

LONG-TERM TRENDS IN PRODUCTION AND CONSUMPTION OF APPLES IN POLAND, EUROPE AND WORLDWIDE

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Abstract. Apples are in many countries dominant species of fruit both in production and consumption. Trends in consumption of these fruits are important indicators for producers. The aim of this study was to determine long term changes in the production and consumption of apples in Poland, Europe and different regions of the world. The basis for the analysis were secondary FAO data. The dynamics of changes of these variables, the trend and the relationship between production and consumption of apples in different regions of the world were determined. On the basis of the analysis, it was found that the production and consumption of apples in the EU in the long term are quite stable. Globally, during the analyzed period, the highest increase in apple production was seen in Asia and Africa. In Poland in the years 1961–2010, apple production increased by 559%, and in the following years there was a rapid increase in production to a level of 3.1 million tones in 2013, while the consumption of apples increased of only over 133%.

Key words: apple, production, consumption, tendency

INTRODUCTION

In Poland as well as in many other European countries and worldwide apples are the dominant species of fruits both in production and consumption. In the last 70 years there were significant changes in apples production. These changes were the results of the growing quantitative and qualitative needs of consumers, and the changes in the economy. They resulted in the changes in the technology of apples production and types of orchards, and also in the organization of the production and selling, and preparation of apples to be sold. Higher yields and fruit quality in the market are inter alia the results of these changes. The structure of cultivar and the sales trends were changing [Makosz 2013]. Trends in the consumption of fruits including apples are a significant indication

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for the producers because their offer aims at meeting the changing needs and expectations of consumers. The social environment and participation in various groups in the society are the source of these needs. Non-economic factors such as health, nutritional and health value, easiness, aesthetics and convenience of consumption have increasingly started to decide what we eat. For example in the last few years the time spent on meals preparation has decreased from 3–4 hours to half an hour per day. Moreover, the growing share of the elderly people in the population, working women and smaller families [Grieg 1995] can be observed. These tendencies can be approved by the research made worldwide. At present the main motivation for fruits choice by consumers and the changes in their opinions is health and convenience [Lappalainen et al. 1998, Harker et al. 2002]. Consumers in Poland are also interested in the method of production and are willing to pay higher price for organic fruits [Czernyszewicz 2009a]. This behaviour of consumers resulted in the changes supported by the governments of various countries of Europe, New Zealand and Canada to replace the conventional production with the integrated one. Nowadays in some European countries the organic production starts to replace the conventional and integrated production [Barritt 2002, Czernyszewicz 2009b].

The aim of this study was to describe the changes of the consumption and production of apples in a long term, in Poland, Europe, and various regions of the world. The hypothesis has been declared that in the long term, in contrary to other regions of the world the production and consumption of apples in the UE will be quite stable.

MATERIALS AND METHODS

The research problem was described on the basis of the empirical data analysis derived from secondary sources. The basis for the long time analysis were FAO data for 1961–2010 in the field of the production and consumption of apples in various regions of Europe and the world. In contrary to other statistics these data are comparable in a long term and in various regions of the world. The level of production and consumption of apples, dynamics of their changes and the trends were described, and also the correlation between the production and consumption of apples was indicated. Coefficient of determination R^2 given by the linear regression equation specified what part of the variability of response variable (dependent) was explained by the model. The calculations were made in MS Excel.

RESULTS AND DISCUSSION

On the basis of FAO data presented in Figure 1 it can be concluded that in Europe the higher number of apples are nowadays produced in its eastern part. Among all countries of Europe Poland is the bigger producer of apples. Italy, France, Russia, Ukraine and Germany are also the significant apples producers. Based on the research made by Dirksmeyer [2012] it can be said that in Germany between 1994 and 2015 the significant changes in horticulture, including the production of fruits, took place. The decrease about 32.3% of the number of fruit farms could be observed, in details the decrease of the number of small (below 5 ha and 5 to 10 ha) fruits farms (respectively 38.5 and 23.9%), although the number of big fruit farms (more than 20 ha) increased of about 26.7%. The total area of fruit farms also decreased of 8.7% and the level of employment decreased of 31.3 what resulted in the abovementioned changes.



Fig. 1. Apple production in Europe in 2013, thousand tonnes. Source: own calculations based on the FAO data

In the past years the significant increase of apples production has been observed and Poland has become the leader of the apples production (fig. 2). In 2011 to 2013 in comparison to years 1961–1965 the production of apples increased of about 758%, and in 2014 reached the record level of 3.7 mln tones. Based on the forecasts of Makosz [2015] it is shown that in the next years due to the increase of new apples planting the harvest of apples in Poland can reach 4.5 mln tones.

