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GROWTH PATH TOOLS FOR YOUNG AND DEVELOPING FARMERS – FARM TASK MAPPING

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This study is to develop techniques for business engineering on farms. Changes outside the farms are reflected in the agricultural sector placing new demands for the farm managers career paths and expertise. To have success in farm business a young farmer needs to find strategies adapting these changes to the operational tasks of the farm. In adaptation, it is important to see the possibilities of development during the farm's life cycle. Agricultural entrepreneur usually faces the farm activities as a holistic system. The sustainability of the farm business depends on the conditions of the production processes and the agricultural entrepreneur's ability to operate at different stages of his or her career path.
In agriculture change is regulated by its own legislation, market regulation, customer requirements, traditions, and work culture, which must be taken into account in maintaining the vitality of the farm system. In Finland, the AgriHubi network offers a new channel for agriculture industry stakeholders to provide tools for the development of agricultural entrepreneurs' management skills and career growth path. One of the results of this project is the identification of farm entrepreneurs' development areas with the help of the farm task map tool. The task mapping method is based on mapping the important elements of the company.

Keywords: *farm safety, agriculture machine injury accidents, safety communication*

INTRODUCTION

The factors of change outside the agricultural enterprise are reflected in different ways in the management of the farm and in the career development path of farmers (Leppälä 2016; Leppälä et al. 2013). Current external challenges on farms, such as the covid-19 virus pandemic, the state of war in Ukraine, the energy crisis, and measures to combat climate change, require farmers to make changes in their business and production. In these changes, operations must be adapted to skills, opportunities, and risks on the farm. When adapting change on farms, it is important to see the potential for development during the whole farm generation life cycle and career paths on the farm. An agricultural entrepreneur usually encounters the operation of the farm as a whole. From the point of view of competence, the social sustainability of a farm enterprise depends partly on the conditions of production processes and the ability of the farmer to utilize the competence capacity of all persons involved in the operation of the farm at different stages of the life cycle of the farm generation. Over 80 percent of the European farms are family farms (Eurostat, 2022). Family life should be integrated to farm life on many farms. As a result of structural development in agriculture, the number of Finnish agricultural enterprises and entrepreneurs has been declining for a long time, and the average age of entrepreneurs is rising. In particular, the share of high age cohorts, such as farmers aged over 65, has increased since 2015 (Eurostat, 2022).

According to previous studies, the farm production context includes using of large areas of land for plant and animal production activities, use of heavy machines in production, handling of costs and investments and taking food products to markets. Farm managers are using knowledge of engineering, economy, environment, biology and natural resources to produce food products. (Kay et al., 2020; Leppälä, 2016; Leppälä et al., 2011; Olson 2004; Öhlmer et al., 2000; Boehlje and Eidman, 1984). The management of expertise in the agricultural sector is particularly affected by the sector's own legislation, market regulation, customer requirements, traditions and work culture, which must be taken into account. However, in the multidisciplinary field of work of a farm manager, one does not have to take care of everything alone or know it himself. Competence management on a farm is to understand what other people working on the farm or

in the surrounding area can do and can help with farm work. One of the objectives of this project was to enhance farms competence portfolio of the farm and the farm entrepreneur. One solution is to define a farm task map, which enables young farmers, who are starting their careers, to identify areas of development and skills needs on the farm throughout their farm career path. The task mapping method is based on mapping and evaluating the farm enterprise's objectives, product offering, new opportunities and related important competence needs. The usability of the farm task map is preliminarily assessed by farm management categories in farm education programs in Finland and Lithuania. The potential tools are to publish on the AgriHubi website, which is a new agricultural knowledge hub in Finland.

