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Quantitative description of the fruit industry and fruit supply chains in Poland

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Abstract: The development of consumer-driven, efficient, responsive and innovative supply chains is crucial for the growth of fruit consumption in Europe and for a competitive, sustainable fruit sector. Currently, fruit supply chains are characterized by a relatively low level of consumer orientation and consumer-driven innovations.
The awareness of the functioning of supply chains in the European fruit sector should be increased to be able to increase the level of consumer-drivenness, efficiency, and responsiveness of fruit supply chains.
This paper presents the results of review of fruit supply chains' from the fruit industry in Poland. The analysis of supply chains is preceded by a review of fruit consumption, fruit production, trade characteristic and trends. Moreover, the role of different actors in the functioning of fruit supply chains is presented as well as their quantitative characteristics.
To present the characteristics of the fruit industry in Poland with particular attention to functioning of supply chains in Poland, desk research was carried out. This type of research includes use of general access sources of information. The following sources were used: literature on functioning of supply chains and role of particular actors in a chain, analyses considering characteristic of fruit industry conducted by various research institutes as well as reports on a current state and development perspectives of fruit market in Poland. In addition, statistical data from the national statistical office were used

Keywords: fruit production, fruit consumption, fruit industry, fruit supply chains, trade, horticulture

Introduction

Increase in fruit production in a situation of declining demand is the basic reason of large economic problems in the world horticulture. Fruit overproduction is mostly noticeable in countries with well-developed horticulture. A group of these countries consists of many Western European countries including Poland. On the basis of forecasts it can be supposed that the economic situation of horticulture will worsen in the future and it applies also to Poland. Quality requirements as well as production costs are growing whereas fruit prices are decreasing. There is also a growth of fruit production in countries, which had not play a significant role in this field before (China, India, Turkey, and Iran). Large trade entities use various methods of encouraging costumers in larger purchase, mainly by prices decrease, which is done at costs to fruit producers. In order to counteract these processes, the attention should be focused on building of supply chains, which are commonly managed.
In the era of globalization companies must quickly react to market needs and offer product of high quality with competitive prices if they want to get a position on market and keep a competitive advantage over rivals. All these things contribute to creation value for a costumer. Contemporary, firms continually look for ways, methods and techniques of management which allow to achieve these goals. One of such concepts is implementation of supply chain management which means management of relations with suppliers and costumers as well as clients in order to provide the highest possible value for a client with lower costs in a whole chain. It is a situation when narrowly understood interest of one link must be confronted with advantages for a whole chain. It is a great challenge for the Polish fruit sector where nowadays it is difficult to talk about supply chain management. Many companies creating supply chains operate currently near each others and do not perceive their costumers as partners who should be involved in determination of a common strategy of operation and agreeing on prices (Lemanowicz 2009). The development of consumer-driven, efficient, responsive and innovative supply chains is crucial for the growth of fruit consumption in Europe and for a competitive, sustainable fruit sector.

Characteristics of the Polish fruit industry

Poland is the biggest apple producer in Europe and one of the greatest ones all over the world. Apart from apples there is a significant contribution of cherries and pears, currants, strawberries. Global fruit production in Poland has not been characterized by increasing tendencies and it has been significantly changeable in particular years. The total production of fruit in Poland in 2006 was over 3.2 million tons.

As far as apples production is concerned, it amounted to about 2.3 millions tons what meant 72% of the total fruit production. In 2007, as a result of strong spring ground frost crops had the lowest level for 20 years and they were lower by 47% than in 2006. Total fruit production in 2007 was at the level of 1.7 million tons. Decrease in production in orchards was at the level of 53%, in the case of apples – 55%, pears – 48% less, sweet cherries – 47% less and cherries – 45% less. In 2008, crops were twice higher as in the previous year and were at the level of 3.5 million tons. Comparing with the previous year, prices of dessert apples raised by 75% whereas apples for industry even by 300%, strawberries, redcurrants and plums by 80% (Nosecka 2008).

