

Estimation of efficiency of functioning of plant products in Poland – a case study based on the potato commodity

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Abstract. The paper is devoted to key problems of Polish agriculture – assessing the level of market efficiency. In the studies, the method of comparing price trends for the years 1991–2008 was used. The analyses which were carried out showed that the potato market can be assessed as an efficient market. The pace of price growth of potato exceeds the price growth of alternative agricultural products. The reduction of the market share of producers in retail prices is not observed in the market of fresh potatoes. The highest economic efficiency for producers is ensured by the production of early crop potatoes. At the same time, on the potato market there are many efficiency barriers to potatoes in terms of low ability to compete on the international market. Lower cost of sales transactions causes a gradual growth of links with potato buyers by contract.

keywords: market, evaluation of efficiency, price trends, potato

INTRODUCTION

Improving the efficiency of production is a key problem for Polish agriculture. In addition to the existing conditions for an increase in the level of economic efficiency of agri-food sector, associated with maintaining competitiveness in the EU and world market and a reduction in income disparity between farmers and non-agricultural occupations, some new circumstances are also involved. They are related to the anticipated increase in salaries and related expenses for the substitution of human labour, increasing amounts of rents and expenses associated with investments in environmental protection (the principle of cross-compliance), irrigation (increasing drought), and the improvement of animal welfare (Józwiak, 2008). According to Józwiak and Mirkowska (2006), only some holdings

is seeking to improve a production efficiency, and receiving direct subsidies is not a motivating factor for achieving this goal.

Efficiency in terms of economic theory is the process by which society produces the maximum satisfaction of consumers by using available resources (Samuelson, Nordhaus, 1985). It is connected with an efficient allocation of land, labour, capital, information, and management. According to Pareto's rule allocative efficiency occurs when "there is no possible reorganization of production that would make everyone better off-the poor, the rich, the wheat and shoe producers, etc." (Samuelson, Nordhaus, 1985). Efficient market model that provides efficient allocation of resources is the market operating in conditions similar to those of perfect competition. A market is defined as competitive, if none of the participants in the market has any influence on the price (price level is determined by autonomous demand-supply mechanism), followed by fast transfer of market information, including price impulses (Chotkowski, Rembeza, 2010).

Agricultural markets are characterized by specificity of the products and fragmentation of supply. Additionally, they are spread in space, and due to high transport costs, transactions are located closest to the contractors, which often leads to a monopolistic market (Rembeza, 2001). The sources of inefficiency of the agri-food markets are also, among others, imperfect (asymmetric) information, the fear of opportunistic behaviour of market participants (behaviour inconsistent with the accepted rules), no valuation of externalities, lack of valuation of the provision of public goods and the presence of forms of state intervention (Rembisz, Stańko, 2007).

The aim of this paper is an attempt to assess the effectiveness of the potato market in Poland. It is assumed that the price is a key parameter shaping the market. The basic method of research was the analysis of trends in prices of potatoes for different directions of use (market segments) compared to alternative plant products, including horti-

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cultural and livestock products. Also, the trends in selling prices of the basic means of production are shown. This had an aim of indicating the trends of profitability of the tested agricultural products. In order to at least partially eliminate the typical phenomenon of fluctuations in prices of agricultural products each year, prices were analysed in the consecutive three-year periods covering the years 1991–2008. The data of CSO (Central Statistical Office) was mainly used for the current annual average procurement price and marketplaces and retail prices. Prices of potatoes were analysed on the basis of the categories of marketplaces prices of CSO in October as it is the month with the highest turnover. For the early crop potato, marketplaces prices from July were taken as representative. Selling prices of certified seed-potatoes were taken as the market price of the crop of a given year according to the records of Laboratory Market Research IHAR Bonin. The results can be a pattern of analysis for the markets of other agri-food products and can be used in creating of state policy. The potential practical usefulness of research is determined by the possibility of using the results in the process of deciding on the forms of market regulation by government agencies.

