AWARENESS OF THE RESEARCH MATERIALS OF SOIL AND CROP ALTERNATION IN FARMS

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Abstract
Soil maps for fields are one of the basic materials for farm development planning and assessment of the land's cadastre value. In order to find out the level of land users' awareness of soil forms and the agrochemical composition of the soil, and the implementation of this in farming practices, a survey of land users was carried out. Simultaneously, information was gathered on crop alternation in farms, crop alternation projects, their prevalence, and interest in such projects. Information on field history was also gathered.
Vircava rural district and its farm land users were chosen as the subject of this research.
Key words: soil evaluation, agrochemical cartogram, plant exchange

Introduction

After 1990 major changes in the Latvian countryside began, with the structure of land users changing rapidly as smaller individual farms were established in place of big collective farms. These changes occurred due to several factors. Some existing owners and some people who acquired land back after the collapse of the Soviet Union, sold sold their properties or rented them out.
Great changes in Latvian farming started after the country joined the European Union (EU) in 2004. These changes brought not only generous subsidies but also a requirement to follow certain EU regulations regarding the movement of goods, animal welfare etc. Planning of farm development plays a big role in today's competitive environment. It has always been the case that a farm can be competitive only if it has stable production, small expenses, longterm contractual relationships for the sale of the produce, and if the management is proficient in taking risks, planning and decision-making.
In recent years farmers acquire new technologies for intensive production of various agricultural products. Support from the government as well as the EU plays significant role.
In order to operate one's farm efficiently and effectively, the entrepreneur should have an understanding of economic relationships in developing the work and budget of the farm. Information about the land (soil), the main capital for agricultural production, is of high importance, and it can be obtained from land research materials – soil evaluation maps and land and agrochemical composition.
Farm soil maps and land evaluation materials are among the basic materials for developing a farm development plan and evaluating the cadastral value of the land used in tax calculations. Soil type and the mechanical composition influence crop choice. Boruks A., K. Brīvkalns, Stalbovs R. and others (Boruks, Brīvkalns) have paid much attention to studies of land-quality and the role of these studies in agriculture.
In Latvia, soil quality studies have not been carried out since the regaining of the country's independence. The soil maps that are used today contain information that is 20 years old. In addition, currently used soil classification differs significantly from the international classification of soils, including the one developed by the Food and Agriculture Organisation (FAO).
Soil mapping materials can also be used in agrochemical research – mapping of the soil. The agrochemical laboratory of the National Plant Protection Service carries out agrochemical mapping of a farm's soil on demand.
The agrochemical laboratory carries out the agrochemical examination of soil on a yearly basis. The work consists of several stages; first, the sampling plan is developed by means of land boundary plans and soil maps submitted by the farmers. Then soil samples are taken from the farms' land and a form with the characteristics of the sampling sites is filled out. Subsequently, the soil samples are analysed in the laboratory where soil reaction, organic matter, the content of phosphorus, potassium, and magnesium which can be utilised by plants, are determined for each sample. The results of the analysis are then entered in to a database of the agrochemical examination of soil, where the results are examined to determine the provision of nutrients (low, medium, high), and necessity to lime the soil. The final stage is the preparation of the agrochemical soil map. As a result, the customers receive a digital agrochemical map of the soil, which is prepared in a geographic information system environment.

