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THE MODERN CONTRIBUTION OF THE BASIC CATEGORIES OF PRODUCERS TO UKRAINIAN AGRARIAN PRODUCTION

Purpose. *The purpose of the article is to analyze the contribution of agricultural enterprises and households to Ukrainian agrarian production, to determine the place of agricultural holdings in its formation and to indicate the role of the agricultural sector in Ukrainian exports.*

Methodology / approach. *The methodological research tool is an economic analysis of the activities of business entities. The statistical data of the main indicators of the production activities of agricultural enterprises is being used as empirical information. In the process of research, the following methods of economic analysis were used: formalized – a graphical method, percentage numbers, methods of mathematical statistics; non-formalized – expert assessment, comparison, analytical tables.*

Results. *An estimation of the dynamics of agricultural output in the basic categories of farms in 2010–2017 was made, the share of the basic categories of farms in the crop and livestock production was determined. It is noted that in the agrarian sector of Ukraine there has been a polarization in the production of agricultural products – self-employed small-scale forms of management dominate the production of labor-intensive and low-profitable products, while large industrial high-quality agricultural enterprises are highly profitable and low labor-intensive. Researches have shown that one of the leading places in the crop production is sunflower cultivation due to its high profitability. In the example of sunflower production shows the possibilities of economic and mathematical modeling as a tool for evaluating production efficiency and forecasting. The place of the agrarian sector in the structure of Ukraine's commodity exports in 2017 has been analyzed. It was shown that an important place in the Ukrainian agro-industrial complex is occupied by agricultural holdings, which, in particular, are very significant in the formation of Ukrainian exports of cereals and oil plants.*

Originality / scientific novelty. *Trends and the current state of the agro-industrial sector of Ukraine researches have been further developed. A comparative evaluation of the effectiveness and contribution of the basic categories of farms to the agricultural production at the present stage was made. For the first time, economic and mathematical models for the analysis of the main indicators of sunflower cultivation have been proposed.*

Practical value / implications. *The growing role of agricultural enterprises, in particular, agricultural holdings, in the development of the agro-industrial complex is shown, the place of Ukrainian agricultural products in the world food market is defined and the importance of diversification Ukrainian exports is pointed out. The established trend lines of sunflower cultivation indicators made it possible to calculate the corresponding short-term forecasts, which can be taken into account when justifying alternatives for the future development of agricultural enterprises.*

Key words: *agribusiness, agricultural enterprises, agroholdings, farm enterprise, innovations, production, statistical methods.*

Introduction and review of literature. *It is difficult to overemphasize the importance of the agrarian sector as it provides the resource base of the food industry,*

which forms the basis of food security, welfare, and quality of the population life. That is why ensuring sustainable agricultural development, global co-operation, international food trade are the most important prerequisites for global food security (Grafton et al., 2015).

The leading role in ensuring food security of the country is given to the state and the operating mechanism of domestic producers support. Ukraine has rich natural resources, favorable climate, and a great creative potential in the production of agricultural products and food. Agro-industrial production is a leading branch of the national economy. The average world index of agricultural land per person is 0.23 hectares. In different countries, this indicator is significantly different. In Australia, it is 2.45 hectares per person, Canada – 1.48 hectares; in China, Bangladesh and Belgium, each inhabitant has 0.07 hectares. Indicator of land resources supply in Ukraine is one of the highest – per capita it is 1.07 hectares.

Today Ukraine tries to take an active part in world processes and integrate into the world economy. The country's investment advantages include a favorable geographical location with respect to the markets for sales – Western and Eastern Europe, the Middle East and Central Asia. Agrarians of Ukraine follow global trends and apply advanced technologies for growing plants and animals, which also contributes to the increased competitiveness of Ukrainian agricultural products on the world market.

The characteristic of the current stage of the agrarian sector development of the Ukrainian economy is the deep socio-economic transformation. Reform of agrarian relations is directed, first of all, to the creation of an effective owner, a favorable economic environment, the search and mobilization of internal resources for the output growth and its effectiveness increase due to the introduction of innovative technologies. Agro-industrial companies have become an integral part of the organizational and legal structure of the agrarian sector of the economy (Andriichuk, 2013). Gyryk (2016) analyzed the agro-industrial units and the development of agricultural holdings in Ukraine; their impact on the country's agriculture was determined. Khodakivska and Mohylnyi (2017) reviewed the stages of the formation of large vertically integrated agro-industrial companies (agroholdings), change in macroeconomic indicators related to their activities, the role and importance of agriculture in the Ukrainian economy.

