

Knowledge Management and Sustainable Agriculture: The Italian Case

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Abstract

The contemporary knowledge-based economy requires global usage of information in all aspects of modern society. Pertinent information is an important asset for successful business, therefore an application of knowledge management in organisational practice has become a crucial factor for the viability and sustainable development of enterprises. This is particularly relevant for the agricultural context, which needs modern practices for enhancement and development.

However, information and knowledge, due to their intangible character, seem difficult to manage and organize. Therefore the paper targeted at developing sustainable organizational model of knowledge management for small and medium enterprises. Italian agriculture is considered as a context for this study, and knowledge management was offered as a tool for facilitating agricultural performance and increasing competitiveness of agricultural sector.

A wide concept of knowledge management and specified agricultural context require a theory-based approach to research and a survey. Thus, the research methodology includes the next four parts. The first one contains literature review and examines definitions, strategies, approaches and models of sustainable knowledge management. The second part includes content analysis of 105 scientific publications. The third part of methodology is based on the results of the two previous parts and includes creating the model of knowledge management. Verification of this model is the last part of the research. Verification was executed through on-line questionnaire distributed to Italian agricultural enterprises throughout the country on their intentions and awareness towards knowledge management and developed model of knowledge management.

The results of the survey have demonstrated farmer's incentives to implement the developed knowledge management model with flexible approach in its organisation.

Keywords: knowledge management, sustainability, agriculture, dissemination.

1. Introduction

Knowledge and information play a key role in the contemporary society and business. Relevant information allows to make right decisions operatively both at individual and business level.

In the era of developed communications and computer technologies the overall use of information in business performance became de facto standard. Usually competitive advantages depend on good decision-making, which, in turn, is based on availability of pertinent information. Though, practical organisation of information provision may cause a number of different obstacles which impede or straiten access to needed business information. In other words, an effective organisation of information flows or knowledge management (KM) is an important strategic asset for a profitable activity of a contemporary enterprise. Scientific literature of the latest decades does not clearly define a rational organisation of knowledge management and its functional model. Some describe this model as "effective", "success" or "mature", but for this study the most appropriate definition of well-organized KM model is "sustainable". Therefore the main research objective of the paper is elaborating sustainable model of KM. As knowledge management is context-specific issue, its sustainability should be approved on the practice and pursue a certain functions in a certain circumstances.

The agricultural context is very peculiar and has its features

and challenges for adopting knowledge management. Agriculture as an industry provides an occupation for rural people and quality food products for every society. However the contemporary European standards of the food quality stipulated by norms of food safety and security are very high and compliance to them requires additional manufacturer's costs and an appropriate information support. Moreover, agricultural economy and environment are linked through many complex relationships (Perman et al., 2011); and farmers should consider this interdependency for adapting their systems to changing environmental, social, market and policy conditions in order to achieve long-term sustainability (Committee 2010).

Under these strict conditions agricultural enterprises need sustainable management. Thus, this research offers an application of knowledge management as a tool for sustainable management in the agricultural context. Contemporary authors consider knowledge management as an instrument for alleviating certain problems: to mitigate and to govern risks (Mauelshagen et al., 2014); to enhance environmental management (Reed et al., 2014); to improve logistic planning, and monitoring systems, thereby facilitating as local delivering as entire agri-food supply chain (Zecca & Rastorgueva, 2014); to smooth information asymmetry within the food market (Zecca, Rastorgueva, 2016).

KM is one of the most quickly developing concepts of management (Lendzion, 2015), nevertheless, only existence of knowledge management is not a sufficient condition for a

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competitive advantage, but it is important for farmer's systemic thinking and enhancing an agricultural performance.

Ordinarily agricultural knowledge management is confused with agricultural extension. Both these issues have the similar objectives, however extension implies counselling of farmers, delivering information to them; whilst knowledge management is related to an arrangement of information provision within an enterprise, it may include extension as an external source of information.

The article highlights agricultural small and medium-sized enterprises, due to their dominance within the European agri-food industry. The selection of the Italian case is conditioned by two reasons: firstly, Italy as the example of EU country is regulated by European legislative norms; secondly, Italian natural, climate and socio-cultural features have a great impact on the development of rural areas, where the world-famous food is produced.

