https://doi.org/10.17221/117/2019-AGRICECON

Economic outcomes in relation to farmers' age in the Czech Republic

Zuzana Hlouskova, Marie Prasilova*

Department of Statistics, Faculty of Economics and Management, Czech University of Life Sciences Prague, Czech Republic

**Corresponding author: hlouskovaz@pef.czu.cz*

Citation: Hlouskova Z., Prasilova M. (2020): Economic outcomes in relation to farmers' age in the Czech Republic. Agric. Econ. – Czech, 66: 149–159.

Abstract: The current paper aims to assess farming enterprise outcomes in the Czech Republic from a socio-economic perspective. The relationship between the age of a farms' managers and its economic results has been analysed for 1 351 farms using the FADN (Farm Accountancy Data Network) database in order to determine whether farms' economic results differ on the basis of the age of their managers. Our analysis confirms that there is indeed a correlation between manager age and a farming enterprise's economic results. The results have been analysed in detail according to the age groups of managers and farm owners, farm specialization, and farm size. The farm net value added per annual work unit reached the best values in businesses managed by young farmers in crop production (EUR 34 445) and young farmers in large enterprises (EUR 43 400). The oldest farmers, specializing in milk production, had the highest level of indebtedness (0.39). The data reveal that the age of farmers is inversely proportional to the level of indebtedness, with level of debt decreasing with increasing farmer age. A Mann-Whitney U test (with Bonferroni correction) confirms a statistically significant difference between young farmers and the remaining three age groups in the ratio of production to cost.

Keywords: Farm Accountancy Data Network; Mann-Whitney U test; socio-economic indicators; sustainable agriculture; young farmers

The problem of farm population ageing has long been discussed at both public and professional levels (Duesberga et al. 2017; European Commission (EC) 2017; Morais et al. 2017; Schuh et al. 2019). Bohackova and Hrabankova (2011) state that the average age of farmworkers is increasing faster than in other professions. Hansson (2008) confirmed that the relationship between a farmer's age and the long-term efficiency of economic inputs is statistically significant. For future agricultural functionality and its sustainable development, it is necessary to prevent irreversible ageing of members of the farm population who not only continue to secure unique sources of food, feed and material but who also influence the face of the landscape as well as environmental quality. This has already been discussed with positive conclusions in research on the current and future sustainability of agriculture (Simpach and Pechrova 2015; Zagata et al. 2015; EC 2017; Schuh et al. 2019).

This paper aims to assess the level of and suggest a possible context for selected economic measurements by age class of farm owners and managers in the Czech Republic, based on a statistical analysis of the Farm Accountancy Data Network database in the Czech Republic.

LITERATURE REVIEW

According to Eurostat (2019), there were 17 660 agricultural enterprises in the Czech Republic in 2016 that may be considered commercial enterprises. These farms fall into the fourth economic size class and higher, i.e. their standard output is at least EUR 8 000 or more annually (EC 2009). Figure 1 shows the changes in the age structure of farm management from 2005

https://doi.org/10.17221/117/2019-AGRICECON

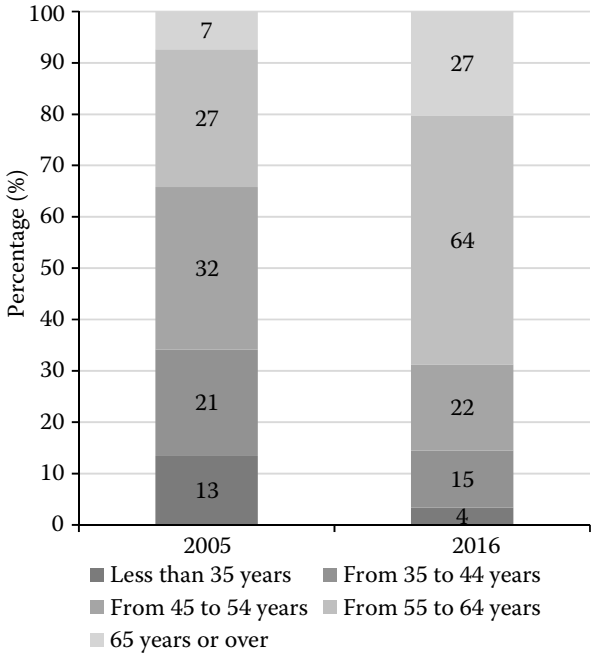

Figure 1. Age structure of farmers in 2005 and 2016

Source: Own processing based on Eurostat data (Eurostat 2018)

to 2016. 19% of farm managers were younger than 45 in 2016, a 15% drop from 2005. Farm population ageing is typical not only for the Czech Republic but also for farmers in other EU countries as well (Leonard et al. 2017), with more than 50% of farmers in Europe being 55 or older in 2010 (Zagata and Sutherald 2015). Old farmers who do not have anyone to transfer their farms to are forced to manage them until late retirement age. For young entrepreneurs, starting a business can be very costly, and few are able to acquire the necessary land and capital before their 40s. The high financial demands for establishing a farm and the limited market for farmland pose significant problems. The literature has already addressed how agricultural policies supporting young farmers have facilitated young entrepreneurs' entry into the farming environment; likewise, the Early Termination of Farming Activities measure facilitates the retirement of farm owners or managers who are in a higher age category. Riley (2016) deals with being a good farmer even at advanced ages (65+), farmers' motivations, reasons and possibilities for farming. Further economic analysis for agriculture policy must account not only for economic or production results but also for sustainable agriculture requirements (Vitunskiene and Dabkiene 2016; Szőllősi et al. 2019).

