

## MARKET ANALYSIS OF SELECTED AGRICULTURE COMMODITIES CULTIVATED ON AGRICULTURAL LAND IN SLOVAKIA REGIONS FROM THE PERSPECTIVE OF SUSTAINABLE DEVELOPMENT

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### *Abstract*

*The Slovak Republic is divided into 8 regions according to NUTS 3. From the total area of Slovakia, the agricultural land occupies 49.16% of the territory, which is 2401293 ha. The most productive land suitable for growing selected agricultural commodities is located in the regions of Western Slovakia. In terms of agricultural land it is undoubtedly extremely important to understanding the potential of economic profitability of the production units by growing different crops. The basic methods for the analysis of the market in selected agricultural commodities were mainly the situation and outlook reports from National Agricultural and Food Centre Branch: Research Institute of Agriculture and Food Economics and materials from Soil Science and Conservation Research Institute, Slovak republic. The paper evaluates the use of land with regard to crop production, particularly of selected commodities - grains and oilseeds during the period 2001 to 2016 and a market analysis of these commodities in Slovakia. The crop production is essential for the sustainable development of the country and its regions while meeting the needs of the population and stabilizing of the living conditions. The volume of the total grains and oilseeds supply in Slovakia sufficiently covers domestic consumption and part of the production can also be exported outside Slovakia because it does not foresee significant changes in the development of the different directions of grain utilization in domestic agri-food market. On the basis of the analysis, it is possible to note the lagging of agricultural production in Slovakia by half to the average of the EU countries.*

**Key words:** crop production, grains, oilseeds, sustainable development, Slovak regions

### INTRODUCTION

Europe is one of the most intensive continents in the world with the highest share of land used by the population, production systems (including agriculture and forestry) and infrastructure. Soil is a limited resource. Land use is one of the main reasons for changing the environment, which has a significant impact on the quality of life and ecosystems, as well as on infrastructure management. Most often the land is related to economic values and generally includes the production function or the socio-economic functions of the soil (source of raw materials, space for human economic activity and housing construction), which simultaneously reduce the value of options and alternatives. Activities in the agricultural sector are primarily based on the exploitation of the production function of agricultural land. The dependence of financial returns on agriculture (especially crop

production) on the land of productivity is statistically highly convincing. In recent years, there are changes in land use and agricultural landscape. Land use according to [4] means linking human activities to land cover. And changes in land use and land cover are largely related to changes in the exploitation of land. The growing demand on land resources has resulted in environmental stress and intensification on land use, which is successful in increasing food production and is detrimental to the environment. Land use and its environmental impact are mentioned by authors like [5] and [3]. Slovakia is considered as agricultural country. Agricultural land in Slovakia covers almost 50% of the entire area. The largest share is arable land, about 60% of the total area of agricultural land. Agricultural land is part of the land fund. It consists of different types of land which are used for agricultural production and crop production. By means of the application the land is divided

into arable land, vineyards, orchards, lands temporary overgrown with grass or used for growing perennial fodder crops and fallow land. According to [8] functioning land tenure systems are crucial for efficient agricultural production and more diversified land use in regions. Focusing on economic efficiency should not, however, obscure the crucial role of land tenure and land policy for equity and social balance as well as environmentally sound development. Authors [6] and [7] evaluate the economic aspect of the agricultural land market. They focus on the regions of Slovakia, specifically the Nitra region. In the paper we will focus mainly on crop production, since in slovak agriculture has important role wheat, barley, corn, potatoes and oilseed production. Quality production in agriculture is in the interest of every country and therefore should be paid enough attention to food preparation and processing in terms of their importance to society. One of the basic indicators of success is also an indicator of profitability and crop production. The company's ability to make a profit and recover the capital invested in production can be defined as profitability and at the same time states that the profitability on agriculture has several distinguishing features. Particular account must be taken to the intensity of land as a production factor. A special feature of agricultural production is the amount of profit that we must also consider at the acreage unit. Primary production in agriculture inherently is depending on the land. Land is the basis for growing plants. It's most important and most significant feature is its production capacity, thus fertility. Proper use and management of land fertility is increasing. It provides nutrition of the population and is also a source of nutrition in the livestock sector. Crop production is the interest of many authors that specified it in their works [10] [2] and [1].