The main goal of the research is to create the model of sustainable knowledge management affordable for European agricultural enterprises. It contributes to development and practical application of KM in the agricultural context.

Scientific literature considers sustainability of knowledge management as an ability to provide sufficient information for solving a certain problems. Therefore, elaborating sustainable KM model should be focused on problem solving and aimed at:

- enhancing a decision-making activity on different levels;
- improving an availability of information;
- providing a relevant information for all production stages.

Moreover, the model needs to be tailored to the agricultural features and the Italian context. The article is structured as follow: introduction, literature review, methodology, results and discussion. The paper ends with conclusions.

2. Review of the scientific literature

2.1. Theoretical issues of Knowledge management

The term "knowledge" has different definitions: an asset (Boisot, 1998); a strategic resource of high economic value (Jawadekar, 2011); an entity/commodity that people possess, but which can exist independently of people in a codifiable form (Hislop, 2009); an organizational practice (Kwan 2003); a fluid mix or framed experience, contextual in formation (Davenport, Prusak, 1998).

Similarly, there is no unified definition of "knowledge management", it was described as an umbrella term which refers to any deliberate efforts to manage the knowledge (Hislop, 2009); as the management of corporate knowledge and intellectual assets (Gupta, 2000); as all methods, instruments and tools that contribute to the promotion of an integrated core knowledge process (Mertins, 2003).

The essence of knowledge management is developing a special dynamic capability that aligns firms' knowledge resources with the needs of the changing conditions; and governance mechanisms and learning routine play the main role in this process (Chen, Fong, 2015). Knowledge management capability can be expressed through its ability to mobilise and deploy knowledge-management based resources in combination with other resources and capabilities, especially those firm-specific, and difficult to imitate or substitute. KM capability and firm performance depend on the size of the pool specific knowledge that a firm can access (Qu, Yang, 2011).

One of the most significant enablers of knowledge management is leadership (Aurum et al., 2008), which means a sense of purpose, and an ability to influence others, interpret situations, negotiate and debate their views (Mumford et al., 2012). The difficulty of managing knowledge, as a key corporate

resource, has made role and responsibility of leadership as critical (Lakshman, 2008). Thus, knowledge leadership is defined as a process whereby an individual supports other group members in learning processes needed to attain group or organisational goals (Stogdill, 1974, Yang et al., 2014). Knowledge-oriented leadership is based on the two key elements: communication and motivation (Donate & de Pablo, 2015). A knowledge leader is the catalyst for a knowledge-sharing culture, owner of the infrastructure specifications that facilitate knowledge transfer and storage, and maintainer of the closed-loop learning system (Yang et al. 2014, Rasmus, 2000).

The Resource-based view (RBV) as the dominant theoretical perspective in strategic management literature (Chuang, 2004), was originally developed to examine the relationships between the resources of a firm and its performance (Canavari, 2012). The resource-based view assumes that the resources a firm can determine the firm's sustainable success in a given market (Meso, Smith, 2000), and resources are transformed into outputs of greater value through various capabilities in deploying resources (Barney, 1991). RBV focuses on resources within an organization rather than the external environment. The KM model based on RBV should have an internal focus, however might be augmented by accounting for environmental factors such as dynamism (Pee, Kankanhalli, 2016). From the RBV of the firm the acquisition of external knowledge must be considered more as a learning opportunity than as a cost, following a complementary vision (Nieves, 2013; Nonaka et al., 2000; Tseng et al., 2011).

Within the RBV, KM resources are classified as technical and social (Chuang, 2004). Hence, approaches of KM are divided as technology-oriented and human-oriented (Maier, 2007), or system and human strategies (Choi, Lee, 2002). Authors have different opinions which approach is the most preferable. Thus, Pee & Kankanhalli (2015) assumed technology was as an obvious mechanism for KM, technology-driven perspectives have traditionally been in a dominant position in the field of knowledge management. Information technology is considered as an important enabler as well as medium to create and distribute knowledge (Pee, Kankanhalli, 2015).

In the more recent approaches to knowledge management, some authors suggest to follow a holistic approach overcoming the distinction between human-oriented and technology-oriented knowledge management (Maier, 2007) and to achieve the balance between technological and social facet of the organization (Bhatt, 2001).