In the Czech Republic, an adult farmer is considered to be a young farmer if they apply for support for young farmers by the age of 40 (inclusive). EUR 2.19 million was paid from the EU budget to support young farmers in 2016, based on 3 611 approved applications in 2015. An additional supporting measure facilitating farmers' generational change is the non-project measure called Early Termination of Farm Activities. Based on this, EUR 3.44 million was paid out in 2016 for 590 applications (Rural Development Program) from national and EU sources, and EUR 1.05 million for 653 applications (Horizontal Rural Development Plan 2004–2006).

It was confirmed by May et al. (2019) that farmers receiving support for young farmers are more willing to continue farming, although other incentives apart from economic profit played a role in this. The literature suggests also including social and psychological aspects such as pessimism about farming, community and family integration, participation in decision making, and the opinion of neighbours, among others, into policy strategy.

In the 2013–2014 period, farms in England were most often transferred within families (34%), up to 27% farmers had not arranged a successor, and for 29% it was too early to say (DEFRA 2015). Most of the arranged successors had some experience in agriculture. According to this study, arranging a successor to take over a farm depends on the production focus, the farm size, the farm manager's age, the property relationship and the type of enterprise. Ingram and Kirwan (2011) state that the joint venture farm agreements between young entrants and older farmers do not work satisfactorily on a formal basis. Only informal partnerships based on common confidence work well to facilitate the entrance of new farmers and the exit of older farmers.

When analysing technical efficiency in the conditions of rice growers in Indonesia, it was confirmed by, *inter alia*, (Haryanto et al. 2016) that the extensive experience of older farmers raises the technical efficiency of production in comparison with the results of young farmers. Young farmers, however, exploit new procedures and new technologies more easily than older farmers and they are also more motivated than the older ones. In analysing the relationship between a farmer's age and their productivity, it has been found that productivity decreases with age (Hamilton et al. 2015).

Cruz et al. (2017) demonstrate that the generation of farmers above 65 contributes positively to the agri-food sector's development. In the conditions of the Czech Republic, studies have focused either on the age structure of enterprise managers and owners in connection with selected indicators (Zagata et al. 2015) or on a forecast of farmers' numbers and composition development (Simpach and Pechrova 2015).

https://doi.org/10.17221/117/2019-AGRICECON

The results of the assessment of the application effects (Medonos et al. 2012) suggest that young farmers in plant production have asked for support more than those in livestock production. An analysis of economic results according to farm specialization may uncover different problems when entering into farm practice between farms with livestock production and farms with plant production.

Information regarding farm size increases can also have an impact on the shaping of agricultural policy in relation to the development of sustainability, as it shows that young farmers are more likely to enter medium-sized enterprises, whereas old farmers are often leaving small businesses (Calus et al. 2008; Zagata et al. 2015).

Bohackova and Hrabankova (2011) and EC (2017) compared the number of farmers under 35 with those 65 and above in individual EU member states. The ageing process in farm practice is not only at the national and European levels (the mean age of a farmer in 2013 was 51, same as in the Czech Republic) but in the USA as well, where the average farmer in 2012 was 58.

MATERIAL AND METHODS

The Eurostat (2019) classifies data by age into 6 groups (less than 25, 25–34, 35–44, 45–54, 55–64, 65 and older). The EC (2017) study has included managers 35 and younger in the young farmers' group. The age classification for young farmers (40 and younger), middle-aged farmers (41–54) and old farmers (55 and older) has been used in farmers' age structure forecasts (Simpach and Pechrova 2015).

Use of the FADN database allows for the creation of specific age groups according to the needs of the study. Due to the opportunity to apply for young farmer's support, and due to the low numbers of the youngest farmers, enterprises with managers up to (and including) 40 years old have been included in the first group for research purposes. The second group covers enterprises with managers between 41–55 years old. The third group includes farms with managers between 56–63 years old, who have the opportunity to leave for an early pension. The last group covers enterprises with managers 64 and older, under the assumption that managers are eligible for old-age pension departure.

The four most important production specializations in the Czech Republic will be analysed. These are crop production, milk production, breeding of cattle, goats and sheep, and mixed productions (EC 2009).

Farm size is the next classification criterion. Farms are sorted by their economic size, taking into account information on specific types of crops grown as well as livestock categories. Four farm size groups have been established. The first group includes farms with a standard output between EUR 8 000 and EUR 50 000. Farms having a standard production between EUR 51 000 and EUR 500 000 fall into the second group. The third group includes farms with a standard production between EUR 501 000 and EUR 1 million. The last group, containing the largest enterprises, includes farms with a standard output over EUR 1 million. The harmonised set of indicators, known as Standard results, was used to assess economic outcomes of farms. These indicators are used by the European Commission within the Farm Accountancy Data Network (EC 2012). Among the most-used indicators of income is farm net value added, the indicator of substitution of all production factors, and its components (production, costs, subsidies).

Data comes from the FADN CZ 2016 survey database (FADN CZ Database 2018). This is a set of 1 351 enterprises, among which there are 239 farms managed by young farmers, 527 farms under managers between 41–55 years old, 374 farms overseen by the manager or owner 56–63 years old, and 211 farms managed by the oldest farmers. The conclusions have been related to this sample of enterprises only.

