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Recent trends and inter-annual variation in apple production in Poland

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Summary and conclusions

This report follows a request from DG AGRI, to analyse recent trends and inter-annual variations in apple production in Poland. The analysis presented is based on a review of available data sources and literature, complemented with information provided by some national experts and sector stakeholders. Specific questions addressed are: (i) how has the industry evolved in recent years; (ii) what is the reason for the record production obtained in 2018; (iii) how can strong discrepancies between production estimates from different sources be explained and (iv) what challenges is the industry currently facing and how could these be addressed from a grower's perspective.

Poland is the leading producer of apples in Europe and one of the top producers in the world (after China and USA). In 2018, Poland was responsible for more than 30% of total EU apple production. Since the late 1980s, Polish apple production has more than tripled, following a linear trend, with large inter-annual variation around the trend. The long-term production increase is mainly due to yield increases, which are attributed to the introduction of high-yielding dwarf varieties, improved agronomic management, and a certain shift of production to the most suitable regions. Inter-annual variations in yield and production are mainly attributed to year-to-year variations in weather conditions and the phenomenon of biannual bearing. In 2018, Polish apple production reached a record level estimated at 4Mt by the Polish Central Statistical Office (GUS), i.e. 29% above the 5-year average. An even higher production estimate (4.81 Mt) was published by the World Apple and Pear Association (WAPA), which bases its estimates on information provided by the Polish Society for Promotion of Dwarf Fruit Orchards. Our analysis shows that the record production level should not be seen as an outlier, but as the consequence of the steep agro-technological development in combination with several other factors favouring production in 2018. On the basis of our analysis it is not possible to determine which estimates are more accurate. Both organisations claim to be unbiased and to base their analysis on best-available information. The estimates of both organisations rely on a combination of producer surveys and a high degree of expert judgement.

The high production levels of recent years combined with the loss of Russia (in 2014) as a main export market led to oversupply and consequent low producer prices, which are perceived by growers as a threat to the survival of the industry. From a growers' perspective, solutions to this problem include continued modernization of orchards and storage facilities and increasing the share of dessert fruits that comply with high quality and safety standards, in order to increase exports to current and new EU, and non-EU markets; investments in irrigation to secure apple production under the changing climate conditions; and providing incentives to convert less viable orchard areas into other types of agricultural production to decrease overproduction.

1 Introduction

This report follows a request from DG AGRI, to analyse recent trends and inter-annual variations in apple production in Poland. The analysis presented is based on a review of available data sources and literature, complemented with information provided by some national experts and sector stakeholders.

Section 2 of the report provides a general overview of the sector and of the challenges faced by Polish apple producers. Section 3 discusses the historical trends in apple production, area and yields. In section 4 we zoom in on the exceptionally high Polish apple production in the year 2018, and in section 5 we discuss which data are currently available to the JRC, and which additional data could possibly be obtained, for more in depth analysis, if required. Special attention is dedicated in this section to discrepancies in yield, area, and production statistics from different sources. Finally, in section 6, we present some preliminary thoughts on the future of apple production in Poland from a growers' perspective.

2 An overview of Poland's apple production

Poland is the leading producer of apples in Europe and one of the top producers in the world (after China, and USA). In 2018, Poland was responsible for 32% of EU apple production, followed by Italy (11%), France (10%), Romania (10%), Germany (6%) and Spain (6%) (Eurostat, 2020a). In 2018, production of apples in Poland reached a historical record, estimated between 4 and 5 Mt¹.

An important characteristic of apple production in Poland is a large variability in size of commercial orchards (<1 to >50 ha) and levels of production intensity (from low to very high), as well as a high number of cultivated varieties (even within one orchard). Poland is a leading world producer of apple concentrate and more than 50% of apples in Poland are grown for processing, which involves less strict quality requirements and lower production costs than so-called dessert apples (i.e. commercially grown apples for direct consumption) (Ogrodnictwo expert, 2017). The orchards with dessert apples constitute around 30% of the apple area; these orchards have highest yields (40-50 ton/ha) and higher production costs. So-called garden apples (for own consumption) occupy ~20% of total apple orchards area, and have rather low contribution to total Polish apple production.

The most common varieties grown are Idared (more than 20% of apple orchards area), Jonagold (17.5%), Szampion (11,2%), Ligol (7,0%), Golden Delicious (5,1%), Gala (5,0%), and Gloster (4,8%) (GUS, 2018b, 2019, reference year is 2017). According to industry sources, Red Delicious, Gala, Jonaprince, and Red Chief are popular for new plantings (USDA, 2018).

In recent years, there seems to be overproduction/oversupply of apples in Poland as compared to what may be consumed domestically, processed or exported. The steep increase in production (Figure 1) was largely driven by the "higher mass - higher profit" concept propagated among farmers during the past century. As a result, not much attention (and associated efforts) was given to improving the quality of apples. Consequently, Polish apples are of predominantly low quality, and only a small percentage of collected apples (15% in 2016, generally ~20%) can meet the export requirements for other EU and several non-EU (e.g. Egypt, China) countries. The quality requirements for export to several non-EU eastern European countries (such as Russia, Belarus and Kazakhstan) are much less severe, and, in the past, large part of Polish apples were exported to these countries; and to Russia in particular (in 2013, 55% of apple exports went to Russia). However, due to political circumstances, in 2014, Russia banned agricultural products from EU countries, which cut off Polish farmers from their largest (and relatively easy) export market. The resulting oversupply led to a fall in prices, temporary problems with handling (storage, transport, processing, etc.) of the fruit, and rendered apple production in the following years unprofitable for many farmers. The partial bypassing of the embargo via Belarus and Serbia solved the problem to a small extent. Currently, farmers have to improve the quality of their apples if they want to export them to new markets. Apples that cannot be exported will be used for processing; however, at a much lower price.