Table 1. Production of fruit in Poland (in thousand tons)

Specification	2002	2003	2004	2005	2006	2007	2008
Total fruits	**3018.0**	**3308.8**	**3520.9**	**2921.6**	**3210.8**	**1695.4**	**3502.0**
Tree fruits	2 605.1	2 877.8	3 021.3	2 424.8	2 708.0	1266.8	2956.0
Apples	2 167.5	2 427.8	2 521.5	2 075.0	2 304.9	1040.0	2515.0
Pears	92.1	77.2	87.3	59.3	59.3	30.7	68.0
Plums	102.9	109.6	132.6	91.4	93.6	53.5	104.0
Cherries	173.1	191.1	201.7	139.9	194.9	107.7	196.0
Sweet cherries	40.8	44.1	48.4	37.5	38.4	20.2	41.0
Other tree fruits	28.7	28.1	29.7	21.7	14.4	14.7	32.0

Source: „Horticultural crops output", GUS Warszawa, successive years
Other fruit: peaches, apricots, walnuts, hazel.

Poland is one of the biggest producer of soft fruit in Europe. In 2008 production of strawberries surpassed for the first time 200 thousand tons and currants exceeded 190 thousand tons. Significant share in soft fruit production had also raspberries and chokeberries (Table 2).

Table 2. Production of fruits from bushes and berry plantations in Poland (in thousand tons)

Specification	2002	2003	2004	2005	2006	2007	2008
Total	412.9	431.0	499.7	496.8	502.8	428.6	546.0
Strawberries	153.1	131.3	185.6	184.6	193.7	174.6	201.0
Raspberries	44.9	42.9	56.8	65.5	52.5	56.4	81.0
Currants	157.5	192.5	194.5	184.6	194.5	139.9	194.0
Gooseberries	21.7	20.3	19.9	16.7	16.2	13.7	17.0
Chokeberries	35.7	38.9	37.5	36.8	39.5	37.0	42.0
Other fruits	3.8	5.1	5.4	6.4	6.4	7.0	9.0

Source: „Horticultural crops output", GUS Warszawa, successive years

The fruit in Poland are grown on the area of 387 000 ha. Apple orchards have the biggest share in fruit cultivating area, which occupies the area of 170 000 ha (44% of total fruit-growing area). Strawberries (14.6%), followed by currants (11.3%) and cherries (9.6%), cover also a significant area of horticultural production (Figure 1).

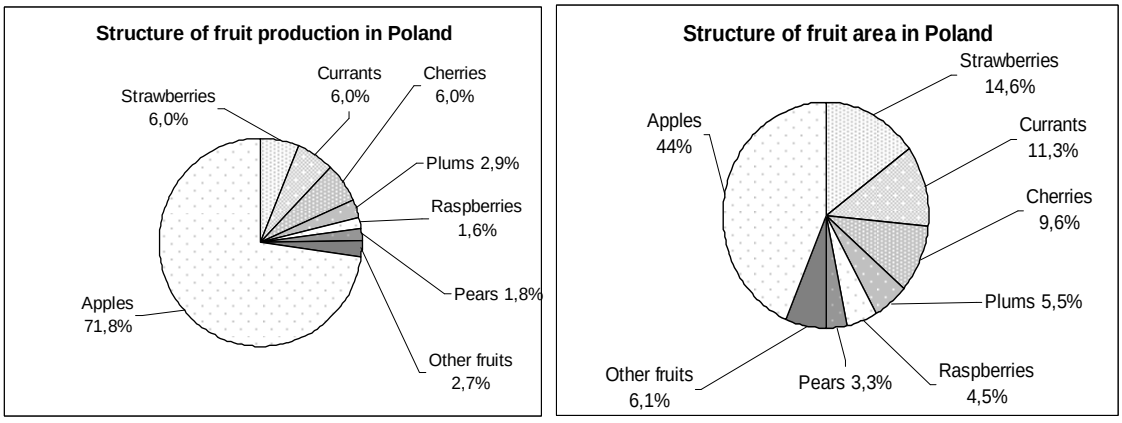

Figure 1. Structure of fruit production and area in Poland in 2006 (%)