Efficiency and market mechanisms in economic theory

Market mechanism should lead to increasing efficiency of production processes and improve the quality and utility value (usefulness to buyer and consumer) of products (Chotkowski, Rembeza, 2010). Kohls and Uhl (1990) distinguish between operational and pricing efficiency in the agribusiness market. Improving operational efficiency leads to an increased level of relationship input–output for example by reducing transaction costs by improving transportation, improving ways of storing and packaging products, and better access to information and its fast exchange (Figiel, 2007). Operational efficiency of the market is low, when there is no competition, entry costs to the sector are high and market information is imperfect. Pricing efficiency should be understood as the capacity of the market existing under given conditions to efficiently allocate resources and coordinate production and marketing in accordance with the expectations of final consumers (Figiel, 2007).

The effectiveness of a particular market price can be measured by the degree of divergence between the price and the theoretical models of price formation in the perfectly competitive market. Pricing efficiency of agricultural markets, leading to prices accurately reflecting actual supply and demand, allows agricultural producers to make decisions for the rational allocation of resources and, consequently, maximize the overall economic effect (Figiel, 2007).

The market mechanism plays a key role in the economic system, constituting a driving force behind the economic processes and the verifier of their effectiveness, and at the

same time ensures the coordination of economic activity and running processes of competition. Basic functions of the market mechanism can be defined as follows (Kowalski, 2007):

- informative – course and results of market games provide market participants with information used for the allocation of resources, optimal use of production factors, the use of an effective marketing strategy, as well as shaping long-term policy of prices, volume of supply, product quality, determining the behaviour towards contractors and manipulating the parameters of the market in the way to take advantage of the ignorance and inefficiency of other market participants,
- profit inducing – the market increases the income of efficient market participants, and inefficient participants take losses,
- efficiency related – the market mechanism enforces economic efficiency by verifying the economic viability of individual businesses with market norms of rationality (the principle of rational action),
- balancing – automatically restores the balance between supply and demand through prices, which implies a balance in the entire market system (self-regulation).

According to the authors of the new institutional economics theory (Williamson, 1985), “the market is (...) something wonderful, not only because of its excellent ability to signal, but also because of the high capacity of identifying and maintaining a strong kind of stimulus”. Substitution of transactions on the open market with transactions under the previously concluded contracts (or the internal transactions in a large multi-company) reduces the cost of transactions (including the search for a buyer), but it usually causes deterioration of incentives for continuous improvement in economic efficiency (Williamson, 1985). Thus the new institutional economics theory assumes that in order to obtain an efficiently functioning market, some of the transactions should occur on the open market, and some through contracts and vertical integration links. The aforementioned trend in economic theory connects economic efficiency with the capacity of institutions (eg forms of vertical integration) to reduce transaction costs of the economy (Wilkin, 2002).

An indirect measure of the effectiveness of a particular market, such as cereals (including wheat), fruit (including apples), potatoes (including table) is its functioning under the conditions maximally close to perfect competition. The assertion that perfect competition provides the most efficient tool to organize the market is at the root of the neoclassical economics, a school of thought classified within the mainstream economic science (Bremond et al., 2004). It is assumed that in these conditions, the optimal allocation of resources and optimal use of inputs occur. In practice of the functioning markets we deal with imperfect competition, however, we get the best results when encouraging competition to the greatest extent possible and leav-

ing a regulatory role to freely evolving prices (Bremond et al., 2004). In addition to the assumptions of the market in the conditions most close to perfect competition, we can formulate some basic premises of an efficiently functioning market of specific product groups:

- Functioning of the market leads to the formation of viable prices for effectively managing market participants, creating conditions for expanded reproduction, market expansion and growth of competitive ability, including the international market.
- A very large number of buyers and sellers causes the situation that fluctuations arising from changes in the supply of harvest immediately cause changes in market prices, leading to the balancing of the market.
- The market encourages lowering of the production costs, specialization, increased scale of production, technological innovation and the implementation of biological, technical and organizational progress.