¹ Production estimates vary greatly depending on the source (see Sections 4 and 5)

3 Historical trends in yields, area and production

Historical trends show a rapid increase in apple production over the past 40 years (Figure 1). This increase was mainly due to the yield component (Figure 3) as the area under apple orchards increased at a much smaller rate (Figure 2). Yields have been increasing due to structural transformations of orchards (which commenced in 1960'-70'), which included replacing traditional apple trees with dwarf ones, and intensification of production. The cultivation of dwarf varieties of fruit trees has many advantages, as compared to traditional tall trees: plants occupy little space, they enter the fruiting season early (even in the second or third year) after planting, can produce high yields each year, and pruning, thinning, protection against diseases and pests, and harvesting of fruit are much simpler than in the case of tall trees. Dwarf fruit trees also make better use of sunlight, which is more evenly distributed in the crown. Significant drops in yield (and production) occurred in 2007 (due to freezing conditions that coincided with flowering and fruit formation in May 2007), and in 2010 (due to unfavourable agrometeorological conditions throughout the season). Also 2017 and 2019 were not very favourable for apple trees (as discussed in section 4), resulting in relatively low production.

Another reason for increasing apple production was the development of producer groups, especially after 1990, accompanied by development of fruit storage, processing capacity (which enabled the increase of commodity production and improvement of the commercial offer) and nurseries. During the years 2011-2015, about 20,000 ha new apple orchards were created, as a result of the favourable economic environment for apple production, large exports to eastern European countries (Russia, Belarus), and availability of EU subsidies for setting up orchards.

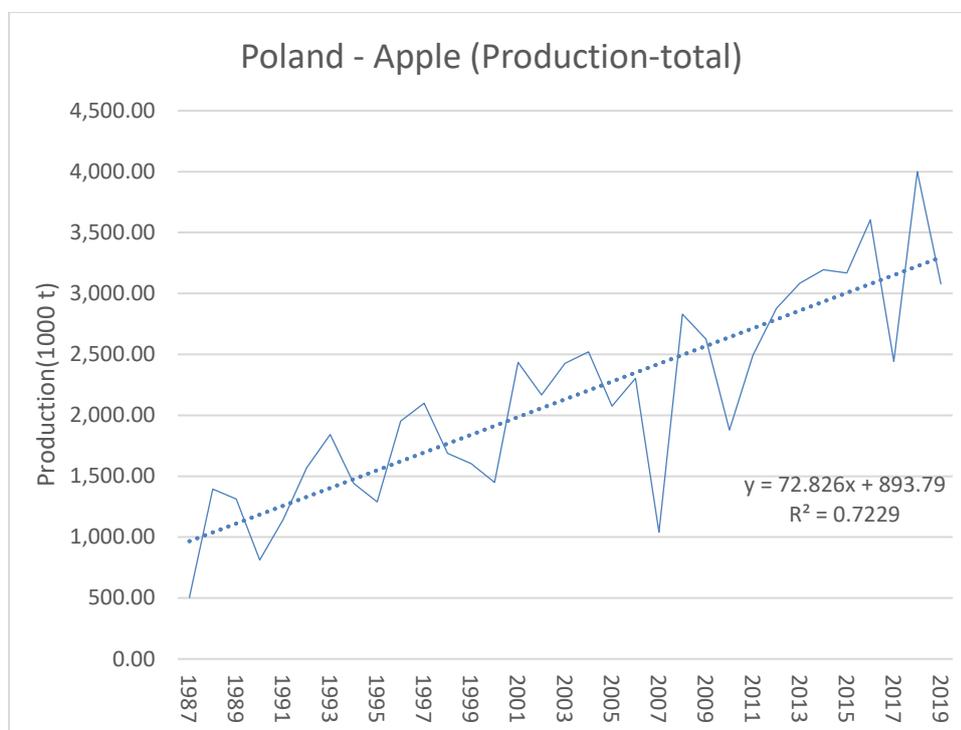


Figure 1: Historical trend in production of apples at national level for period 1987-2019, source: Eurostat. The blue solid line represents Eurostat data; the blue dotted line represents a linear regression trend.

