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THE IMPORTANCE OF PRODUCTION TRENDS IN THE ECONOMIC PERFORMANCE OF FRUIT FARMS*Elżbieta Jadwiga Szymańska, dr hab. inż.prof. SGGW*

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Шиманьська Е., Черевко І., Риш М. Роль напрямів спеціалізації виробництва в економічній діяльності господарств з вирощування фруктів

Показано економічний аспект роботи плодових господарств різних виробничих напрямів щодо рівня ефективності їхньої діяльності залежно від низки напрямів. Сформульовано гіпотезу, згідно з якою економічні та фінансові результати у плодових господарствах залежать від переважаючого напрямку спеціалізації господарства. Джерелом інформації в дослідженні були аналіз літератури із заданої тематики та результати анкетних опитувань. Досліджувана вибірка складалася з господарств Малопольського та Погужського регіонів, що спеціалізуються на вирощуванні плодових дерев та кущів, які у 2018 році вели облік за FADN. За структурою виробництва досліджені господарства були поділені на дві групи залежно від домінуючого напрямку виробництва твердих або м'яких плодів. Для аналізу даних використано непараметричний U-критерій Манна-Уїтні. Показано, що господарства, які спеціалізуються на вирощуванні твердих плодів, мають менші обсяги земельних ресурсів та характерні більшою вартістю будівель і оборотних засобів. У свою чергу господарства, що вирощують м'які плоди, мали більші обсяги трудових ресурсів та більшу вартість машин і пристроїв. Статистичний аналіз засвідчив, що прибуток господарства й рентабельність окремих виробничих чинників (земля, праця й капітал) не залежали від домінуючого напрямку спеціалізації у виробництві плодів господарством, імовірно, через невелику кількість господарств.

Ключові слова: виробництво, фрукти, ферми, дохід, рентабельність, U-критерій Манна-Уїтні.

Szymańska E., Cherevko I., Rysz M. The importance of production trends in the economic performance of fruit farms

By the logic of things, the higher level of specialization should provide a higher level of efficiency of producer's economic activity. So, the aim of the research is to identify the economic situation of fruit farms work in different production directions regarding the level of efficiency of its activity depending of such directions. The hypothesis is formulated, according to which economic and financial results in fruit farms depend on the prevailing direction of specialization of the farm. The sources of information in the study were literature studies on the subject and the results of questionnaire surveys. The sample under study consisted of farms from the Malopolska and Pogurze Regions. The researched farms are focused on the production of fruit from fruit trees or shrubs, which in 2018 kept accounting under FADN. Due to the production structure, the researched farms were divided into two groups, depending on the dominant production direction, producing hard fruit or soft fruit. The fruit growers were mainly involved in production of apples. On the other hand, in the group of farms which specialized in production of soft fruit, dominated black currant, additionally there were grown cherries, plums, pears, red currants and raspberries. The non-parametric Mann-Whitney U test was used in the data analysis. The research showed that hard fruit farms were characterized by lower land resources and a

higher value of buildings and current assets. In its turn, farms cultivating soft fruit had higher labor resources and a higher value of machines and devices, that could be confirmed by the fact that they had specialized harvesting machines. Growers of fruit trees gained a higher value of production or farm income than farmers producing soft fruit. However, statistical analysis showed, that farm income and profitability of individual production factors (land, labor and capital) did not depend on the dominating direction of fruit production of the farm, presumably - due to the not quite significant number of farms.

Key words: production, fruit, farms, income, profitability, Mann-Whitney U test.

Problem setting. In the modern conditions of intensive competition on the markets of agricultural products, the factor of a level of specialization of the producer in a certain direction of production of a concrete kind of production has become more important, so, by the logic of things, the higher level of specialization should provide a higher level of efficiency of the producer's economic activity. Production specialization is limiting the range or increasing the production of a selected product, which is accompanied by maintaining the production of other products at the current level. Unfortunately, not all producers are aware of the factor importance. Therefore, the problem of exposing this dependence requires presentation of specific results of research that confirm (or not) this thesis, which determines the relevance of the research in order to determine whether this assumption is true.

