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## PROFITABILITY OF PRODUCTION OF PASTA FROM SPELT FLOUR<sup>1</sup>

*Veljko Vukoje<sup>2</sup>, Đorđe Psodorov<sup>3</sup>, Jasmina Živković<sup>2</sup>*

### Summary

*This paper analyzes the most important parameters for profitability of production of pasta made from spelt flour produced in an organic farming system. Research pertains to plant of medium capacity which is also suitable for construction on family agricultural households. In order to obtain a more reliable assessment of profitability, the comparison is performed with the production of wheat flour pasta. Comparative analysis of the profitability level is based on analytical calculations of production and additional derived indicators.*

*The main raw material, spelt flour, dominates the total costs with 59.4% (whereas for wheat flour it is 37.5%). As expected, significant share of cost is assigned to labor (12.9%), as well as fixed costs (12.4), while energy has a relatively small share (4.6%). Assuming that the high level of productivity is achieved, the average wholesale price of about € 2.11 per kilo provides an annual income of € 30,766.00 (whereas annual income for wheat is € 12,260.00). Taking into account a solid economy ratio (1.32) and payback period of investment (6.9 years), it is evident that this can be a very profitable business.*

**Key words:** *pasta, profitability, spelt, wheat, organic production*

**JEL:** Q12

### Introduction

Grain crops which are botanically not a part of cereals (buckwheat, pigweed) and archaic forms of wheat (single grain, two grain, spelt and kamut) have been increasingly introduced into the production process worldwide. They are used as raw materials in baking or manufacturing of specialty products (Bognar and Kellermann, 1993; Bojnanska and Francakova, 2002).

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Spelt is used in many areas of food industry, both in human and animal nutrition (Rozenberg et al., 2003). Obtaining various end products, particularly in the baking industry (bread, pasta, etc.) represents its significant potential (Abdel-Aal and Hucl, 2005). Therefore, it is essential to master ecological production and produce new, functional, non-traditional products with high added value, such as pasta from spelt flour.

The content and quality of proteins are the main factors that determine pasta quality (Marchylo et al., 1998). Pasta is a product rich in starch but lacking in protein. In literature, numerous studies have noted the possibilities of enriching wheat pasta in order to improve its nutritional quality and functional properties (Bahnassey et al., 1986; Rayas-Duarte et al., 1996; Shogren et al., 2006). One of the raw materials suitable for enriching traditional wheat pasta with significant nutritional and functional profile is spelt flour.

Replacement of white or whole-wheat flour with flour made from spelt improves the nutritional and functional value of the product. A positive effect on human health is made by regularly consuming the product. The grain of spelt, in ideal ratios, consists of: proteins, carbohydrates, fats, minerals, vitamins, and cellulose. Dietary fibers of spelt are very soluble in water, which promotes good absorption of nutrients in the body while containing significantly more protein, fat and dietary fiber than other grains.

Since they are not seasonal goods, the sales of pasta remain consistent throughout the year. Research shows that about 88% percent of consumers in Serbia eat pasta. A third of respondents consume pasta at least once a week, about 20% consume it two to three times a month, while the same percentage of people use it more than once per week. Our market consists of about 45 domestic manufacturers of pasta, which offer roughly the same number of brands. Of those, six main manufacturers hold the major share of the market (73%), while others have a relatively small market share. Of course, foreign brands are also represented, most notably the Italian brands: Barilla, Riscossa and Buitoni.

The competition in the market does not only exist between the manufacturers that produce the same products or perform the same services, but there is also a so-called generic competition that exists between the products and services that meet the same needs of consumers, and as such the competition is prevented through detailed analysis of the market and significantly more secure long-term business is ensured (Kuzman, Cvijanovic, and Subić, 2007).

Currently, spelt pastry of undefined composition and non-standard quality appears sporadically on the domestic market. Production of pasta from spelt flour is a novelty in terms of defining formulations, nutritional quality and functionality of the final product.

In our country there are no awareness about organic food and organic products. The market is not sufficiently developed. Most of the respondents (40%) have confidence in domestic products of organic farming, which are usually bought at markets (40%), while decreasing the importance of specialist shops. It is necessary to expand the

range of products from organic agriculture, and have a continuous supply and proper marketing. With good information and consumer education spending of organic food can be raised to a higher level (Vlahović et al., 2011).