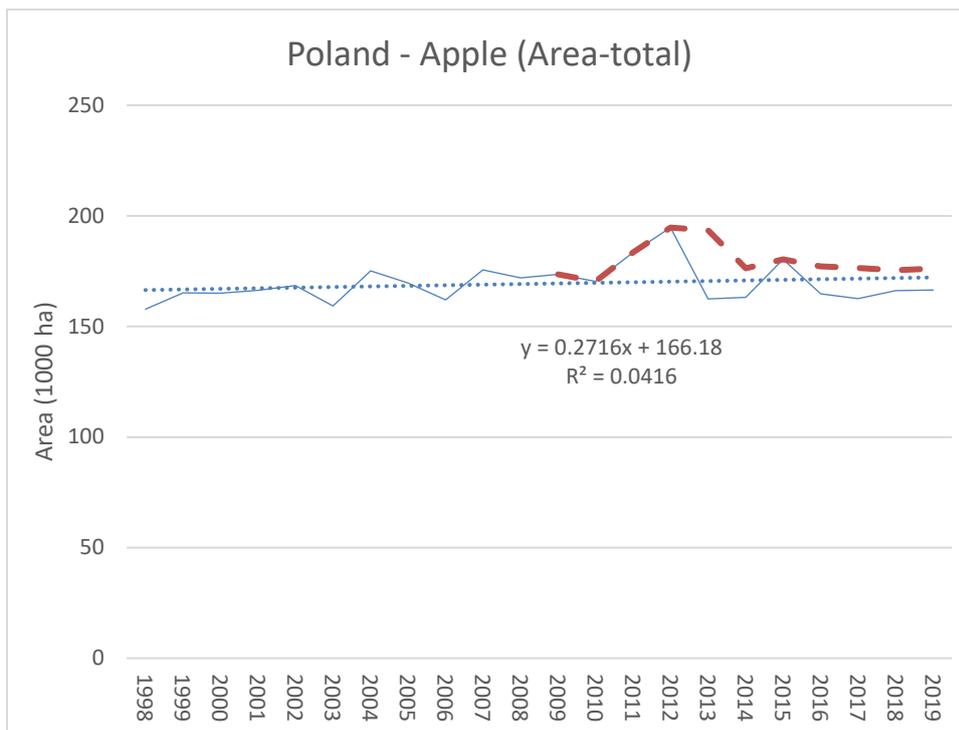


Figure 2: Development of the area of apple orchards at national level for period 1998-2019, source: Eurostat. The blue solid line represents Eurostat data (1998-2019); the blue dotted line represents a linear regression trend, fitted to the Eurostat data; the red dashed line represents Statistics Poland data (2009-2019).

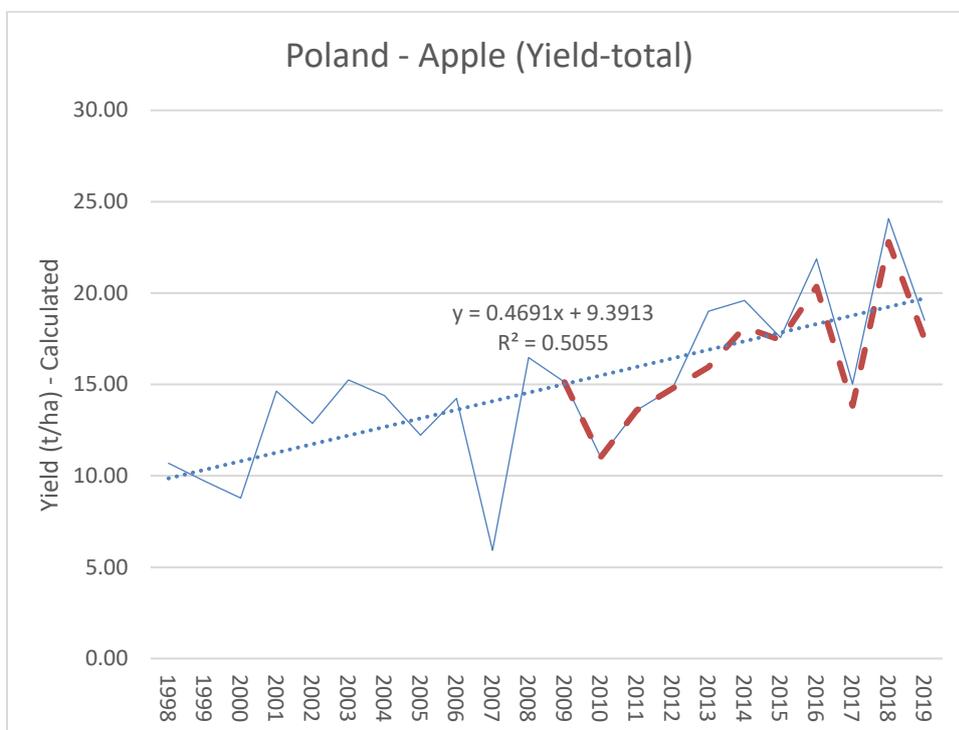


Figure 3: Historical trend in apple yields (calculated as production/area) at national level. The blue solid line represents calculations based on Eurostat data (1998-2019); the blue dotted line represents a linear regression trend, fitted to the Eurostat data; the red dashed line represents calculations based on Statistics Poland data (2009-2019)

4 Record-high apple yields and production in 2018

Apple production was record high in 2018. The Polish Central Statistical Office estimates 4.0 Mt (GUS, 2018a), which is 29% higher than the 5-year average and 64% higher than in 2017. The World Apple and Pear Association (WAPA²), provides an even higher estimate, of 4.8 Mt (WAPA, 2019); see also Appendix, Table A1.

How could 2018 yields be so much higher than the historical figures? We found that the following factors may have contributed:

- The long-term production trend – attributed to agro-technological developments and efficiency gains as mentioned in section 3 – shows a steep increase. Just extrapolating this trend would give a 2018 production of around 3.3 Mt, i.e. 18% above the 5-year average and 35% above 2017;
- Apple orchards replanted between 2011 and 2015 with high-yielding varieties, and under intensive management, are now reaching full productivity, which implies an acceleration of production compared to the linear trend;
- Apple has a tendency of biennial bearing, which means that low-yielding years (“off” years) tend to be followed by high-yielding years (“on” years) and vice versa, in particular when the low yields in the off year were caused by events that primarily affected fruit bearing rather than growth. The relatively low yields in 2017, caused by frosts around flowering, could have triggered an “on” year in 2018.
- Normally, the tendency for biennial bearing is controlled by thinning (eliminating/cutting excess fruits at the early stage of fruit formation during “on years”). In 2018, thinning may have occurred less than necessary due to labour scarcity and the low apple prices; in particular on smaller/poorer farms. The result would be a very high number of fruits per tree.
- 2018 was a sunny and relatively dry year which resulted in high biomass formation and very limited pest and disease pressure; water stress was not a significant issue as there was sufficient moisture in deeper soil layers. These favourable weather conditions would have contributed to fruit size.
- In the following year of 2019, apple production was 3.08 Mt (23% less than in 2018) according to Statistics Poland (GUS, 2019). Lower yields in 2019 were caused by unfavorable meteorological conditions (freezing temperatures during flowering and fruiting), as well as prolonged water deficits during spring and summer. Additionally, due to the biennial bearing phenomenon, 2019 was an “off year”, with below-average production due to lower-than-usual numbers of fruit per tree. However, the production losses in 2019 were somehow mitigated by high-yielding varieties that reached full productivity.