So, the aim of the research was to identify the economic situation of fruit farms work in different production directions. Based on the existing knowledge, a hypothesis was formulated according to which, the economic and financial results in fruit farms depend on the prevailing production trend.

Analysis of recent research and publications. The problem of farm specialization in production of certain types of products or their varieties is of interest to many scientists. As this problem is multifaceted, the approaches to it of different scientists are also quite diversified. For example, Singbo A. G., Emvalomatis G. and Lansink A. O., referring to the results of their research, claim that «specialization is assumed to have an effect on production frontier itself, as well as on the distance of each producer's observed data to this frontier (technical efficiency)» (Singbo, Emvalomatis and Lansink, 2021). According to A.Flynn, «Specialization can

increase the productivity and provide a comparative advantage for a firm or economy... As workers become more adepted to a specialized task, they become more efficient and production increases» (Flynn, 2019). In their study, Fritsch M. and Slavtchev V. analyze the relationship between the regional specialization in certain industries and the efficiency of the region in generating new knowledge (2010). According to R. Manteuffel (1984), «a specialized farm is the one that produces for sale or to fulfill the needs of the farmer and his family, one or two products, or in which, even with the multilateral final production, one or two products have such a large share in it, that they set the course for the entire farm» (Manteuffel, 1981). The specialization of farms and the related increase of production range is one of the most important factors in the agricultural sector development, especially in case of farms with a fragmented agrarian structure and low economic efficiency (Smedzik, 2010, p. 343). Thanks to the specialization of production, the activity of farmers, including fruit growers, can provide higher economic benefits as compared to multi-lateral agricultural production. Specialization allows increasing the scale of production, which is important for the economy of farms, i.e. efficiency and profitability. The benefits of specialization also include the high quality of produced goods, improving the organization of production and reducing its costs (Milek and Nowak, 2014).

One of the areas of specialization of farms is a fruit production. In 2016, the area of orchards in Poland was 370.5 thousands of hectares and the harvest was 4643.7 tones. The share of fruit production in the value of commercial plant production was at 23.5 % (*Statistical Yearbook of Agriculture*, 2017, p. 171). In Poland, growth of fruit production is favored by the adequate land resources, a large group of producers, an increase in fruit

consumption and the possibilities of export to new markets (North Africa, Middle East, India, China). The size, quality and structure of production depend, on the one hand, on the natural circumstances stemming from location, and on the other, on weather (Zhmija, 2011). Fruit farms specialize in the production of hard or soft fruits, in order to achieve higher economic results. Buildings, machines and devices are adapted to the chosen production trend.

Materials and methods. The sources of information in the study included literature studies on the subject and the results of questionnaire surveys. The research group consisted of farms from the Malopolska and Pogurze Region, specializing in the cultivation of fruit trees and shrubs (without vines and olives), which in 2018 kept accounting under FADN. This region includes four voivodships: Malopolskie, Podkarpackie, Swetokrzyskie and Shlaskie. In 2016, orchards in this region occupied the area of 66.4 thousands of hectares, which accounted for 17.9 % of the area of orchards in the country; 712.7 thousands of tons of fruit were collected from them, which accounted for 17.5 % of the harvest in Poland. In its turn, the harvest of soft fruit amounted to the area of 62.9 thousand tons and covered 10.9 % of the berry harvest in the country (*Local Data Bank*). Although the research group included 49 farms, during the research four farmers did not agree to fill in the questionnaires. Due to this situation, a detailed

analysis covered 45 farms where research was carried out on the basis of a questionnaire with the help of employees of Agricultural Advisory Centers. Due to the production structure, the researched farms were divided into two groups, depending on the dominant production direction, producing hard fruit (fruit from trees) or soft fruit (berry fruit). First group consisted of 36 farms and the second of 9 farms. The non-parametric Mann-Whitney U test was used in the data analysis. The results of the analyses are presented in a descriptive, tabular and graphic form.