TRENDS IN PRICES OF POTATOES IN COMPARISON TO OTHER AGRI-FOOD PRODUCTS

In practice of almost all countries, the basis for fixing prices of table potatoes, especially intended for direct consumption, is the market mechanism (Rembeza, 1995). In addition, it must be assumed that the production of potato works in the competitive structure similar to the conditions of perfect competition, where a single producer has no possibility to influence the level of market prices. It is only on the market of industrial starch potatoes that the prices are subject to the statutory EU regulations (Chotkowski, Gaziński, 2009) similar to those in force on the grain market. The release of market prices, after a period of centrally planned economy, in the case of potatoes occurred in 1988. Since then, prices of potatoes in Poland have shown a sea-

sonal variation as large as those of other Western European countries (Rembeza, 1995).

Price volatility is mostly determined by supply fluctuations stemming from the variability in yield (risk quantification). Like the entire crop production, this is due to the dependence of production on climatic conditions (rainfall, temperature) during the growing period. Under these conditions, using three-year average is the appropriate method of study of price trends in potato production and changes in their relationships against the background of the agricultural market.

Table 1 describes the CSO data on the formation of marketplaces prices and purchase of potatoes according to the intended end use (market segments) of potatoes in the subsequent three-year periods of 1991–2008.

Among the five intended uses of potato production, the highest prices (except seed-potatoes in the period 2006–2008) were imposed by the growers of the earliest-crop potatoes (for example, marketplaces prices in the month of July). If this trend of potato use in 2006–2008 compared to a three year period of 1991–1993, a relatively low growth rate in market prices was achieved, as they increased by 426% (Table 2). This is due to the relatively high prices of earliest-crop potatoes at the beginning of economy transformation in Poland. The lowest growth rate of purchase prices was noted for potato starch used as raw material in starch factories. In turn, the fastest pace of price growth was characteristic for production of certified seed-potatoes (dynamics index 851), and marketplaces prices of table potatoes – almost sevenfold increase in prices. Among the agricultural products compared in Tables 1 and 2, an almost sixfold increase in the price was achieved in the case of milk. Purchase prices of wheat, vegetables (carrots for example), and market prices of fruit (apples, for example) are characterized by nearly fourfold increase in

Table 1. Changes in market prices of potatoes compared to prices of selected agricultural products in the years 1991–2008.

| Price category | 1991–1993 | 1994–1996 | 1997–1999 | 2000–2002 | 2003–2005 | 2006–2008 |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| Marketplaces – table potatoes [PLN dt ⁻¹] | 11.0 | 25.3 | 30.5 | 35.6 | 43.7 | 72.9 |
| Marketplaces – very early potatoes [PLN dt ⁻¹] | 25.0 | 46.8 | 54.4 | 63.7 | 68.7 | 106.5 |
| Purchase – table potatoes [PLN dt ⁻¹] | 8.0 | 23.3 | 28.0 | 33.8 | 34.7 | 43.1 |
| Purchase – starch potatoes [PLN dt ⁻¹] | 5.6 | 12.9 | 13.5 | 19.2 | 22.0 | 20.8 |
| Sales – seed-potatoes [PLN dt ⁻¹] | 13.9 | 43.0 | 41.0 | 51.0 | 68.3 | 118.3 |
| Purchase – rye [PLN dt ⁻¹] | 10.2 | 25.3 | 33.1 | 35.3 | 32.7 | 51.2 |
| Purchase – wheat [PLN dt ⁻¹] | 16.0 | 39.1 | 46.9 | 48.3 | 43.1 | 60.6 |
| Purchase – carrot [PLN kg ⁻¹] | 0.09 | 0.18 | 0.23 | 0.26 | 0.26 | 0.32 |
| Marketplaces – apples [PLN kg ⁻¹] | 0.5 | 1.0 | 1.3 | 1.5 | 1.5 | 2.0 |
| Purchase – pigs [PLN kg ⁻¹] | 1.0 | 2.4 | 3.4 | 3.9 | 3.7 | 3.7 |
| Purchase – milk [PLN l ⁻¹] | 0.17 | 0.41 | 0.60 | 0.76 | 0.84 | 1.00 |
| Diesel [PLN l ⁻¹] | 0.50 | 1.03 | 1.56 | 2.54 | 3.27 | 4.00 |
| Ursus Tractor 2812 [tys. PLN] | 6.5 | 18.8 | 28.2 | 38.3 | 54.1 | 69.5 |
| Ammonium nitrate [PLN/25 kg] | 4.6 | 8.2 | 10.7 | 12.9 | 17.1 | 23.1 |
| Miedzian 50 WP [PLN/1,5 kg] | 9.6 | 19.0 | 29.8 | 34.0 | 36.4 | 44.7 |