Both technological and social issues are necessary elements for KM success. KM success can be considered as an ability to leverage knowledge resources to achieve actionable outcomes (Jennex et al., 2010). Some authors use KM success and KM effectiveness interchangeably by implying that increasing decision-making effectiveness has a positive impact on the organisation resulting in successful KM (Murray, Olfman, 2010). However, the most general meaning of KM success is capturing the right knowledge, getting the right knowledge to the right user, and using this knowledge to improve individual performance (Wang, Yang, 2016).

To satisfy this definition, a KM success model needs to cover the effect of different types of activities and mechanisms (Kulkarni et al., 2006); and to apply mixed strategies in its given situations (Kim et al., 2014).

Contemporary literature offers two the most interesting models of KM success, very different from each other.

Both models contain different components and mechanisms, where a Knowledge User is positioned differently.

The first model (fig.1), developed by Kulkarni et al. (2006) studies knowledge sharing and use from a knowledge worker perspective as an indication of success of a KM initiative. Besides, Kulkarni et al. (2006) underlined a significance of knowledge content quality and KM System Quality, and important determinants of Knowledge Use through their

intermediate effect on User Satisfaction with KM initiatives.

The second model of KM success, by Jennex & Olfman (2010), is demonstrated on fig. 2 and describes user satisfaction as a construct that measures perceptions of KM by users, and as one of the most frequently measured aspects of IS success, constructed with a multitude of measurement instruments.

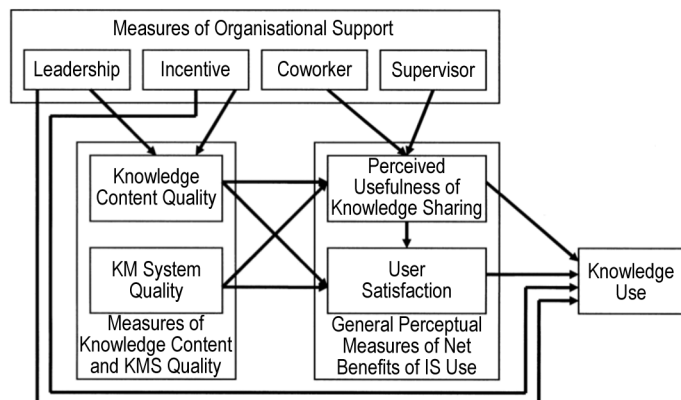


Figure 1. KM Success Model (Source: Kulkarni et al., 2006)



Figure 2. The KM model (Source: Jennex, Olfman, 2010)

2.2. Knowledge management application in agricultural context

The principal characteristics of knowledge management application strongly depend on the context, therefore aforementioned features of agro-industrial sector are crucial to understand organisation and goals of agricultural KM.

Agriculture as an industry depends on the natural factors and characterises by the next features which regulate all activities from the organisation of enterprise to food sale: seasonality or dependence on season and climatic cycle; outdoor character of performance affected by variations in temperature; and perishability of food products determines a tight timing constraints for its store and trade. These features stipulate a hazardous character of agricultural performance. Contemporary agriculture is becoming more knowledge-intensive, changing rapidly, and making farm management more complex. Skills and knowledge are critical for farmer's success. However, practical dissemination of information and knowledge in agriculture faces the following problems: user variety, linkage of disciplines; flexibility in access information/ knowledge (Carrascal et al., 1995).

Agricultural knowledge base as an asset of KM, is composed of scientific or specific knowledge linked to agricultural

production and to innovations in that production. The construction of such a knowledge base implies the development of specific procedures: collective experiments, building and testing of prototypes, and securing the implementation of innovations (Labarthe, 2009).

The concept of 'agricultural knowledge system' embraces all the institutions, advisers, education and research involved in the construction of a sustainable agriculture (Cerf et al., 2000), underlines the interest of the production and acquisition of knowledge within the framework of a partnership between the actors of the general agricultural world (Soullignac, 2012). Knowledge management in the context of rural development involves the realisation of the main functions of management focused on the resources of personalised, codified and established knowledge, the processes with their participation and the conditions of realisation of the processes (Ziemianczyk et al., 2014).