RESEARCH METHODS

The objective in this study is to develop farm management methods and a task mapping tool for managers, which can be used for farm management development. The study is constructive management research, which purpose is to produce practical solutions to existing management problems (Kasanen et al., 1993). The testing of a model is based on their practical use and usability (Kasanen et al., 1993). This study is not testing pre-determined hypotheses but aimed to create new management tool applicable to define farm management skills and needs. Empirical observation and theoretical model development is an iterative process. The study problem is that farmers are facing challenging broad scope of agricultural work, where several different areas of expertise must be managed. There is no company manager, who deals with such number of tasks and skills. The research tasks were therefore to find out: 1. what farm managers do, 2. what management skills and competence is currently required to run a farm, and 3. what training are available to help the farm entrepreneurs in farm management. The European Qualification Framework EQF describes the competence or competency as learning outcomes, which refers to person knowledge, cognition and practical skills and person ability to apply knowledge and skills autonomously and responsible manner. Management skills usually vary depend on the industry and the manager position, but in principle management skills are ability to plan and set goals, make strategy and decisions what should be done in practice, monitor and checking the results of the activities and act if some changes are needed. This management model is usually called a Plan-Do-Check-Act (Juran & Godfrey, 1998). In this article, the farm management context and farm task map and management skills are defined. The task map model is compared to Finnish and Lithuania higher education programs farm management themes.

The farm management context is based on literature in previous farm risk management and farm management studies in MTT Agrifood Finland and Natural Resources Institute Finland (Luke) during the years 2006–2016 (Leppälä, 2016: Leppälä et al., 2013; Kinnunen et al., 2010; Leppälä et al., 2008a; Leppälä et al., 2008b; Mattila et al., 2007). In Kasvupolku project conducted during years 2021–2023 the farm educational programs were determined and categorized by their farm management themes collected from five applied university in Finland. The applied universities were HAMK, Savonia Jamk, OAMK and SeAMK, which are providing college or bachelor level agricultural education. Students get an agrologist degree, which gives agricultural vocational qualification. The information was collected from the named institute websites.

There are many types to categorize farm manager tasks. A model presented in Figure 1 is dividing farmer tasks to management and goal setting, farm business economy tasks, production and product quality management tasks, occupational health and safety on farms, farm resources and estates, environment management and knowledge management and data handling (Leppälä et al., 2012; Leppälä et al., 2011; Leppälä et al., 2008a).

Figure 1. The original farm management task model (Leppälä et al., 2012; Leppälä et al., 2011; Leppälä et al., 2008a)

The farm management tasks were modified in this study so, that the overall management goal setting tasks and business economy tasks are compounded as overall business management tasks. Furthermore, production and product quality management tasks were compounded as production and product management tasks. Maintaining farm resources and estates are basically tasks like taking care of the farm assets and infrastructure. Farm safety management includes both occupational health and safety and farm family safety management tasks. Knowledge management and data handling

tasks are included also with communicational tasks. After categorizing the farm management themes in higher education, the table content was compared to the farm task map content. The task map model was compared and tested both in Finland and Lithuanian agriculture educational programs.

RESEARCH RESULTS AND DISCUSSION

Finnish national agency for education has defined agriculture educational objectives in farming occupation In Finland. Working in the agricultural sector requires responsibility for one's own activities, animals, environment and nature. Success in the field requires knowledge of the biological basis of production and production technology, business skills and environmental responsibility. In the future, the challenges of a competitive industry will be consumer valuations and their reflection in the business structure of the industry, the supply of skilled labour and the utilization of new technology. Succeeding in the agricultural sector requires the ability to follow the development and market prospects of one's field, as well as the ability to assess their impact on one's own operations. The high-quality care of the rural environment and animals give the industry an image that consumers also feel positive. Basic skills for farmers includes learning and problem solving, interaction and cooperation, farming occupation ethics, health safety and functionality, initiative and entrepreneurship, sustainable development, aesthetics, communication and media skills, mathematics and natural sciences, technology and IT skills, active citizenship and working with people from different cultures.

The agricultural occupational programs in the five applied universities in Finland provide broad range of skills for the future farmers (Table 1). In this sense, the provided education in Finland is in line with the farming occupational needs defined by the national agency for education. Other education themes were using of agriculture research knowledge, technology, and new innovations in farm management. New technology includes the use of digital technology and automation in farming processes.