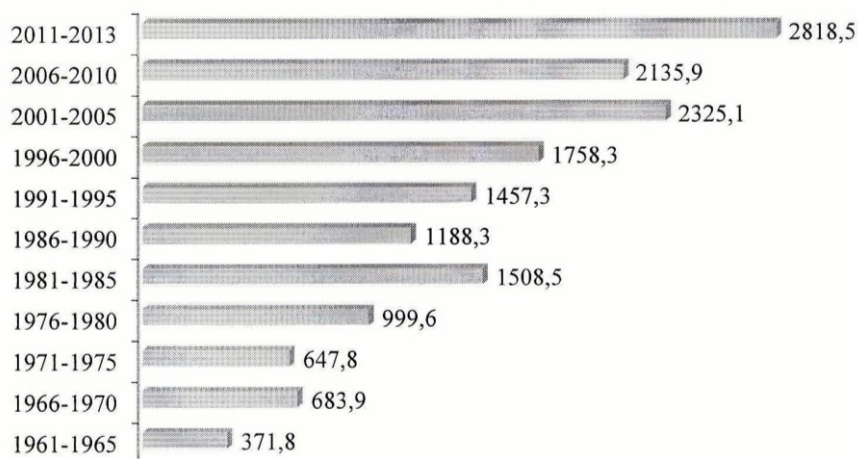


Fig. 2. Apple production in Poland during 1961–2013, thousand tonnes. Source: own calculations based on the FAO data

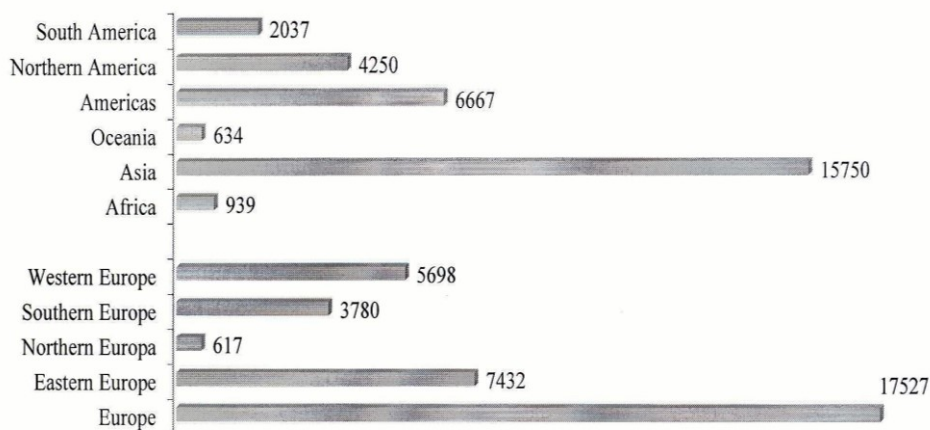


Fig. 3. Apple production in different regions of Europe and the World average during period 1960–2010, thousand tonnes. Source: own calculations based on the FAO data

Worldwide the biggest production of apples is in Europe, especially in Eastern and Western Europe and in Asian countries. Northern America is also relatively big area of apples production (fig. 3). Damos et al. [2015] said that in 2012 the biggest producer of apples was China, and next respectively the USA, Turkey and Poland.