The Farm Advisory System (FAS) is described as an essential tool for a successful implementation of the Common Agricultural Policy. The mission of the FAS includes: farmer's support in their efforts to comply with the EU's legal requirements relating to the environment, food safety and animal health and welfare; farmers assistance to adhere these 'cross-compliance' requirements and to avoid losing CAP payments (EC Report, 2010).

An important part of FAS, agricultural extension service, is a key factor in the innovating agriculture, it remains the main source of knowledge for farmers in developing countries.

Extension can be considered as a non-formal educational function that applies to any institution that disseminates information and advice with the intention of promoting knowledge, attitudes, skills and aspirations, although the term "extension" tends to be associated with agriculture and rural development. At the same time, extension is a political and organizational instrument used to facilitating rural and agricultural development. Extension has a wide range of purposes, from technology transfer by companies organized around specific, farm systems to problem-solving educational approaches or participatory programmes aimed at alleviating poverty and advancing community involvement in the process of development (Rivera, Quamar, 2003).

In other words, agricultural extension and advisory services can be defined as systems and mechanisms designed to create and strengthen the capacity of rural farmers. This is accomplished by providing access to information and technologies but also by enhancing agricultural skills and practices, capacity to innovate and address varied rural development challenges through training programs, improved management and organisational techniques (Mbo'o-Tchouawou, Colverson, 2014). A well functioning agricultural extension service plays an important role to and demonstrate to the farmers the best ways to implement relevant practices of sustainable development (Jacobsson, 2014).

Measuring impact of agricultural KM and extension is a complicated issue due to intangible character knowledge and information, and many factors affecting to agricultural performance. Some authors offer to use monitoring for an estimation of extension impact (Hortan, Peterson & Ballantyne, 1993).

Monitoring is described as a specialised, dynamic, semi-autonomous, and institutionalised management resource, which helps to ensure the implementation of extension programmes in accordance with their design and takes into account the interests of various stakeholders (Swanson et al., 1997). Monitoring is an integral important part or subsystem of a management information system and in the same time it is one

of management's sources of information (Swanson et al., 1998).

2.3. The Italian case of agricultural extension and knowledge management system

The Italian Agricultural Knowledge System (AKIS) is characterised by different organisational models, working methods in all the macro-components recognized by OECD: Higher Education, Research and Development (R&D) and extension systems.

On the other hand the agricultural knowledge system in Italy includes two parts, very different for their objectives, methods and evolution:

- the complex organisation connected with the farms that produce fertilisers, seeds, chemicals, animal feeds, human food (and so on), the principal objective of this part is to keep its own share of the market;
- the system of public services for farmers, connected with national and regional institutions for agriculture, this system targeted at promoting the development of agriculture and rural territories (Vagnozzi, 2009).

Both parts try to meet farmer needs concerning: innovative and more rational productive processes that improve agricultural products, decrease costs and lower the negative impact of agricultural processes on the environment (OECD).

There is no unique policy for the entire system; rather it is possible to identify a specific policy for each component, with different roles and objectives (Materia, 2012). Another relevant question about the Italian agricultural extension system is the lack of coordination with the respect to the development policy for rural territories. The paradox is that rural development policy funds the advisory services, but it disregards them and the extension and vocational training system operates with their own specific objectives, not always consistent with the political goals (Vagnozzi, 2009).

Notwithstanding some common goals, involved bodies, promoted activities and policy objectives, each region has its own Department of agriculture and its own unique organisation of research and advisory services. Therefore there are 21 different advisory services in Italy (Caggiano, 2014), with different financing principles: 33% of Italian extension are funded by regional institutions and 67% by other institutions; in the same time 85% of advisory bodies are financed by public funds and 15% by private (Vagnozzi, 2008).

Moreover, the national framework is even more complex due to several institutional levels which are responsible for the different components of extension. Every region has a specific extension policy which is regulated by regional laws regarding applied research in agriculture (according to an integrated approach generally developed and introduced in the regional legislation since 2000). The main objectives of the regional extension policy are: technological transfer, farm competitiveness, cross-compliance (mechanism of payments provided by CAP), diversification, food safety, environmental impact.