Presentation of main material. The examined fruit farms were focused on the production of fruit from fruit trees and/or shrubs. The analysis of the production structure showed that apples were produced in all researched farms (Fig. 1). Among other tree fruits dominated, cherries (44.0 %) and sweet cherries (22 %). The owners of the analyzed farms also cultivated plums, hazelnuts, pears, peaches, apricots and walnuts.

The cultivation of currants, especially black currants, dominated the structure of soft fruit production which was present in 1/3 of the researched farms (Fig. 2). Red currants and raspberries were grown on a smaller scale. Gooseberries were grown only on one farm and chokeberry on one farm. None of the farms produced blackberries or blueberries.

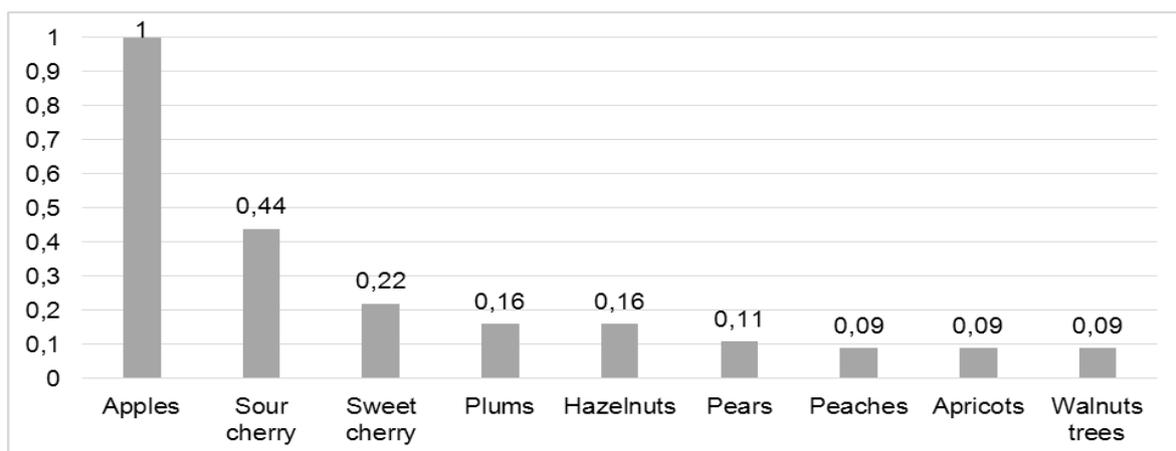


Fig. 1. The structure of production of individual tree fruit species in the researched farms

Explanation: The results do not add up to 100% because each respondent could indicate several variants.

Source: the results of the authors' research

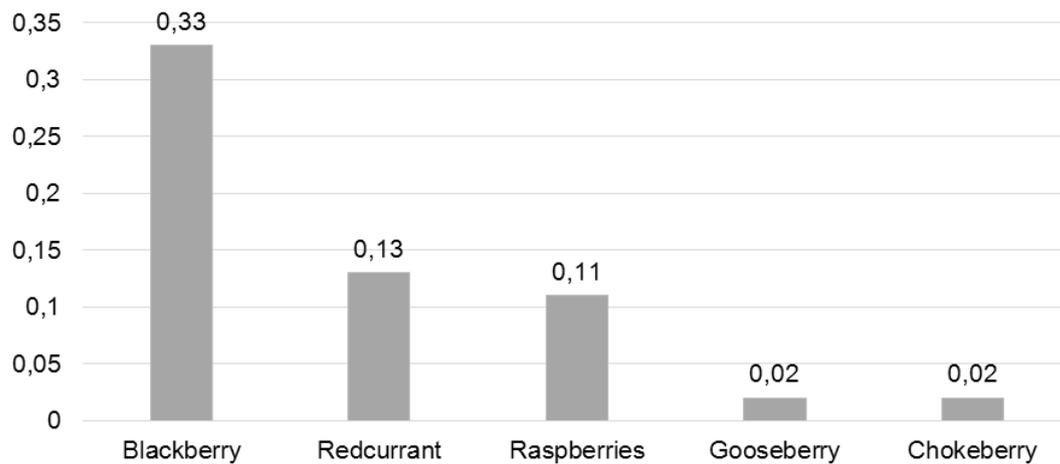


Fig. 2. The structure of production of individual species of berry fruit in the researched farms.