The results of the agrochemical examination of the soil give the possibility to decide on the need for soil liming, optimise crop placement, plan the possible harvest, calculate the efficient amounts of fertilisers for each field, and develop farm production plans.
A farm production plan is desirable to all farms using fertiliser for crops, but it is obligatory for farms located in vulnerable areas according to agrochemical soil mapping data.
Highly vulnerable areas according to Cabinet of Ministers regulations No.531 'Regulations Regarding Protection of Water and Soil from Pollution with Nitrates Caused by Agricultural Sources' of 18 December 2001, are areas where increased requirements for the protection of water and soil from pollution with nitrates caused by agricultural sources apply. The Cabinet of Ministers regulations prescribe the borders of highly vulnerable territories, as well as criteria for the designation of territories and procedures for managing such territories.
In order to facilitate the protection of water and soil from pollution by nitrates, recommendations have been approved which include the code of good agricultural practice for persons involved in agricultural activity
Ministry of Agriculture's order No.20 of 2005 'On the Implementation of Measures in Highly Vulnerable Areas', states that farms where the crop-field area exceeds 10ha shall have a crop alternation plan.
The task of crop alternation is to use each section of land efficiently by growing crops which correspond to the ecological terms of the territory and soil conditions; to get higher crop yields through use of previous years' crops' effects and compatibility between crops; to reduce the amount of fertilisers and plant protection products used; to ensure better use of the natural fertility of the soil and to reduce loss of plant nutrients; to reduce the negative impact of farming on the environment (Ruža, Labas prakses).
According to State Statistical Bureau data, from 1929-1930 57% of all farms had fixed crop rotation, with 60% of farms in Zemgale alone implementing crop rotation (Latvijas zeme, zemnieki, 1940).
Cabinet of Ministers regulations No.531 have been amended (in 2004, 2005, 2007, 2008 and 2009) and currently the Cabinet of Ministers regulations No. 33 of 2011 'Regulations Regarding Protection of Water and Soil from Pollution with Nitrates Caused by Agricultural Sources' requires the operators of agricultural land of 20 ha and more, as well as farmers that grow vegetables, fruit trees or berry bushes within an area of three hectares and more, to produce a plan of crop fertilising, to document the history of each field and the fertilisers used.
The fertilisation plan for each crop field should be developed, at the latest, before crop sowing or planting, and plans for perennial crops and plantations, before the beginning of vegetation. The crop fertilisation plan should be based on data from an agrochemical examination of the soil (mapping), which is not older than five years, and the files of the agrochemical soil mapping are to be kept for at least five years. Fertilisation plans should be developed for one year, based on data from an agrochemical examination of the soil that is not older than 6 years; the summary of the crop fertilisation plan is to be submitted to the State Plant Protection Service before 15th of May. If any of the indicators used in the crop fertilisation plan (e.g., size of the field, crop, type and amount of fertiliser) have been significantly changed, the updated plan is to be submitted by June 15.
The regulations of the Cabinet of Ministers also envisage documenting all fertilisers purchased for the farm, including the name of the fertilisers, ingredients and quantity; it also envisages the history of each field to be documented.
The history of fields has to reflect the crops grown, the varieties, the yields reached, and fertilisers received.
The aim of this study is to discover land users' awareness about, and application in farms of:

- soil quality and agrochemical mapping;
- crop alternation projects and the desire to obtain them;
- field history in farms.

Results and discussion.

The change of land owners and users in Latvia is continuous; the land property market is active and it is governed by the laws and regulations of the country. The results of these activities are reflected in the State Land Service database of property owners and indicators characteristic to each estate.

However, the database lacks data on acreage of each piece of farming land due to a lack of uniform minimum requirements regarding registration of the leased land into a single system.
The database of the Central Statistical Bureau of Latvia holds data on the division of farms by area intervals according to their number and size (Saimniecības grupējums). The data of the Statistical Bureau show that the biggest number of farms are in the group that manages agricultural area from 1 to 20 hectares, i.e. 76.4% , but the most commonly used area for farming is in the range from 5 to 20 hectares - 26.9% (Table 1).

Table 1

Division of Latvian farms by acreage in the country

Intervals	Number of farms		Area	
	Number	%	thousands.ha	%
≤ 0,9	10607	9,5	4,5	0,3
1,0-4,9	37622	33,8	104,4	5,9
5,0-19,9	47470	42,6	477,7	26,9
20,0-49,9	10753	9,6	319,3	18,0
50,0-99,9	2870	2,6	196,7	11,1
100,0-199,9	1260	1,1	174,9	9,8
200,0-499,9	662	0,6	201,1	11,3
< 500	288	0,3	297,2	16,7
Total	111532	100	1775,8	100

Source-CSB

In 2010 Land Survey students carried out surveys and questionnaires of Vircava Parish farms.
130 respondents from the parish territory participated in the survey. The acreage of the land operated by the respondents is from a few hundred square meters to large farms. The farm land is operated by the owners of the land, as well as leased to others. The leaseholders of the land are not only farmers from the respective parish, but also from other parishes. For example – Lielvircava Ltd in the district of Platone manages an area of 600 ha. The farm has heavy-duty machinery as it has to sow and harvest up to 3,000 ha in a short term. The yield of winter wheat is 7.5 tonnes, and 4.5 tonnes of rapeseed per hectare. The farm has a grain pretreatment plant, storage for 11000 tonnes of grain, and a herd of 300 dairy cows. Fito-AL Ltd, from the district of Jaunsvirlauka, has a farm with an area of 2000 hectares, but in Vircava parish they operate 87 ha The farm specialises in cereal grains and winter rapeseed. The farm produces high crop yields: winter wheat 9 t / ha; winter barley 9 t / ha, with yields in individual fields as high as 10-13 t / ha; winter rape seed 4.9 t / ha.
A breakdown of the surveyed farms in the parish by acreage is close to the distribution of farms in the whole country (Figure 1). It can therefore be expected that the study gives a comprehensive picture of the situation in the country.