### **Material and work methods**

The analysis focuses on the main economic indicators of production of pasta from spelt flour. In order to gain a clearer understanding of the level of profitability of production, the comparison is drawn with the production of pasta made from wheat flour. Comparative economic analysis is based on calculations of production, performed on the basis of real data from a particular company "A" from the region of southern Banat which manufactures pasta. It is a medium-sized business (producing about 60 tons of pasta a year) built on an own agricultural household, which, in conjunction with a partial reconstruction of existing facilities and the use of other, previously built infrastructure (roads, electricity, gas, transport, etc.), significantly reduces the total amount of investment (about € 260,000).

The calculations and further analyses use profit as the primary form of financial result whereby full utilization of capacity is assumed. Costs are also divided into fixed and variable which allow the results to be expressed in the form of cover margins or changes in the results at different levels of capacity utilization. For a reliable assessment of viability, it is necessary to identify additional indicators of success (cover margin, income, economy co-efficient, the rate of accumulation of production, payback period of investment). By utilizing the method of sensitive analysis, changes in obtained results are considered in relation to the change in market price of flour as the main raw material and / or finished products.

Research needs to examine whether production of spelt flour pasta can be a profitable business, considering the level of development of the domestic market or the possibility of exporting these products.

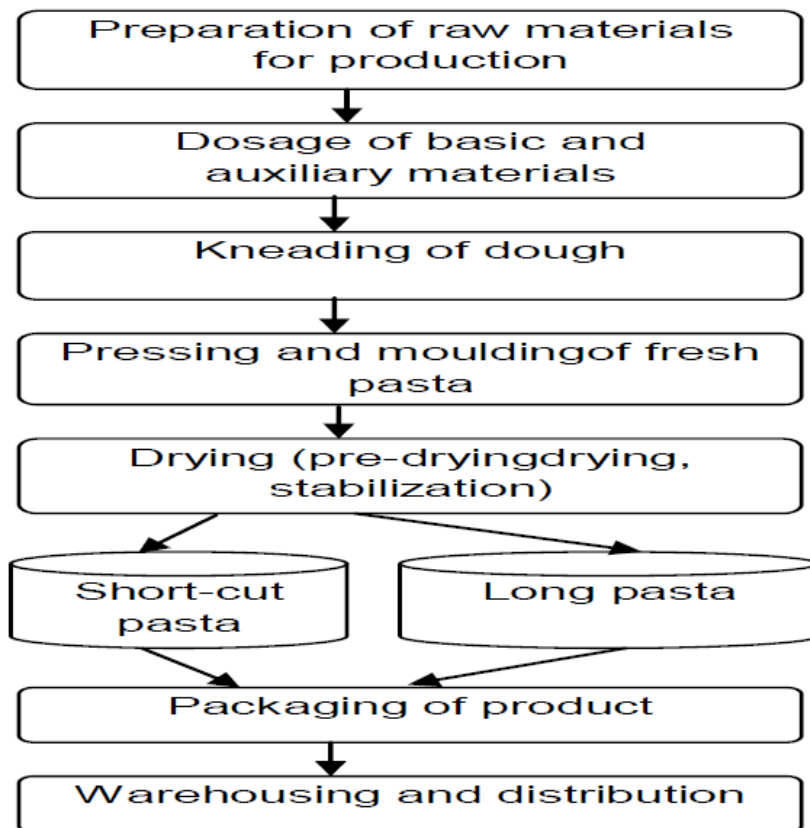
### **Results of research**

Taking into account that economic calculations are based on the specific technical-technological and production-organizational conditions, it is necessary to first briefly describe these aspects of production. Company "A" has established and applies a HACCP system, which is an indicator of ongoing efforts to enhance product quality and an interest for product placement into foreign markets. Special attention is paid to the selection of raw materials which are procured only from well-known suppliers according to established procedure and with rigorous quality control. Maximum standardization is strived for in the entire chain, from the procurement of raw materials to the sale of finished products. Analysis of the quality and safety of raw materials is regularly conducted.

Pastry is produced with cutting-edge Italian technology, using machines featuring latest technological advances. It is a highly automated process consisting of 7 basic technological stages (*Figure 1*).

Required daily quantities of raw materials are shipped from the warehouse to the plant where pasta is produced. Preparation of raw materials involves their weighing, with additional sifting of flour.

**Figure 1.** Diagram of technological process for production of pasta



Dosing of all raw materials is automated using appropriate metering devices (for dosing of flour, water and water-soluble additives). Kneading of dough is performed using dough mixer which is an integral part of the machine for making pasta. Pressing and molding of fresh pasta. Depending on the type of pasta, the corresponding designing mould or a system for cutting and sorting of raw pasta is used. After formation, the pasta goes through a series of operations aimed at stabilizing the product.