Explanation: The results do not add up to 100% because each respondent could indicate several variants.

Source: the results of the authors' research

The average area of agricultural cultivation in farms with different production directions differed significantly. Farms focused on production of soft fruit had an average area of 13.22 hectares of agricultural cultivation (Table 1). On the other hand, at farms producing hard fruit, the average area of arable land was 9.7 hectares. The share of leased land in the first group was 8.0 % and in the second – 13.5 %.

The area of orchards was larger in farms that focused on the production of soft fruit by 2.1 hectares. However, there were fewer full-time employees working in this group, on average 1.2 per farm. In the first group, the number of such people was 1.7. The demand for contract work was at a similar level in both groups of farms and amounted on average 0.7 of a full-time employee.

Table 1

Production factors and their differentiation at the studied farms

Specification	Production direction	
	Fruit from trees	Fruit from shrubs
Total Utilised Agricultural Area [ha]	9.67	13.22
Rented U.A.A. [ha]	0.77	1.79
Orchards [ha]	8.24	10.32
Total labor input [AWU]	2.40	1.97
Unpaid labor input [FWU]	1.67	1.19
Paid labor input [AWU]	0.73	0.78
Total fixed assets, including: [thou. PLN]	608.45	505.16
Land, permanent crops and quotas [thou. PLN]	357.07	276.36
Buildings [thou. PLN]	161.78	104.87
Machinery [thou. PLN]	89.59	123.88
Total current assets, including: [thou. PLN]	101.91	31.48
Stock of agricultural products [thou. PLN]	55.31	1.15

Source: the results of the authors' research

The capital resources of farms consist of fixed and current assets. Fixed assets dominate in both groups and they include: buildings, machines, devices and the means of transport. Farms engaged in the production of hard fruit had fixed assets at greater value, which amounted to the average of PLN 608.5 thousand. In the soft fruit, production group their value was lower by PLN 103.3 thousand per farm. Such a large difference between the analyzed groups probably resulted from the necessity to have farm cooling rooms in the first group. Fruit-growers try to store hard fruit (especially apples) until the next season to be able to sell them in the period when their price is

higher, which positively influences the farm income. However, the most soft fruits are only suitable for consumption or processing immediately after harvest, so they do not require refrigeration and this probably caused the difference in the value of the buildings. In the first group, their value was on average PLN 161.8 thousand, and in the second PLN 104.9 thousand. A different situation occurred in case of machines and devices, their lower value occurred in the group of farms producing hard fruit. This could be due to the fact that at farms producing soft fruits (especially currants), the harvesting is done mechanically with the help of expensive harvesters.

Table 2

Production value in the researched farms

Specification	Production direction	
	Fruit from trees	Fruit from shrubs
Total output [thou. PLN]	141.55	88.90
Total output crops and crop production, including: [thou. PLN]	136.63	87.10
Fruit [thou. PLN]	128.47	74.45
Total output livestock and livestock products [thou. PLN]	1.09	0.55
Other output [thou. PLN]	3.84	1.25

Source: the results of the authors' research.

Table 3

Fruit production costs at the studied farms

Specification	Production direction	
	Fruit from trees	Fruit from shrubs
Total inputs [thou. PLN]	106.34	77.69
Total specific costs [thou. PLN]	28.25	10.53
Seeds and plants [thou. PLN]	1.48	0.33
Fertilizers [thou. PLN]	5.97	5.62
Crop protection [thou. PLN]	16.25	3.02
Other crop specific costs [thou. PLN]	3.94	1.19
Total farming overheads [thou. PLN]	20.95	13.22

Source: the results of the authors' research

Although the orchard area was smaller, a higher production value characterized the farms producing hard fruit (Table 2). The average value of total production at the farms growing soft fruit was by 37.2 % lower than in farms having fruit trees. This was probably due to the low prices at the soft fruit market in 2018 and the lack of the possibility of their longer storage. Additionally, due to the low profitability of production some fruit growers decided to leave some of the fruit unharvested.