On the basis of these considerations, we conclude that the apple production of 4Mt in 2018 as reported by GUS should not be regarded as an outlier, but as the consequence of a steep trend in agro-technological development combined with favourable weather conditions, new orchards coming into full production and crop-physiological traits that resulted in an “on” year”. The level of 4.8 Mt, reported by WAPA appears to be more

² Polish apple production estimates are provided to WAPA by the Society for the Promotion of Dwarf Fruit Orchards (TRSK), the only Polish member of WAPA.

exceptional, but not implausible, and not so much when compared with the production data of the preceding years reported by this organization.

5 Data

5.1 Spatial distribution of the main apple production areas

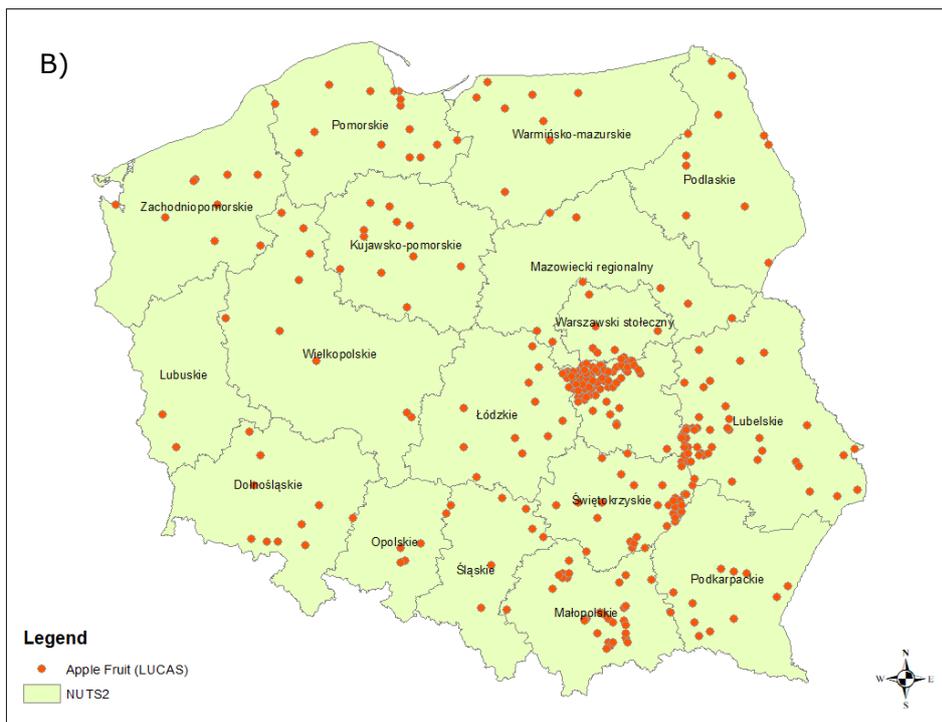
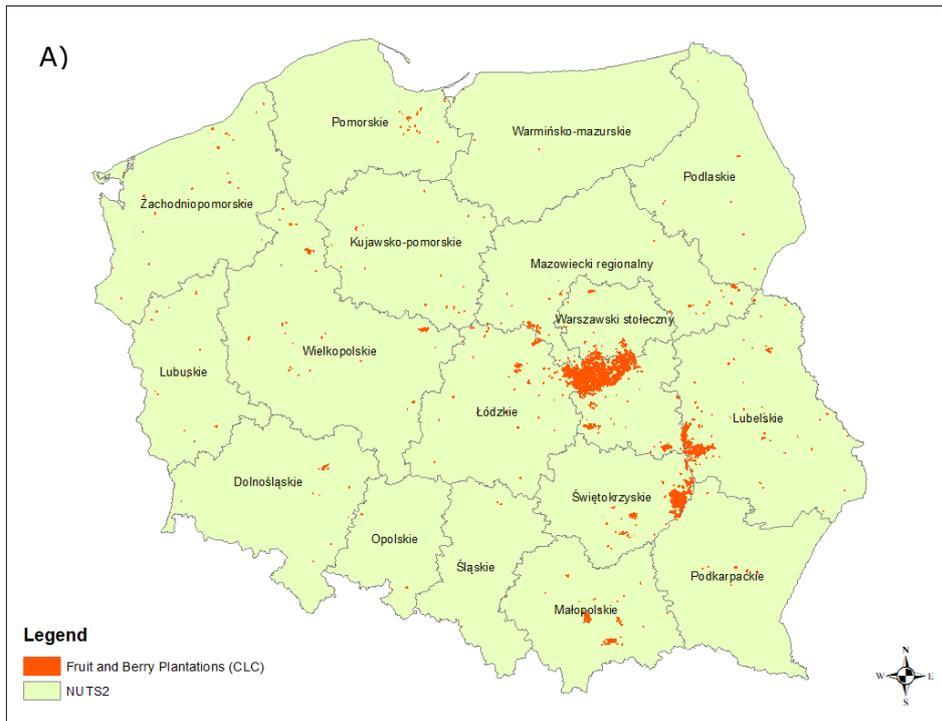
The biggest area of apple tree orchards is located in Mazowieckie region (around the towns of Grójec, Warka, Tarczyn). Significant concentration of orchards can also be found in Lubelske, Lodzkie, Świętokrzyskie and Zachodniopomorske regions³.