Extension coordinated by the public organizations may be managed and implemented by different organisations, including private ones in some cases. As the field of interest of the public extension is very broad and diverse, services have needed a complex system of classification (Materia, 2012). The public extension services tend to focus on "government driven" programs such as land reform and therefore reduce its ability to supply proper services to the "private driven" sector (commercial farming).

Commercial farmers look for alternative extension services, which are normally available at a cost. If the alternative service offers better quality, the farmers are willing to pay a certain price for it. However, most Italian farms are small and could not afford expensive extension services, yet they are not satisfied by the

services offered by the government (Jordan, Nell, Zecca, 2004). In the same time, small farms seem more limited in their ability to adapt new practices to environmental requirements. For many technical problems, the nature of the possible solution depends on the size of the agricultural holding, and farmers need advice matches their farm structure (Labarthe & Laurent, 2013).

The Italian AKIS suffers for a lack of "systematic knowledge about the agricultural knowledge system", including the absence of common databases about the services delivered and the ongoing research, a systematic collection of information about "who does what", etc. This knowledge is necessary and crucial to improving the system and for supporting the policy makers (Caggiano, 2014).

Each region autonomously manages programmes and funds policy interventions to promote public extension services in the context of a specific law that identifies areas of expertise, roles, actors and procedural arrangements for the funding allocation. It follows that the Italian AKIS lacks a 'national' extension system as each regional reality has organised the issue in peculiar ways both in terms of productive sectors and territorial typologies, and in terms of actors to be involved (Materia, 2010).

Extension and the support system in Italy refer to a unique, complex and evolving entity which usually covers basic/specialised technical and financial extension support to farms and farmers, as well as all possible forms of information and innovation dissemination that enable farms to express their economic and social potential. The support system is a sub-system of extension: the first is supported exclusively by the public as it provides advanced level technical instruments whose high cost could not otherwise be afforded.

Extension and the support system, in particular, suffer in Italy from a sort of isolation, as they often are not able to organise their structures in order to interact more effectively and efficiently with the policy makers. As a result, the structural robustness of the system is jeopardised, especially with reference to the management and organisation of institutions that offer services to farms (Materia, 2012).

Extension and advisory services help farmers to enable their business under conditions of changing world. However, the process of adoption of agricultural extension services shows some complexities, starting from the hypothesis that idea of spreading innovation through simple contact is not acceptable (Bartoli et al., 2012). Furthermore, adoption of agricultural innovations depends on their affordability for farmers, and financial aspect plays for it an important role.

Prager et al. (2016) assumed that commercialization of farm advice affects on the quality of services. According to them, commercialised advice has several advantages but only for clients with sufficient financial capacity, in the same time public support is important to improve the knowledge flows between public research and private organisations.

3. Methodology

Besides literature review, the second part of the research includes content analysis in order to select the main theoretical factors necessary for organising KM process. Knowledge management was developed and widely applied during the recent years, thus the period of the latest decade (2005-2015) seems more interesting for the content analysis. Therefore 105 articles of the specified period were selected in scientific databases as Scopus, EBSCO and Sciencedirect. 105 articles it is not a huge number, but highlighted scientific focus is very narrow and limited by 2 scientific fields: knowledge management and agricultural context. In other words, the selected articles should satisfy to the next conditions:

1. publication in academic journal from all over the world;

2. 10-years period 2005-2015;
3. described agricultural context.

The place of journal's publication and geographical situation of authors are not specified because there is no scientific interest for the content analysis. Studied articles were systematised and elaborated by Excel.

The third part of the research includes developing the theoretical model of KM based on the results, received after two previous parts (i.e. strategy, approaches, perspectives and clarified factors).

Finally, the last part of the research includes the survey to verify the developed KM model. The survey is based on questionnaire, as the most appropriate method for KM research. In order to estimate the developed knowledge management model (KMM) from farmers' viewpoint, the questionnaire contains 13 close-ended questions to clarify the next issues:

- 1) farmers' awareness towards knowledge management;
- 2) farmers' knowledge needs (type and form of required knowledge/information);
- 3) the role of extension, its utility for farmers;

- 4) farmers' attitude towards factors of knowledge management model;
- 5) farmers' readiness to implement the developed KM model.