The relationship between farmer age and selected economic indicators was analysed by means of correlation analysis. In order to quantify the relationship of two variables where a normal distribution cannot be presumed, the Spearman rank correlation coefficient was applied for significance at a 5% and 1% level. In order to determine whether two independent samples come from the same distribution, the Mann-Whitney U test was applied. As opposed to the parametric *t*-test, applied in comparisons of normally distributed sample means, the Mann-Whitney U test compares the accordance of medians (Smalheiser 2017). The Mann-Whitney U is given as:

$$U = n_A n_B + \frac{n_B\left(n_B+1\right)}{2} - \sum_{i=n_A+1}^{n_B} R_i \quad (1)$$

where: n_A – sample of size A; n_B – sample of size B; and R_i – sample size rank. For large samples exceeding the extent of the Mann-Whitney critical values table size, the z-score (Z) is applied according to the formula:

$$z = \frac{U - \frac{n_A n_B}{2}}{\sqrt{\frac{n_A n_B\left(N+1\right)}{12}}} \quad (2)$$

where: n_A – sample of size A; n_B – sample of size B; and N – total number of observations in both samples.

https://doi.org/10.17221/117/2019-AGRICECON

In order to adjust the significance level of the test, Bonferroni correction was used. This multi-comparison correction is used when several statistical tests are processed simultaneously, using an adjusted α to avoid false positive results. The adjusted value of α is calculated so that the original α is divided by the number of comparisons.

The program Statistica 13 was used to process data.

RESULTS AND DISCUSSION

The exploratory analysis containing descriptive statistics of the indicators studied has shown important properties of the data collected (Table 1). Young farmers have the lowest annual work units (AWU), farmed land area in hectares, and number of cattle units. This is not only the case for cattle breeding specialization,

Table 1. Selected average indicators of structure of the 1 351 farms ranked by age groups, focus of production and economic size

Class I	Class II	Age group	AWU	Area (ha)	Number of livestock unit	Number of observations
Type of farming	field crops	40 and less	4.9	262.8	53.3	90
		41–55	10.1	541.6	97.6	169
		56–63	9.4	525.1	84.2	128
		64 and more	10.4	491.7	111.1	67
	milk production	40 and less	14.9	460.4	280.6	18
		41–55	20.2	610.0	366.8	51
		56–63	37.2	952.7	653.1	42
		64 and more	26.8	689.9	465.5	29
	grazing livestock	40 and less	3.3	209.8	87.6	52
		41–55	3.6	168.6	82.5	103
		56–63	5.6	257.4	132.7	53
		64 and more	8.7	423.1	175	32
	mixed farming	40 and less	15.7	595.9	304.7	47
		41–55	26.3	963.1	466.1	141
		56–63	34.8	1 235.7	623.6	112
		64 and more	42.1	1 439.3	717.2	55
Farm size	small	40 and less	1.6	45.6	27.3	69
		41–55	1.6	44.8	22.6	110
		56–63	1.6	34.9	18.9	77
		64 and more	1.5	33.2	17.6	51
	medium	40 and less	2.9	160.5	74.1	126
		41–55	3.7	173.8	76.7	252
		56–63	4.5	212.2	107.3	141
		64 and more	5.0	247.8	137.7	74
	large	40 and less	11.7	717.7	359.1	16
		41–55	14.0	711.1	324.1	51
		56–63	15.0	708.8	306.9	41
		64 and more	16.7	705.1	298.9	23
	very large	40 and less	39.8	1 351.4	1 054.4	28
		41–55	47.0	1 705.2	914.4	114
		56–63	50.8	1 737.4	941.9	115
		64 and more	53.1	1 775.9	944.4	63

AWU – annual work unit

Source: Authors' calculations based on FADN CZ 2016 data (FADN CZ Database 2018)

https://doi.org/10.17221/117/2019-AGRICECON

Table 2. Correlation between farmer's age and selected indicators for 1 351 farms

Variables	Spearman's correlation	Variables	Spearman's correlation
Standard output (EUR)	0.1552**	Depreciation	0.1290**
Other gainful activities rate	0.0413	External factors	0.1841**
Annual work unit	0.1912**	Taxes	0.1565**
Family working unit	–0.0217	Direct payments	0.1430**
Utilised agricultural area (ha)	0.1642**	Subsidies on investments	0.1525
Number of livestock units	0.1710**	Farm net value added	0.1492**
Rented area (ha)	0.1828**	Farm net value added/AWU	–0.0362
Own land rate	–0.1161**	Total assets	0.1151**
Rent paid/ha	0.1744**	Total liabilities	0.0875**
Total production	0.1412**	Average farm capital	0.1312**
Crop production	0.1523**	Return on equity	0.0094
Crop production/ha	0.0137	Quick ratio of liquidity	0.0568*
Livestock production	0.1595**	Long term loans	0.2075**
Livestock production/LU	0.0862**	Short term loans	0.1185**
Other production	0.2157**	Own capital	0.1279**
Production/inputs	–0.0824**	Dept ratio	–0.0065
Total intermediate consumption	0.1453**	Gross investment on fixed assets	0.1035**
Other farming overheads	0.1584**	Cash flow	–0.1672**

correlations are significant for level $p < 0.05$* and $p < 0.01$**; LU – number of livestock unit; AWU – annual work unit

Source: Authors' calculations based on FADN CZ 2016 data (FADN CZ Database 2018)