Plant production accounted for the largest share in total production in the analyzed groups of farms. It amounted for 96.5 % in the first group and 98.0 % in the second group, respectively. Livestock production accounted for only 0.8 % of the total production in the first group and 0.6 % in the second.

The value of direct costs at the farms producing hard fruit was by PLN 17.7 thousand higher than in the group dealing with the cultivation of soft fruits (Table 3). The structure of direct costs in the first group was dominated by plant protection chemicals, which on average accounted for 57.5 %, and the share of the costs of mineral fertilizers in this group was on average 28.7 %. A different situation was observed in the second group, where the costs of mineral fertilization accounted for 53.3 % of direct costs, and the costs of plant protection products accounted for 21.1 %. In the second group their share was more than 5 times lower than in the first group.

The differences in the level of plant protection products costs between the analyzed groups can be present due to the fact that fruit on trees is more often attacked by pests and diseases than fruit bushes. Growers wanting to protect their orchards use chemical spraying. Thanks to this treatment, they receive higher and better quality crops. The applied treatments also contribute to the fact that the fruit that is put into storage retains its firmness, taste and nutritional values for longer and can be stored until the next season. Soft fruits should be delivered to the consumer or processed immediately after harvest, because they are not suitable for longer storage in fresh form and therefore fruit growers can use smaller amounts of plant protection chemicals.

The economic efficiency of fruit production in the analyzed groups of farms trended at

different levels. Labor productivity was higher at farms focused on the production of hard fruit, and lower in farms with fruit bushes (Table 4). In the first group, the production value per a full-time employee amounted to PLN 56.0 thousand, and in the second it was lower by PLN 11.5 thousand. A higher productivity index of fixed assets, at the level of PLN 237.0 thousand was found at farms where production of fruit from trees was dominant. Its lower value at the level of PLN 206.2 thousand was noted at farms which focused on production of soft fruit, probably related to a higher value of fixed assets in these farms.

To assess the income of farms, gross value added, net value added and income from a family farm are used, which are the important determinants of the living standard of a farming family and therefore, may constitute a significant indicator of farming efficiency (Wrzaszcz, 2017, p. 11).

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In its turn, the added value characterizes the increase in the value of goods on the farm. At the farms with dominant tree fruit production, gross value added amounted on average to PLN 102.9 thousand and was by PLN 15.1 thousand higher in relation to the farms producing soft fruit. A similar situation occurred in case of net value added, but the difference in this range between groups of farms was slightly smaller and amounted to PLN 13.3 thousand.

Agricultural income in the researched farms came mainly from fruit production. Farms producing fruit from trees reached an average of PLN 46.7 thousand, and growing berries PLN 34.4 thousand of income. In the group of farms producing hard fruit, the higher value of agricultural income resulted from the possibility of storing fruit and selling it after the end of the season, when prices are higher. Soft fruit producers more often have to sell their fruit in the season when prices, due to great supply at the market, are lower, which means that they get lower income. In this situation, the profitability of land, labor and fixed assets was higher in farms producing hard fruit.