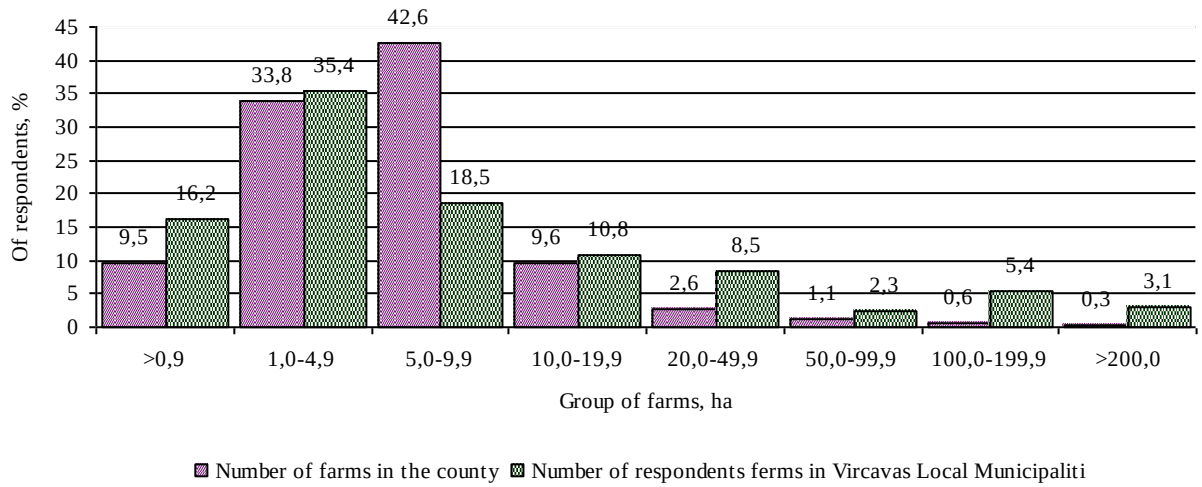

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Figure 1. Division of farms according to acreage in Latvia and respondents' farms in Vircava parish, %

The questionnaires included the following questions: does the respondent have information on soil mapping materials and are these used when planning the work of the farm?
Maps of soil types, mechanical composition, and agrochemical cartograms were distributed.
Of the 130 respondents' farms with an area up to 4.9 ha, only some had information on the soil materials and the production of agricultural produce, the study included analysis of 63 farms with an area of more than 5 ha.
The largest number of respondents' farms had an area up to 50 ha, but only 14 respondents - more than 50 ha (Table 2).

Table 2

Area of the holding group intervals, ha

Intervals	Grouped intervals of farm acreage, ha					
	5,0-9,9	10,0-19,9	20,0-49,9	50,0-99,9	100,0-199,9	>200,0
Number	24	14	11	3	7	4
Percentage	38	22	17	5	11	6

Author drawn

Survey results show that awareness of soil materials and their use in planning farm activities increases as the acreage of the farm increases. In average, only a quarter of the farms with an area up to 50 ha have information on soil mapping materials, while in larger farms the awareness is higher and reaches 75% of the number of farms (Figure 2).