Source: Own calculations based on Central Statistical Office data (Rocznik Statystyczny ..., 1999, 2002, 2009)

Table 2. Indices of dynamics of market prices of potatoes compared to prices of selected agricultural products in the years 1991–2008 (previous period = 100).

| Price category | 1991–1993 | 1994–1996 | 1997–1999 | 2000–2002 | 2003–2005 | 2006–2008 | Dynamics 2006–08/1991–93 1993=100 |
|---|-----------|-----------|-----------|-----------|-----------|-----------|---|
| | | | | | | | |
| Marketplaces – table potatoes | 100 | 230 | 121 | 117 | 123 | 167 | 663 |
| Marketplaces – very early potatoes (in July) | 100 | 187 | 116 | 117 | 108 | 155 | 426 |
| Purchase – table potatoes | 100 | 291 | 120 | 121 | 103 | 124 | 539 |
| Purchase – starch potatoes | 100 | 230 | 105 | 142 | 115 | 95 | 371 |
| Sales – seed potatoes | 100 | 309 | 95 | 124 | 134 | 173 | 851 |
| Purchase – rye | 100 | 248 | 131 | 107 | 93 | 157 | 502 |
| Purchase – wheat | 100 | 244 | 120 | 103 | 89 | 141 | 379 |
| Purchase – carrot | 100 | 201 | 127 | 111 | 100 | 123 | 356 |
| Marketplaces – apples | 100 | 213 | 130 | 115 | 100 | 133 | 400 |
| Purchase – pigs | 100 | 240 | 142 | 115 | 95 | 95 | 370 |
| Purchase – milk | 100 | 241 | 146 | 127 | 111 | 119 | 588 |
| Diesel | 100 | 206 | 151 | 163 | 129 | 122 | 800 |
| Ursus Tractor 2812 | 100 | 291 | 150 | 136 | 141 | 128 | 1069 |
| Ammonium nitrate | 100 | 178 | 130 | 121 | 133 | 135 | 502 |
| Miedzian 50 WP | 100 | 198 | 157 | 114 | 107 | 123 | 466 |

Source: see Table 1

Table 3. Changes in retail prices of potatoes and their products against the retail prices of selected food products in the years 1991–2008.

