ROCZNIKI NAUKOWE STOWARZYSZENIA EKONOMISTÓW ROLNICTWA i AGROBIZNESU
doi: 10.5604/01.3001.0012.2954 **Roczniki Naukowe SERIA • 2018 • XX (4)**

received: 22.05.2018 acceptance: 18.07.2018 published: 23.08.2018

**Iwona Mystkowska, Alicja Baranowska, Mateusz Wierzchowski**

Pope John Paul II State School of Higher Education, Poland

# COST CALCULATION AND COST-EFFICIENCY OF STARCH POTATO IN A FAMILY FARM IN THE YEARS 2016-2017

*KALKULACJA KOSZTÓW ORAZ OPŁACALNOŚĆ PRODUKCJI ZIEMNIAKA SKROBIOWEGO W GOSPODARSTWIE RODZINNYM W LATACH 2016-2017*

**Key words: starchy potato, tuber yield, gross margin**

*Słowa kluczowe: ziemniak skrobiowy, plon bulw, nadwyżka bezpośrednia*

*JEL codes: Q1, Q14*

**Abstract.** The aim of the study was to present cost calculations and to examine the profitability of starch potato production in a family farm in the county of Łuków, cooperating with PPS PEPEES in Łomża in 2016-2017. The highest yield of starch potato tubers was obtained in 2017, and the value of production from 1 ha in particular years ranged from 8,517.75 PLN/ha in 2016 to 10,123.0 in 2017. The high volatility of income in individual years was dictated by the amount of the yield and the different price obtained per unit of production. The cost-effectiveness of growing starch potato was determined by direct costs. The largest costs in the structure of direct costs were related to the purchase of seed potatoes and costs of fuel and transport of potatoes to PPS PEPEES. The highest profitability of starch potato was obtained in 2017.

## Introduction

Currently, in Poland, more and more farmers grow starch potatoes. The premise for conducting this type of production is to obtain income adequate to expectations, and making a decision about further cultivation or resignation from it is preceded by a profitability analysis. Price fluctuations mean that even with very intense production it is difficult to avoid significant differences in the level of income obtained, and only high yields allow to cover production costs and ensure profitability [Chotkowski 2000, Nowacki 2012, Rembeza, Chotkowski 1995]. The amount of starch yield depends on the percentage of starch in tubers and potato yield [Hołubowicz-Kliza 2009]. These values shape the genetic characteristics of the cultivar, the weather conditions during the growing season and properly applied agrotechnical measures. The starch content also depends on the length of vegetation of potato plants and the size of tubers [Wierzbicka 2011]. The starch content is more dependent on the variety than on the applied agrotechnics, whereas the potato yield is mainly determined by agrotechnical factors. Changes in the Common Agricultural Policy in 2012 regarding the abolition of payments related to the production of starch were unfavourable for the profitability of starch potato production. From 2012, additional payments in the starch sector are paid only in the form of historical value [Ginter et al. 2013, Dzwonkowski 2014]. However, farmers do not give up contracting, because of the conditions in multi-annual contracts that are provided with sales and the incurrence of lower production costs. They also have the option of receiving an attractive price for their yield, which, together with other subsidies to the basic price, ensures profitability of production. Prices are known already before the spring outing to the field and there is no risk that the price will be lower or the plant will not buy the raw material. Therefore, it can be stated that the situation of a farmer or a starch potato producer is more stable than the growing of edible potatoes. In accordance with the act of February 5, 2015 on payments under direct support schemes, the payment related to the area of starch potato cultivation is granted to the farmer and amounts to 400 EUR per ha. With reference to the aforementioned act, it should be

noted that the farm under investigation concluded a contract for the cultivation of starch potato with PEPEES S.A. Łomża. Thanks to this, PEPEES S.A. through its actions, tries to influence the profitability of starch potato cultivation.

The aim of the work was to present the cost calculation and to test the profitability of production in two consecutive years of starch potato in a family farm in the county of Łuków, which concluded a contract for the cultivation of starch potato with PPS PEPEES in Łomża.

## Material and research methodology

The work compared the profitability of starch potato in the years of 2016-2017 using the incomplete calculation method. Empirical data for the study come from a farm, in which potato was grown in two successive years, in Rzymy-Rzymki, in the Łuków municipality, in the Łuków district, on the basis of records of sales and purchases. The examined farm cooperates with the PEPEES Food Industry Company in Łomża as part of a long-term contract for the supply of starch potato. The calculation of direct costs included: the cost of seed potatoes, mineral fertilizers, plant protection chemicals and the cost of fuel and machine operation. The direct costs were calculated on the basis of the actual consumption of means of production and use of equipment [Harasim 2006, Lorencowicz 2007, Muzalewski 2008].