Table 3. Average economic results by age groups for 1 351 farms

	Measure-ment unit	All farms	Groups by age (years)			
			40 and less	41–55	56–63	64 and more
Age of farmer	years	52	35	49	59	68
Standard output	EUR	711 013	402 338	670 747	871 627	876 533
Total production/AWU	EUR	49 962	53 880	50 467	49 738	44 659
Total production/ha	EUR	1 557	1 654	1 544	1 573	1 512
Production/cost	%	95	102	94	94	92
Crop production/ha	EUR	2 977	2 735	2 664	3 800	2 578
Livestock production/LU	EUR	920	860	928	952	909
Intermediate consumption/ha	EUR	1 202	1 289	1 205	1 215	1 134
Depreciation/ha	EUR	190	189	184	193	198
External factors/ha	EUR	487	417	457	514	536
Subsidies on investment per farm	EUR	20 816	18 761	19 475	20 937	28 816
Farm net value added per farm	EUR	345 041	190 128	304 619	432 865	465 803
Farm net value added/AWU	EUR	21 744	25 430	21 207	21 077	20 094
Total assets per farm	EUR	1 876 133	1 053 082	1 695 027	2 329 738	2 456 717
Total liabilities per farm	EUR	679 250	385 403	618 895	888 927	792 219
Operating subsidies	EUR	263 875	145 553	232 960	330 040	357 041
Operating subsidies/farm net value added	%	76	77	76	76	77
Quick ratio	days	37	54	30	15	74
Debt ratio	%	22	19	23	23	19

AWU – annual work unit, LU – number of livestock unit

Source: Authors' calculations based on the FADN CZ 2016 data (FADN CZ Database 2018)

https://doi.org/10.17221/117/2019-AGRICECON

where the number of heads and the area in the first age group exceed the average values of the second age group. As for the distribution by farm size, in both small and large farms the young farmers manage most of the land and on average breed most of the animals. In the small farms' category, the average work unit is comparable between all age groups. Very large enterprises belong to the next farm size group, with young farmers breeding more animals on average than farmers from the other age groups. Zagata and Sutherland (2015) also confirmed the importance of the relationship between farm size and differences in farming performance between young and old farmers by comparing young and older farmers between new EU member states and old EU member states.

This paper emphasizes the economic outcomes reached by managers of farming enterprises by age. The indicators applied mostly come from the harmonized system of standard results described by the European Commission (EC 2012) document. Firstly, an examination of the relationship between the age and selected indicators was performed. Outcomes of the Spearman correlation indicate (Table 2) that for most of the variables, a statistically significant relationship exists (at significance levels of $\alpha = 0.05^{*}$, $\alpha = 0.01^{**}$) with the manager's or farm owner's age. Indicators for which no correlation with the age has been found include: share of other gainful activities on total production, FWU (unpaid work unit), crop production per hectare, investment subsidies, FNVA/AWU (farm net value added per annual work unit), and level of indebtedness.

Table 3 displays the average values of selected economic indicators by age group. The first age group shows the lowest average value for standard production; however, the value for total production per work unit per year and per hectare is the highest. The youngest farmers' group also had the best ratio of total production to costs. Hamilton et al. (2015) also confirmed the higher productivity (production/work unit) and profitability (output/input) of young farmers in comparison to other age groups.

Intermediate consumption per ha is the highest in the youngest farmers' group. In 2016, young farmers gained the least on average subsidies per farm, both in operating subsidies as well as subsidies on investment. Average subsidy values increase with increasing