There are several European-scale data sources showing sub-regional distribution of orchards:

1. Corine Land Cover 2012 and 2018 version (formally released in 2019), class fruit and berry plantations (222, Figure 4)
2. LUCAS survey, data available for years 2009, 2012, 2015, 2018, the points identified as apple orchards are presented in Figure 4.
3. Farm Structure Survey (FSS) 2010 gridded data that contains the class: fruit species of temperate climate zones (B_4_1_1_1) (Figure 5).
4. LPIS/IACS. This data is believed to be the most accurate in terms of spatial allocation of parcels. However, the data, which are updated every year as part of the farmers' aid application, are not available to the JRC. Polish LPIS data currently available to D.5 within the frame of the LPIS QA/QC only contains cadastral boundaries of reference parcels for verification and the indication of permanent crops, annual crops or permanent pasture; without further specification. More detailed information can possibly be obtained on request, from the Polish authorities. Such data might be especially useful for monitoring or re-tracking orchard transformations.

A map of irrigated fruit and berries areas, obtained based on the 2010 FSS is also available to the JRC (JRC, 2019).

³ According to government statistics for 2017: 45,6% of apple orchard area was in Mazowieckie region, 12,7% in Lodzkie, 12,4% % in Lubelskie, 11,7% in Swietokrzyskie; and in total these 4 regions constitute 82,4% apple orchards in Poland, source: GUS 2018.



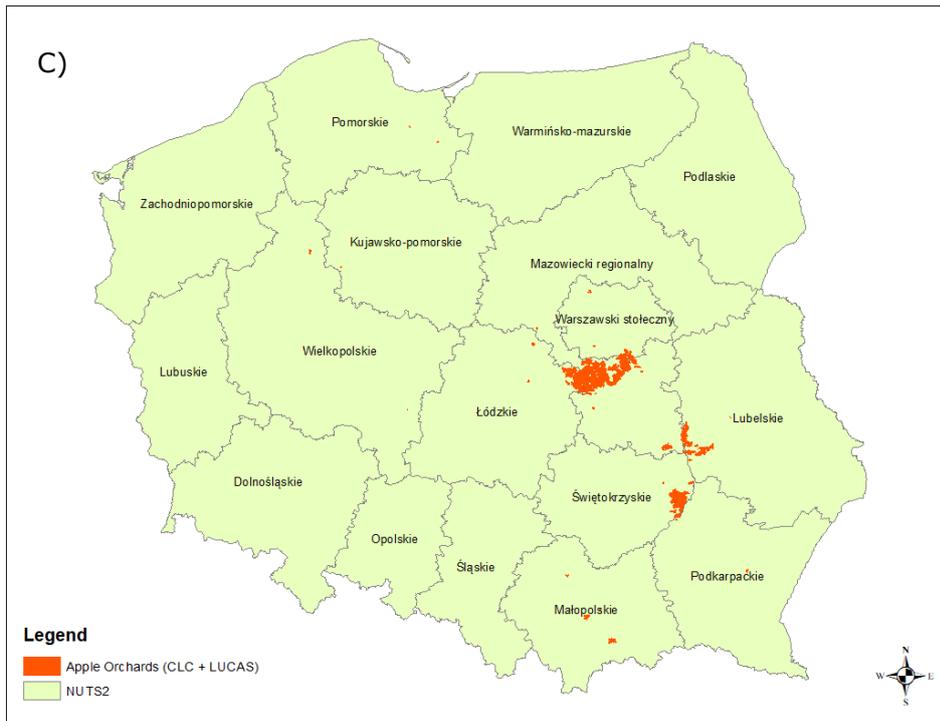


Figure 4: Spatial data on distribution of apples in Poland: A) CLC 2018, class: Fruit and Berry Plantations (code: 222); B) LUCAS survey (2009, 2012, 2015, 2018), class: Apple Fruit (code: B71), C) Combination of these two data sources (CLC 2018 polygons, classified as Fruit and Berry Plantations, intersecting 500 buffer around LUCAS points, classified as Apple Fruit).

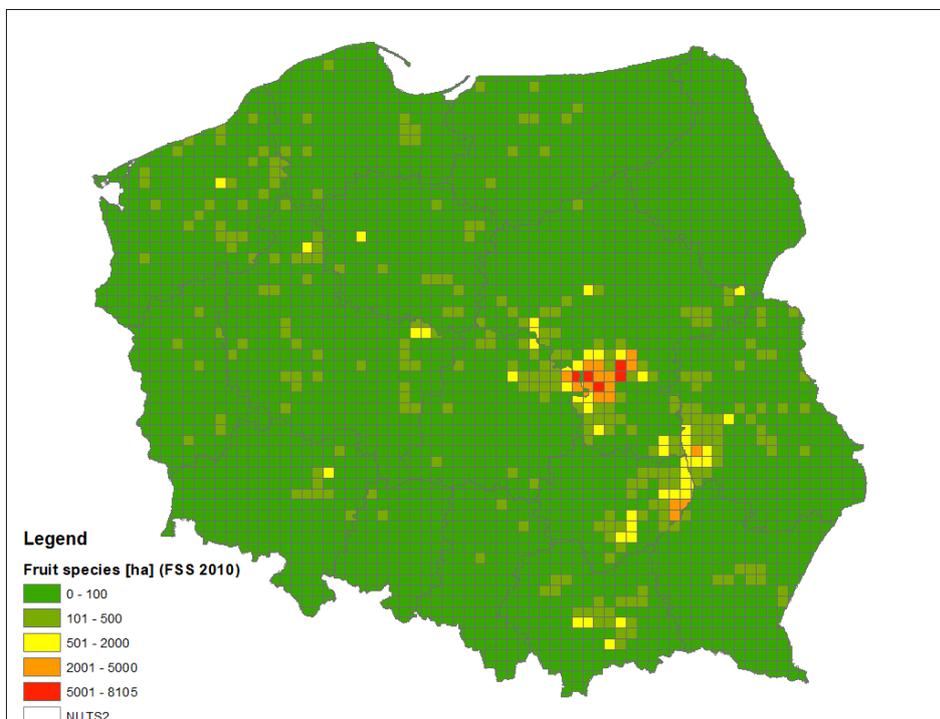


Figure 5: Distribution of "Fruit species of temperate climate zones" according to the Farm Structure Survey, 2010. The units presented in the map are ha within one grid cell (10 x 10 km). Note that in Poland about 72% of orchards area in 2017 constituted of apple orchards (GUS 2017, Tab 30).