Table 1. Farm management educational themes in agricultural occupational programs in Finnish applied universities

Farm asset and farm infrastructure management	**Farm production and product management**	**Farm safety management**	**Farm environmental management**	**Farm business management**	**Knowledge management, data handling and communication**
-Farm development - Maintenance of buildings, construction -Water system, drainage -Roads and farmyard environment planning - Logistics -Energy infrastructure - Animal shelter functional design -New technologies, smart technology infrastructure	- Growth conditions of fields and forests -Livestock production -Plant production, crop planning -Production technology -Specified farm production methods (crop, dairy, meat etc.) -Time management, scheduling -Forestry management -Organic farming -Animal feed production -Animal welfare -Process planning -Agricultural supplies	-Worker and work management - Occupational safety in farming (included usually in production courses) - Farm labor safety	-Farm environment management, environmental farming methods - Responsibility in agriculture -Organic production - Energy solutions -Environmental use controls -Chemistry in food chain	-Farm business development, investment planning -Sales and marketing -Farm strategic management -Farm succession management - Enterprise business management, budgeting, starting enterprise - Bookkeeping - Agriculture tax system, legislation .-Business software use -Productization -Entrepreneurial skills - Agricultural production economics	- Own career development, career planning - Learning skills - International and domestic rural networking - Social status of agriculture, agricultural policy - Communication, media and social media skills, cooperation - Using of agriculture research knowledge, technology, and new innovations - Digital device skills, use of information systems, cyber security - Organizing events

The table 1 shows that in Finland the farm production, business management and knowledge management and communication tasks are stressed. Environmental subjects are increased in agriculture education last years, because of the raised awareness about climate change effects. Health and safety and asset management have smaller number of subjects in bachelor level education in Finland, but that may differ based on the students' own choices and focusing on specific studies. However, it is fair to say, that farm production, business management and communicational and data handling subjects have been stressed based on the course supply in agriculture bachelor level education currently in Finland.

In farm education programs the asset and infrastructure management skills are mainly included in farm overall development, building maintenance needs, taking care on water systems and farm road logistics and on the farmyard and farm operative environment. The use of new energy and smart technology infrastructure has also increased. The resource

management of the farm's operating environment are closely related to the management of the production environment, even though they have some differences, which need different expertise in farm production tasks.

Production and product management skills include knowledge management on field and forest plant biology, animal husbandry, plant production, production methods, use of agricultural machinery and other technology, time management, animal feed production, and specific production courses in different production lines such as milk production, meat production, forestry, organic production, and horse husbandry. In addition, production data management also includes learning information management skills. The use of driven agricultural vehicles is closely related to arable crop production. Arable farming also requires expertise in soil science, plant biology and plant physiology. In animal production, animal nutrition, animal physiology and behaviour, animal production technology and methods, and animal welfare and health are the key role players in animal production skills.

There are not many courses on the management of safety and health on farms and agriculture in general in higher education agriculture programs in this field. Savonia carried out a farm safety management program for farm entrepreneurs in 2018–2021. Work management includes basically competence in orientation and employee supervision skills. Farm employees as well as family members should be oriented on occupational safety issues if they participate to farm work. However, in agriculture higher education programs the occupational health and safety issues are taught in connection with the teaching of production tasks. However, occupational safety education objectives are not often mentioned accurately in course programs. When it comes to occupational safety, the most important competence is to understand health and safety concepts, employer and employee responsibilities, risks and risk management. The objectives and implementation of factors related to health and safety culture are easily inadequate on the farm if the farm manager does not have sufficient knowledge and competence about these factors (Leppälä et al., 2021; Coman et al., 2020).

The demand for environmental management in agriculture has increased over the past 20 years. This has also raised the supply of agri-environmental training. The agriculture education programs in Finland include training in environmental management methods, environmentally and customer-responsible production, organic production, and the use of renewable forms of energy. In environmental management, as in safety management, an essential competence is to understand the concepts, legislation and risks related to environmental issues. The assumption is also that the implementation of environmental management on the farm is equally influenced by the attitudes, values, and knowledge of the farm manager (Mills et al. 2017).

The business management education content includes subjects in farm business development, investment planning, sales and marketing, strategic management, farm succession management, business management, budgeting, accounting, starting a farm business, taxation, and legislation. Financial competence in farm business management is largely related to planning and information management. In investment planning, various key figures of corporate finances and farm economics are used on profitability and annual income and expenses to assist financial management. Marketing and sales skills are related to the communication channels and communication of one's own products to different target groups as well as market monitoring and productization. Goal setting and strategic management are related to decision-making on what products or services the farm produces for the market and how to achieve the set goals. If farm goals are not set correctly or are not set at all, there is a risk that the farm operations are not in balance with what farm manager wants. Legislation, stakeholder contractual arrangements and farm support schemes provide the framework conditions for farm business.

