their main source of information for monitoring information flows. Reports on the viability of agricultural farm operations, the costs of the production process (categorised, annual, etc.), the value of realised production by cultures, municipalities, and regions, internal and external implementation methods, and related information are of interest to many institutions.

Farm activity outcomes are of great importance to professional agricultural associations, including those representing vegetable, fruit, animal, grain, and beekeeping industries. This is a result of the significance of up-to-date knowledge regarding market prices, standards, the costs and prices of certain goods, the amount of money required to invest in each production, and other factors. Producers must consider the cost price of a product when comparing prices across equal or identical products. Their production processes will be more efficient and cost-effective due to their enhanced ability to anticipate needs and act promptly.

Alternative agricultural producers, such as cooperatives or other associations, have the same informational benefits. The methods for categorising agricultural producers discussed above also create significant data that is advantageous to this enterprise on a micro and macro level. Through these types of organisations, agricultural producers can receive detailed information about incentives and other types of support that the relevant ministry, municipalities, and other national or international entities offer. Likewise, information about the quantity of these associations, the number of farmers that are members of them, and the recommendations and concepts that these associations promote (during the creation of incentive schemes and other pertinent papers and programs) all add to the system's enhanced efficacy.

Professionals from scientific and research organisations, institutes, etc., should be involved in order to generate adequate and informed opinions and ideas aimed at improving the agricultural sector. These entities have a significant impact on the overall architecture of this system's functionality. They can utilise the previously described data beyond computing specific norms or criteria for specific outputs. They can support the development of the agricultural industry by utilising established theoretical principles and providing agricultural producers with additional information. For instance, they can do this by hosting expert lectures, offering recommendations and proposals to enhance the structure and organisation of information reports, providing guidance and recommendations while preparing strategic documents, and establishing precise guidelines to help producers make better decisions. As another entity engaged in the aforementioned information flows, the Chambers of Commerce should be aware of the core competencies offered in this sector.

Figure 3 The structure of the agricultural sector's information system



Therefore, it is important to adopt new growth plans and strategies, immediately grant funds from both domestic and foreign sources, and, most importantly, create educational frameworks for prospective local and foreign investors. Data on agricultural farm activities, particular locations, and production types are essential to statistical institutes. After laying the groundwork, the institute might utilise this information to create more comprehensive reports, bulletins, and other announcements.

Ministries of agriculture are responsible for implementing initiatives that promote the agricultural policy, and their ability to access information from producers is critical to their decision-making processes. The ministries and their departments should:

- use the information and reports that have been previously indicated to build the appropriate legislative framework, which should include the bylaws and regulations
- specify the proper strategies to follow (by region, types of output, etc.) in order to carry out necessary programmes
- adopt rules that impact the operations of agricultural farms in order to improve production activities (which, once implemented, will offer higher financial rewards).

Ministerial departments, as well as national councils, that are responsible for this sector and agricultural policy should share specific information with other ministries, governmental and non-governmental organisations, the EU's Directorate for Agrarian Policy, and other international organisations about funding opportunities, initiatives to increase agricultural productivity in general, and creative approaches they have taken. The aforementioned institutions collaborate to generate more information that enhances participant data at both the macro and micro levels and moves through the previously indicated information channels.

By examining the results of farm operations, the knowledge-based framework in the agricultural sector seeks to advance the industry's growth in a systematic and comprehensive way. This implies that all institutions that have access to information should be included as they are the essential building blocks for building a large database in this sector. Combining data from other sources with information from agricultural holding activities provides agricultural producers with a solid basis on which to make decisions. By integrating external and internal data sources, manufacturers can anticipate future operations that will be more efficient and profitable from quick coordination of production activities.

3 Conclusions

The ability to create, receive, and transmit information through a process, as well as to connect information appropriately, is evidence of cooperation, and it is the key function of all agricultural stakeholders in the knowledge-based framework. Collecting data is not always within the control of one institution. For example, a government's statistics office is mandated to collect data on average yields, sown areas, and other subjects, but other ministries and scientific research institutions are responsible for conducting studies and analyses related to agricultural production.

Therefore, collaboration is the cornerstone of diverse organisations and the distribution of their activities to obtain data and construct a crucial database in the agriculture sector so quality decisions can be made at the macro and micro levels. The main activity of farm advisory services' operations is to provide guidance on technical information. To help the rural population improve their standard of living, farm association services should prioritise increasing agricultural productivity efficiency and generating farm income.

To accomplish the stated goals, substantial time, effort, and investment in knowledge will be needed to complete the following tasks:

- give farmers information on local and national agricultural markets, as well as the economic and market conditions that affect this sector of the economy

- give farmers information on modern agricultural technologies, such as new developments and digitalisation
- have advisory services give expert help to producers to resolve problems related to production activities for all types of agricultural production
- enhance education by raising the professional and knowledge levels of agricultural producers.

It is essential for farmers to receive data from their own operations and information from outside sources that indirectly impact the their business. The lack of trustworthy data about farm management and productivity is one of the biggest issues facing the agriculture sector. Production in this business is down from its current level for a number of reasons, but one of the most significant is that agricultural producers do not maintain proper accounting records. For farmers, there is no legal obligation or custom to document production operations or monetary transactions that take place when labour is hired, raw materials are bought, or agricultural products are sold. When they do not have records of business activities on the farm, producers rely on orientation data – which they remember from the realisation production activities – when making decisions about their business and upcoming endeavours. Consequently, farmers are deprived of everyday awareness of the expenses and profits of their own land. The basis for quick decision-making about the best use of the resources at hand is a knowledge-based framework. Tracking and recording the value of capital invested and production realised is the first step towards better farm management, or more productive operations. This framework should help farmers make timely and appropriate economic decisions, such as adjusting production levels to satisfy market demands.

Departments within the ministry, including national councils in charge of agricultural policy and this sector, should communicate specific information about funding opportunities, general agricultural productivity-boosting initiatives, and innovative approaches undertaken by other countries to other ministries, governmental and non-governmental organisations, and the EU's Directorate for Agrarian Policy, among other international organisations. The aforementioned organisations work together to produce additional data that improves participant information at the macro and micro levels and travels through the information channels outlined before. Farmers are required to commit a set amount of time to these operations, and occasionally, while doing certain seasonal responsibilities, they neglect to record commercial activities on the farm.

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