The starch content in tubers, which shapes the unit price, is very important in this production. The highest yield of tubers of 35 t/ha, with the highest starch content of 18.9% was obtained in 2017 (tab. 1). According to Jacek Chotkowski [2000], the level of income, that is the value of production, is decided by the level of yield and price. Antoni Bombik and Anna Wolska [2004] also stated that the yields and prices obtained from the sale of potatoes, as well as the expenditures incurred in production, have a large impact on the economic effect of potato production. The direct costs of starch potato production amounted to 7,476.6 PLN/ha in 2016 and to 7,526 in 2017 (tab. 2).

A direct surplus calculated as the difference between the value of production per hectare and the direct costs incurred was assumed as the basic criterion for the assessment of economic effectiveness. The analyses conducted showed that a largest direct surplus was received

Table 1. Tuber yield of starchy potato and production value from 2016-2017

| Specification | Years | |
|---|---|---|
| | 2016 | 2017 |
| Starch in potatoes [%] | 18.5 | 18.9 |
| Procurement price [t/ha] | 241.0 | 256.0 |
| Surcharge for the production of potato starch [t/ha] | 1,287.8 | 1,163.0 |
| Starchy potato yield [t/ha] | 30.0 | 35.0 |
| Total production [t/ha] | 8,517.8 | 10,123.0 |

Source: own study

Table 2. The calculation of costs and profitability of starchy potato production in the years 2016-2017

| Costs [PLN/ha] | Years | |
|---|---|---|
| | 2016 | 2017 |
| Seed potato own | 2,700.0 | 2,500.0 |
| Mineral fertilizers: | 1,030.0 | 1,072.0 |
| – nitrogen | 334.0 | 405.0 |
| – multinutrient | 557.0 | 583.0 |
| – foliar | 139.0 | 84.0 |
| Plant protection agent: | 791.6 | 989.0 |
| – herbicides | 195.5 | 270.0 |
| – fungicides | 540.1 | 680.0 |
| – insecticides | 56.0 | 39.0 |
| Transports costs | 1,000.0 | 800.0 |
| Tractor fuel and work costs | 1,955.0 | 2,165.0 |
| Total direct costs | 7,476.6 | 7,526.0 |
| Gross margin without subsidies | 1,041.2 | 2,597.0 |
| Direct cost PLN per 1 dt potatoes | 249.0 | 215.0 |

Source: own study

in 2017 and amounted to 2,597.0 PLN/ha (tab. 2).

The largest share in the structure of direct costs were the costs of seed potatoes and they were at the level of 36.1% in 2016 and 33.2% in 2017. The fuel and labour costs were high – respectively, 26.1% in 2016 and 28.8% in 2017. Another item in the direct cost structure was the cost of transporting potato tubers to PPS "PEPEES" in Łomża and they amounted to 13.4% in 2016 and 10.6% in 2017, respectively (tab. 3). These costs largely determined the profitability of cultivating starch potato varieties.

Table 3. The structure of direct costs incurred per 1 ha of starchy potato cultivation from 2016-2017 [%]

| Specification | Years | |
|---|---|---|
| | 2016 | 2017 |
| Seed potato | 36.1 | 33.2 |
| Mineral fertilizers | 13.8 | 14.2 |
| Plant protection agents | 10.6 | 13.2 |
| Tractor fuel and work costs | 26.1 | 28.8 |
| Transports costs | 13.4 | 10.6 |
| Total | 100.0 | 100.0 |

Source: own study

## Summary

The analysis of the profitability of starch potato cultivation was carried out in 2016 and 2017, in which farmers were entitled to a starch production subsidy at the amount of PLN 1,287.7 in 2016 and PLN 1,163 in 2017. Thus, among other things, the direct surplus has reaches a positive value. An important factor affecting the profitability of starch potato production are the increasing costs associated with costs of fuel and seed potatoes as well as transport of potato tubers. An import factor affecting the profitability of starch potato production are the increasing costs associated with, among others, costs of fuel and seed potatoes as well as transport of potato tubers. The economic analysis carried out shows that the basis for obtaining income may include the favourable climatic conditions during the growing season conducive to high yields of tubers and high starch content. The use of appropriate starch potato cultivation technology has a significant impact on the yield, the size of which is proportional to the income of the farmer. Therefore, the common knowledge among agricultural producers to calculate a given agricultural activity is and should be important. According to Aldona Skarżyńska [2010], the prices of agricultural products and the prices of the purchased production means constitute a variable amount on which the farmer has no influence.