Information and data management as well as communication skills also play a key role in agricultural education in Finland. Information management involves acknowledging one's own competence and development, but also managing farm data. It is essential to be aware of what kind of information and data is important for the company. The identification of the farm manager's own development, learning skills or raising awareness of farm development needs has been considered in agricultural education in Finland. The use of international and national networks requires social communication and interaction skills as well as language skills. In addition, education in media and social media communication skills has become common in Finland also in the agricultural sector. The social status and prestige of agriculture is partly linked to the image and attractiveness of the sector and to the management of its continuity in society. Knowledge of agricultural policy helps in interpreting agricultural legislation and monitoring new laws, as well as following and using the latest research in the field to develop farm objectives and activities. Communication and contract skills play a key role in cooperation skills, but also which areas of cooperation affect financial indicators. Learning new innovations and technologies requires constant interest and familiarity with new products, opportunities, inputs, and digital technologies. For example, the use of automation in agriculture and the use of agricultural machinery has increased in recent years.

Farm task mapping on the content of farm education programs in Finland

Higher education in agriculture provides a wide range of skills for farm management in Finland. The themes included in agricultural education can be added to the previously presented field of work of a farm manager, which provides a more accurate and systematic picture map of the tasks and competence needs of a farm manager (Figure 2). In this farm task map model, at first the farm manager task is to set or define the current goals for key activities, such as production quality requirements, profitability, time management, occupational safety, health goals or environmental goals. Then general task is to look the current set of products and services, which bring the incomes on the farm. Next is to consider the objectives in relation to the abilities and qualities of the farm manager himself and others working on the

farm. After this ´the other resources on the farm are considered. If there are imbalances in the farm's workforce, production, and other resources, it is necessary either to change the objectives, production, or to bring in changes in resources.