As far as apple production is concerned, on the basis of balance date (IERiGŻ) and experts estimation it is possible to indicate the main directions of apple use. In 2006, the production of apples achieved the level of above 2.3 million tons, from which above half, (1.1–1.2 million tons), was destined for processing industry, mainly for concentrated apple juice production. Nearly 35% of total apple production (0.7-0.8 million ton) was destined for direct consumption. Part of the production (0.3-0.4 million ton), mainly dessert apples, is exported. Concentrated juice is mainly produced from apples, which is a half-finished product for juice, nectars and fruit beverages production. Above 90% of concentrated apple juice is exported. Poland is among European countries where significant part of apple production is destined for processing. In 2007, there was significant decrease in production of fruit preserves as a result of decline in fruit production caused by spring ground frosts. The most considerable was decrease in concentrated apple juice (by 40%). However, decline in apple concentrate production was lower than decrease in apples production and supply of a processing industry as a result of import of apples for processing.
In Poland above half of all apple production is destined for processing. In Poland there is a lack of statistical data concerning only fresh fruit distribution channels. On the basis of a partial research and experts' estimations (Nosecka, 2005) it can be stated that fresh fruit and vegetables are sold for consumers through local markets (40%). The share of wholesaler markets in fresh fruit selling is about 20%. Direct selling to retailers account for about 25% of fruit producers supply (from this 10% goes to super- and hypermarkets). The remaining 15% is sold directly on fruit-growing farms (Table 3). The structure of the fruit sale channels differs in accordance with the scale of production in individual farms.

Table 3. Structure of fresh fruit and vegetable distribution (% of volume)

Specification	Share (% of volume)
Local markets	40
Wholesale markets	20
Retailers (supermarkets)	25 (10)
Directly from the farms	10
Other forms of helling	5

Source: Nosecka B. Produkcja owoców i warzyw – informacja dla producentów, Warszawa, kwiecień 2005.

The structure of fruit supply chains

This chapter presents the structure of fruit supply chains in Poland. As an apple production has the biggest meaning in Polish horticultural, this diagrams reflects the directions of apple distribution, however what should be stressed this structures are also typical for others fruits. Figure 2 presents the main actors taking part in fruit supply chains in Poland.

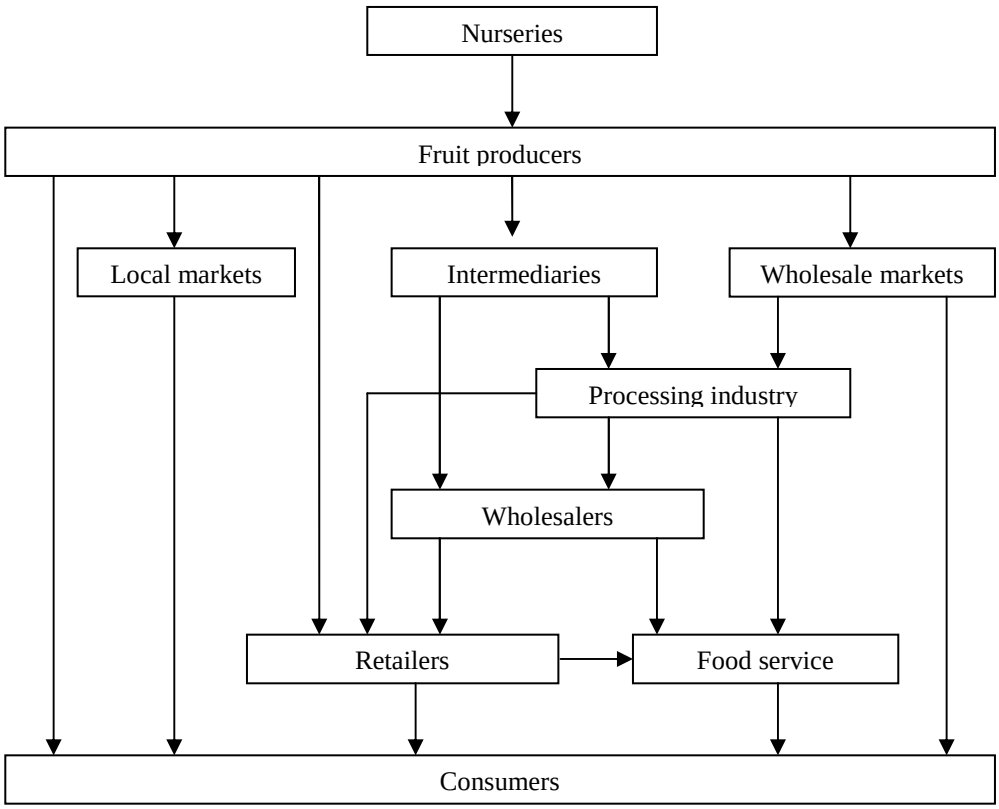

Figure 2. Fruit supply chains in Poland
Source: own elaboration.

