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THE USE OF LOCAL RAW MATERIALS FOR THE DEVELOPMENT OF HIGHER VALUE-ADDED CHAINS: THE LITHUANIAN CASE OF PEAS

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Abstract

The Lithuanian agricultural system survived paramount structural changes after the country had joined the EU. This paper investigates the case of peas. The study applies qualitative and quantitative methods in order to identify the potential of this raw material and map the most important solutions that allow to increase value added by introducing new products. Results suggest that in 2004 the harvested peas were mainly directed to domestic uses, while in 2020 farmers were mainly producing this crop for the export of dry peas. Indeed, the creation of the higher value-added products is a desired alternative for the locally produced raw material. The combination of literature and other relevant sources analysis and expert interviews allows us to identify food and feed directions as the most attractive ways to increase value added. However, experts suggest that the Lithuanian market imposes some restrictions on business development.

Key words**:** *agriculture, structural change, value added*

INTRODUCTION

The enlargement of the European Union (EU) fostered fundamental structural changes in agricultural systems of Member States. Although the most recent academic research focuses on different aspects of change, this paper pays attention to insufficiently explored nexus of transformations and value added.

The concept of value added could cover different aspects. According to [5], value added could be applied to measure the national (regional) development employing the criterion of the export structure. It is acknowledged that agriculture is classified as the low value added generating economic activity, while processed products are treated as the higher value-added one. The paper employs this aspect to investigate the situation of the selected raw material, namely peas, because the abovementioned measure is closely connected to other aspects of value added.

For example, the economic aspect of value added has the nexus with the national (regional) economic welfare of citizens [5]. This measure goes beyond business profits, because it pays regard to labour costs and taxes. In fact, the higher share of raw materials in export structure could be associated with lost opportunities to generate the higher economic welfare. In this context, new products from biological mass are obtained because of the greater focus on research and innovations [8], while the expansion of different value-added chains for the same raw material results in the creation of the higher value added.

Given that the Common Agricultural Policy (CAP) could contribute to the higher value-added products' appearance on the market, the important aspects of the EU budgetary added value referred to by [10] should be considered. Thus, public spendings must be linked to the benefits that arise when investments in new higher value-added chains allow us to increase the added value at the EU level.

This paper investigates the potential for new higher value-added products from peas in Lithuania and deals with the main barriers of innovative value-added chains establishment in the country.

To authors knowledge, in Lithuania, the academic research with this focus was not carried out. However, some fundamental

academic research studies that contribute to the better understanding of the aforementioned topic were carried out by [1], [9], [16], and [18]. Indeed, the largest number of previous studies focus on the potential of peas for the developing of particular products and (or) the overcoming of specific problems (for example see [2], [3], [7], [11], [17], [19]).

MATERIALS AND METHODS

The methodological development framework combines couple directions that rely on different methods. The analysis of raw material's potential relies on data from Statistics Lithuania. The results are explained employing graphical visualization and comparative analysis methods.

The review of the academic literature and other reference material (e.g. reports, legislation, and etc.) allows us to identify main relevant drivers that encourage to use peas for the higher value-added products and highlight the most paramount directions for the value chains creation.

Finally, the main results of the semi-structured research interviews with 15 experts representing agricultural production (7), processing (3), and science (5) are provided. The research was carried out in March 2022 and focused on experts with the relevant competence. The interviews were used to verify main possible directions of the higher value-added products' creation, as well as for a better understanding of business barriers.

RESULTS AND DISCUSSIONS

Changes in the cultivation of peas and uses in value-added chains

This section identifies the potential of harvested peas that could be used to increase the domestic value added. First, it is important to note that the cultivation of peas did not play an important role in the Lithuanian agriculture before the accession to the EU. According to Fig. 1, in 2004, only 11.5 thou ha were sown by peas, while this crop represented 1.3% of the area sown by cereals. The role of leguminous crops in the structure of cereals was modest (3.4%) too. Nevertheless, peas accounted for 37.7% of the leguminous crops. However, the introduction of the CAP and other fundamental changes that took place on the Lithuanian market after the country had joined the EU made a significant influence on agriculture. The growth of cereals production, represented in Fig. 1, was led by a sudden shrinking of livestock population. The CAP support measures also introduced important changes in domestic structure of cereals.