Pasta is dried in a discontinuous dryer using electrical energy. Dried pasta is automatically packed in packing units (polypropylene, polythene or duplex bags) of different masses. Finished products (short-cut and long-cut pasta) are stored in a warehouse that fulfills all requirements for maintenance of quality and easy manipulation. The distribution is performed through a developed system of dispatch.

The entire process virtually does not have any negative impact on the environment and health of employees. Natural gas is used in production of hot water and heating of spaces. Dry cleaning of floors in the facility is provided, which means there are not any waste waters. Water for washing of the mold may exert a certain load on the sewerage network but only in the part of the central collector. The estimate of individual elements of calculation is based on real expenditures (material, labor, energy, etc.) as well as current market prices of inputs and finished products (*Table 1*). Prices of inputs and finished products exclude VAT fco household, all amounts are also stated in Euros and the average exchange rate for 1 Euro is 113 dinars. Calculation is primarily compiled for the monthly production (5000 kg of dry pasta), and if necessary, the indicators are shown on an annual basis or per unit of product.

### **Analysis of expenses**

The total cost structure is dominated by the costs of whole-wheat spelt flour as the main raw material, with 59.4%. In wheat, the share of these costs is significantly less (37.5%), due to the significantly lower price of wheat flour. Total difference in production costs of € 2794 between spelt and wheat originates mostly from the higher cost of flour. Given that this is the same production technology, the rest of the expenses are identical but the percentage share of expenses in spelt is significantly lower than that in wheat.

Labor cost (12.9%) is a significant item, despite relatively well developed automation systems. There is an indication of the low share of energy costs (4.6%), contributed significantly by the low cost of electricity in the country. The cost of € 0.10 per kw/h (which can be regarded as the average in comparable EU countries), raises the cost of energy to still acceptable 7.7%, i.e. increases production costs by 3.3%.

Fixed costs account for 12.4% of the total production cost of spelt pastry flour, which is within the acceptable limits. This percentage is applicable, of course, only for the observed level of capacity utilization (5 t/month, or 60 t/year). Any reduction in the volume of production causes a proportional increase in the share of fixed costs and increase in the cost per unit of production, thereby reducing the financial result (profit). Most of the fixed costs consist of depreciation of facilities and equipment (about 75%) while others include the cost of maintenance, interest on investment loans and working capital, as well as general expenses. General expenses are a relatively heterogeneous group made up of mostly company overheads (stationery and supplies, postal fees, administrative fees, travel expenses, insurance, various taxes, property taxes, benefits, potential cost of sales, representations, etc.).

This production is related whereby, as a result of a single technological process or common costs, two different products are created (short cut pasta - macaroni and long pasta - fida). Therefore, it is necessary to separate the total cost of certain products or determine their cost per unit of measurement (1 kg) using a separate accounting procedure. Since these are “equal” market products, this is performed in proportion to wholesale prices of each product. The average cost of spelled pasta flour (RSD 180.1/kg) is larger by about 54% compared to the cost of wheat pasta (116.9).

### Analysis of obtained results

By adding commercial margins (20%) and VAT (20%) to wholesale prices, retail prices of RSD 367.2/kg of macaroni and 306 din/kg feed for pasta are obtained. The market prices of these products from wheat flour are lower by about 70% (macaroni: 216 din/kg, fida pasta: 180 din/kg). It is about 10% below average prices of imported (mostly Italian) pasta of similar quality.

The value of final production of pasta from spelt also increased by 70% compared to wheat (*Table 1*). Since the production of spelt pasta increases the total cost by 54%, the annual amount of profit provided by this production (€ 30,766) increased by 51% compared to the production of pasta made from wheat flour (€ 12,260). It is obvious that a very significant difference is in favor of spelt.

To gain a more complete picture and provide a more precise assessment of profitability, it is necessary to consider other indicators. Cover margin is more appropriate in certain cases as an indicator for assessing the viability of individual production, compared to profit (*Table 2*). Using cover margins eliminates the impact of increase/decrease of fixed costs on the result in case of reduction/increase in the degree of capacity utilization, which in this type of production is not rare. Reduction in the level of capacity utilization and production volume for spelt pasta by, for example, 30% causes a decline in the cover margin at the same rate, while profit decreases by 41.5%. Therefore, profit changes (increases or decreases) 1.38 times faster than the volume of production and margin coverage. Yet, there is a significant reserve given that the result becomes negative only with a reduction in the level of capacity utilization by about 70% (*for wheat: by about 50%*).

The domestic market for products from organic production, and generally the market for functional and safe food are not well developed. These products are still not adequately priced, that is they are more expensive compared to conventional products. Certain products from conventional production of spelt have relatively high prices, close to those of products from organic production (Vukoje et al., 2011). In our conditions, however, it is probable that the same plant is used to produce both types of pasta (from spelt and wheat) as confirmed by the observed practices of companies.