## **MATERIALS AND METHODS**

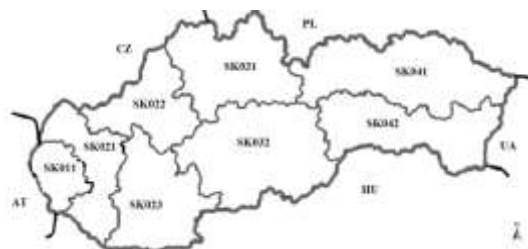
The paper has been processed on the basis of data from the situation and outlook reports, which are compiled on selected commodities, crop and livestock production in collaboration

with the Department of Trade and Promotion of Ministry of Agriculture and Rural Development of the Slovak Republic. Contains analysis of the development of outlook reports for evaluated commodity in economic and calendar years, information on regulatory and market support policy in Slovakia and the EU, pricing information and information on commodity markets in the EU and worldwide. Reports prepared research team of the department of agrarian market and are continuously provided to members of the expert committees, government bodies and their organizational units and relevant professional bodies. Reports are baseline source in the processing of various policy documents, analyses, comparative studies, theses and dissertations and market information for the wider public. Situation and outlook reports are issued exclusively in the online version on the website National Agricultural and Food Centre Branch: Research Institute of Agriculture and Food Economics. Frequency of each output is one or two times a year. Specifically, for grains it is twice a year, for oilseeds once a year. As with grains it is twice a year, the second report follows the report, which is published in June. For grains is given analysis of the market for grains (wheat, barley, rye, oats, maize and other grains) in Slovakia in the marketing year 2001/2002 to 2015/16. The marketing year for grains starts on 1st of July each year and ends 30th of June of the following year. The presented situation and outlook report for oilseeds assess the situation on the oilseeds market in the marketing year 2001/2002 to 2015/16 based on available data. The marketing year for oilseeds begins on 1st of July of the preceding year until 30th of June of the year.

Analysis of the soil in Slovak regions was calculated according the Information system of National Agriculture and Food Centre (Slovak republic) and Soil Portal. The yield of agriculture commodities were evaluated according the database STATdat.

Slovakia Regions were evaluated on the basis of the statistical territorial division – NUTS 3 (Nomenclature of Territorial Units for

Statistics). These administrative units represent a geographical area with an administrative authority that is empowered to take administrative or strategic decisions in accordance with the legal and institutional framework of the Member State of the EU. NUTS 3 are territorial units characterized as small regions for specific diagnoses. Slovakia is divided into 8 regions (Figure 1).



Legend: SK011 – Bratislava Region, SK021 – Trnava Region, SK022 – Trenčín Region, SK023 – Nitra Region, SK031 – Žilina Region, SK032 – Banská Bystrica Region, SK041 – Prešov Region, SK042 – Košice Region, AT – Austria, HU – Hungary, UA – Ukraine, PL – Poland, CZ – Czech

Fig. 1. Spatial definition of Slovak regions according to NUTS3

## RESULTS AND DISCUSSIONS

Knowing the potential opportunities of economic profitability of production units according to the cultivation of various crops is essential. The basis for determining the economic profitability of crops is a database of potential economic parameters valuated soil-ecological units developed on the basis of correlation dependence between soil production potential and real economic indicators in more than 250 farms.

The Figure 1 shows rate of crop production in Slovakia.

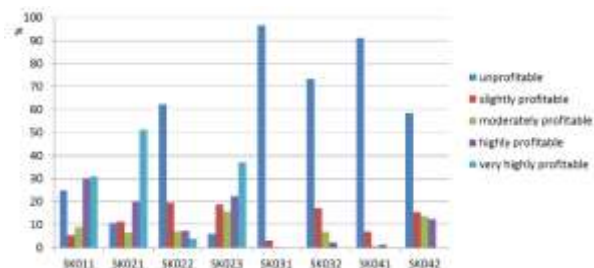


Fig. 2. Representation of soil categories according to potential rate of crop production in Slovakia regions [% of agricultural land]

Source: podnikmapy.sk, own processing

The Figure 2 shows representation of soil categories according to potential rate of crop production in Slovakia regions expressed in percentages of agricultural land. From Figure is clear that a large part of Slovakia regions is unprofitable and the highest rate of crop production can be found in western Slovakia regions (SK011, SK021 and SK023).