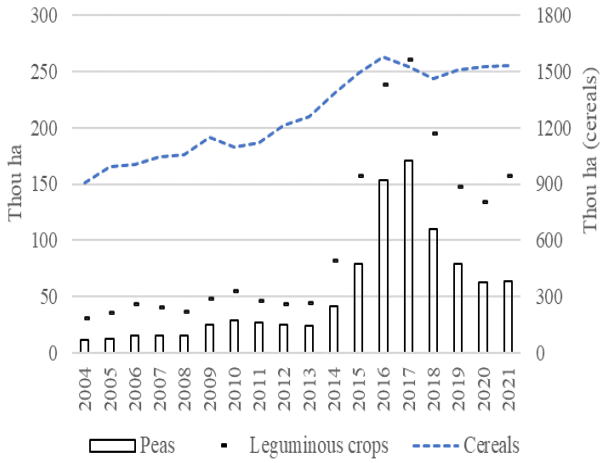

Fig. 1. Sown area of peas, leguminous crops, and cereals in 2004–2021
Source: Statistics Lithuania [12].

Coupled direct payments for the protein crops and the evolution of the direct payments scheme resulted in growing volumes of leguminous crops in Lithuania. Since 2014, the share of leguminous crops in the structure of cereals increased remarkably. Over the investigated period, the share of area sown with peas in leguminous crops fluctuated from 34.4% (in 2005 and 2006) to 65.6% (in 2017) and exceeded 50.0% in the structure of leguminous crops in 2009–2019. Experts link the later decline of areas sown with peas with the contraction of demand due to gradual consumption changes in main export markets. Other concerns are linked to the CAP regulations that make a remarkable impact on the agricultural output.

Fig. 2 shows the dynamics of harvested peas in 2004–2021. The results allow us stating that farmers do not generate a stable supply of peas. Indeed, this fact is critical for the functioning of domestic value-added chains,

and this circumstance must be taken into the consideration. The fluctuations of yields also do not allow to state that the progress in this area results in larger harvests over the period 2004–2021.

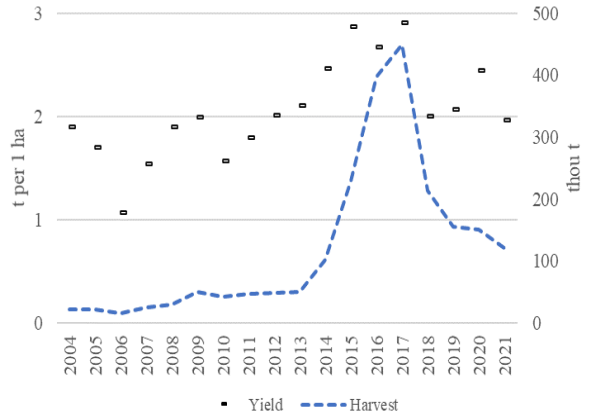

Fig. 2. Dynamics of harvests and yields per ha: the case of the Lithuanian peas
Source: Statistics Lithuania [13, 14].

As mentioned above, the sudden changes in supply rely heavily on dependence on foreign markets, because the consumption of peas in domestic value-added chains is low. Nonetheless, Table 1 reports about important structural changes in supply balance sheets over the period 2004–2020.

Table 1. Supply balance sheets for peas

	2004		2010		2015		2020	
	thou t	%	thou t	%	thou t	%	thou t	%
Initial stocks	17.2	41.2	17.2	28.5	48.2	16.7	107.0	39.1
Usable production	22.0	52.8	42.5	70.4	228.7	79.0	154.7	56.5
Imports	2.5	6.0	0.7	1.2	12.5	4.3	12.0	4.4
Total resources	41.7	100.0	60.4	100.0	289.4	100.0	273.7	100.0
Exports	3.7	8.9	16.8	27.8	174.2	60.2	148.6	54.3
Domestic uses, total	26.2	62.8	27.0	44.7	50.6	17.5	69.0	25.2
Final stocks	11.8	28.3	16.6	27.5	64.6	22.3	56.1	20.5
Total resources	41.7	100.0	60.4	100.0	289.4	100.0	273.7	100.0

Source: Statistics Lithuania [15] and own calculations on the basis of data from Statistics Lithuania.