Kutsenko (2018) determined the motivational component of the integration of agricultural enterprises into agro-industrial holding structures. Using the example of integrated formations, it is substantiated that the result of the implementation of the strategy for the development of inter-sectoral integration will be a synergistic effect, which is defined as an increase in the efficiency of the activity of integrated formations (Dankevych, 2018).

Apart from agricultural enterprises, households that own a large part of the resources are essential in the market transformation of the economy. The small scale of production ensures their high maneuverability and adaptability. The successful activity of rural households is a prerequisite for creating a business class in the

countryside, forming the welfare level of the rural population, an important source of self-sufficiency and profit (Samarets, 2016; Kononenko, 2018).

In Ukraine, the number of households is declining, and their share in agricultural production is decreasing. During 2011–2016, the number of personal peasant households decreased from 4.9 million to 4.2 (–14.3 %), and the share in the production of gross agricultural products from 59 to 46%. In connection with changes in the management of rural areas (decentralization), the issue of further developing personal peasant households based on the unity of economic, social and environmental interests and enhancing business activities in terms of income growth, employment and social protection through the development of family farms is urgent (Malik and Shpykuliak, 2018). Ricciardi et al. (2018) presented a global sample of 55 countries, representing 51 % of global crop production and measurements of crop production, nutrient and crop diversity by farm size. Otzuka et al. (2016) called the policy of supporting small farms in Asia false, stimulating the loss of competitive advantage, and forced a number of countries to become net importers of food. In recent years in some countries, there is a clearer positive relationship between efficiency, productivity and size.

Ukraine is at the beginning of building a market for agricultural land, so it must use the existing European experience to ensure the functioning of a regulated, open and civilized market for agricultural land. The family farming model is a reference model in the EU, therefore, the regulation of the land market is carried out precisely in this context. The farmer is always the top buyer on the land market (Levesque et al., 2017). Zinchuk and Dankevych (2016) proved that the most similar conditions to the Ukrainian market for the development of agricultural land were in such countries as Bulgaria, Estonia, Latvia, Lithuania, Poland and Romania.

Vasylieva and Pugach (2017) explore the ways of increasing Ukrainian contribution to the grain segment of the world food security system. The main priorities of the development of the grain-producing subcomplex of Ukraine are to ensure the growth in the production of high-quality grain and the increase in export potential (Karamushka, 2014). An effective means of the study of food safety issues is an economic and mathematical modeling, which provides tools for economic measurements and a methodology for model parameters estimating (Nuzhna, 2016; Samarets, 2017; Samarets, 2018). Econometric studies in agriculture attract the attention of scientists from different countries. So, Bessler et al. (2010) gave examples of the use of econometric methods in agriculture over the past 100 years. One of the most effective tools for data mining and forecasting is artificial neural networks, with which new models for a regional clusterization of the indicators of crop and animal production in Ukraine (Vasylieva, 2016) were presented.

The purpose of the article. The studies were aimed at determining the modern state of development and contribution to the agricultural production of Ukraine of the main categories of farms – agricultural enterprises (including private farms and agricultural holdings) and households. For a statistical evaluation of sunflower production in agricultural enterprises and households, it was necessary to build trend

lines and regressions. In addition to the dynamics of agrarian production, it was necessary to consider the role of the agro-industrial complex, in particular, agricultural holdings in the country's export products, as well as the latest technologies and technical tools used in this sector of the economy. A number of statistical materials, scientific publications and Internet resources have been processed to achieve this goal.

Results and discussion. The State Statistics Service of Ukraine identifies the following basic categories of agricultural producers: agricultural enterprises (including private farms) and households. As of 01.11.2017, the total number of Ukrainian agricultural enterprises was equal to 45558; the area of their agricultural land was 19.96 million hectares. There were enterprises that did not have agricultural land at all, which is 10.6 % of their total number. The structure of agricultural enterprises shows that most of them had a small area of land use:

- up to 10 hectares – 12.6 % of their total;
- from 10.1 hectares to 100 hectares – 44.1 %;
- from 100.1 hectares to 1000 hectares – 22.0 %;
- from 1000.1 hectares to 3000 hectares – 7.8 %;
- from 3000.1 hectares to 7000 hectares – 2.2 %;
- from 7000.1 hectares – 0.7 %.