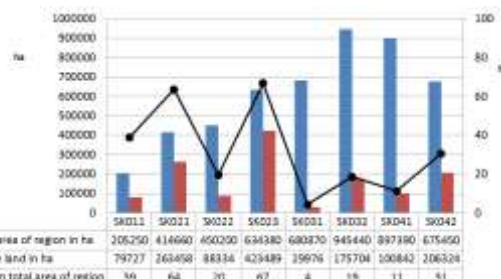


Fig. 3. Area of arable land suitable for growing selected commodities from the total area of Slovakia regions

Source: own processing

The possibilities of growing grains and oilseeds on arable land are markedly differentiated in individual regions of Slovakia (Figure 3). As mentioned above, the most suitable conditions are located in the regions of western Slovakia. The largest areas can be identified in the SK021 regions (64% of the area) and SK023 (67% of the area). The least suitable for cultivation are SK031 (4%), SK032 (19%) and SK041 (11%) regions. These regions have the least favourable climatic and geomorphological conditions for the cultivation of agricultural commodities.

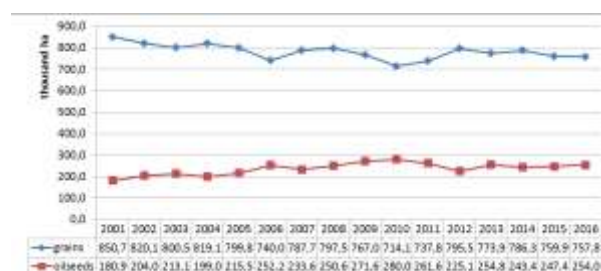


Fig. 4 Trend of grains and oilseeds areas in Slovak republic (thousands ha)

Source: Statistical Office of the Slovak republic, own calculation

The most important group of crops include grains and oilseeds. Grains are the most important crop in the entire group of plant production. Grains play crucial importance in human nutrition and livestock, provide

important raw material for the food, chemical and pharmaceutical industries, too. Range of grains related to their species diversity and broad economic recovery. Grains are represented in almost all growing areas. The grains include wheat, rye, corn, oats, sorghum and others.

The size of planed areas is an important factor in total production of monitored commodities. The figure 4 shows the trend of the area of grains and oilseeds in Slovakia. It is possible to see a decrease in the grains size (decrease by 11% compared to 2001) and an increase of oilseeds size to 40% compared to 2001.

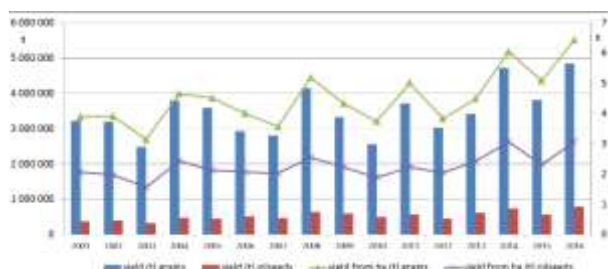


Fig. 5. The trend of yield of the grains and oilseeds in Slovakia for the years 2001 to 2016

The Figure 5 presents the evolution of grains and oilseeds productivity during the years 2001 to 2016. The trend of grains production has a volatile tendency depending on the natural conditions of the year. Nevertheless, the grains production is rising. The trend of oilseeds production on agricultural soils in the Slovakia regions has a stable increasing tendency.

Market analysis of agriculture commodities (grains and oilseeds) is expressed in the Figure 6 and 7.

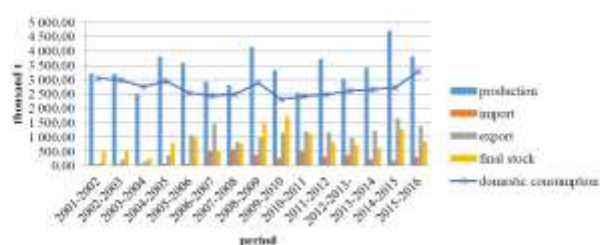


Fig. 6. Development of balance indicators of grains in total in Slovakia

Source: vuepp.sk, own processing

In the period 2003/2004 are monitored results affected by unfavourable weather conditions, mainly the lack of atmospheric precipitation

and record high temperatures. Especially during the maturation this situation adversely affected the mass volume of grain harvest in the current year. Slovakia's accession to the European Union in that marketing year was affected by foreign trade with grain, as are reflected in increased movement of grain between Slovak and other European Union countries as a result of the duty free regime.

In the marketing year 2006/07 grains in Slovakia were grown on a smaller area than in the previous cultivation period. Grain harvest was in the 2005/06 was less than in the previous marketing year. Final stocks of grains to 30 June 2006 represented a few thousand tons more than at the end of the marketing year 2004/05. In the marketing year 2006/07 grains in Slovakia were grown on a smaller area than the previous cultivation period. Grain harvest in the 2005/06 was lower than in the previous marketing year.