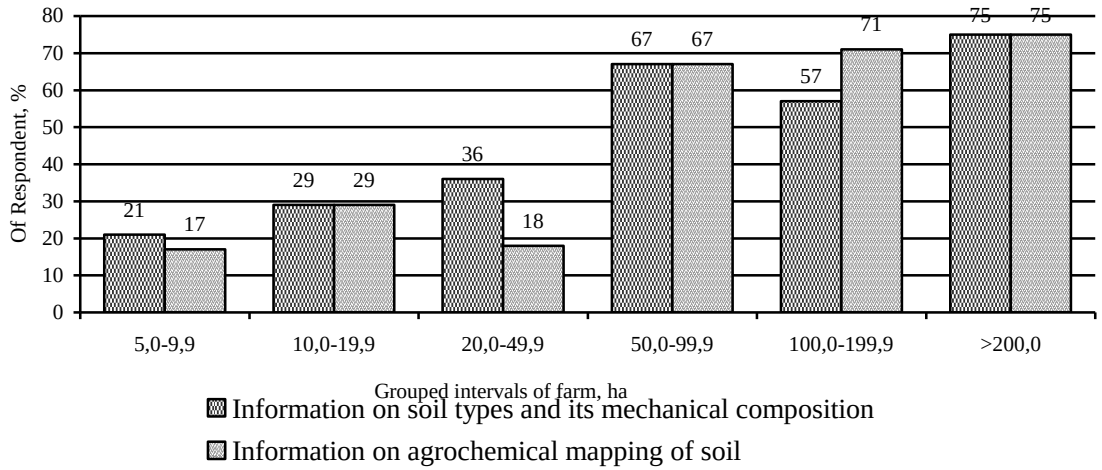

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Figure 2. Respondents' provision of information about the soil.

A farm's agrochemical materials (soil acidity, nitrogen, phosphorus, potassium, and amount of trace elements) are used primarily in developing a production plan - forecasting crop yield and fertilisers to be used. With the help of the Latvian Rural Consulting and Education Centre farms can develop computerised fertilisation plans. In the development of the fertilisation plan it is possible to choose different combinations of fertilisers. When developing a fertilisation plan the current amount of nutrients (agrochemical mapping) as well as crop yield should be taken into account in order to balance (compensate) the need for nutrients.
The survey included questions about the use of agrochemical materials while planning crop alternation, crop fertilisation and soil liming.
According to answers supplied by respondents, farms with an area up to 20 ha rarely use agrochemical materials in their business planning, while the largest farms use materials of agrochemical studies (Figure 3).

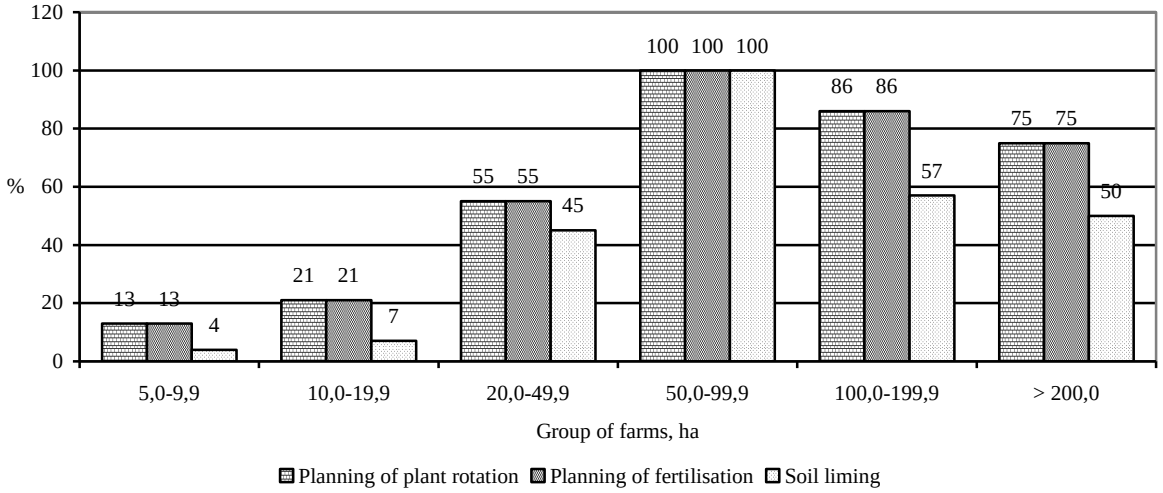

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Figure 3. Use of agrochemical materials in the groups of farms surveyed (% of the number in the group).

Respondents views on the use of agrochemical materials show that large farms pay attention to crop alternation (Figure 4). Large farms have difficulties with crop structure as currently farms in the Zemgale region mainly specialise in cereal grains and rapeseed. According to data from the Central Statistical Bureau these occupy 85% of Zemgale. The Ministry of Agriculture recommends growing 65-75% cereal grain and 25% rapeseed. The large proportion taken up by cereal grain in Zemgale makes it difficult to use the traditional crop rotation scheme. There is no economic justification for planting legumes and grasses in producing areas. The rotation of crops should be planned in the light of the economic situation; a solution might be, for example, to use intercropping and to strictly follow the crop fertilisation plans.