Given the features of agricultural context, the survey has anonymous character and includes simple questions translated to Italian. Close-ended questions were used to simplify analysis of answers and to emphasise the most important points. On-line questionnaire was executed through Google platform and was sent to 420 agricultural small and medium-sized enterprises situated in all parts of Italy. Thus, executed survey allows to improve developed KMM considering the practical point of view and to make theoretical model more affordable for agricultural context.

4. Results and Discussions

As the result of the content analysis there were selected 4 main factors: indigenous (local) knowledge, knowledge transfer, learning process and knowledge sharing (fig. 3).



Figure 3. Selected factors for agricultural KM model

Knowledge transfer occurs when experience in one unit of an organisation affects another unit. Knowledge transfer can occur explicitly when, for example, a unit communicates with another unit about a practice that it has found to improve performance (Argot, Ingram, 2000).

Learning process is a cumulative process where individuals gradually internalise more and more complex and abstract entities (concepts, categories, and patterns of behaviour or models) (Nijhof et al., 2002); as the vehicle for utilising past experiences, adapted to external changes and enable future options (Berends et al., 2003).

Indigenous (local) knowledge is the result of the quotidian interactions in indigenous peoples' territories. Indigenous knowledge is immersed in the whole culture and is recreated through generations (Semali, 2002).

Knowledge sharing is a key component and also a substantial barrier in achieving an effective knowledge management. Knowledge sharing can be defined as a process of exchanging knowledge (skills, experience, and understanding) among individuals, a community and within an organisation (Kumaresan, Liberona, 2013).

Selected factors consist the central part of the theory-based KM model demonstrated on Fig. 4. The central part of the developed KM model includes leadership, as it plays a crucial role for KM routine (Yang et al., 2014), and knowledge-oriented leadership has a positive influence on KM practise of an enterprise (Donate, de Pablo, 2015).

Besides the central part, developed model of Knowledge management includes issues highlighted in the literature review: human-oriented approach (social aspect, particularly commu-

nication and knowledge sharing) and technology-oriented approach (provision of technical devices, computer-supported data-bases and infrastructure for documented knowledge).

Developed model has problem-solving focus. As demonstrated on Fig. 4 formulated tasks and problems are addressed to advisory services. Extension and advisory services consist the external part of the KM model. They, in turn, provide an information support in form of assistance or dissemination of information, furthermore contacts of advisory services and farmers should be based on trust.

According to the TBL conception, of the offered model satisfies to the 3 pillars of sustainability:

- ☐ from the economic viewpoint KMM needs optimum organization to have a sufficiently low costs and high impact;
- ☐ from the social viewpoint KMM will improve relations within enterprise, and allow to improve skills of staff;
- ☐ from the ecological viewpoint well-organized KM will allow to decrease office paper consumption.

However sustainable functioning of developed model requires monitoring of KM success. Regular monitoring as an integral part of KMM is a necessary element for detection barriers to knowledge flow. It is an important factor for sustainable KM as it helps to reduce costs for the enterprise.

For sustainable functioning of the developed KM model is necessary to divide monitoring process into two parts:

- 1) extension monitoring to regulate quantity and quality of information provided by extension services, its costs and time-

liness. Extension monitoring requires group of indicators, and main indicator is cost of advise;

2) KM monitoring to control the results of the elaborated KMM and information utility for users. Good results can be provided by well-functioning system with a good organisational culture and devoid of toxic elements. Thus this unit of monitoring

needs regular questionnaire of farmers as the users of information. Qualitative and quantitative data of monitoring will help to control all aspects of sustainability.

An essential item for success KM is the relevant information, sufficient for user's decision-making process.