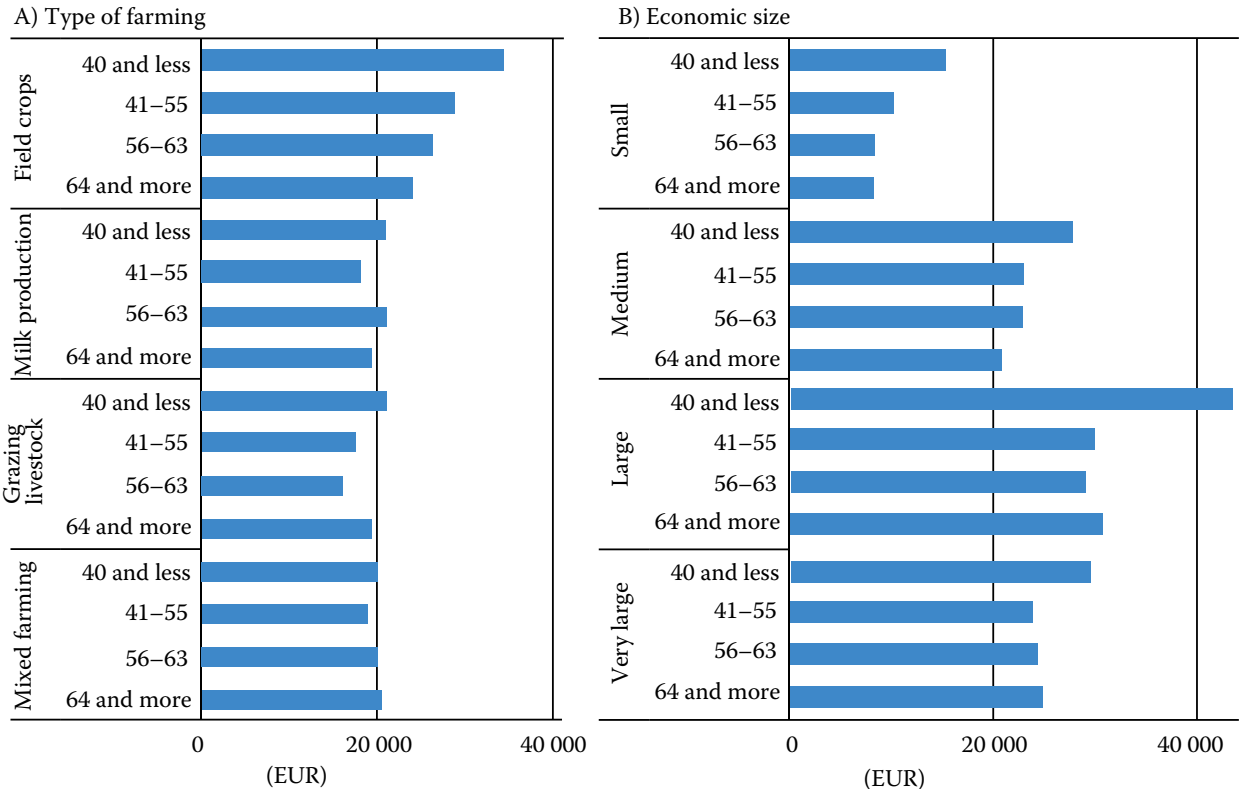

Figure 2. FNVA/AWU by type of farming, economic farm size and age group

FNVA/AWU – farm net value added per annual work unit

Source: Authors' elaboration based on FADN CZ 2016 data (FADN CZ database 2018)

https://doi.org/10.17221/117/2019-AGRICECON

age group. The youngest farmers had the best results for farm net value added/AWU; older manager groups, on the other hand, had both the greatest assets and liabilities. The share of operating subsidies and farm net value is similar in all the groups compared, fluctuating between 76% and 77%. The second age group is on average the most indebted. Farms in the third group are able to repay their short-term liabilities the fastest, whereas farms run by the oldest managers do so the slowest.

Farm net value added is one of the most frequently applied final indicators of farm management. It is calculated as the sum of production and operation subsidies after subtraction of intermediate consumption, taxes and depreciation. The efficiency of labour input is indicated by its conversion to work units. No relationship between the manager's age and the FNVA/AWU indicator has been discovered, nor has any difference between the tested groups' distributions been confirmed; due to its importance, however, this indicator has been displayed for the separate age groups, both in the relationship to production focus and to economic size (Figure 2). The highest FNVA/AWU values are reached by young farmers specialized in field production. The lowest values fall to the 3rd age group (56–63 years) in the cattle, sheep and goat breeding production focus. Also, Hamilton