Area of grains in the marketing year 2007/08 compared to the previous period widened. Total grain production in the marketing year 2007/08 increased against the previous cultivation period. Harvest of grains in the marketing year 2007/08 was greater than in the previous marketing year. A final stock of grains at 30 June 2008 was lower in comparison to the stock situation at the end of the marketing year 2006/2007. The total supply of grains in marketing year 2007/08 due to lower harvest was less than the supply of the previous marketing year. Final stocks of grains at 30 June 2009 were in comparison to the stock situation at the end of the marketing year 2007/08 higher.

The marketing year 2008/09 was in terms and weather conditions favourable for grains, which led to a record production. High grains production in Slovakia in marketing year 2008/09 resulted in increasing supply of grains on the domestic market.

In the marketing year 2009/10 reached the total grain production reduction annually. The production was collected from an area of land that was smaller than the previous year. The total supply of grains produced of initial stocks, imports and production reached less than the in previous year. Reached grain

production in marketing year 2009/2010 was reduced annually.

In 2010, the yield of grains was significantly affected by unfavourable weather (floods). Grain was harvested from areas that were smaller than in the previous year. Despite the relatively high initial stocks and higher imports nearly doubled from a year earlier to our agrarian market offered for domestic consumption and export less grain than in the previous year. Total supply created in addition to the production and importation of initial stocks declined year on year, while import of grains was up.

Year 2011 in terms of reached production of grains assessed favourably. Gross domestic consumption has increased annually. The production was higher compared to 2010. Favourable weather conditions influenced the increase of harvest.

During the vegetation period in 2012 hit our area extremely drought, causing considerable damages to agricultural crops. In 2012, cereal production declined. Unfavourable weather conditions have shown the reduction of the average yield of grains. Decline in production was reflected in the total supply.

Favourable weather conditions during the vegetation period in 2013 reflected on increase of the average yield of grains. According to the Statistical Office of the Slovak Republic, grain production in 2013 increased annually and increased production was reflected in an increase in the total supply of grains.

Utilized acreage of grains in marketing year 2014/15 increase annually and the share of grains in total area of arable land in Slovakia have increased as well. In terms of achieving yields and production is year 2014 assessed very positively and in 2014 grains production reached a maximum since 2000.

Based on the development of the grains consumption especially in domestic consumption, in the marketing year 2015/16 was estimated annual decline in self-sufficiency of Slovakia in grains. In the 2015/16 marketing year, the area of the grains decreased. The intensity of crop production on several crops was negatively affected by the dry spring and above average hot summer.

Oilseeds are crops that provide vegetable fats and oils, which can be industrially obtain. In addition to oil from the seeds can also obtain moldings with high protein content, which is a valuable livestock feed. Vegetable oils are used to produce cooking oil, margarine and candles, cosmetics, glycerine, plastics, biodiesel and so on. The most important oil crops are: soybean, rapeseed, sunflower, flax, sesame and others. The year 2011 was in terms of crops, despite fluctuations in the weather in some regions of Slovakia for the majority of crops favourable and reflected the increase in harvest from one hectare. Due to favourable weather conditions during the vegetation was reached record crop. Oilseed production in Slovakia in 2011 declined. The highest share of the production of oilseed had rape, other shares belong to corn, sunflower, soybean, flax and poppy and mustard.

Climatic conditions in 2010 were unfavourable for farmers. Weather was full of extremes, hot and dry periods alternated with wet and cold. From mid-May the farmers were not able to enter the field. Crops were covered by water and a hailstorm destroyed. These conditions have caused low yields per hectare of oilseeds declined annually.

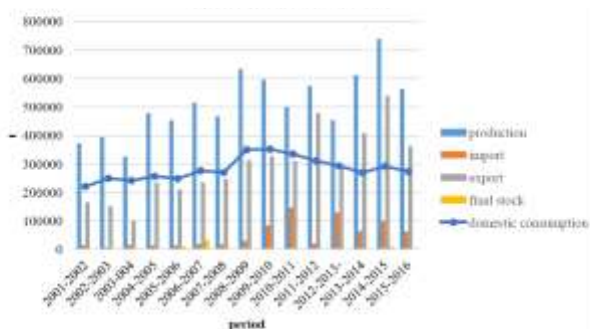


Fig. 7. Development of balance indicators of oilseeds in total in Slovakia

Source: vuepp.sk, own processing

Lack of rainfall in 2012 caused low yields per hectare of oilseeds, mainly rape. Winter temperature was within the long-term average. In March, significantly warmer, but at the end of this month and early April came true winter weather. This caused a delay of vegetation oilseeds. In some regions of the Slovak Republic was flooded oil, causing their digestion, respectively pest infestation. The

highest share of the production of oilseed rape had followed sunflower, soybean, flax, mustard and finally poppy.