Nurseries

In Poland nursery material is produced by about 1150 nursery gardens on the area of 1100 ha. Fruit trees are produced on the area of about 500 ha. Polish fruit-tree nurseries have fragmented structure. The majority of fruit- nurseries have about 0.5 ha. There are about 20% of farms with area ranging from l to 3 ha and the same percentage applies to farms over 3 ha.

The production of fruit trees is about 10 million annually. Apple-trees account for 50%, cherry-trees for 20%, plum-trees for 9% and pear-trees and sweet cherry-trees both for 7% of total nursery material. The production of peach-trees, apricot-trees and walnut trees ranges around 250 thousand annually. The contribution of apple trees on vegetative stocks is now very high - about 98%, including trees on dwarfed rootstocks about 30%.

The production of berry-bushes amounts about 3.5-5.0 ml annually. Production of black-berry bushes has the biggest importance (1.5-3.2 million annually). The rest ones: (gooseberry, red currant, raspberry – production is about 350-600 thousand annually and strawberry seedlings about 25 million.

Fruit producers

In the period 1998-2004, the total area of orchards in Poland raised from 265.2 thousand ha to 277.6 ha. After the Polish accession to the EU there was significant increase in the area of orchards. In 2007, the area of orchards was 336.7 thousand ha (increase by 21.3% comparing to the year 2004).

In Poland small orchards have been still in majority – these with no more than 1 ha constitute 77% of the total number of farms whereas they take only about 18% of the area under orchards. Next 17% of fruit-growing farms have from 1 to 5 ha and they constitute nearly 33% of the total area of orchards in the country. Only 0.25% of the total fruit-growing farms have orchards with an area of 20 ha and more and they constitute nearly 10% of the total area of orchards in Poland (Table 4).

Table 4. Structure of number and area of orchards in particular area groups of orchards

Specification	Area groups of orchards in ha						
	total	to 1 ha	1.01-4.99 ha	5.0-9.99 ha	10-19.99 ha	20-49.99 ha	>50 ha
	in % of the total number and area						
Number of fruit-growing farms	100	76.9	16.7	4.6	1.3	0.2	0.05
Area of orchards	100	18.1	32.8	25.3	14.1	5.4	4.3

Source: Badanie produkcji roślinnej, Departament rolnictwa i gospodarki żywnościowej, GUS 2008

Sector of fruit producers in Poland is very fragmented. This situation results in difficulties in creating efficient exchange relation between farms and others actors in the chain. Transaction costs are high, information scattered and quality of product difficult to control.

From the presented data it turns out that in Poland there is a low level of concentration of horticultural production. Despite this fragmented horticultural farm structure, the process of producer groups creation are going slowly, although there has been significant acceleration in this field recently. Currently, only 65 producer groups in horticultural sector are functioning. The supply of horticultural producer groups does not exceed 3% of total fruit production. In UE-15 concentration of production is considerably higher and share of producer groups (cooperatives) in market supply on average exceeds 40%, in Belgium and the Netherlands even 80%.

Intermediaries

The structure of fruit-growing farms crucially affects the sale. The majority of small farms are subsistence oriented and have only marginal contacts with the market. The small-sized farms have practically no direct relations with large processing companies. Most of these contacts are with local markets or with casual purchasers (like trading companies). In Poland fruit deliveries to processing companies, in over 60%, are made by intermediaries.

Many small-sized farms deliver their fruit to a collecting point. A collecting point exists usually in ever larger region, to which the fruit is delivered during the harvest season. The collecting points are organized either by private traders or processors. The delivery to the collecting points usually takes place without previous arrangements.

Wholesale markets

The creation of wholesale distribution system in Poland, similar to the one in the EU, was introduced under the governmental program „For Organization of Wholesale Markets and Commodity Exchanges" in 1994. Currently, as part of this program, 7 supraregional, 6 regional and many local markets are functioning.