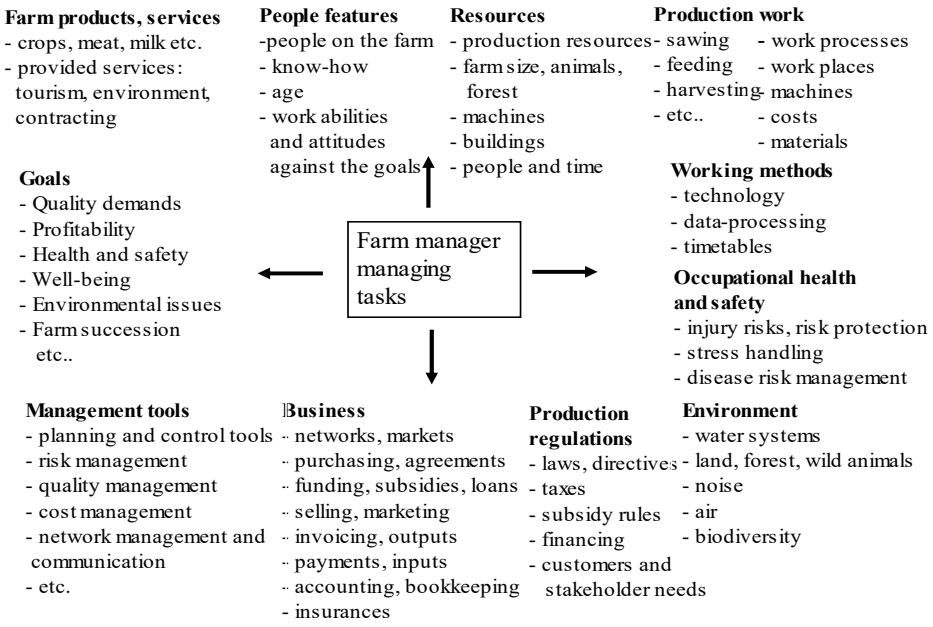

Figure 2. The farm task map by the content of agriculture education in Finland

Work processes and methods, work safety and environmental management are important tasks, as they affect work organization and resourcing on a farm. After this the farm task mapping procedure examines the framework conditions for operations produced by legislation, support schemes and stakeholders in the management of the farm and in relation to the objectives. Do these factors include various limiting factors for farm goals or resource management? Business management always ensures that production or services should meet the customer requirements and the main stakeholder expectations. In connection with these, figures and production volume monitoring data is important also for farms. The indicators of the profitability and finances of the farm goals are reviewed at this stage at the latest, when the farm's labor capacity, resources, production or service forms and the framework conditions from legislation, main customers and stakeholders are identified. The final task is to check the management of the farm in general, how the farm the is managed. Is farm management systematic in some way and what tools does the farmer use to help with management in planning and monitoring? Are operational opportunities and risks, production quality or the ratio between income and costs monitored with certain proven indicators? Is there any plan, who do what on the farm?

Comparing the farm task map on the content of agriculture higher education program in Lithuania

In Lithuania agriculture higher education university study programs are provided in Agriculture Academy of Vytautas Magnus University (VMU). VMU has 5 different educational programs closely linked to agriculture. The programs in VMU are Agronomy, Bioeconomy Business Management, Sustainable Engineering, Agricultural Mechanical Engineering and Food Quality and Safety. The study subjects related to farm management are categorized into same categories as in Finnish studies in the table 2. The main subjects in VMU are in farm business education and production education like in Finland. In Lithuania human safety or safety have presented as a study subject and environmental education are provided in renewable resources and circular economy processes, agriculture ecological aspects, environmental protection and biowaste handling methods.

However, worker management, own learning skills, farm career development and the asset and infrastructure subjects are not much provided in higher education in Lithuania. Some of these skills such as own learning skills, teamwork skills or social skills are typically by some part included into various study subjects as learning outcomes. Knowledge management, communication and data handling are concentrating on robotics and automation. There was not much emphasis also on communication, media skills and networking like in Finland. Strategic management is supposed to be present in business planning subjects. However, despite there are some small differences between Finland and Lithuania higher agriculture education emphasis, there aren't functional questions, why task mapping procedure cannot be used with Lithuanian farmers or agriculture education. In the future, it would be useful to test the farm task map method in different farm types and agriculture settings and provide the tools in Agrihubi knowledge hub for farmers and farm education (Agrihubi 2023).

Table 2. Farm management higher educational themes in agricultural occupational program in Lithuania VMU.

Farm asset and farm infrastructure management	Farm production and product management	Farm safety and worker management	Farm environmental management	Farm business management	Knowledge management, data handling and communication
- Storage engineering	- Quality control of vegetative products - Process management - Logistics management - Quality management - Agronomy - Sustainable animal husbandry - Quality control - Animal husbandry technology engineering - Soil tillage and harvesting technologies - Engineering economics - Storage of food raw products - Agriculture systems - Food safety and quality control systems - Agricultural products' processing	- Agricultural Engineering and Safety - Management of Human resources - Enterprise social responsibility - Human safety	-Renewable resources - Biowaste utilization engineering - Circular economy - Agronomy and ecology - General ecology and environmental protection	-Management of agricultural business projects -Agricultural economics and management -Basics of business and public management - Basics of finance management - Customer behavior - Project management - Bio-businesses planning and modelling - Innovation management - Business planning and assessment	- Robotics, robots and drones in agriculture - Data science - Smart precision farming machinery

CONCLUSIONS

It has been shown that farm management requires diverse skills. If there are too many tasks on the farm that only one person can do, it is no wonder that stress and coping problems also accumulate for that one person. In principle, the farm task map can be used to examine who can do what on the farm, define the categories of work tasks on a farm and determine which areas of management require more skills, learning and education on the farm. It is essential to structure the tasks of farm management into a functional entity that is suitable for each farm. There is no single right way for each farm to organize the farm tasks, but by the farm task map, it brings in a more systematic tool for farm competence management or farm management competence on the career growth path of a young farm entrepreneurs. In the future there will be more and more increasing organizational management needs on farms. These are for example seen worker management, contracting, communication management, information management and strategic management skill needs in agriculture soon. The farm management higher education programs in Finland and Lithuania had many same kinds of basic emphasis in farm production, business management and environmental issues. However, farm health and safety was more present in Lithuania education than in Finland, but Finland had more emphasis on communication, media work, worker management and learning skill development.

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