Oilseed production in 2013 reached 612 thousand tons, which is the second highest production since 1993. The highest share of the production had oilseed rape followed by sunflower, soybean, flax, mustard and poppy.

In 2014, production reached a record volume of 738.667 tons. The highest share of the production had oilseed followed by sunflower, soybean, poppy, mustard and linen.

In 2015, climate conditions for growing oilseeds were optimal. Weather enables seeding without any problems. The problem has become pests. Farmers were forced to treat rapeseed crops several times. Winter was mild and did not produce hardly any downtime of crop areas. Spring oilseed treatment was carried out in a timely manner due to the fact that winter has ended prematurely. Period to harvest went smoothly and there was a decline in revenue, root system has sufficient thickness and length, summer heat and drought did not have any influence.

## CONCLUSIONS

About the use of the productive potential of soils decides in addition to soil and environmental parameters of given locality also economic factors. Agricultural land should fulfil also the economic function in addition to production and ecological functions. No one will create a financial loss on a soil for a long time. It is therefore on decision of a particular land user as it can exploit the potential of its land to gain profit.

Large part of Slovakia's regions is unprofitable and the highest rate of crop production can be found in western Slovakia regions (SK011, SK021 and SK023). The possibilities of growing grains and oilseeds on arable land are markedly differentiated in individual regions of Slovakia. The largest areas with the most suitable conditions can be identified in the SK021 regions (64% of the area) and SK023 (67% of the area). The least suitable for cultivation are SK031 (4%), SK032 (19%) and SK041 (11%) regions.

Balance of grains in Slovakia is varied. Production during the years has grown and declined. The largest decline occurred from the year 2014/2015 to 2015/2016, when production fell by 902.6 thousand tons and the largest increase occurred from the year 2007/2008 to 2008/2009, it represents an increase of 1343.76 thousand tons. Import grew rapidly from the year 2005/2006 to 2006/2007 by 447.7 thousand tons and largest decline occurred from the year 2007/2008 to 2008/2009 by 194.3 thousand tons. Regarding export, the largest increase observed from the year 2004/2005 to 2005/2006 by 703.4 thousand tons and the largest decline we note from the year 2006/2007 to 2007/2008 by 629 thousand tons. Final stock and domestic consumption during the selected period were accompanied by fluctuations, the final stock increased the most from the year 2007/2008 to 2008/2009 by 704.1 thousand tons, the biggest decrease of 591 thousand tons was from the year 2009/2010 to the following year. Domestic consumption grew the most in the last reporting year and most fell by 586.4 thousand tons from the year 2008/2009 to 2009/2010.

Based on the statements mentioned in the paper the total resources of grains adequately cover domestic consumption and a significant part of the surplus will be exported also outside Slovakia. The volume of the total supply of grains in Slovakia sufficiently cover domestic consumption and part of production can also be exported outside the territory of Slovakia as it is not expected significant changes in the development of various directions of use of grains for domestic agri-food market.

At the balance of oilseeds, we concluded that the production and final stocks reached the biggest drop from the year 2014/2015 to 2015/2016 and import and domestic consumption achieved the largest decline from the year 2010/2011 to 2011/2012. The largest increases over the years differed. The largest increase in export was achieved in the year 2010/2011 to 2011/2012, about 168,512 tons. At final stocks it was from the year 2005/2006 to 2006/2007 by 22,927 tons. Domestic

consumption increased the most from the year 2007/2008 to 2008/2009 by 79,759 tons.

Oilseeds in the current period have an important position for their various uses. Oilseed production in Slovakia is essential, as evidenced by a significant increase not only in production but also the fact that the structure of seeding occupies has a dominant position immediately after grains. Oil sector is significantly influenced by the nature of the market mainly rapeseed and sunflower, active support of manufacturing industry and penetration in the technical field (feedstuffs, cosmetics, pharmaceuticals, construction and biofuel). Their share in the structure of seeding from year to year increases. Oilseeds in the current period have an important position for their various uses. Market of oilseeds in the Slovak Republic since 1990 developed very favourably. It makes their substitutability in the nutrition of the population and livestock as well as growing interest in consumption of biodiesel.

## ACKNOWLEDGMENTS

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