List of wholesale markets in Poland:

7 supraregional:
- Poznań (Wielkopolska Giełda Rolno-Ogrodnicza S.A.)
- Warszawa (Warszawski Rolno-Spożywczy Rynek Hurtowy S.A. w Broniszach)
- Gdańsk (Pomorskie Hurtowe Centrum Rolno-Spożywcze S.A.)
- Wrocław (Dolnośląskie Centrum Hurtu Rolno-Spożywczego S.A)
- Katowice (Centrum Handlu Hurtowego sp. z o.o.)
- Lublin (Lubelski Rynek Hurtowy S.A)
- Szczecin (Zachodniopomorskie Centrum Hurtowe „ROLHURT")

6 regional:
- Białystok (Podlaskie centrum Rolno-Towarowe S.A)
- Bydgoszcz
- Łódź (Łódzki Rynek Hurtowy „Zjazdowa")
- Radom (Rolno-Spożywczy Rynek Hurtowy S.A)
- Rzeszów (Podkarpackie Centrum Hurtowe „AGROHURT" S.A)
- Zielona Góra (Zielonogórski Rynek Rolno-Towarowy S.A.)

Others:
- Elbląg (Rolno-Spożywczy Rynek Hurtowy „Giełda Elbląska")
- Bielsko-Biała (Beskidzki Hurt Towarowy S.A. and Giełda Ogrodniczo-Kwiatowa)

- Gorzów Wielkopolski (Gorzowski Rynek Hurtowy S.A)
- Legnica (Rolno-Przemysłowy Rynek Hurtowy „Giełda Hurtowa" S.A.)
- Białystok (Rynek Rolno-Spożywczy sp. z o.o.)
- Olsztyn (Olsztyńska Giełda Towarowo-Pieniężna S.A)
- Piła (Pilski Rynek Hurtowy sp. z o.o.)
- Sandomierz (Sandomierski Rynek Hurtowy S.A.)
- Tarnów (Małopolski Rynek Hurtowy)
- Wałbrzych (Wałbrzyski Rynek Hurtowy S.A)
- Wrocław (Rolno-Spożywczy Rynek Hurtowy „TARGPIAST" sp. z o.o.)

Processing industry (juices, nectars, fruit beverages)

In 2008, there was the highest increase per year in value of juices and nectars sale in this decade – by 7.9% but it has been rising at the lowest pace comparing to other categories of alcohol-free beverages. It results among other from higher prices of these beverages. A leader of juices and nectars production in Poland is Maspex. In 2008, its participation in sale value was 28.1%. A position of the Agros Nova company has been weakening from 17.8% in 2006 to 13.2% in 2008 whereas Hortex has been gaining a stronger position – increase from 12% in 2006 to 15.7% in 2008. In the years 2007 and 2008, there was also increase of the Coca-Cola Company in value of juices and nectars sale. It was respectively 2.1% and 4.5%. A reason for such a rise is launching one line of juices, nectars and fruit beverages within Cappy brand on market. Proportion of own brands of chain stores was at the level of 33.9% in the sale volume and 19.2% in the sale value in 2008. Table 5 presents changes in juices, fruit as well as fruit and vegetable nectars and beverages in the period 2001-2008. An analysis of this data displays that production of drinking juices has been continuously declining whereas there has been increase in nectars production, which were unpopular in Poland at the beginning of the present decade but their production reached the level of 320 million liters. Decrease of a role of drinking juices is caused by adjusting process of entities in this sector to high prices of concentrated fruit juices on the world market. In the season 2008/2009 drinking juices constitute about 30% of total juices, nectars and beverages production whereas in the previous one – 35% and about 45% in the seasons 2004/05 and 2006/07

Table 5. Production of juices, nectars and fruit- and fruit-vegetable beverages (in million l)

Specification	2001	2002	2003	2004	2005	2006	2007	2008
Total drinking juices	621.5	640.7	668.3	579.8	626.3	429.4	462.0	470
- from citrus	218.7	215.8	200.4	186.2	188.9	124.4	93.4	95.0
- from apple	135.4	160.4	192.6	172.8	157.8	90.3	86.2	85.0
- others	267.4	264.5	275.3	220.8	279.6	214.7	282.4	290.0
Nectars	61.7	59.7	132.3	230.0	222.2	344.9	302.9	320.0
Fruit and fruit-vegetable beverages	305.1	319.3	386.4	310.4	355.2	609.6	7119.1	760.09
Total	**988.3**	**1019.7**	**1187.0**	**1120.2**	**1203.7**	**1383.9**	**1484.0**	**1550.0**

Source: Rynek owoców i warzyw. Stan i perspektywy, IERiGŻ, 2008

In 2008 there were about 110 enterprises functioning in beverage sector. The contribution of 4 market leaders: Maspex Wadowice, Agros Nova, Hortex Holding and Coca Cola Company (Cappy juice) in market of juices, nectars and fruit and fruit-vegetable beverages reaches 60%. Apart from big firms there is numerous group of small plants producing for the local markets.