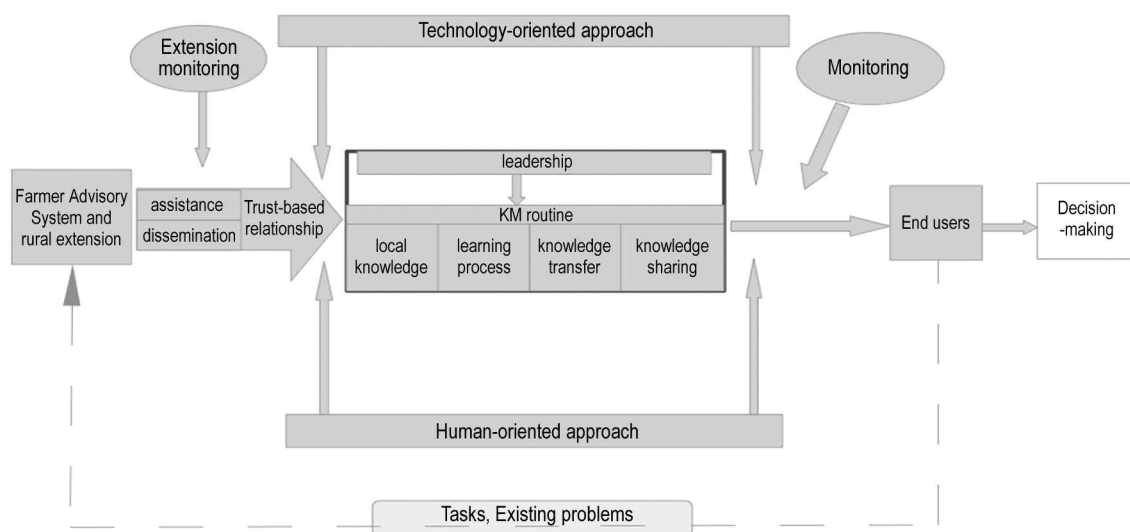


Figure 4.
Sustainable model
of knowledge
management

After executed survey it may say the follow.

The first question of the questionnaire regarded the age of the respondents. An implementation of knowledge management for an enterprise can be considered as innovative activity and age of respondents is a significant indicator of the farmer's propensity to innovate: the older the age of the owners the less likely they are to innovate (Szirmai et. al, 2011). As was mentioned above, ageing farming population is a relevant problem of the Italian agriculture and about 70% of farmers are above 50 years in 2010. However, the results of this research demonstrate that more than half of respondents are younger than 45, this denotes about farmers' potential to implement different practices of knowledge management.

According to the survey, only 40% of respondents use different forms of knowledge management in their enterprises. The reasons of the quite low percentage can be different, for instance lack of an appropriate devices, low access to needed information, low quality of advisory services etc.

All respondents have demonstrated their willingness to enhance knowledge management. For 35% of respondents the issue of KM efficiency is the most relevant and about 40% of respondents have pointed out reducing of KM costs as the most important issue in improvement of knowledge management. Therefore, level of costs and received results are crucial in the KM organization.

As for a type of necessary information, the results of the survey have demonstrated that the market information is the most required by respondents than technological information or financial aspects. The market information includes current prices, new markets, supply chain issues and so on. However, this information has an external character, and requires a reliable information source, such as extension services.

For rational organisation of KM it is necessary to clarify the main barriers to the adoption of knowledge management. Thus, for the most respondents limited time and lack of qualified staff are the main impediments for application or improvement of knowledge management. This can be explained by presence of many farmers' duties and lack of sufficient time to implement or reorganise KM system.

In theory, level of KM efficiency is difficult to count, therefore it is important to understand practical point of view to criteria of KM efficiency. The majority of respondents (66%) pointed out as

the main criterion of effective KM its positive impact on the agricultural performance, while user's satisfaction and presence of sufficient information were evaluated as not significant criteria.

Concerning farmers' perception of information and consequently, type of presented information, 41% of respondents would like to receive information in figures and 35% need expert's advise. This fact can improve the organisation of knowledge flows in order to receive necessary results, for example, relevant information should be systematised in diagrams and figures, or expert advises received in meetings.

In the literature agricultural extension was described as the main external source of information for farmers. This was confirmed in our survey: more than 60% of respondents have emphasised the principal role of advisory systems in informational provision. The opposite attitudes of the rest farmers toward extension systems can be explained by regional differences in quality of advisory services.

Expectations of farmers from KM were clarified in this part of survey. Thus, the majority of interviewed farmers assumed that knowledge management improves farmer's skills in all aspects of agricultural performance (i.e. financial management and administration; human resource management; general planning; customer service). However some respondents underline improvement of general planning skills as the main expected result.