Table 4

Productivity and profitability of production factors at the studied farms

Specification	Production direction	
	Fruit from trees	Fruit from shrubs
Production per 1 ha of U.A.A [thou. PLN/ha]	14.20	6.53
Production for 1 AWU [thou. PLN/AWU]	56.02	44.53
Production for PLN 1 000 of the value of fixed assets [zł]	236.97	206.19
Gross Farm Income (GFI) [thou. PLN]	102.89	87.78
Farm Net Value Added (FNVA) [thou. PLN]	67.22	53.94
Family Farm Income (FFI) [thou. PLN]	46.73	34.44
Family Farm Income (FFI) per 1 ha of U.A.A [thou. PLN]	4.45	2.22
Family Farm Income (FFI) per 1 FWU [thou. PLN/FWU]	28.81	24.47
Family Farm Income (FFI) per PLN 1 000 of the value of fixed assets [PLN]	76.81	68.18
Return On Assets – ROA [%]	6.77	8.59
Return On Equity – ROE [%]	6.85	8.59
Profitability index [%]	136.21	112.71

Source: the results of the authors' research

The average value of the return on total assets (ROA) for the analyzed groups of farms was positive, although it was at a different level. A higher average rate of return on assets at the level of 8.6 % was recorded in the group of farms producing soft fruit. In the group of farms growing fruit from trees, it was by 1.8 % lower. In terms of return on equity (ROE), its higher value (8.6) was achieved by farms dominated in production of soft fruit. A high return on equity may indicate a favorable financial situation at the studied farms. In this group of farms, the equity multiplier was 1, which means that at those farms there were no short-term and long-term liabilities.

In case of fruit farms in the Malopolska and Pogurze Regions, fruit production in 2018 was profitable, despite of low prices. The production of hard fruit (136.2 %) was more profitable than production of soft fruit. The production profitability index in farms producing fruit from trees was higher by 23.5. However, it should be noted, that fruit growers engaged in the production of soft fruits have greater opportunities to adjust the structure of fruit shrubs to market conditions than producers of fruit from trees in the situation when the profitability of production is low. They can change the type of fruit they produce faster.

The analysis of the degree of debt is the basis for assessment of the equity and external capital management. It also enables for a proper assessment of the applied asset financing strategy. Equity dominated in the capital structure of the researched fruit farms, the average value of which was PLN 535.0 thousand in the group growing soft fruit and PLN 692.7 thousand at the farms producing fruit from trees (Table 5).

The debt structure in the first group was dominated by long-term liabilities, which on average amounted to PLN 14.8 thousand per farm. In the second group, there were no such liabilities that was probably due to the fact that the owners of fruit farms used loans only when forced to do so by a bad financial situation or when their own cash resources were too small to carry out the planned activities. The farms producing soft fruit used only short-term liabilities, in this group, they constituted on average PLN 1.6 thousand per farm. In case of the first group of farms, the share of foreign capital in the sources of financing economic activity was 2.6 %, and in the second – only 0.3 %. Investments are decisive for the development of business entities, including fruit farms.

Table 5

Value of liabilities in the analyzed farms

Specification	Production direction	
	Fruit from trees	Fruit from shrubs
Net worth [thou. PLN]	692.66	534.99
Total liabilities [thou. PLN] including:	17.70	1.64
Long and medium-term loans [thou. PLN]	14.85	0.00
Short-term loans [thou. PLN]	2.84	1.64

Source: the results of the authors' research

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Regardless of the adopted direction of production, fruit growers are forced to invest in order to maintain and develop their activities. The necessity to incur investment expenditures

results from competition from other fruit farms, growing customer requirements and still widening price range.

Higher profitability of production at the farms producing hard fruit made it possible to implement investments of higher value (Fig. 3). Gross investment in these farms reached the average level of PLN 7.1 thousand, and at the farms producing soft fruit their value was by PLN 4.2 thousand lower. The comparison of gross investments with depreciation shows the actual development of these farms. In 2018, the analyzed groups of farms were characterized by a negative net investment value. Apart from a lower level of gross and net investment, farms producing soft fruit were also characterized by a lower investment rate of 8.4 %.