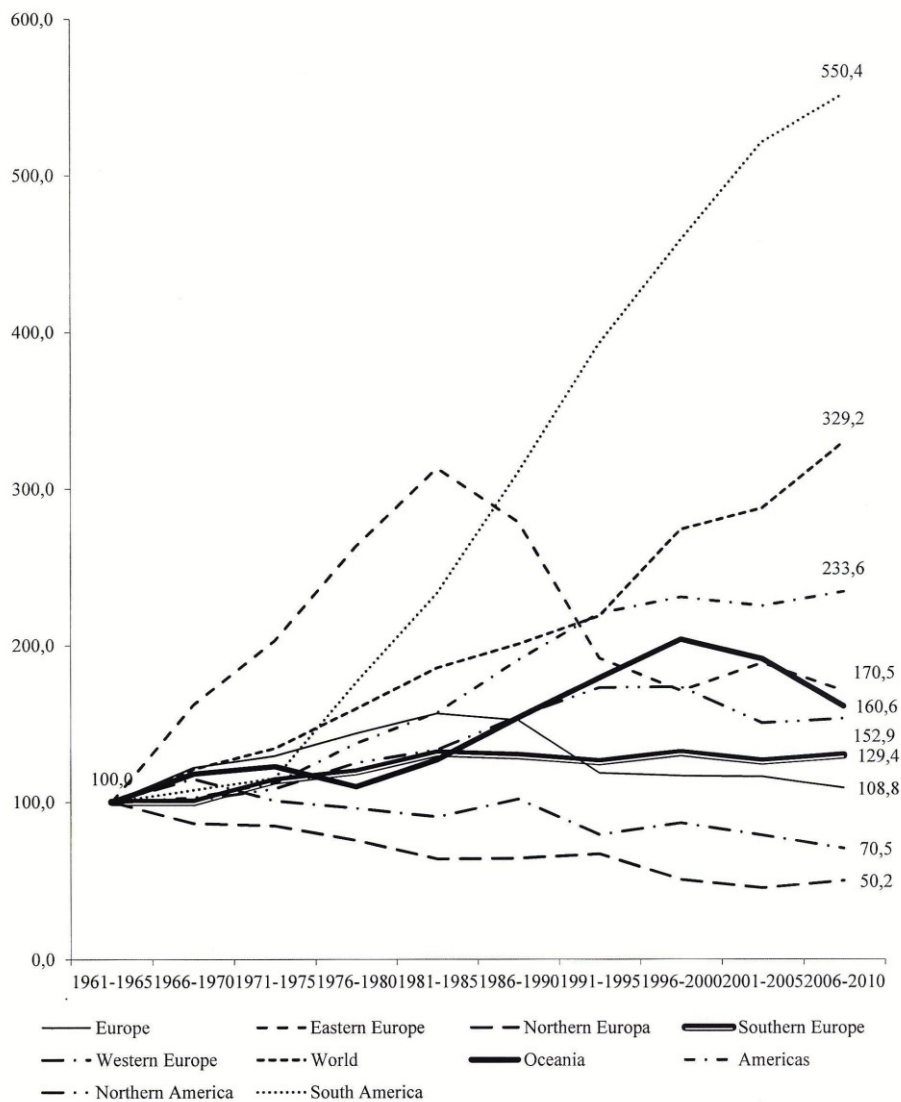


Fig. 4. Dynamics of apple production in different regions of Europe and the World during period 1960–2010, in percent. Source: own calculations based on the FAO data

Between 1960 and 2010 the production of apples worldwide increased of about 330% but the consumption only of about 209%. The most dynamic growth in apples production was observed in Poland and Southern America – of more than 550%. The decrease of apples production was observed in Northern and Western Europe (respectively of 50 and 30%; fig. 4). The highest average annual growth of apple production was recorded in Asia and Africa, and a downward trend in Northern and Western Europe (tab. 1). The production of apples in South America was characterized by a significant average annual rate of growth.

Table 1. Tendency of dynamics of apple production in different regions of Europe and the World during 1960–2010

Specification	Equation	R ²
World	$y = 24.927 x + 63.83$	0.98
Africa	$y = 134.43 x - 173.58$	0.95
Americas	$y = 17.749 x + 73.249$	0.94
Northern America	$y = 7.9271 x + 93.522$	0.74
South America	$y = 56.797 x + 16.187$	0.97
Asia	$y = 187.45 x - 341.49$	0.90
Oceania	$y = 10.267 x + 90.03$	0.74
Europe	$y = -0.6591 x + 129.92$	0.01
Eastern Europe	$y = 2.4838 x + 190.38$	0.01
Northern Europe	$y = -5.6441 x + 99.869$	0.92
Southern Europe	$y = 3.3325 x + 102.15$	0.69
Western Europe	$y = -3.8042 x + 112.8$	0.74

Source: own calculations based on the FAO data

Together with quantitative changes came qualitative changes resulting from advances of the physiology of fruit trees and fruits production as well as the development of genetic engineering and genetics of new cultivars of fruit trees [Denis and Hull 2003]. The results of these changes are the cultivars resistant to diseases (mainly scab and mildews) and pests. Thanks to this the usage of pesticides in the orchard can be significantly reduced. Other changes enabled to increase the productivity of orchards and the quicker exchange of cultivars what makes it possible to meet customers demand. According to the analysis of the tendencies of apple trees production in the UE countries made by Sansavini et al. [2004] it can be said that the development of breeding apples trees in the world also resulted in the improvement of fruits quality, including taste, colour, nutritional value, storability and processing. These trends are confirmed by the review made by Baldoni and Rugini [2002] on genetic modifications used in crops of various fruits.