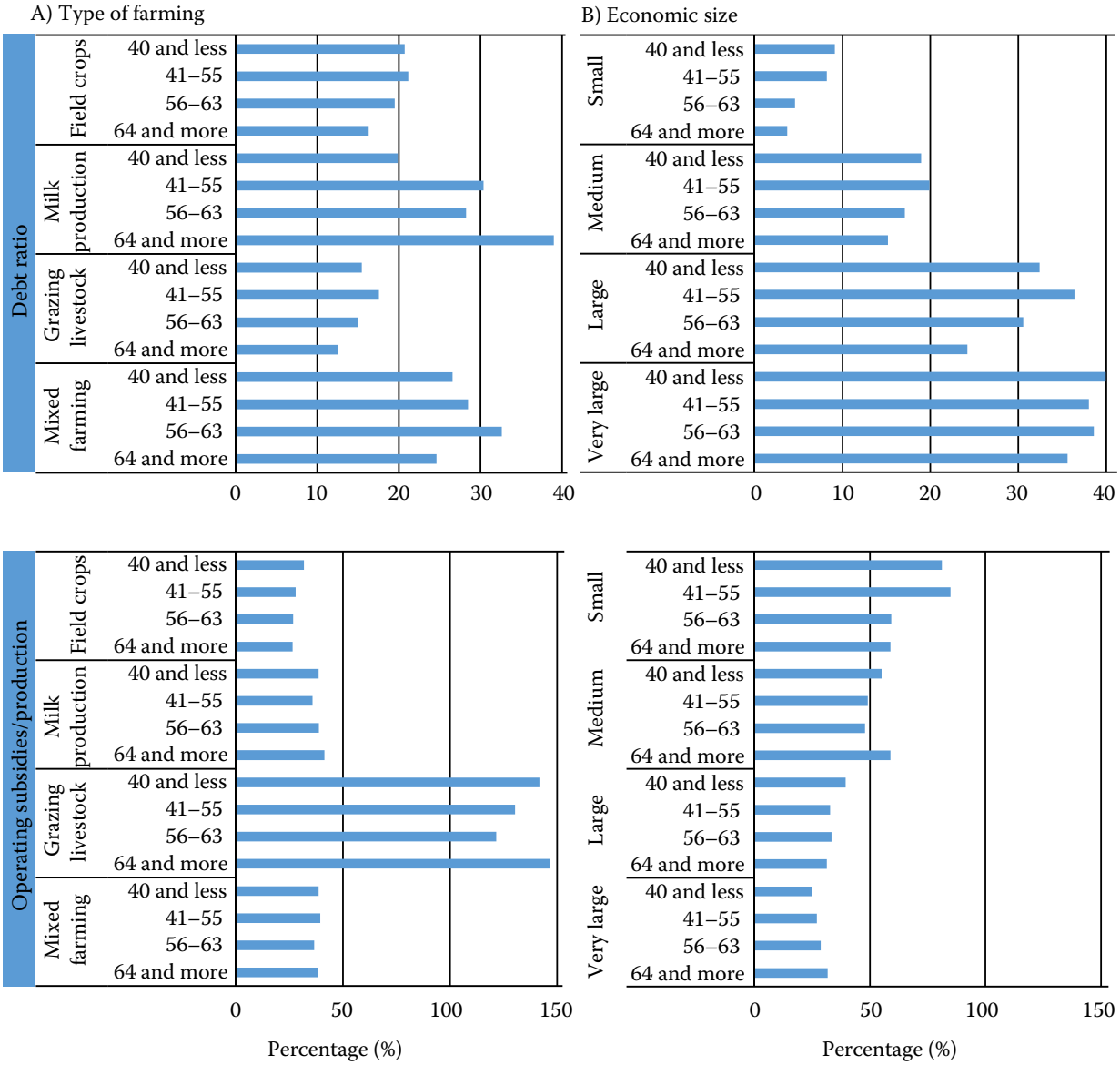

Figure 3. Break down of selected indicators by type of farming, farm size and age group

Source: Authors' elaboration based on the FADN CZ 2016 data (FADN CZ database 2018)

https://doi.org/10.17221/117/2019-AGRICECON

Table 4. Results of testing the economic indicators distribution differences between the age groups

Variable	Age groups	Mann-Whitney U	*Z*-score	*P*-value
Standard output (EUR)	1–2	50 927	–4.2466	0.0000***
	1–3	32 170	–5.8555	0.0000***
	1–4	19 309	–4.2893	0.0000***
	2–3	88 086	–2.7182	0.0066**
	2–4	51 951	–1.3937	0.1634
	3–4	38 002	0.7409	0.4587
Total production/AWU	1–2	61 927	–0.3697	0.7116
	1–3	43 537	–0.5403	0.5890
	1–4	23 475	1.2635	0.2064
	2–3	97 737	–0.2110	0.8329
	2–4	50 643	1.8935	0.0583
	3–4	35 385	2.0741	0.0381
Production/costs	1–2	55 118	2.7697	0.0056**
	1–3	38 751	2.7782	0.0055**
	1–4	20 926	3.1147	0.0018***
	2–3	97 553	0.2586	0.7959
	2–4	52 362	1.2368	0.2162
	3–4	37 461	1.0165	0.3094
Crop production/ha	1–2	59 604	–0.3951	0.6927
	1–3	40 038	–1.3664	0.1718
	1–4	24 209	–0.1037	0.9174
	2–3	91 056	–1.2750	0.2023
	2–4	53 611	0.3234	0.7464
	3–4	35 941	1.3064	0.1914
Livestock production/LU	1–2	27 007	–1.4829	0.1381
	1–3	16 951	–2.5144	0.0119**
	1–4	10 239	–1.7029	0.0886
	2–3	44 982	–1.3699	0.1707
	2–4	27 147	–0.4799	0.6313
	3–4	18 015	0.7581	0.4484
Farm net value added/AWU	1–2	57 943	1.7738	0.0761*
	1–3	42 321	1.1089	0.2675
	1–4	22 820	1.7389	0.0820*
	2–3	95 316	–0.8398	0.4010
	2–4	54 603	0.3802	0.7038
	3–4	37 443	1.0257	0.3050
Operating subsidies/total production	1–2	60 778	0.7747	0.4385
	1–3	40 559	1.9330	0.0532*
	1–4	24 209	0.7304	0.4652
	2–3	92 664	1.5288	0.1263
	2–4	55 186	0.1574	0.8749
	3–4	37 497	–0.9984	0.3181

https://doi.org/10.17221/117/2019-AGRICECON

Continuation Table 4

Variable	Age groups	Mann-Whitney U	*Z*-score	*P*-value
Debt ratio	1–2	58 694	–1.5093	0.1312
	1–3	41 247	–1.6111	0.1072
	1–4	23 957	0.9134	0.3610
	2–3	97 897	–0.1693	0.8656
	2–4	49 174	2.4551	0.0141*
	3–4	34 541	2.5040	0.0123**

Age group 1 – 40 and less years, 2 – 41–55 years, 3 – 56–63 years, 4 – 64 and more years; statistically significant differences between groups after Bonferroni correction for *pbc < 0.025, **pbc < 0.0125, *** pbc < 0.0025; AWU – annual work unit; LU – number of livestock unit

Source: Authors' calculation based on the FADN CZ 2016 data (FADN CZ Database 2018)

(2015) found that young farmers gain higher profitability and productivity in England.

The debt ratio shows how farmers employ external financing resources compared to their own assets. Figure 3 displays that the debt ratio grows when a farmer's assets grow. However, within a given size group the debt ratio mainly decreases from the youngest farmers to the oldest. Our results confirm that young farmers exploit higher shares of extraneous resources, especially with regard to initial investments in business and higher willingness to bear the risks. The variation between the production type is caused mainly by different technological demands. The lowest level of indebtedness can be seen in the oldest farmers' production focused on breeding of cattle, sheep and goats, while the oldest farmers specializing in milk production have the highest level of indebtedness.