Concentrated juices and mousses produced in Poland are used as raw material to produce juices nectars and beverages. The leaders in this sector cover part of the demand for concentrated apple juice with their own production. As far as juices-producing branch is concerned there are tendencies to separate the sector of concentrated juices from drinking juices sector. Factories producing juices and beverages reduce your own production and purchase in enterprises producing concentrated juices and vegetable mousses. The contribution of juices produced directly from fruit and vegetables amounts to about 5% .

Wholesalers

Wholesale in Poland is run in closed storehouses (free-standing buildings), shelters, silos and storage yards – the majority of them are storehouses. In 2004, 28 445 closed storehouses with storage area were functioning (with area of 16 001,0 thousand m^2) . They contributed 78.8% of all storehouses and 51.2% of their total storage area. Among closed storehouses – the majority are small ones. It is confirmed by average storage area coefficient - in 2004 it was 562.5 m^2 . Shelters are in minority and constitute the smallest group.

Wholesale hypermarkets (self-service wholesaling) functioning in Poland, belong to two firms with foreign capital: Makro Cash and Carry Poland Ltd. (part of Metro AG Concern) and Selgros (main shareholder is Rewe Group). In 2008 Makro had the network composed from 29 outlets and Selgros from 11 outlets.

Distribution centers are considered to be the most modern forms of capital-area concentration established by wholesale enterprises to service their own or cooperating storehouse networks as well as logistics centers organized by specialized firms (logistic service operators). Regarding fragmented structure of both production and trade, there are difficulties in establishing distribution and logistics centers faster so consequently there are differences between Poland and developed countries concerning above mentioned. However, a process of building of professional distribution centers is nowadays very dynamic in Poland.

Retailers

In Poland still the majority of food shops are traditional small ones with area to 500 m^2. Their share in food trade in 2004 was over 60.7%. The significance of hypermarkets, supermarkets and discount shops in FMCG sector turnover dynamically grows. Their overall contribution in food trade was nearly 40% (Figure 8).

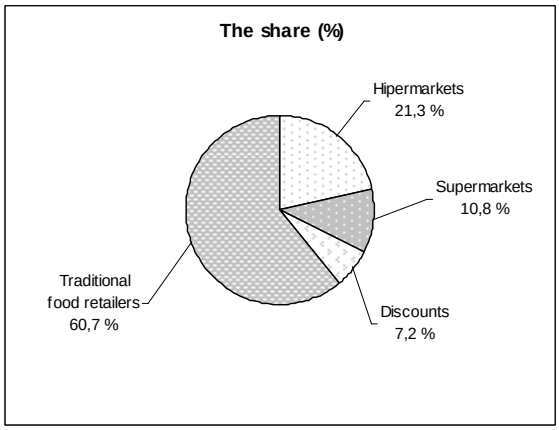

Figure 3. The share of retailers in food trade in Poland in 2004 (% of volume)

From the data of the research company Nielsen it can be concluded that a number of all food shops in Poland declined in 2008. There has been decrease in a number of small entities, community shops and food kiosks whereas there has been increase in a number of super- and hypermarkets.

In 2008, there were 59 827 small food shops and the number was by 10% less than in the previous year. Comparing to the year 2004, there was decline in a number of small shops by 13.3 thousand trade entities. In the period 2007-2008, an average number of food shops increased by 2%, from 31 951 entities to 32 547. For the comparison, a number of hypermarkets raised from 245 to 267, which means increase by 9% whereas in the case of supermarkets it was increase from 3567 to 3916 – by 10%.

Totally in a traditional trade in 2008 there were 102 153 food shops whereas in modern trade – 4183 entities.

Discount shops are very popular among Polish consumers. In 2006 the total number of discount shops exceeds 1500. Table 6 presents changes in a number of discount shops in Poland in the period 2001-2006.