Table 2. Tendency of apple consumption in different regions in The World during 1961–2010, kg/person/year

Specification	Equation	R ²
World	$y = 0.384 x + 4.90$	0.96
Africa	$y = 0.2102 x - 0.12$	0.93
Americas	$y = 1.2336 x + 10.97$	0.73
Northern America	$y = 1.3474 x + 11.03$	0.79
South America	$y = 0.2611 x + 2.60$	0.88
Asia	$y = 0.7669 x - 0.35$	0.95
Oceania	$y = 0.3972 x + 16.31$	0.25
Europe	$y = 0.0808 x + 19.64$	0.01
Eastern Europe	$y = 0.19119 x + 16.41$	0.02
Northern Europe	$y = 1.2336 x + 10.97$	0.73
Southern Europe	$y = 0.3636x + 15.20$	0.45
Western Europe	$y = -1.0556 x + 34.07$	0.45

Source: own calculations based on the FAO data

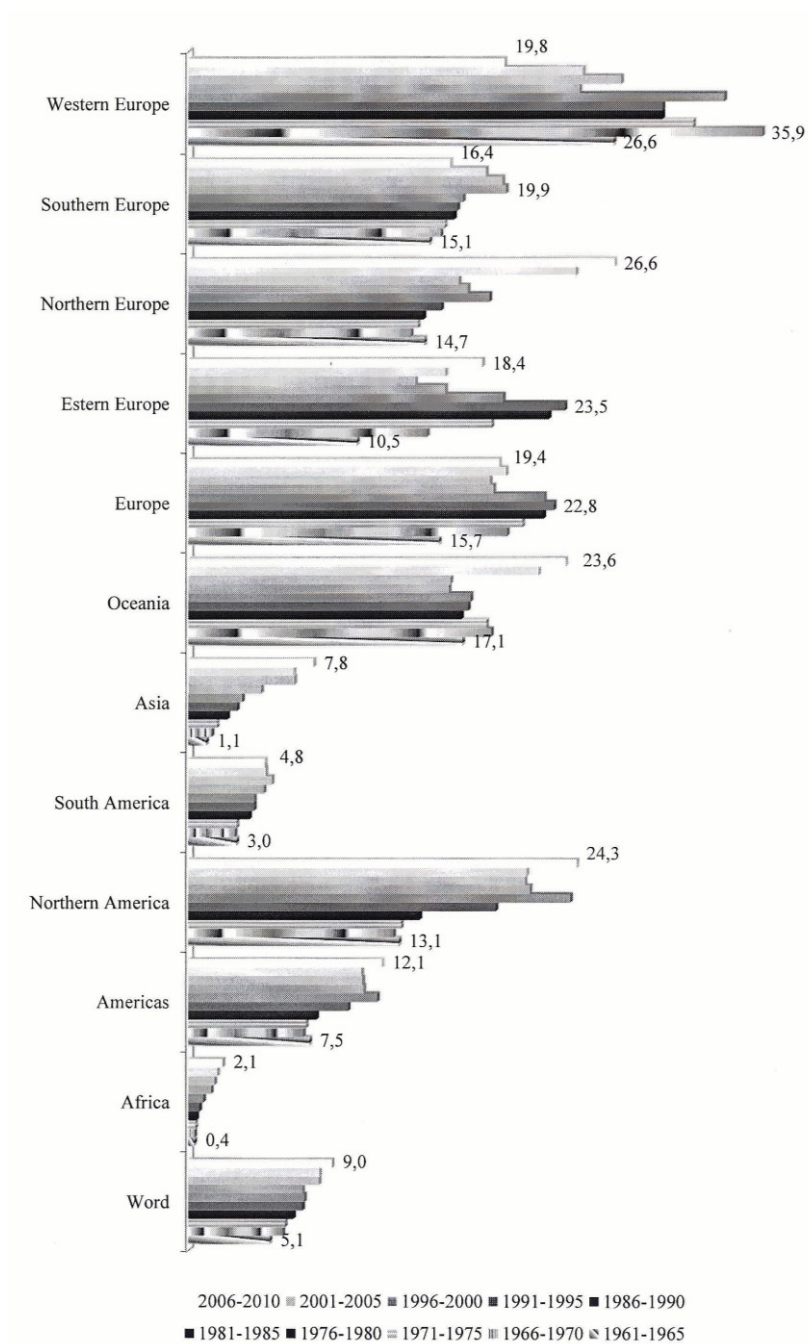


Fig. 5. Consumption of apples in different regions in Europe and the World during 1961–2010, kg/person/year. Source: own calculations based on the FAO data