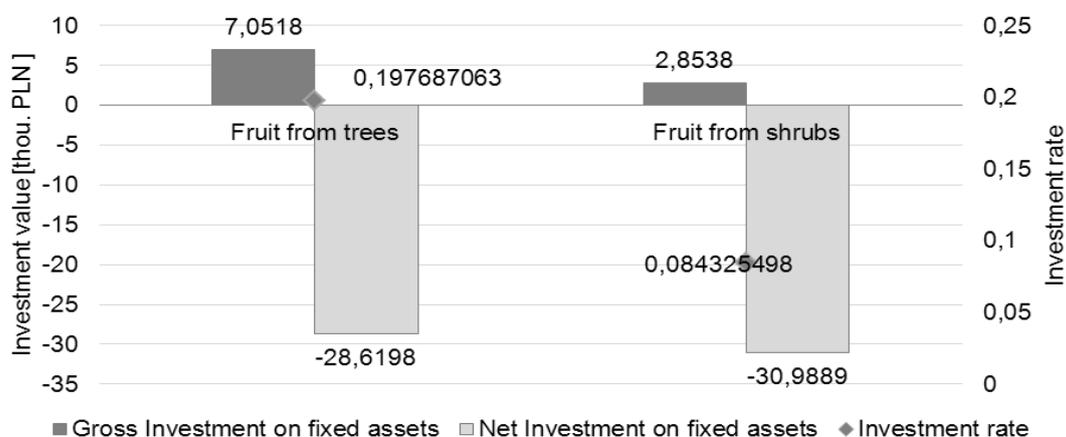


Fig. 3. The level of investments at the studied farms

Source: the results of the authors' research.

In the researched groups of farms, an analysis of the variances of the dependences of economic and financial results on the adopted direction of production was also carried out. Due to the fact that in case of all economic and financial features, at least one of the two

compared distributions of variables was not consistent with the normal distribution, the verification of the relationship between the variables was carried out using the non-parametric Mann-Whitney U test. The results of the analysis are presented in Table 6.

Table 6

Economic and financial results depending on the dominant production direction (results of the Mann-Whitney U Test)

Variables	Production direction		Z	p
	Fruit from trees	Fruit from shrubs		
	Median			
Family Farm Income (FFI) [zł]	25925.0	15651.5	1.43	0.150
Family Farm Income (FFI) per 1 ha of U.A.A [thou. PLN]	3703.6	2390.8	1.49	0.136
Family Farm Income (FFI) per 1 FWU [thou. PLN/FWU]	13752.0	12874.8	1.02	0.306
Family Farm Income (FFI) per PLN 1 000 of the value of fixed assets [PLN]	62.0	52.9	0.63	0.525
ROA [%]	5.3	5.8	-0.24	0.809
ROE [%]	5.7	5.8	-0.21	0.831

Source: the results of the authors' research

They contain the median values for individual variables and the values of the Mann-Whitney U test. The data shows that in all cases the test probability «p» was higher than the significance level of $\alpha = 0.05$ adopted in the studies. In this situation, the level of the analyzed economic and financial results did not depend on the dominant production direction. Other factors probably influenced the differentiation of economic results in the analyzed groups of farms. Therefore, the conducted research does not exhaust the subject of the analyzes. Further research on the specialization of fruit farms is recommended. Moreover, the obtained results concern only the researched farms. Because of the small number of farms, the obtained results cannot be generalized.

Summary and conclusions. The choice of the direction of production made by growers is influenced by many factors, including the resources of land, labor or capital, the possibility

of selling the produced fruit, the price of fruit on the market or family traditions. The researched farms focused on the production of fruit from fruit trees or shrubs, the fruit growers were mainly involved in production of apples. On the other hand, in the group of farms which specialized in production of soft fruit, black currant dominated, additionally there were grown cherries, plums, pears, red currants and raspberries. The hard fruit farms are characterized with lower land resources and a higher value of buildings and current assets. In its turn, farms cultivating soft fruit had higher labor resources and a higher value of machines and devices, which could have been due to the fact that they had the specialized harvesting machines. Growers of fruit trees gained a higher value of production or farm income than farmers producing soft fruit. Statistical analysis of the data from farms with use of the Mann-Whitney U test showed that farm income and profitability of individual production factors (land, labor and capital) did

not depend on the dominating direction of fruit production of the farm, presumably it was due to a small number of farms, therefore, the obtained results cannot be generalized.

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