5.2 Statistical data

Statistics on apple production and areas provided by Eurostat are available at national level since (at least) 1998.

Production data at NUTS1 level are available from the same source (Eurostat), for the years 2012 and 2017. Additional data for these two years include the area of dessert apple trees, classified by age (at NUTS1 level, orch_apples1; Figure 6), and the area of specific apple varieties at national level (Eurostat, 2020b).

Annual production and area statistics are also made available by the Polish Central Statistical Office (GUS) and there are also records of national growers associations (e.g. Towarzystwo Rozwoju Sadow Karlowatych⁴), World Apple and Pear Association (WAPA) and USDA (the latter are currently not available to us). So far, we have found no annual production data at subnational level.

It is noted that data from different sources (and in some cases even from the same source) show substantial discrepancies. In principle, Eurostat data are provided by GUS. However, for example, the area of apple orchards presents a sharp (17%) decrease from 2012 to 2013 in the data from Eurostat (Figure 2), whereas the data reported by GUS indicate a much smaller decrease, over a longer period. Also in recent years, orchard areas reported by GUS have been different from Eurostat (Figure 2), whereas data on total production reported by both sources have been practically the same (see Appendix, Table A1). As a consequence, the yields (calculated as production/area) are different and have different patterns in time. We also noted discrepancies in figures on dessert apples vs apples for processing. For example, while it is well known that most apples produced in Poland are destined for processing, the sum of orchard areas of dessert apples reported for 2012 and 2017 by Eurostat (see Figure 6) is very close to the total areas of apple orchards reported for the same year. In reality, dessert apples and apples for processing might be produced in the same area and even from the same tree, as determined by quality aspects on the spot.

⁴ Society for the Promotion of Dwarf Fruit Orchards (TRSK)

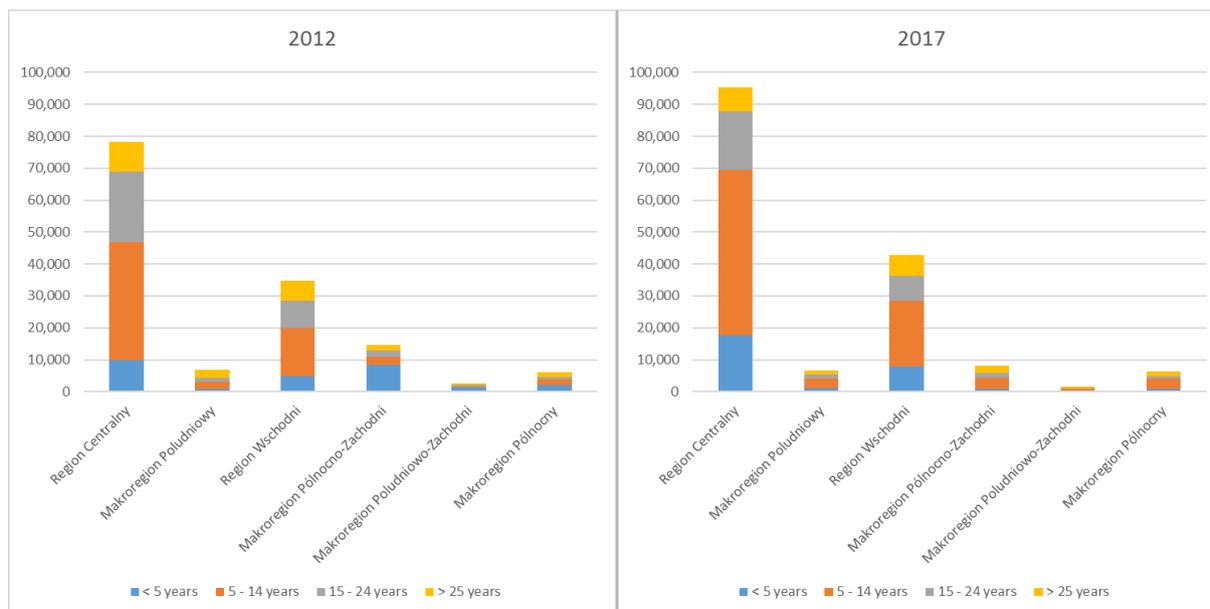


Figure 6: Distribution (in ha) of apple orchards among Polish Macro-regions (NUTS1), and age classes, in 2012 and 2017. The data for 2017 compared with 2012, show a further concentration of orchards in the main producing regions and ageing and/or decrease of apple orchards in other regions. Source: Based on data from Eurostat (Eurostat, 2020b). It is noted that all data in the source tables for this figure refer to dessert apples; however, the sum of the areas is close to the total area reported for Poland for the same year

Production data published by WAPA and Eurostat are also different. Differences in production data from before 2014 are small (<3%), but from 2014 to 2018 production figures from WAPA (which, for Poland are provided by TRSK) are 12% to 26% higher than the figures from Eurostat (which are based on data provided by GUS), In contrast, for 2019 WAPA's estimate is 6% below the official figure from Eurostat (see Table A1). An overview of the methodologies used to estimate production is given in Appendix. On the basis of this information it is not possible to determine which estimates are more accurate: Both organisations claim to be unbiased and to base their analysis on best-available information. The estimates by GUS seem to be based on a broader range of information and more systematic analysis. The estimates of both organisations rely on a combination of producer surveys and a high degree of expert judgement.