On average in the whole analyzed period the consumption of apples was the biggest in Western Europe. Nowadays more apples are consumed only by the citizens of Northern Europe, Northern America and Oceania. The lowest number of apples in that period 1960–2010 was consumed by the citizens of Africa, Asia and Southern America (fig. 5). The source of these tendencies are the differences of the structure of fruits consumption made by the climate conditions, availability various cultivars of fruits in the market, and also the level of wealth of consumers and many more socio-demographical factors. Consumption of apples in North America and Northern Europe (tab. 2) was characterized by the highest average annual growth rate.

Big average annual decrease of apples consumption took place in Western Europe. The consumption of apples in Poland is the lowest in Europe. According to the data of FAO the consumption of apples in the last decade was between 16 to 18 kg per capita per year, and also its share in the consumption of fresh fruits declined. Based on the research of Klepacka et al. [2014] it can be concluded the level of income, the size of the household, place of living, education and other socio-demographical factors influence the consumption of fresh fruits including apples. The growth rate of production was higher than the growth rate of apples consumption. In Poland this situation, with a slight growth in domestic consumption and a significant decline in exports of apples to the main importer – Russia resulted in falling prices and temporary problems with handling with the fruit. The analysis made by Bieniek-Majka [2015] show the growing importance of exporting the domestic production of fruits and vegetables including apples, and changes of the geographical structure of the export in 2004–2014, with the focus on the export development on the eastern market. Estimates show that in 2001–2003 exports to Russia accounted for approximately 32% of Polish exports of apples and in 2010–2012, this share increased to 53% [Kraciński 2014]. In past years, in the situation of very big apple production in Poland, groups and producer organizations and growers were forced to seek new distribution channels of apples and destinations of apples usage (i.e. production of cider, NFC juice or concentrate). Markets of North African countries (Algeria and Morocco), the United Arab Emirates and the former USSR countries as Belarus or Kazakhstan appeared to be promising markets. Part of apples produced is used for processing. Poland is currently the second largest producer of apple juice concentrate in the world.

In the period 2012/2013 in 47 food processing companies 275.000 tons of apple concentrate was produced. In past years in the food processing branch in many countries of Europe and in Poland the production of NFC (not from concentrate) juices has developed. This product meets the consumers expectations as they look for natural products and of high nutritional value. The tendencies of handling apples in Poland are in line with the quantitative, structural and qualitative changes in consuming food. The analysis of food consumption and consumers behaviour in a long term in Poland shows the increase of fruits consumption and the decrease of meat, fats of animal origin and sugar consumption [Gulbicka and Kwasek 2004]. These changes also involve the higher interests of high quality food, highly processed and convenient to use on a global scale.

CONCLUSIONS

On the basis of the analysis made it was found that the production and consumption of apples in Europe are quite stable with a decreasing trend in a long term. In the analysed period the biggest increase of apples consumption was noted in Asia and Africa. The high average annual decline in consumption was noted only in Western Europe. In Poland from 1961 to 2010 the production of apples increased of 559%, and in the following years 2010–2013 the continuous very high rise of production reaching the highest level of 3.7 mln tones that was the highest level in Polish horticulture. However, the growth of consumption of apples was slower. In 2014 the mentioned situation as well as the limitation of the export to Russia was one of the problem with domestic apples handling. Therefore, in the situation of a significant increase of the production of apples in recent years, and the bigger consumption of fresh and processed apples, and the diversification of export destinations and processing may be the opportunity to manage the fast growing amount of the production of apples. On the other hand, the share of dessert fruits of high guaranteed quality and safety, meeting the needs of various groups of consumers in the production of fruits should be increasing.