**Table 1.** Calculation of production of pasta from spelt and wheat flour (€ 1=113RSD)

The calculation refers to a one month production in the plant, approximately 5000 kg of dry pasta														
Row no.	TYPE OF COST	U.M.	Quantity y	S P E L T				W H E A T				DIFFERENCE (€)		
				Price	RSD	€	%	Price	RSD	€	%			
1	2	3	4	5	6	7	8	9	10	11	12	13 (7-11)		
1	Wheat flour	kg	5500	97.2	534722	4732.1	59.4	39.8	218981	1937.9	37.5	2794		
2	Eggs	pcs	5500	9.5	52381	463.5	5.8	9.5	52381	463.5	9.0	0		
3	Additives	1	5.5	2875.0	15813	139.9	1.8	2875.0	15813	139.9	2.7	0		
4	Water	1	17760	0.094	1672	14.8	0.2	0.094	1672	14.8	0.3	0		
5	Packaging				23750	210.2	2.6		23750	210.2	4.1	0		
6	Other				3208	28.4	0.4		3208	28.4	0.5	0		
<b>I</b>	<b>Material</b>				<b>631546</b>	<b>5588.9</b>	<b>70.1</b>		<b>315806</b>	<b>2794.7</b>	<b>54.0</b>	<b>2794</b>		
7	Electricity	Kw/h	7150	5.81	41530	367.5	4.6	5.81	41530	367.5	7.1	0		
8	Labor	hrs	3.0	35650	115950	1026.1	12.9	38650	115950	1026.1	19.8	0		
<b>A)</b>	<b>VARIABLE COSTS (1 to 8)</b>				<b>789026</b>	<b>6983</b>	<b>87.6</b>		<b>473285</b>	<b>4188</b>	<b>81.0</b>	<b>2794</b>		
9	Fixed costs				111264	984.6	12.4		111264	984.6	19.0	0		
<b>B)</b>	<b>TOTAL COSTS (1 to 9)</b>				<b>900289</b>	<b>7967</b>	<b>100.0</b>		<b>584549</b>	<b>5173</b>	<b>100.0</b>	<b>2794</b>		
	ACHIEVED RESULTS	U.M.	Quantity y	Price	AMOUNT		Cost price (RSD)	Price	AMOUNT		Cost price (RSD)			
					RSD	€			RSD	€				
10	Long pasta	kg	3000	255	765000	6770	<b>192.9</b>	150	450000	3982	<b>125.3</b>			
11	Short cut pasta	kg	2000	213	425000	3761	<b>160.8</b>	125	250000	2212	<b>104.4</b>			
<b>C)</b>	<b>PRODUCTION VALUE (10+11)</b>				<b>1190000</b>	<b>10531</b>			<b>700000</b>	<b>6195</b>		<b>4336</b>		
<b>D)</b>	<b>GROSS PROFIT (C - B)</b>				<b>289711</b>	<b>2564</b>			<b>115451</b>	<b>1022</b>		<b>1542</b>		



**Table 2.** Additional indicators of success

No.	Type of indicator	Spelt	Wheat	Difference
		(€/year)	(€/year)	(€/year)
1	Cover margin (C - A)*	42581	24076	1542
2	Income (D + 2/3 of labor costs)**	38975	20469	1542
3	Economy of production (C / B)	1.32	1.20	0.12
4	Accumulation of production (D / C)	24.3%	16.5%	7.8%
5	Investment value	260000	260000	0.0
6	Annual financial flow (D x 12 - 10% tax on result + Depreciation)	37753	21098	16655
7	Payback period of investment (5 / 6)	6.9	12.3	-5.4

\* Marks refer to the data from the Table no. 1

\*\* The assumption is that 2/3 of labor force consists of members of the family

For the purposes of analysis, it is important to consider the most important economic parameters and these (target-specialized) types of pasta manufacturing. Assuming that the production of pasta from spelt wheat is equally represented (50%:50%), the company achieves an annual income of € 21,513, economy ratio is 1.27 and investment is to be repaid in about 8.8 years. It is clear that this is also a very profitable business.

If the plant is being built, that is the production takes place on an agricultural household, the result can be expressed as household income (*Table 2*). In such case, it is possible to obtain significant additional benefit (€ 684/year) through the employment of two members of the family, which is a realistic assumption.