Table 6. Number of discount shops in Poland

Chain/Year	2001	2002	2003	2004	2005	2006	% change in 2006 comparing with 2001
Biedronka	617	628	657	712	790	832	35%
Leader Price	44	107	135	154	206	211	380%
Lidl	20	31	72	117	183	201	905%
Netto	39	63	72	81	96	104	167%
Plus	111	129	149	160	170	185	67%
Total	831	958	1085	1224	1445	1533	84%

Source: Data from Ac Nielsen, 2006.

Consumers

Nowadays costumers do not have to be persuaded that fruits play an important role in their diet. Fruit provides necessary nutritional elements, diversify our diet. Discovering vitamins and their role for an organism shifted fruits from a group of foodstuff of additional tastes to a group of basic and necessary stuff in a rational nutrition (Kubiak 2009). Fruit consumption in Poland changed significantly from 33 kg per person in 1970 to 55 kg per person in 2004.

Recent increase in fruit consumption in Poland has been irregular and has fluctuated. However, in a long period we can observe considerable raise of its level. Despite of significant increase in fruit consumption in Poland, it has been still very low comparing with other countries of the EU. Fruit consumption in Poland is more than 20 kg lower than recommendations of the National Food and Nutrition Institute.

Taking a fact of a low level of fruit consumption in Poland into account, there have been taking up more promoting activities in order to encourage consumers to fruit consumption. An example of such activities was a campaign “vegetables and fruit 5 times per day” as well as product innovations continuously launched on market.

Since the school year 2009/2020 the European Commission will start a programme “Fruit at school”. The aim of this programme is a long-term change of children’s and youth’s food habits through increase in proportion of fruit in their daily diet. The programme will be financed by the resources of the EU and from national levels. The European Commission will spend 90 million euro for a school year for the realization of this programme in the EU. Financial resources will spend for providing children in educational institutions with fresh and processed fruit as well as for covering some logistic costs, monitoring of market, etc. The programme is directed at pupils at age from 6 to 10 years, whose group in Poland is estimated at 2.128 million, which constitutes 8.2% of all children in the EU in this age range. It means that if all of the EU countries apply for a full participation in the programme, Poland theoretically can receive about 8% from 90 million euro for providing children with fruit and vegetables.

Conclusions

Continuous changes take place in fruit farming, both in fruit production as well as distribution. They are getting more and more difficult for fruit producers. New problems are complex and require long-standing solving. An analysis or solution of one problem often needs thinking commonly on a few different factors, closely related with each other. Such problems’ solving is described as **system or complex activities**. A group of basic activities which should be implemented in the Polish fruit farming consists of: increase in yield per an area unit and improvement of fruit quality, building of efficient, managed supply chains. That is why processing plants should take up system activities in order to provide themselves with necessary material. The most important operations in this filed are: contract agreements with a particular producer group, which will take into account minimal purchase prices. Other important task for plants is to establish own producer organizations, which can be closely cooperated with. It is a necessity of serious treatment of a partner – a producer of fruit for processing, especially in the case of fruit purchase and prices. Many firms look for improvement of their profitability at cost to companies they cooperate with. However, such operation, which consists of throwing costs on other partners in a chain, does not contribute to improvement of competitiveness. As a result, all costs generated by chain’s participants are displayed in a product price paid by a consumer at the moment of providing a product on market. It should be stressed that contemporary smaller plants operating on the base of Polish capital are characterized by better cooperation and treatment of producers.

Other very important activity is fruit promotion, which allows ensuring increase in consumption. The programme “Fruit at school” is a very good example and it will start in the EU countries from the school year 2009/2020.

Moreover, a lack of a strong trade organization is a weak side of the Polish fruit farming, especially in the situation of fruit export. There has been "Polish-Polish" competition on foreign markets of fresh and processed fruit. As a result, prices of fresh and processed fruit are considerably lower. It is loss for fruit and processed fruit producers.

Development of fruit farming is strongly connected with a level of national nurseries. It has been on a good level for a few years. National production of nursery material covers needs of our fruit farming. However, there is necessity of improvement of trees' quality.

Activities specified above do not exhaust of course all operations which should be taken up in order to improve the situation of the Polish fruit industry. It is especially important to build supply chains because the development of consumer-driven, efficient, responsive and innovative supply chains is crucial for the growth of fruit consumption in Europe and for a competitive, sustainable fruit sector.

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