REFERENCES

- Baldoni, L., Rugini, E. (2002). Genetic modification of agronomic traits in fruit crops. In: *Fruit and Vegetable Biotechnology*, Valepusta, V. (ed.). Woodhead Publ., 25–113.
- Barritt, B.H. (2002). *The Apple in the World of 2002: Present Situation and Developments for Producers and Consumers*. Interpoma 7–9 November, Bolzano, Italy, 11–19.
- Bieniek-Majka, M., (2015). Determinanty eksportu owoców i warzyw z Polski w latach 2004–2014. *Rocz. Nauk. Stow. Ekon. Rol. Agrobiz.*, 17, 4, 32–38.
- Czernyszewicz, E. (2009a). Changeability of consumer preferences concerning the methods of fruit production. *J. Agribus. Rural Dev.*, 1(11), 5–14.
- Czernyszewicz, E. (2009b), State and perspectives of fruit organic production in Poland. *Pam. Puł.*, 151, 2, 425–438.
- Damos, P., Colomar, L.A.E., Ioriatti, C. (2015). Integrated fruit production and pest management in Europe: The apple case study and how far we are from the original concept? *Insects*, 6(3), 626–657; DOI: 10.3390/insects6030626.
- Denis, F.G., Hull, J. (2003). Deciduous tree fruit. *HortSci.*, 38(5), 901–910.
- Dirksmeyer, W. (2012). Structural change in fruit and vegetable production in Germany. *Proc. XXVIIIth IHC-IS on Integrating Consumers and Economic Systems*, Batt, P.J. (ed.). *Acta Hort.*, 930, 91–97.
- Grieg, D. (1995). The nutritional transition in Western Europe. *J. Hist. Geogr.*, 22, 247–261.
- Gulbicka, B., Kwasek, M. (2004). *Spożycie żywności w Polsce i innych krajach Unii Europejskiej*. *Studia i Monogr.*, 123. Inst. Ekonom. Roln. Gospod. Żywn., Warszawa.
- Harker, R.F., Gunson, F.A., Brookfield, P.L., White, A. (2002). An apple a day: the influence of memory on consumer judgment of quality. *Food Qual. Prefer.*, 13(3), 173–179.
- Klepacka, A.M., Meng, T., Florkowski, W.J. (2014). Apples or orange? Recent household fruit consumption in Poland. *Rocz. Nauk. Stow. Ekon. Rol. Agrobiz.*, 16, 6, 220–229.
- Kraciński, P. (2014). Polish export of apples on the background of world market. *Rocz. Nauk. Stow. Ekon. Rol. Agrobiz.*, 16, 3, 159–164.

- Lappalainen, R., Kearney, J., Gibney, M. (1998). Pan EU survey of consumer attitudes to food, nutrition and health: An overview. *Food Qual. Prefer.*, 9, 6, 467–478.
- Makosz, E. (2013). Przyszłość polskich jabłek, możliwości rozwoju i zagrożenia. In: *Przyszłość polskiego jabłka*. Mat. Międzynarodowej Konferencji Sadowniczej, UP w Lublinie, 4 grudnia, Lublin, 57–63.
- Makosz, E. (2015). Trzecia rewolucja w produkcji i dystrybucji jabłek w naszym kraju. In: *Mat. Konf. Sadowniczej*, UP w Lublinie, Lublin, 9–20.
- Sansavini, S., Donati, F., Costa, F., Tartarini, S. (2004). Advances in apple breeding for enhanced fruit quality and resistance to biotic stresses: New varieties for the European market. *J. Fruit Ornam. Plant Res.* 12, spec. ed., 13–52.

DLUGOOKRESOWE TENDENCJE W PRODUKCJI I KONSUMPCJI JABŁEK W POLSCE, EUROPIE I NA ŚWIECIE

Streszczenie. Jabłka są w wielu krajach dominującym gatunkiem owoców zarówno w produkcji, jak i w konsumpcji. Tendencje w konsumpcji tych owoców są ważną wskazówką dla producentów. Celem pracy było określenie zmian w produkcji i konsumpcji jabłek w długim okresie w Polsce, Europie i różnych regionach świata. Podstawą do przeprowadzenia analiz były dane wtórne FAO. Określono dynamikę zmian tych wielkości, trend oraz współzależności pomiędzy produkcją a konsumpcją jabłek w różnych regionach świata. Na podstawie przeprowadzonych analiz stwierdzono, że produkcja i konsumpcja jabłek w UE w długim okresie są dość stabilne. W skali świata w analizowanym okresie produkcja i konsumpcja jabłek najbardziej wzrosła w Azji i Afryce. W Polsce w latach 1961–2010 produkcja jabłek wzrosła o 559%, a w kolejnych latach zanotowano bardzo gwałtowny wzrost produkcji do poziomu 3,1 mln ton w 2013 r., natomiast spożycie jabłek wzrosło tylko o ponad 133%.

Słowa kluczowe: jabłka, produkcja, konsumpcja, tendencje

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