Aforementioned combination of human-oriented and technology-oriented approaches was confirmed by this survey. Therefore, similar to literature browse, practical viewpoint of majority farmers is based on the assumption that both human-oriented and technology-oriented approaches are necessary for KM organization.

Role of leader and leadership, as the key enabler of KM process, was suggested as an embedded central part of the KM model. Notwithstanding different authors' attitude toward leadership, and particularly toward leadership in KM process, executed survey has approved the presence of leader as a very important point in the organization of KM process in agricultural context.

Process of monitoring is defined as an integral and important part of KM. This research has considered monitoring as the main tool of KM sustainability, important for steering KM organization and efficiency of its routine. Quantity and quality of monitoring processes depends on the specificity of the agricul-

tural enterprise. The necessity of monitoring in KM was proved by 92% of respondents.

At the end of questionnaire an estimation of KM model was offered to farmers. According to 30% of respondents, developed model of knowledge management is ready for implementation, however major part (70% of respondents) prefers to reconsider some elements and their combination. It may be explained by the fact that Italian agricultural enterprises have great differences in the number of staff, level of revenue and needs of information.

5. Conclusions

This study has developed sustainable model of KM for agricultural enterprises. An executed wide literature review has systematised general issue of KM and allowed to appoint the most important aspects for answer the stated research question.

Thus, RBV was selected as strategical perspective which considers knowledge as an important resource. From the resource based perspective there were discussed two main approaches of KM: technology-oriented and human-oriented. In the literature they are described in the different ways, however organisation of KM in the contemporary conditions requires rational combination of two these approaches. On the practice, the same opinion shares the most respondent farmers. An application of a certain approach is not enough; and rational organisation of contemporary KM requires as technological as human aspects.

KM in literature has been considered as context-specific, and context features are crucial to KM organisation, therefore issues of agriculture, Italian agricultural KM and extension services were highlighted.

Multidimensional concept of sustainability was discussed particularly for the level of small and medium-sized enterprises. Sustainability or "ability to continue the performance" is considered as a main long-term goal for farmers. Therefore, sustainable KM first of all should contribute to sustainable performance, and needs effective organisation. Furthermore sustainable KM is based on the issues of efficiency and effectiveness which are difficult to measure, the paper offers monitoring to control and steer KM process and to clarify its impact on the agricultural performance.

Used methodology has allowed to achieve stated research objective. Thus, according to this paper may be said:

1) Any forms of KM organisation are important for sustainable development, and farmers are incentives to apply any practices of KM for improving performance and competitiveness of their enterprises.

2) From the theoretical point of view, the follow factors are the most important for functionality rural KM: local knowledge, learning process, knowledge transfer, knowledge sharing; and the main obstacles of KM application in agricultural context are: limited time and lack of qualified staff.

3) From the theoretical viewpoint, the most important criteria for sustainable KM model in agriculture are: ability to provide necessary information in the required time; organisational costs; and level of user's satisfaction. However, from the practical viewpoint the most expected result of applied agricultural KM is a positive impact on the agricultural performance. Undoubtedly, user's satisfaction and presence of required information can contribute to good decision making, however farmers prefer to estimate KM efficiency by its overall impact on the performance.

4) The most preferable result of KM activity for interviewed farmers is information in form of figures/diagrams and expert's advices. This requirement is important for organising KM model and underlines the necessity of extension services.

Activity of contemporary extension perfectly complies with contemporary paradigm of knowledge-based economy. Extension services and FAS play crucial role for agricultural KM due to their function of delivery information supported by the Common Agricultural Policy 2014-2020. However, organisation of agricultural extension in Italy, their services and financing principles are different in every region. Therefore, improvement of extension quality requires efforts of the regional governments.

5) For farmers a positive impact of KM on agricultural performance is the main criterion of KM sustainability. Practically a positive impact of KM depends on its organisation. However, an impact of KM can be only indirect due to intangible character of KM assets and many other factors affecting agricultural performance.

Thus, the further research will be based on an experiment and will include adoption of the developed KM model into different agricultural enterprises. The term of the experiment is supposed one year. This experiment will allow to estimate the offered model of KM in the different conditions.

Q-as

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