In 2004, the cultivation of peas followed signals of the domestic market, i.e. 26.2 thou t were mainly used as seed, feed, and food, while the usable production accounted for 22.0 thou t. In 2020, 96.1% of usable production was exported, while in the previous period we observe the growing role of export. Indeed, the main feature of export was dried peas, i.e. an agricultural commodity that created low value added on the domestic market. In fact, these volumes of peas could be treated as a potential and used as a raw material for the higher value-added products that increase value added of the country.

According to Tables 1 and 2, the domestic market reacted to the overproduction of peas and domestic uses increased from 26.2 thou t in 2004 to 69.0 thou t in 2020. Nevertheless, in 2020, the domestic uses accounted for 44.6% of usable production, while the strong orientation towards export was evident.

Table 2. Changes in domestic uses of peas

	2004		2010		2015		2020	
	thou t	%	thou t	%	thou t	%	thou t	%
Domestic uses, total	26.2	100.0	27.0	100.0	50.6	100.0	69.0	100.0
Uses for seed	3.4	13.0	7.1	26.3	13.9	27.5	13.4	19.4
Uses for animal feed	13.4	51.1	10.6	39.3	17.5	34.6	38.8	56.2
Human consumption	8.7	33.2	8.9	33.0	10.1	20.0	10.6	15.4
Losses	0.7	2.7	0.4	1.5	9.1	18.0	6.2	9.0

Source: Statistics Lithuania [15] and own calculations on the basis of data from Statistics Lithuania.

Supply balance sheets do not identify significant changes in dietary habits during the period 2004–2020. The indicator of human consumption increased from 8.7 to 10.6 thou t (Table 2). The growth of uses for seed goes in lines with the enlargement of the sown area. However, fundamental changes are observed in uses for animal feed, because this indicator has almost tripled over the investigated period. The increase in losses also shows undesired trend, because those raw materials could be used as a potential to create higher value-added products.

The main directions of the increase in value added

Main drivers behind the change. This section provides the results of academic literature and other relevant documents analysis combined

with results of experts' interviews to identify the alternative uses of peas that could result in the higher value added.

Literature review and interviews with experts allow us to identify several important at the EU level added values that ground the development of the new value-added chains in Lithuania. First, the current CAP support scheme could be treated as an important factor contributing to the presence of leguminous crops in national agriculture. The importance of peas is linked to the management of environmental challenges. According to The legumes expert forum [18], peas increase soil fertility and allow to reduce dependence on synthetic fertilisers and chemical weed control, while the aforementioned benefits reduce the pollution from agricultural systems and enhance agricultural biodiversity.

Multiple academic studies link peas and climate change mitigation challenges. The most recent academic paper [6] argues that peas lose less important nutritional components under the scenario of growing concentration of atmospheric carbon dioxide than widely consumed wheat. This fact could have an impact on the future consumption and dietary changes that deal with health issues.

Another climate change mitigation challenge is related to the phenomenon of flexitarianism, which is promoted in the EU to reduce meat consumption. As the consumption of meat products has a significant impact on the increase in greenhouse gas emissions, people are encouraged to become semi-vegetarians that focus their diets on plant foods and have the occasional inclusion of meat into their diets. In this context, peas become an alternative that allows us to change animal protein.

Thus, the spread of vegetarianism, veganism, and flexitarianism creates an attractive niche for new products from peas that supplement dietary needs by plant protein. Academic research underlines the importance of functional ingredients from peas [1] that could be used in food, animal feed, and pet food. In addition to the traditional usage, peas as a raw material become popular producing meat substitutes, confectionary and baked goods, desserts, etc. [1, 11]. Peas could be successfully used in meat products to improve the texture, enrich the fiber, and obtain other important properties [1, 19]. Academic studies show that even by-products from processing can be successfully used to obtain food, feed, and other products [16]. Indeed, the research still identifies that the substitution of meat by legumes faces serious challenges [9], because people prefer meat products.