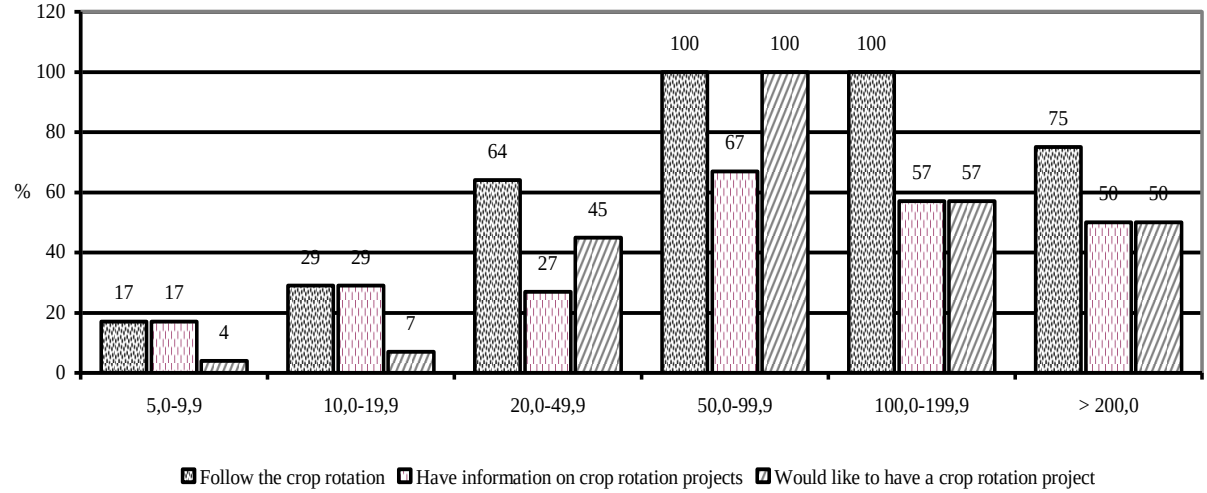

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Figure 4. Observation of crop rotation in groups of farms (% of the number in the group).

Respondents' information on alternation of crops and observation of alternation within the farm.
The survey included a question – does the farm maintain the history of each field?
Laws and regulations provide that farms which are located in the vulnerable zones have to keep records of the crops grown during the previous two years as well as records of varieties, yields, fertilisers. These documents are to be kept for at least three years.

Vircava parish is located in a highly vulnerable area and, in accordance with the provisions, all of those who operate more than 20 ha should maintain field histories. However, this question had an insignificant number of responses. The author believes that the respondents have not understood the question.

Each farm should keep records of field history, as it could serve as a diary of farm work. The field history records should reflect: information on the field (field number, field unit designation, acreage, agrochemical data); field processing (type, time); fertilisers and chemicals used (type, quantity, time); and information on harvest (harvest time, yield).

The field history can be used to plan the next year's crop sowing, to compile an application for the Rural Support Service to receive area payments, to compile reports on fertilisers and chemicals used, as well as when calculating the balance sheet.

Conclusions

1. The available materials for soil and land evaluation are more than 20 years of age. It is necessary to restore soil and land evaluation materials in Latvia to comply with EU regulations.
2. Farms do not have sufficient information on soil mapping materials.
3. The largest farms use soil research materials and are able to achieve excellent yields and are interested in crop rotation projects.
4. It is necessary to continue educating medium-sized farms about the role of a crop fertilisation plan, crop rotation, and field history in efficient and effective management.
5. The study conducted is to be considered as a beginning for future research on the views of the farm owners and the economic opportunities in rural areas.

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Краткое содержание:

МОДРИС МЕНГОТ АНАЛИЗ ИСПОЛЬЗОВАНИЯ МАТЕРИАЛОВ ПОЧВЕННОГО ОБСЛЕДОВАНИЯ И АГРОХИМИЧЕСКОГО КАРТИРОВАНИЯ

Почвенные карты полей является одним из основных документов для планирования развития хозяйств и определении кадастровой стоимости.

Проведен опрос землепользователей, чтобы определить их информированность о видах почв, их агрохимического состава и применении в хозяйствовании. Одновременно получена информация о чередовании сельскохозяйственных культур в хозяйстве и существования проектов чередования культур и желании их составить. Установлено информация о истории полей в хозяйстве.

Обектом исследования выбран Вирцавская волость.

Ключевые слова: *почвенная карта, агрохимическая карта, чередования культур*

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