Economy and accumulation (profitability) of production allow efficient comparison between different productions, given that they are expressed as a ratio/percentage. For every 100 dinars incurred in the production of spelt pasta, a profit of 32 dinars is obtained. The rate of return shows that the value of production represents 24.3% of profits. This can be considered a good indicator of the value for this type of production. Production of wheat pasta recorded much lower values, but within satisfactory limits (economy:1.20; profitability:16.5%).

Payback Period of Investment is one of the primary indicators for justification of an investment. In this case, the investment is repaid in 6.9 years, which is a relatively reasonable period of time (*for wheat it is 12.3 years*).

Sensitive analysis shows changes in profit depending on the changes in average market prices of pasta and / or flour by +/- 20% (*Table 3*).

**Table 3.** Sensitive analysis (in RSD)

Spelt				Wheat			
Spelt flour (+/- 20%)	Dry pasta (+/- 20%)			Wheat flour (+/-20%)	Dry pasta (+/- 20%)		
	190	<b>238*</b>	286		112	<b>140</b>	168
77.8	158655	396655	634655	31.9	40248	159248	299248
<b>97.2</b>	51711	<b>289711</b>	527711	<b>39.8</b>	-3549	<b>115451</b>	255451
116.7	-55234	182766	420766	47.8	-47345	71655	211655

\* Average prices of products were determined as a weighted average of short- and long-cut pasta.

The financial result is significantly more sensitive to the fall in prices of finished products (pasta) than on the increase in price of raw material (flour). In the production of spelt pasta, the result becomes negative with an increase in flour prices of about 65% (RSD 150/kg) or a reduction in the average price of pasta of 44% (RSD 157/kg). In wheat, this reserve is significantly lower, but large enough. Financial loss occurs when the price of flour increases by 53% (RSD 61/kg) or when the average price of pasta decreases by 17% (RSD 116/kg).

### Conclusion

Products made from spelt are of high quality, there is a significant and stable domestic demand for them, but also a very serious potential for exporting. Production of spelt has long been neglected in our country, which is one of the main reasons for insufficient supply of spelt products in the domestic market. Spelt has higher protein content than regular wheat, which makes it suitable for the production of a wide range of high quality food products, including the production of different types of pasta. Lately, spelt has increasingly been grown in the system of organic production. However, even the products from conventional production of spelt reach relatively high prices, close to those of products made by way of organic production.

The analysis of economic parameters shows that production of whole-wheat pasta made from spelt can be very profitable. The observed production volume at the medium-sized plant (about 60 t/year) brings in a profit of € 30,766. Considering other relevant indicators (economy ratio: 1.32; rate of return: 24.3%; payback period of investment: 6.4 years), it can be concluded that it is a very profitable business.

Higher market prices of pasta made from spelt flour are the key factors to much higher levels of profitability in relation to the production of wheat pasta, which provides about 2.5 times lower returns (€ 12,260/year).

Construction of plants for production of pasta on family households, which can supply some of their own raw materials (flour), makes this production even more profitable. An additional benefit for the household can be obtained by hiring family members. Benefits to the community are numerous and are reflected in increasing levels of employment in rural areas, further development of agricultural sector, export growth and rural development in general.

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## ISPLATIVOST PROIZVODNJE TESTENINA OD SPELTINOG BRAŠNA

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### Rezime

*U radu se analiziraju najvažniji parametri isplativosti proizvodnje testenina od brašna spelte, proizvedene u organskom sistemu gajenja. Istraživanja se odnose na pogon srednjeg kapaciteta, koji je pogodan za izgradnju i na porodičnim poljoprivrednim gazdinstvima. U cilju dobijanja pouzdanije ocene profitabilnosti, vrši se poređenje sa proizvodnjom testenina od pšeničnog brašna. Uporedna analiza stepena profitabilnosti zasniva se na analitičkim kalkulacijama proizvodnje, odnosno dodatnim izvedenim indikatorima.*

*U strukturi ukupnih troškova dominira osnovna sirovina, brašno spelte sa 59,4% (kod pšenice: 37,5%). Očekivan je i značajan udeo troškova rada (12,9%), i fiksnih troškova (12,4), dok energija predstavlja relativno skromnu stavku (4,6%). Prosečna veleprodajna cena od oko 2,11 €/kg omogućuje godišnju dobit od 30.766 € (kod pšenice: 12.260 €), uz pretpostavku ostvarenja visokog stepena iskorišćenosti proizvodnih kapaciteta. Ako se uzmu u obzir i solidan koeficijent ekonomičnosti (1,32), odnosno period povraćaja investicionih ulaganja (6,9 godina), jasno je da ovo može biti vrlo isplativ biznis.*

**Ključne reči:** *testenine, isplativost, spelta, pšenica, organska proizvodnja.*

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