| Product | Retail prices | | | | | |
|--------------------------------------|---------------|-----------|-----------|-----------|-----------|-----------|
| | 1991–1993 | 1994–1996 | 1997–1999 | 2000–2002 | 2003–2005 | 2006–2008 |
| Potatoes [PLN dt ⁻¹] | 21.4 | 44.5 | 65.7 | 68.3 | 76.7 | 112.0 |
| French fries [PLN kg ⁻¹] | 0.72 | 4.1 | 5.9 | 7.6 | 7.9 | 8.80 |
| Starch [PLN kg ⁻¹] | 0.9 | 2.7 | 2.7 | 3.2 | 2.9 | 3.90 |
| Bread [PLN/0.5 kg] | 0.27 | 0.62 | 0.97 | 1.33 | 1.34 | 1.58 |
| Pasta [PLN/0.4 kg] | 0.69 | 1.58 | 2.72 | 3.47 | 3.91 | 3.43 |
| Carrot [PLN kg ⁻¹] | 0.41 | 0.83 | 1.26 | 1.45 | 1.43 | 1.81 |
| Apples [PLN kg ⁻¹] | 0.52 | 1.10 | 1.50 | 1.92 | 1.96 | 2.95 |
| Pork [PLN kg ⁻¹] | 4.69 | 8.71 | 12.47 | 13.84 | 13.32 | 13.68 |
| Milk [PLN l ⁻¹] | 0.30 | 0.66 | 1.00 | 1.28 | 1.37 | 1.58 |

Source: see Table 1

prices in the tested period of 18 years. For rye it is by five-fold. For all the analysed products, the strongest growth occurred in 1994–1996 compared to 1991–1993 period, so under the conditions of the highest inflation. In conclusion, the majority of intended uses of potatoes are characterized, compared to competing products, by relatively favourable trends of changes in prices in the period after marketization of Polish economy, including agriculture.

In relation to the growth of prices of mineral fertilizers (ammonium nitrate for example), and plant protection products (for example, Miedzian 50 WP), the aforementioned market segments of potatoes present themselves favourably. The costs of mechanical work (for example,

prices of tractor Ursus 2812 and diesel) grow definitely faster than any of the compared agricultural products.

The largest market segment of the potatoes are table potatoes. To stabilize the high level of consumption of fresh potatoes in Poland, followed by processed potato, it is important to compare the dynamics of changes in prices paid by consumers. Retail prices of potato products in the industry can be analysed by comparison with retail prices of bread and pasta (energy products), carrots and apples (products of dietetic use) and the most important animal products – milk and pork (Table 3).

As was shown in Table 4, the growth rate of retail prices of potatoes in most of the analysed periods was lower

Table 4. Indices of dynamics of retail prices of potatoes, compared to retail prices of selected food products in the years 1991–2008 (previous period = 100).

| Product | 1991–1993 | 1994–1996 | 1997–1999 | 2000–2002 | 2003–2005 | 2006–2008 | Dynamics 2006–08/1991–93 1991–1993=100 |
|--------------|-----------|-----------|-----------|-----------|-----------|-----------|--|
| Potatoes | 100 | 208 | 148 | 104 | 112 | 146 | 523 |
| French fries | 100 | 569 | 144 | 129 | 104 | 111 | 1222 |
| Starch | 100 | 300 | 100 | 119 | 91 | 134 | 433 |
| Bread | 100 | 230 | 156 | 137 | 101 | 118 | 585 |
| Pasta | 100 | 229 | 172 | 128 | 113 | 88 | 484 |
| Carrot | 100 | 202 | 152 | 115 | 99 | 127 | 441 |
| Apples | 100 | 211 | 136 | 128 | 102 | 151 | 567 |
| Pork | 100 | 186 | 143 | 111 | 96 | 103 | 292 |
| Milk | 100 | 220 | 152 | 128 | 107 | 115 | 523 |

Source: see Table 1

than the growth rate of producer prices (marketplaces and purchase prices) (Table 2). Growth rate of retail prices of potatoes in 2006–2008 relative to 1991–1993 period is the same as in the case of milk, but lower compared with bread and apples. Most advantageous in terms of price relations compared to the cereal products was the situation for potatoes in 2007, characterized by very high prices for cereals.

A lower growth rate of the retail prices than for potatoes occurs for vegetables (for example carrots), and pork. Among the potato processing products retail prices of starch (potato flour) increased at a slightly faster pace as the purchase prices of raw material, while the price of chips rose in the years 1991–1993 and 2006–2008 more than twelvefold. It is believed to be due to the growing domestic demand and to higher prices in export transactions. In this situation, processing plants and distributors obtained an above-average profit margin.