Another paramount direction of new value chains' development is the use of peas and pea processing waste in animal feed. In 2018, "A European strategy for the promotion of protein crops" [4] declared the intention to reduce the dependence of the EU livestock sector on imported proteins from the third countries. The current plant protein deficit is linked with important problems, including the emerging demand of feed proteins on the global market, especially in China. These changes could have an impact on the EU food security and the desire to facilitate GMO-free feed production in order to have non-GMO products in the EU. The use of local leguminous crops also contributes to the climate change mitigation. Although the conducted research shows that during the investigated period some progress was achieved in Lithuania to increase use of peas for animal feed, the further steps are necessary, because the country remains dependant on imported cheap proteins.

Academic research demonstrates that local peas could be used as a raw material for three main market segments, namely GMO-free feed, organic feed, and conventional feed [1]. Those market segments will empower premium products for costumers (for example, organic or GMA-free meat, eggs, dairy products). A wide range of feed products could be received due to different levels of raw material processing. Indeed, the digestibility and safe norms for animal health, including maximum incorporation norms for peas, remains an important research question that attracts the attention of scientists around the world [3, 7, 17]. Another research direction deals with innovative technologies that improve digestibility of peas [2, 16].

Interviews with experts. To summarize, experts also argue that new products that represent food and feed chains are the most attractive development directions to increase value added. However, the low funding for science and business collaboration projects is mentioned among the most important problems that make the development of innovative value-added chains rare and force local businesses to adapt innovations that have already been created in other countries. In fact, even those projects require good cooperation of business and academic society and the relevant funding that is not provided. Thus, significant attempts must be taken to improve the current situation.

Indeed, the most important challenge is named as finding markets for the higher value-added products, while the markets for less processed products are available. Table 2 demonstrates that changes in human consumption are very slow, and it puts serious limitations on the demand for new food products on the domestic market. Some progress could be achieved investing in marketing and educational projects that aim at changing dietary habits. Since the switch from animal to plant protein use brings added value at the EU level, these measures could be lunched as individual programs with the corresponding funding.

Experts also stress the barriers that prevent local producers from access to foreign markets and suggest directing the value added into business-to-business segment as the most realistic viable solutions. Proteins from peas, pea concentrate, and pea isolate were mentioned by many experts as possible business development directions.

Another important direction of the establishment of new value-added chains is feed manufacturing. Experts mentioned three main problems that must be overcome in order to develop this direction successfully. First of all, this feed must be competitive with the current alternatives available on the market. Experts also mentioned that ingredients from peas could be linked with some limitations, because this crop has different impact on animal health, while ruminants are proposed as the most promising feed manufacturing development niche. The third problem deals with the livestock sector shrinking in Lithuania that introduces the decline in demand for these products on the domestic market and encourages to consider business investments that propose competitive products for foreign markets.

It should be noted that the support for the new value-added products is mentioned as a very important factor that could accelerate the payback period and allow to enter a new market with lower prices. This issue is mentioned as critical for both food and feed directions.

CONCLUSIONS

Over the period 2004–2021, in Lithuania the cultivated area and the volumes of harvested peas increased significantly. This fact could be linked to the availability of excessive raw material that was not common in Lithuania before the accession to the EU. Indeed, the analysis of national supply balance sheets shows that the country survived a remarkable switch from domestic uses of peas to export during the investigated period. This transformation supposes losses of value added in the country. The dependence on demand from foreign markets results in sharp fluctuations of sown areas and the relevant changes in rotations.

The review of academic research and other relevant material shows that the most attractive niches for the development of new higher value-added products cover food and feed directions. These directions contribute to the creation of added value at the EU level, because this crop contributes to climate change mitigation, reduces dependence on synthetic fertilisers and chemical weed control, allows to develop the sustainable and secure food system in the EU. Interviews with experts confirm the attractiveness of these niches, however, introduce some limitations on the wide list of available options. Experts stress that the domestic market for food products is limited and suggest business-to-business models and the development of

functional ingredients as a viable alternative. Business projects introducing new feed products also must offer competitive prices that could cover both domestic and foreign markets.

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