## Bibliography

Bombik Antoni, Anna Wolska. 2004. Selected factors shaping the economic effect of potato production. *Acta Scientiarum Polonorum. Oeconomia* 3 (2): 17-26.

Chotkowski Jacek. 2000. Technological and market factors of profitability of potato production. *Zagadnienia Ekonomiki Rolnictwa* 2-3: 48-59.

Dzwonkowski. Wiesław (ed.). 2014. *Rynek ziemniaka. Stan i perspektywy. Analizy rynkowe* (Potato market. Status and prospects. Market analysis). Warszawa: IERiGŻ-PIB.

Ginter Agnieszka, Halina Kałuża Halina, Iwona Soczewka. 2013. The impact of Common Agricultural Policy reforms on the income situation of starchy potato producers. *Journal of Agribusiness and Rural Development* 2 (28): 53-62.

Harasim Adam. 2006. *Economic and agricultural guide in outline*. Puławy: IUNG-PIB.

Hołubowicz-Kliza Grażyna. 2009. *Growing potatoes*. Puławy: IUNG-PIB.

Lorencowicz Edmund. 2007. *Guide for using agricultural technology in tables.* Bydgoszcz: Agencja Promocji Rolnictwa i Agrobiznesu.

Muzalewski Aleksander. 2008. *Operating costs of agricultural machines*. Warszawa: IBMER.

Nowacki Wojciech. 2012. Integrated potato production compared to other cultivation systems. *Progress in Plant Protection/Postępy w Ochronie Roślin* 52 (3): 740-745.

Rembeza Jerzy, Jacek Chotkowski. 1995. *Profitability of potato production in various directions of use.* Poznań: CDiER.

Skarżyńska Aldona. 2010. The season of sale of edible potatoes and the profitability of their production. *Journal of Agribusiness and Rural Development* 2 (16): 111-123.
Wierzbicka Anna. 2011. Selected quality features of potato tubers grown in the ecological system depending on irrigation. *Journal of Research and Applications in Agricultural Engineering* 56 (4): 203-207.

***Streszczenie***

*Celem badań było przedstawienie kalkulacji kosztów i zbadanie opłacalności produkcji ziemniaków skrobiowych w rodzinnym gospodarstwie rolnym na terenie powiatu łukowskiego współpracującym z PPS „PEPEES" w Łomży w latach 2016-2017. Najwyższy plon bulw ziemniaków skrobiowych uzyskano w 2017 roku, a wartość produkcji z 1 ha w poszczególnych latach kształtowała się od 8517,75 zł/ha w 2016 roku do 10 123,0 zł/ha w 2017 roku. Duża zmienność przychodu w poszczególnych latach była podyktowana wysokością plonu i różną cenną uzyskaną za jednostkę produkcji. O opłacalności uprawy ziemniaka skrobiowego decydowały koszty bezpośrednie. Największe koszty w strukturze kosztów bezpośrednich stanowiły koszty związane zakupem sadzeniaków oraz koszty paliwa i transportu ziemniaków do PPS PEPEES. Największą opłacalność ziemniaka skrobiowego uzyskano w 2017 roku.*

Correspondence adrresss
Iwona Mystkowska, PhD
orcid.org/0000-0002-8361-5806
Pope John Paul II State School of Higher Education
Department of Environment Sciences
Sidorska Str. 95/97, 21-500 Biała Podlaska, Poland
e-mail: imystkowska@op.pl

Alicja Baranowska, PhD
orcid.org/ 0000-0003-0998-1944
Pope John Paul II State School of Higher Education
Department of Environment Sciences
Sidorska Str. 95/97, 21-500 Biała Podlaska, Poland
e-mail: alabar@tlen.pl

Mateusz Wierzchowski, PhD
orcid.org/0000-0001-6498-4983
Pope John Paul II State School of Higher Education
Department of Environment Sciences
Sidorska Str. 95/97, 21-500 Biała Podlaska, Poland
e-mail: wierzchowski.mateusz@wp.pl