Private farms are the prevailing organizational and legal form of management, the share of which in the total number of agricultural enterprises and agricultural land is 74.9 % and 22.9% respectively. The shares of the other enterprises engaged in agricultural activities are, %: business associations – 15.3; private enterprises – 7.1; production co-operatives – 1.0; state enterprises – 0.4 and enterprises of other types of business – 1.3. The number of households was 4.03 million (State Statistics Service of Ukraine, 2018). In Europe, family and predominantly self-employed forms of business in rural areas dominate virtually all branches of agriculture. In the EU, about 85% of all farms are family-owned; they farm about 70 % of all agricultural land. Speaking about the main agribusiness models that exist in the world, experts often cite as an example two main ones: the so-called “Argentine”, in which large agribusinesses cultivate large tracts of land and provide a very significant amount of production of agricultural products of mass demand and consumption, and the so-called “French” or “European” model, in which the main producer of agricultural products is a farmer with his family, and the main products are cheese, oil, olives, etc.

A process of concentration of agricultural land is currently underway in Ukraine and the number of small enterprises sharply decreases due to their transition under the control of powerful agribusiness units. Agroholdings are created by leasing land by powerful industrial enterprises, financial and service structures that invest in the productive and social spheres of a village. Agroholdings are actively attracting capital through the issue and stock floatation at share market abroad, which cannot afford other forms of agribusiness. The number of agricultural holdings and their land bank continues to grow in Ukraine. According to the State Statistics Service of Ukraine, in 2017, the number of enterprises that cultivated land on more than 10000 hectares was

166 (0.4 % of the total number of agricultural enterprises). The area of their land was 3643.1 thousand hectares – 18.3 % of the total land area of agricultural enterprises.

In the aggregated land, the rating of agrohholdings included 93 companies that had over 10 thousand hectares in use in 2017. The increase in the share of agrohholdings among other enterprises in the industry generally suggests a continuing phenomenon of scaling in the agricultural sector. The average size of an agricultural enterprise, which is part of the holding, is 4850 hectares. The average value of this indicator for Ukraine excluding enterprises of agricultural holdings and farms is 1058 hectares.

In general, we can note the positive dynamics of growth of Ukrainian agricultural products in recent years: UAH 187.5 billion in 2010 against UAH 247.7 billion in 2017 at constant prices in 2010 (the increase of 32%). During this period, crop production increased by 48%; the growth of livestock production was 3%. The contribution to the production of agricultural enterprises in comparison with households has gradually increased (Fig. 1).

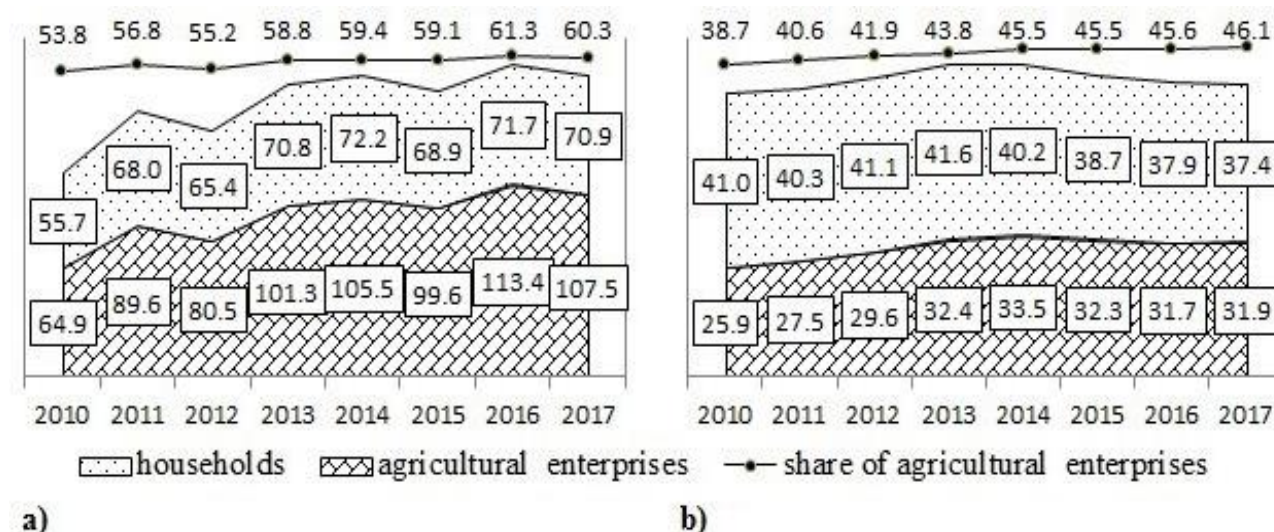


Fig. 1. Dynamics of the agricultural products, UAH billion, and the proportion of agricultural enterprises in production, %:
a – crop production; b – livestock production

Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

The total structure of gross output in 2017 is as follows, %: agricultural enterprises – 56.4 (including private farms – 15.5, agrohholdings – 22.0), households – 43.6. In the structure of the volume of agricultural enterprises production in the crop sector, the percentage of private farms was 18.7, agrohholdings – 20; in the animal husbandry sector – 4.4 and 29 respectively. In 2010–2017 the sown area of agricultural enterprises increased by 1.4 %, households – by 4.8 %; agricultural holdings – by 48.7 %. In 2017, the sown areas of agricultural crops of all categories of farms amounted to 27.59 million hectares, including agricultural enterprises – 19.26 million hectares (private farms – 4.30 million hectares, agrohholdings – 5.95 million hectares), households – 8.33 million hectares. Figure 2 shows the structure of the crop area of agricultural crops by farm categories.

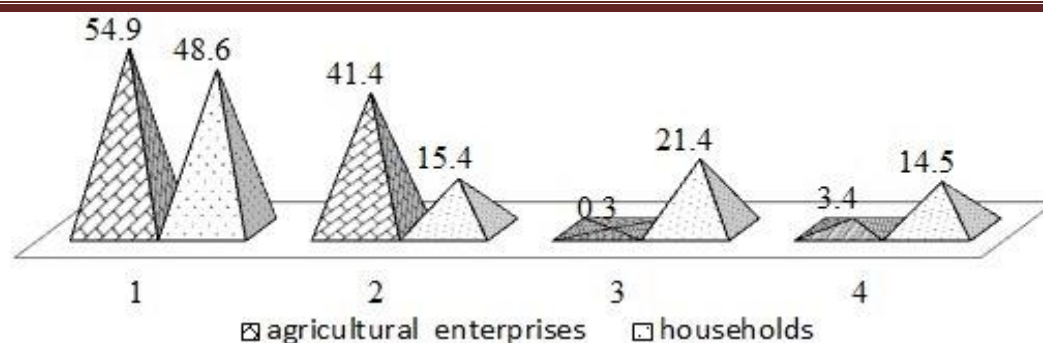


Fig. 2. Structure of crop planted area, %: 1 – grain & leguminous plants; 2 – industrial crops; 3 – vegetable and melons; 4 – fodder crops

Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

The growth of crop production is due, in particular, to the increase in crop capacity (Table 1).

Table 1

Crop capacity increase by the main categories of farms

Agricultural crop, centners per hectare	Agricultural enterprises / private farms		Households	
	2017	% by 2010	2017	% by 2010
Grain & leguminous crops	45.6 / 37.1	165 / 169	34.6	138
Sugar beet	484.1 / 499.1	172 / 199	335.5	130
Sunflower	21.3 / 18.8	138 / 140	15.2	116
Potatoes	238.4 / 189.2	139 / 119	166.8	127
Vegetables	435.3 / 348.4	210 / 219	191.0	112

Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

The average yield increase for these crops was, %: for agricultural enterprises – 65, private farms – 69, households – 25. Table 2 shows crop capacity by the main categories of Ukrainian farms and some other countries in 2016.

Table 2

Crop capacity by the main categories of Ukrainian and other countries' farms

Agricultural crop, centners per hectare	Ukraine				Other countries			
	Agricultural enterprises	Private farms	Agro holdings	Households	Austria	Greece	Germany	USA
Wheat	43.7	42.1	51.0	43.7	62.5	27.7	76.4	35.4
Barley	35.2	30.7	48.0	30.1	61.2	26.4	66.9	41.9
Corn	72.4	55.4	81.0	46.0	111.6	109.3	96.5	109.6
Soy	23.4	20.3	24.9	18.3	30.6	31.1	27.3	35.0
Rape	25.8	25.4	25.9	22.5	35.8	19.1	34.5	20.4

Source: formed on data from State Statistics Service of Ukraine, 2018; FAOSTAT, 2018; Ukrainian Agribusiness Club, 2018a.

Tables 3, 4 show production of agricultural crops by the main categories of farms and agricultural holdings. Households have a lead in potatoes, vegetables and fruits & berries production, agricultural enterprises – in grain & leguminous crops, sugar beet and sunflower production, soy and rape. The main reason for the decline in crop production was a strong heat in the summer of 2017. The contribution of

agricultural enterprises increased in the production of vegetables, sunflower and sugar beet. Agricultural holdings have a key role in the formation of Ukrainian grain and oilseed crops exports.