CHANGES IN THE ECONOMIC RELATIONS OF THE POTATO MARKET

Key facts about the economic conditions for development stem from the observation of changes in economic relations. Table 5 contains data about the price relations of potatoes against selected products of agri-food market. There is no one-way tendency of relations of marketplaces prices to purchase prices of table potatoes. Up to the period 2000–2002, there was a tendency of these levels of price categories to become similar to each other, while in subsequent years marketplaces prices grew relatively quickly. As previously stated, a prevalence of very early potato prices compared to the prices of table potatoes from the so-called main harvest systematically decreases. This is due to an increasing competition from the specialist potato producers for the earliest-crop potatoes and to an increase

Table 5. Indices of dynamics of potato price relations in the years 1991–2008.

| Relations of prices | 1991–1993 | 1994–1996 | 1997–1999 | 2000–2002 | 2003–2005 | 2006–2008 | Dynamics 2006–08/1991–03 1991–1993=100 |
|---|-----------|-----------|-----------|-----------|-----------|-----------|--|
| Table – marketplaces/purchase | 1.38 | 1.09 | 1.09 | 1.05 | 1.26 | 1.69 | 122 |
| Early – marketplaces/table – marketplaces | 2.27 | 1.85 | 1.78 | 1.79 | 1.57 | 1.46 | 64 |
| Seed-potatoes/table – marketplaces | 1.26 | 1.70 | 1.34 | 1.43 | 1.56 | 1.62 | 129 |
| Table – marketplaces/starch – purchase | 1.96 | 1.96 | 2.26 | 1.85 | 1.99 | 3.50 | 179 |
| Table – purchase/starch – purchase | 1.43 | 1.81 | 2.07 | 1.76 | 1.58 | 2.07 | 145 |
| Share of marketplaces prices in retail prices | 0.51 | 0.57 | 0.46 | 0.52 | 0.57 | 0.65 | 127 |
| Share of potato marketplaces prices in french fries prices | 0.38 | 0.15 | 0.13 | 0.12 | 0.14 | 0.21 | 55 |
| Share of starch potato prices in starch retail prices | 0.37 | 0.29 | 0.30 | 0.36 | 0.46 | 0.32 | 86 |

Source: see Table 1

Table 6. Indices of dynamics of potato prices compared to prices of selected agricultural food products in the years 1991–2008.

| Relations of prices | 1991–1993 | 1994–1996 | 1997–1999 | 2000–2002 | 2003–2005 | 2006–2008 | Dynamics 1991–1993 = 100 |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------------------------|
| Marketplaces – potatoes/purchase – wheat | 0.69 | 0.65 | 0.65 | 0.73 | 1.01 | 1.20 | 173 |
| Marketplaces – potatoes/purchase – rye | 1.08 | 1.00 | 0.92 | 1.01 | 1.34 | 1.42 | 131 |
| Marketplaces – potatoes/purchase – pork | 0.11 | 0.11 | 0.09 | 0.09 | 0.12 | 0.20 | 181 |
| Purchase – pork/purchase – starch potatoes | 17.9 | 18.6 | 25.2 | 20.3 | 16.8 | 17.8 | 99 |
| Retail prices – potatoes/pasta | 0.12 | 0.11 | 0.10 | 0.08 | 0.08 | 0.13 | 108 |
| Retail prices – potatoes/carrot | 0.52 | 0.54 | 0.52 | 0.47 | 0.54 | 0.62 | 119 |
| Retail prices – potatoes/bread | 0.40 | 0.36 | 0.34 | 0.26 | 0.29 | 0.35 | 88 |
| Retail prices – potatoes/apples | 0.41 | 0.40 | 0.44 | 0.35 | 0.39 | 0.38 | 93 |
| Retail prices – potatoes/milk | 0.71 | 0.67 | 0.66 | 0.53 | 0.56 | 0.71 | 100 |
| Retail prices – potatoes/pork | 0.046 | 0.051 | 0.053 | 0.049 | 0.058 | 0.084 | 183 |