The lowest values for the ratio of operating subsidy to total production may be found in the field crops type farms (Figure 3). Farms focused on milk and mixed production have a similar relationship between operation subsidies and production. The highest values have been shown by the cattle, sheep and goats breeding farms, with these farms not only focusing on agricultural production but also engageing in other activities (countryside maintenance) supported by the Common Agricultural Policy. The ratio of operating subsidy to total production falls greatly as a farm's size and a farmer's age rise. The highest values were reached by both farmers in the 41–55 age group and farmers on small farms.

Based on the Mann-Whitney U test results with Bonferroni correction between the age groups, statistically significant differences for some indicators were detected. The results are presented in Table 4 for three levels of the adjusted *p*-value (pbc). Most differences have been found in the standard output, which is closely related to farm specialisation and farm size. The profitability (production/costs ratio) also shows that a distribution of the young farmers' group differs from all the other age groups.

A study by Hassan (2015) demonstrated that income is strongly dependent upon the age of a farmer, with income increasing by 4.6% for every 1% increase in farm manager age. A statistically significant correlation (0.1492, $\alpha = 0.01$) between the manager's age and the farm net value added was proven also for the case of Czech farmers. Nevertheless, the relationship between age and FNVA/AWU has not been confirmed. Williamson and Williams (2017) indicate that the majority of a young farmer's total revenue comes from non-agricultural resources. On the one hand, the higher indebtedness level of young farmers corresponds to the theory concerning innovative approaches and the use of new technologies by younger generations (Haryanto et al. 2016); on the other hand, it is also due to a lack of financial resources when starting and developing a business.

The positive relationship between a farmer's age and non-agricultural incomes was also previously confirmed (Alasia et al. 2007; Jette-Nantel et al. 2011). Jette-Nantel et al. (2011) point to the positive correlation between a farmer's age and non-agricultural income up to a certain age, at which point non-agricultural income can be supplemented or even replaced by a pension or by investment income. The FADN database does not contain data on non-agricultural incomes, but a relationship between a farmer's age and other gainful activities was discovered. Other gainful activities include non-agricultural activities, the costs of which cannot be distinguished from agricultural activities. These are for instance a farmer's own energy production, processing of farm products, income from agricultural services, or agritourism.

https://doi.org/10.17221/117/2019-AGRICECON

CONCLUSION

The assessment of selected results of agricultural enterprises in the Czech Republic has been processed based on enterprise manager age. The results have been analysed in detail by age groups of farm managers and/or owners, production specialization, and the economic size of farms. The ageing of farmers is one of the risks which must be taken into account while forming further sustainable agricultural policies. The results of this study confirm its importance not only with regard to farmers' successors but also with regard to economic growth and agricultural sustainability. Although this is a Europe-wide problem, the Czech Republic has the means to respond to the long-term decline of young farmers through measures of its own. The results of the study highlight important implications for policymakers in particular, with the information necessary to indicate which types of agricultural production are the most sensitive and which farms policy should be aimed at according to size. As Hamilton (2015) notes, it is important to distinguish the conditions under which young farmers enter farming. They either continue family heirlooms, start a brand-new farm, or are employed in a legal entity as managers. At an inherited farm, a young farmer will seek innovation and modernization of the existing state. When setting up a new farm, a young farmer will seek support in acquiring land, property and machinery. A young manager in a legal entity will use the company's background and will not require state support. The farm net value added per one annual work unit reached the best values in the farms managed by young farmers in field production and young farmers in large enterprises. The highest level of indebtedness was found among the oldest farmers specializing in milk production. The rate of indebtedness by farm size shows a decreasing trend with increasing age of a farmer. These results clearly show the indispensable need for entry investment by young farmers. The current subsidy for the young farmer is paid per unit of cultivated land and does not take into account any of the above-mentioned specificities of farming. It may be suggested that the state provide more favourable conditions for young and starting farmers in the form of measures supporting interest and insurance. The support may also be aimed at guaranteeing loans and ensuring the availability of loans to young farmers.

Paired testing of independent samples confirmed comparable results for most indicators. However, the ratio of production to costs differs at a statistically significant level between young farmers and the remaining three age groups as a group of young farmers is the only one gaining a positive margin. The share of operation subsidies on the farm net value added differs at a statistically significant level between the farmer age groups of 41–55 and 56–63. The mean values of the rate of indebtedness differ between the oldest farmers and the 41–55 and 56–63 farmer age groups. A significant finding was a high degree of similarity between the mean values of FNVA/AWU and return on equity among the groups. These outcomes confirm that young farmers' economic results are comparable with older farm managers' results. The conclusions affirm that agricultural policy should emphasize supporting young farmers as they take on managerial roles at agricultural companies. It has been confirmed that young farmers are capable of manageing large companies within different farm types and that they are capable of achieving sufficient incomes.

REFERENCES

Alasia A., Bollman R.D., Weersink A., Cranfield J. (2007): Off-Farm Labour Decisions of Canadian Farm Operators in 2001: The Role of Operator, Farm, Community and Regional Determinants. Ottawa, Ministry of Industry, Statistics Canada Agriculture Division.

Bohackova I., Hrabankova M. (2011): Ageing of agricultural population and generation exchange in EU member states. Acta Universitatis Bohemiae Meridionales, XIV: 45–52.

Calus M., van Huylenbroeck G., van Lierde D. (2008): The relationship between farm succession and farm assets on Belgian farms. Sociologia Ruralis, 48: 38–56.