Table 3

Production of agricultural crops by the main categories of farms

Agricultural crop, thousand tons	Agricultural enterprises / private farms		Households		Share of agricultural enterprises, %	
	2017	% by 2016	2017	% by 2016	2017	% by 2016
Grain & leguminous	47905.1 / 8686.4	92.1 / 97.8	14011.6	99.6	77.4	98.3
Sugar beet	14227.2 / 1105.0	106.6 / 113.5	654.4	98.7	95.6	100.3
Sunflower	10596.7 / 2365.3	90.3 / 89.4	1638.8	86.4	86.6	100.6
Potatoes	429.4 / 107.4	91.7 / 89.0	21778.8	102.3	1.9	86.4
Vegetables	1343.9 / 272.1	101.6 / 91.2	7942.4	98.2	14.5	102.8
Fruits & berries	333.8 / 75.5	90.1 / 79.1	1714.2	104.7	16.3	88.1

Source: own calculations based on data from State Statistics Service of Ukraine.

Table 4

Production of agricultural crops by the agricultural holdings

Agricultural crop, million tons	Production		Share in general production, %		Share in total exports, %
	2017	% by 2016	2016	2017	
Wheat	6.1	89.8	26.3	23.3	37
Barley	0.8	83.9	10.1	9.5	27
Corn	9.4	79.7	41.9	37.6	45
Soy	1.4	87.0	37.2	35.9	28
Rape	0.7	233.0	27.3	31.8	41
Sunflower	2.8	87.5	23.5	22.5	–

Source: own calculations based on data from State Statistics Service of Ukraine, 2018; Ukrainian Agribusiness Club, 2018a.

The level of production of gross agricultural production is directly dependent on the level of equipment of farms with a machine-tractor park in combination with other material resources. In smaller farms, preference is given to technologies using universal machinery. In large farms, it is advantageous to use specialized high-performance equipment, since depreciation costs are distributed over a large number of products. Figure 3 shows the distribution of the main types of agricultural machinery at agricultural enterprises by the size of agricultural land.

Ukrainian farmers gradually increased the area under the sunflower. Attention to it is due to the high profitability of its production; the cultivation of exactly sunflower seeds in 2017 was the most profit-making – 41.3%. The contribution of agricultural enterprises to the total production of sunflower was in the range of 82 to 87% in 2010–2017. In 2017, the total production of sunflower amounted to 12.2 million tons; the share of agricultural enterprises was to 86.6% (including 22.3% of private farms, 22.5% of agricultural holdings), and households – 13.4%.