Source: see Table 1

in the scale of the earliest potato production on the farms. Potatoes from the early harvest are less and less perceived by customers as a delicatessen item for which a much higher price must be paid. During the tested 18 years, there was a tendency of increasing potato-seed prices in relation to the marketplaces prices of table potatoes. This relation increased from 1.26 in 1991–1993 to 1.62 in the period 2006–2008. In Poland, however, it is still, almost twice lower than in Western European EU countries. Marketplaces price of potatoes in most periods are about twofold higher than purchase price of industrial potatoes (starch). In the last three years, this ratio increased to 3.50 with a risk of deterioration in the profitability of potato starch as a raw material for starch production. The ratio of purchase prices of table potatoes compared to purchase prices of the industry potatoes remained at the levels close to 2.0.

The share of producer prices in retail prices shows the directions of changes in the development of the distribution and processing margins. Generally, a reduction in the share of marketplaces prices in the retail prices of potatoes was not observed (Table 5). So, the economic situation of producers in relation to the sphere of trade and commerce does not worsen. In part this situation is undoubtedly caused by the gradual improvement of quality of potatoes destined for sale, including the delivery of packaged potatoes. The high growth in the prices of french fries in the years 1991–2002 meant that the share prices of the prices of raw material in the final product decreased. However, it should be noted that relating marketplaces prices to the prices of french fries is a significant simplification, because the actual, arising from contracts, purchase prices of potatoes as a raw material for conversion into fried products are relatively lower. In the case of potato starch market, there were wide fluctuations in the rate of purchasing prices of raw starch in retail starch prices in different periods of time. In the last three years we can see, however, the deterioration of the relationship.

No decline in the share prices of producers of final products targeted for consumption, which is undoubtedly characteristic for the market of potatoes, should be treated as a unusual conditions in both Polish and global agri-food market (Rembeza, Seremak-Bulge, 2006). For example, in the U.S. at the beginning of the decade, the share of agricultural production of food in retail prices was only 20% in comparison to 30% 35 years earlier (Figiel, Białek, 2005). The share of agricultural producer in the price paid by consumers decreased significantly in all groups of products. The decline in this ratio was the lowest in the case of processed fruits and vegetables, and the largest in group of cereal products. We can hypothetically assume that this unusual situation concerning a non-deterioration in the share of producer prices of potatoes in the retail price is due to self-regulating properties of the free market. Market of fresh potatoes is not a subject to any form of government regulation (Common Agricultural Policy of the European Union) and operates in conditions similar to those of perfect competition. A lower share of producer prices in the final product price occurs in processed potato market, where competition is limited as a few large customers are on the side of the demand (so-called oligopsonistic market) (Wrzosek, 1997).

The relations between sale prices of potatoes and sales prices of other agricultural products are a proof of tendencies in cost-effectiveness of alternative branches of agricultural production. As for the changes in relations in retail prices lead us to the conclusion regarding the level of competitiveness of products on the market. After 2000, the relations of market prices for potatoes compared with wheat purchase prices grew slowly (Table 6). Dynamic growth of potato prices in 2003–2008 caused that the price of table potatoes significantly exceeded purchase price of wheat. Similar relations exist between the prices of potatoes and rye purchase price, except that the price of rye was shaped

slightly below the prices of potatoes throughout the period of free-market economy in our country. In 1997–2002, the relations of potato prices compared to the purchase prices of pork deteriorated, while in the last examined six-years period they significantly improved. The relations of prices of pork purchase to starch potato purchase in the last three years (2006–2008) returned to the level from the early 90s, when about 18 kg of potatoes equaled the 1 kg of pork.