Cruz L., Ramos P.N., Barata E., Sargento A.L. (2017): Assessing an agri-food development strategy: a bi-regional input–output model with resource-constrained sectors. European Review of Agricultural Economics, 44: 860–882.

DEFRA (2015): Farm Succession: Results from the Farm Business Survey, England 2013/14. [National Statistics]. Department for Environment, Food and Rural Affairs, GOV.UK. Available at https://www.gov.uk (accessed Dec 10, 2018).

Duesberga S., Bogue P., Renwick A. (2017): Retirement farming or sustainable growth – land transfer choices for farmers without a successor. Land Use Policy, 61: 526–535.

European Commission (EC) (2009): Commission Regulation (EC) No 867/2009 of 21 September 2009, amending and correcting Regulation (EC) No 1242/2008 establishing a Community typology for agricultural holdings, European Commission.

European Commission (EC) (2012): RI/CC 882 Definitions of Variables Used in FADNStandard Results. Commu-

https://doi.org/10.17221/117/2019-AGRICECON

nity Committee for the Farm Accountancy Data Network (FADN). Brussels, Directorate-General for Agriculture and Rural Development.

European Commission (EC) (2017): Young Farmers in the EU – Structural and Economic cCharacteristics. European Commission, EU Agricultural and Farm Economics Briefs, 15, Oct 2017.

Eurostat (2019): Eurostat Database. Eurostat. Available at http://ec.europa.eu/eurostat/data/database (accessed Oct 20, 2019).

FADN CZ Database (2018): Farm Accountancy Data Network database in the Czech Republic. Available at http://www.fadn.cz

Hamilton W., Bosworth G., Ruto E. (2015): Entrepreneurial younger farmers and the "young farmer problem" in England. Agriculture and Forestry, 61: 61–69.

Hansson H. (2008): How can farmer managerial capacity contribute to improved farm performance? A study of dairy farms in Sweden. Acta Agriculturae Scandinavica, Section C – Food Economics, 5: 44–61.

Haryanto T., Talib B.A., Salleh N.H.M. (2016): Technical efficiency and technology gap in Indonesian rice farming. Agris on-line Papers in Economics and Informatics, 8: 29–38.

Hassan T. (2015): Economic analysis of factors affecting the farmer income under traditional farming system in South Darfur State – Sudan. African Journal of Agricultural Science and Technology, 1: 114–119.

Ingram J., Kirwan J. (2011): Matching new entrants and retiring farmers through farm joint ventures: Insights from the Fresh Start Initiative in Cornwall, UK. Land Use Policy, 28: 917–927.

Jette-Nantel S., Freshwater D., Beaulieu M., Katchova A. (2011): Farm Income Variability and Off-Farm Diversification in Canadian Agriculture, Agriculture and Rural Working Paper Series. Statistics Canada, Catalogue No. 21-601-M-No. 93.

Leonard B., Kinsella A., O'Donoghue C., Farrell M., Mahon M. (2017): Policy drivers of farm succession and inheritance. Land Use Policy, 61: 147–159.

May D., Arancibia S., Behrendt K., Adams J. (2019): Preventing young farmers from leaving the farm: Investigating the effectiveness of the young farmer payment using a behavioural approach. Land Use Policy, 82: 317–327.

Medonos T., Ratinger T., Hruska M., Spicka J. (2012): The assessment of the effects of investment support measures of the Rural Development Programmes: the case of the Czech Republic. Agris on-line Papers in Economics and Informatics, 4: 35–48.

Morais M., Binotto E., Borges J.A.R. (2017): Identifying beliefs underlying successors' intention to take over the farm. Land Use Policy, 68: 48–58.

Riley M. (2016): Still being the 'good farmer': (non-) retirement and the preservation of farming identities in older age. Sociologia Ruralis, 56: 96–115.

Schuh B. et al. (2019): Research for AGRI Committee – The EU Farming Employment: Current Challenges and Future Prospects. Brussels, European Parliament, Policy Department for Structural and Cohesion Policies.

Simpach O., Pechrova M. (2015): Development of the Czech farmers' age structure and the consequences for subsidy policy. Agris on-line Papers in Economics and Informatics, 7: 57–69.

Smalheiser N.R. (2017): Nonparametric tests. In: Smalheiser N.R.: Data Literacy. Cambridge, Massachusetts, USA, Academic Press: 157–167.

Szőllősi L., Szűcs I., Huzsvai L., Molnár S.J. (2019): Economic issues of Hungarian table egg production in different housing systems, farm sizes and production levels. Journal of Central European Agriculture, 20: 995–1008.

Vitunskiene V., Dabkiene V. (2016): Framework for assessing the farm relative sustainability: a Lithuanian case study. Agricultural Economics – Czech, 62: 134–148.

Williamson J., Williams R. (2017): Beginning Farmers and Age Distribution of Farmers, Economic Research Service. USDA. Available at https://www.ers.usda.gov (accessed Dec 6, 2018).

Zagata L., Hadkova S., Mikovcova M. (2015): Basic outline of the problem of the "ageing population of farmers" in the Czech Republic. Agris on-line Papers in Economics and Informatics, 7: 89–96.

Zagata L., Sutherland L. (2015): Deconstructing the 'young farmer problem in Europe'. Towards a research agenda. Journal of Rural Studies, 38: 39–51.

Received: April 29, 2019
Accepted: January 3, 2019