5.3 Phenological data

So far, no systematically reported phenological data (e.g. flowering dates, ripening dates) have been found for Poland. Such data would be crucial for accurate identification of sensitive periods during the season and the analysis of potential impacts of extreme events (such as frost around the flowering period) on yield and production. An additional bottleneck in this context is the lack of meteorological data at sufficiently fine resolution, which would be required for the analysis of local events.

6 Future of apple production in Poland

From an economic point of view, recent years have not been good for apple growers in Poland, and 2018 was a very bad year. This may negatively impact production in the following seasons (some farmers cannot afford to buy fungicides/pesticides/fertilizers for the next season, some decided to liquidate orchards and use the land for profitable crops, etc.), and puts the future production under a big question mark.

The biggest challenges for apple production in Poland include: overproduction, deficit of labour, and stronger competition from abroad (e.g. Moldova) and to realise expansion to new export markets.

Due to labour shortage, growers are moving towards less number of varieties, rather than multiple varieties. This is expected to reduce labour costs by concentrating work within a shorter period of time. However, at the same time, this could lead to an increased risk of damage by extreme weather events as phenological development will be more synchronised (e.g. the frost sensitive flowering period will also be concentrated in time).

According to grower representatives, the future of apple production is conditioned on finding new distribution channels and export markets (Ogrodnictwo expert, 2017). This will require modernization of orchards and increasing the share of dessert fruits of high guaranteed quality and safety, as well as suitability for long-term storage. So far new varieties suitable for these requirements started appearing in 2016-2017, but these changes occur at a slow rate. Finally, it should be noted that currently insufficient irrigation and limited storage infrastructure impose certain limitations (GUS, 2018b), and there are ongoing investments in irrigation of apple orchards in order to secure apple production under the changing climate conditions (i.e. more commonly occurring extreme temperatures and drought conditions, Toreti et al. 2019). Area of irrigated apple orchards is constantly increasing, which may favor apple production in near future. Some Polish apple growers have already converted orchard area into other types of production following a sustained period of low apple prices (USDA 2018). Some groups of growers postulate that mechanisms leading to reduction of apple orchard areas should be introduced and subsidized by EU. According to these producers the current aid mechanisms (e.g. governmental plan to buy off some apples from the market) are not efficient and are limited to a small number of growers. The growers propose that subsidies should be used for converting orchards into other crops (e.g. maize, rapeseed, feed crops) for a period of time (e.g. 5 years) until the apple market situation improves. Furthermore, some regulations are considered to ensure a certain level of prices for the processing apples (contracting prices) to ensure that growers sell crops with profit.

7 References

- Eurostat, 2020a: Crop production in national humidity [APRO_CPNH1]. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=apro_cpnh1&lang=en
- Eurostat, 2020b: Apple and pear trees - Area by density classes and group of varieties (area in ha) [orch_apples2]. https://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_production_-_orchards#Apple_trees
- GUS, 2013. Wyniki Produkcji Roslinnej w 2013 r. <http://stat.gov.pl/obszary-tematyczne/rolnictwo-lesnictwo/uprawy-rolne-i-ogrodnicze/wyniki-produkcji-roslinnej-w-2013-r-,6,10.html>
- GUS, 2017. Wyniki produkcji roślinnej w 2017. https://stat.gov.pl/files/gfx/portalinformacyjny/pl/defaultaktualnosci/5509/6/15/1/wyniki_produkcyj_rolnej_w_2017.pdf
- GUS, 2018a. Wynikowy szacunek głównych ziemioplodów rolnych i ogrodniczych w 2018r. https://stat.gov.pl/files/gfx/portalinformacyjny/pl/defaultaktualnosci/5509/5/17/1/wynikowy_szacunek_glownych_ziemioplodow_rolnych_i_ogrodniczych_w_2018.pdf
- GUS, 2018b. Produkcja ogrodnicza. Badanie sadów w 2017 roku. <https://stat.gov.pl/obszary-tematyczne/rolnictwo-lesnictwo/uprawy-rolne-i-ogrodnicze/produkcja-ogrodnicza-badanie-sadow-w-2017-roku,8,4.html>
- GUS, 2019. Produkcja upraw rolnych i ogrodniczych w 2019 roku. <https://stat.gov.pl/obszary-tematyczne/rolnictwo-lesnictwo/uprawy-rolne-i-ogrodnicze/produkcja-upraw-rolnych-i-ogrodniczych-w-2019-roku,9,18.html>
- GUS, 2020. Przedwinykowy szacunek głównych ziemioplodów rolnych i ogrodniczych w 2020 roku. Informacja sygnałowa w formacie PDF. <https://stat.gov.pl/obszary-tematyczne/rolnictwo-lesnictwo/uprawy-rolne-i-ogrodnicze/przedwinykowy-szacunek-glownych-ziemioplodow-rolnych-i-ogrodniczych-w-2020-roku,4,19.html>
- JRC, 2019. Distribution of irrigated crops in Europe. <https://agri4cast.jrc.ec.europa.eu/DataPortal/Index.aspx>
- Ogrodnictwo expert, 2017. Newspaper interview with apple expert Prof. dr Eberhard Makosz. <http://ogrodnictwo.expert/prawo-ekonomia/prawo-ekonomia-ekonomia/jakie-jablka-produkujemy-w-polsce-dwie-rozne-grupy-producentow-jablek/>
- Toreti, A., Belward, A., Perez-Dominguez, I., Naumann, G., Luterbacher, J., Cronie, O., et al. (2019). The exceptional 2018 European water seesaw calls for action on adaptation. *Earth's Future*, 7, 652– 663. <https://doi.org/10.1029/2019EF001170>
- USDA, 2018. Gain Report from 8/17/2018. <https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Polish%20Apple%20Growers%20Expect%20Record%20Harvest%20Warsaw%20Poland%208-17-2018.pdf>
- WAPA, 2018. European Apple Forecast 2018. www.wapa-association.org/docs/2018/European_Summary-compressed.pdf
- WAPA, 2019. European Apple Forecast 2019. www.wapa-association.org/docs/2019/European_summary_reduced.pdf
- WAPA, 2020. European Apple Forecast 2020. https://agfstorage.blob.core.windows.net/misc/FP_com/2020/08/06/Crop_Forecast_European_Summary.pdf