Up to 2003–2005, there was a growth tendency of retail prices of pasta compared to retail prices of potatoes. In the last examined three years there was some deterioration in this relation. Relations between retail prices of potatoes and carrots in the tested 16 years remained at a ratio of 1:2, with a predominance of potatoes in the last years. The comparison of changes in retail prices of potatoes and apples indicates maintaining of these relations at a similar level. The same applies to relationships in retail prices of bread in relation to the prices of potatoes, taking into account the fact that until 2002 there was a trend of relative increase in the price of bread, while in later years it was the opposite. Retail prices of potatoes in relation to the retail price of milk in the first period were decreasing, but they showed a growing tendency in the years 2003–2008.

SUMMARY

The analysis presents many indications that the potato market, especially the market of table potato with the highest turnover, is an efficient market. Its operational efficiency is determined by, among others, higher dynamics in potato price changes compared to prices of other primary agricultural products in 1991–2008. The effectiveness of the market is also indicated by the fact that it constitutes a stimulant to improve microeconomic efficiency of production: increase in the scale of cultivation and in the degree of farm specialization, technological innovation leading to, among others, a substitution of human labour for mechanical work, implementation of various forms of advances in biology, technology, organization and economics. The impact of these factors shows that in the long run we should not anticipate a rise in real unit price of the product, but rather its decrease.

On the other hand, the potato market cannot cope with the presence of numerous barriers to efficiency in terms of ability to compete on the international market. Restrictions in this regard are due to the following factors:

- restrictive phytosanitary control system, especially for a quarantine disease – potato ring rot (*Clavibacter michiganensis* subsp. *sepedonicus*), which effectively discourages manufacturers from offering potatoes for export,
- scarcity of enterprises/companies which would have an economic and marketing potential high enough to be able to compete on the international market,

- slow progress in improving the product so that it is delivered to the market in large batches of uniform quality,
- high market prices for potatoes in the country, exceeding in many cases, prices in countries such as Germany, Holland, Belgium, France.

Production of potatoes (except potato starch sector) is one of the few branches of agricultural production which is not subject to any elements of market regulation under the Common Agricultural Policy. Market supply-demand mechanism is the basis for pricing, determining its high variability, also by regions. The segment of edible potato market operates relatively to the highest extent according to the rules similar to the perfectly competitive market principles.

In light of the principles of institutional economics, the desire to minimize transaction costs leads to the formation of specific relationships between free market transactions and the development of integration. Vertical integration leads to a reduction of transaction costs. However, in the potato industry purchase and processing enterprises benefit most from this situation, since the level of profitability of potatoes produced under contracts is lower compared to the cultivation of potatoes in the free-market supply. However, we should emphasize the benefits of contracting due to an increase in sales certainty (reduction of market risk). The factor responsible for gradual changes leading to the development of the contractual relationship and the relative decline in the importance of free-market transactions is the need to increase the competitiveness of the domestic market offer.

An interesting case in the aspect of assessing the effectiveness of the functioning of the market is the sector of the earliest crop of potatoes (so-called „young” potatoes). This market segment is an example of the effectiveness of market mechanisms towards the deepening of specialization, scale of production, product quality, organizational efficiency and implementation of the biological and technological progress. It should be noted that compared to other lines of potato production, it provides the highest economic efficiency for producers. Above mentioned relations cause that the dynamic of growth of very early potato prices is much lower compared to marketplaces prices of table potatoes (for later harvest).

On the market of table fresh potatoes, a substantial reduction in the producer share of retail prices is not observed. We can assume that this is due to self-regulating nature of the market, which in this segment operates according to rules similar to those of the perfectly competitive market. A role in creating these trends can be attributed also to the market supply of potatoes with better quality parameters and partly prepared for use (eg cleaned, packaged). The decreasing tendency in the share prices of producers in the final product occurs in the processed potato market, where competition for the demand for raw potato is limited (oligopsonistic market).

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