Appendix - Methodologies for estimation of apple production

Production estimation for apples in Poland is a complicated task due to a very high variability of orchards in terms of size, number of varieties, and agro-management practices (unlike in the western countries where orchards tend to be very uniform). For this reason, estimation of production at national scale is challenging.

At this point there is no generally accepted, robust methodology for estimating Polish apple production. The Society for Promotion of Dwarf Fruit Orchards (the only Polish member of the World Apple and Pear Association) has been elaborating on the development of such methodology, but this advancement is still ongoing (Dr Tomasz Lipa, personal communication).

This appendix presents a brief description of the methodologies currently applied for the estimation of apple production in Poland by: 1) Statistics Poland (GUS), and 2) The Society for Promotion of Dwarf Fruit Orchards which provides the Polish apple production data to the World Apple and Pear Association (WAPA). An overview of apple production data between 2009 and 2019 according to these two sources and Eurostat is given in Table A1. It is noted that, with one exception (2015), the Eurostat data are identical to those of GUS. Differences between the data from WAPA and GUS are minor (<3%) until 2013, but substantial (>10%) since then. The GUS data are higher in most of these years, except for 2019.

Estimation of Apple Production by Statistics Poland

Based on information provided by Stanisław Niszczoła, on behalf of Artur Łączyński – Director of Agricultural Department of Statistics Poland

Estimation of production of the main horticultural crops (including general class of fruit, and specific class of apples) is carried out by the Statistics Poland during a multi-step procedure.

At the first step, county-level (i.e. Polish "gmina") field assessors collect data for individual counties or for groups of neighboring counties. As a second step, these data are compiled at the regional "voivodship" level (corresponding to NUTS2 level) by the voivodship statistical offices. The NUTS2 level data undergo verification, and are analyzed, taking under consideration additional factors (e.g. economical estimates of amount of fruit/apples purchases). Next, the data are transferred to the (national) data analysis center of Statistics Poland where the country-level estimates are obtained. In order to ensure accuracy and reliability of these estimates, further verification is conducted by external experts (central assessors), selected from a panel of outstanding experts of fruit production. These experts are associated with both departmental and scientific institutions, and use their specialist knowledge, experience and extensive contacts throughout the country to collect information independently from Statistics Poland, and to verify and correct national production estimates.

As pointed out by the Statistics Poland contact, only the comparison of the estimates obtained by the field, regional (i.e. voivodship) and central assessors provides a reliable picture of the situation and allows for the objective and most correct assessments of the apple production. Additional information on yields and production for a given year is provided by the mandatory reports from farms belonging to both legal entities as well as informal entities. It should also be noted that in the methodology used by the Statistics

Poland, the production is defined as the amount of apples that have been actually harvested (so only a part of the actual biological production).

Estimation of Apple Production by the Society for the Promotion of Dwarf Fruit Orchards

Based on information provided by Dr Tomasz Lipa – Chair of the Society for the Promotion of Dwarf Fruit Orchards

The Society for the Promotion of Dwarf Fruit Orchards (TRSK) is the only Polish member of the World Apple and Pear Association (WAPA). The association provides estimates of Polish apple and pear production to WAPA since more than 10 years. TRSK associates more than 400 members. The vast majority of members are knowledgeable and experienced growers who have been running well-organized fruit farms for many years. So far the estimates of apple production were obtained during joint discussion amongst the TRSK members, using their knowledge, experience, and intuition. According to Dr. Lipa, this approach has resulted in very accurate estimates of apple production in Poland so far (including in 2018 when the estimates of the association were almost 5 Mt, compared to 4 Mt estimated by Statistics Poland). Nevertheless, the need for the development of more robust methodology is acknowledged, and this is an ongoing challenge, undertaken by TRSK.

Table A1: Comparison of estimates of Polish apple production in [1000 t] for period 2009-2019, data sources: Eurostat, 2020, GUS 2019, and WAPA, 2020.

| Year | Eurostat | GUS | WAPA |
|------|----------|--------|---------|
| 2009 | 2,626 | 2,626 | 2,600 |
| 2010 | 1,878 | 1,878 | 1,850 |
| 2011 | 2,493 | 2,493 | 2,500 |
| 2012 | 2,877 | 2,877 | 2,900 |
| 2013 | 3,085 | 3,085 | 3,170 |
| 2014 | 3,195 | 3,195 | 3,750 |
| 2015 | 3,169 | 3,146 | 3,979 |
| 2016 | 3,604 | 3,604 | 4,035 |
| 2017 | 2,441 | 2,441 | 2,870 |
| 2018 | 4,000 | 4,000 | 4,810 |
| 2019 | 3,081 | 3,081 | 2,910 |
| 2020 | - | 3,400* | 3,400** |

* Forecast GUS (GUS 2020)

**Forecast WAPA (WAPA 2020)

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