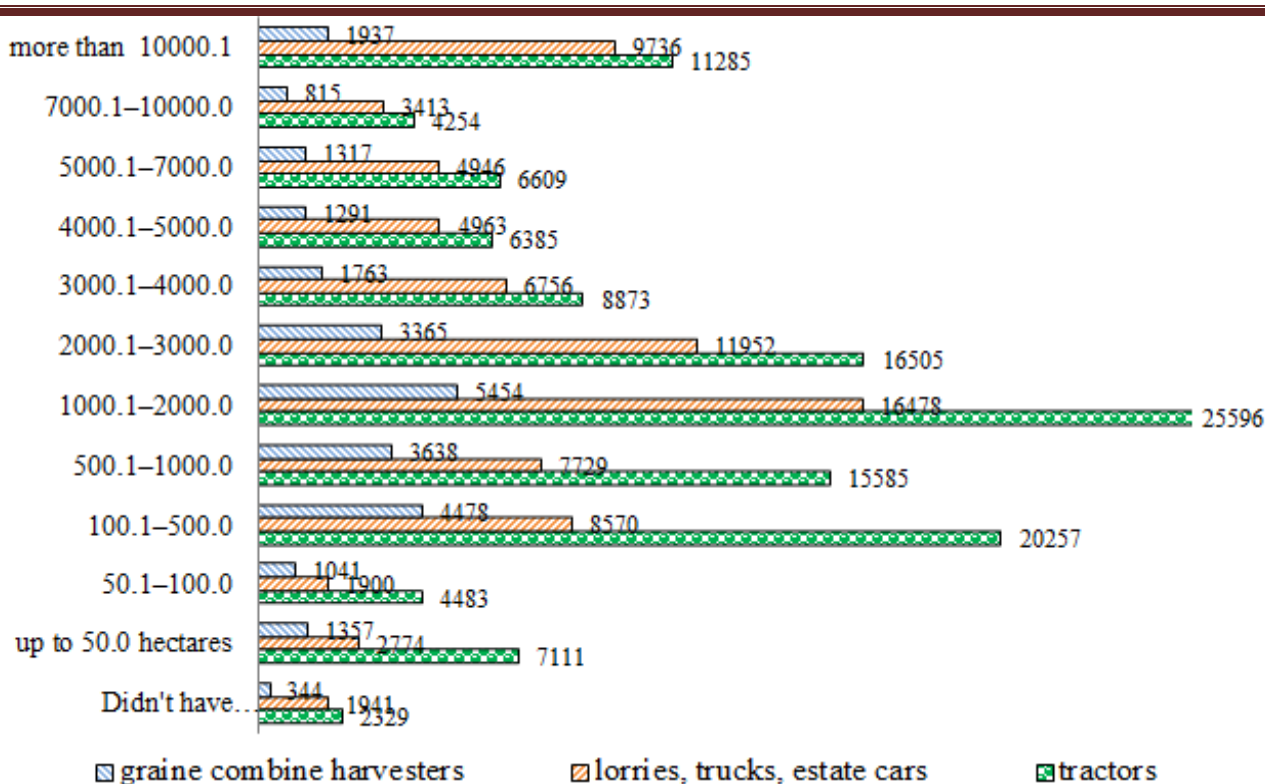


Fig. 3. Distribution of the agricultural machinery by the size of land, pieces

Source: formed on data from State Statistics Service of Ukraine, 2018.

The highest yield of the crop was reached in 2016, centners per hectare: in agricultural enterprises – 23.5, agricultural holdings – 24.7, households – 17.2. In 2017, these figures were 21.3, 24.0 and 15.2 centners per hectare, respectively. For comparison, we present the yield of sunflower in some countries in 2016, centners per hectare: Uzbekistan – 36.9; Austria – 32.9; Greece – 28.2; China – 27.0; Bulgaria – 22.9; Germany – 21.4; Canada – 19.5; USA – 19.4 (FAOSTAT, 2018).

Table 5 shows the economic and mathematical models of sunflower seed production for main categories of farms, calculated using MS Excel based on the information of the State Statistics Service of Ukraine for 2010–2017.

Table 5

The economic and mathematical models of sunflower seed production

Categories of farms	Lines of production volume trend y , thousand tons	Trend lines for sown area S , thousand hectares	Regression dependences of production y , thousand tons, on yield x , centners per hectare
All agricultural producers	$\hat{y} = 6706.3t^{0.304}$ $R^2 = 0.88$	$\hat{S} = 200.43t + 4351.2$ $R^2 = 0.81$	$\hat{y} = 116.8x^{1.506}$ $R^2 = 0.88$
Agricultural enterprises	$\hat{y} = 5548.5t^{0.325}$ $R^2 = 0.90$	$\hat{S} = 170.90t + 3490.3$ $R^2 = 0.79$	$\hat{y} = 89.6x^{1.517}$ $R^2 = 0.89$
Households	$\hat{y} = 1161.9t^{0.188}$ $R^2 = 0.72$	$\hat{S} = 29.53t + 860.95$ $R^2 = 0.88$	$\hat{y} = 41.7x^{1.317}$ $R^2 = 0.81$

Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

In the given ratios $t = 1, 2, 3, \dots$ is the time series; R^2 – coefficient of

determination. The linear model reflects a stable tendency to increase the crop area of oilseeds. On average, over the year, the sown area of sunflower seeds increased in agricultural enterprises by 170.90 thousand hectares, in households by 29.53 thousand hectares.

Power functions allow us to estimate the elasticity coefficient of the volume of production by the corresponding characteristic, that is, the relative effect of the explanatory variable on the dependent. Sunflower seed production is elastic over yield and inelastic over time, with the elasticity coefficient for agricultural enterprises higher than for households. The growth rates of sunflower seed production in agricultural enterprises are significantly higher than in households. So, in 2017, its production by agricultural enterprises increased by 89% compared to 2010 and by households – by 33%.

Based on the obtained trend lines, it is calculated that the sown area of sunflower can increase from 6034 thousand hectares in 2017 to 6556 thousand hectares in 2020 for all categories of farms; for agricultural enterprises, these figures are 4954 and 5370 thousand hectares, for households – 1080 and 1186 thousand hectares, respectively. Sunflower cultivation by all categories of farms can increase from 12235 thousand tons in 2017 to 13900 thousand tons in 2020; for agricultural enterprises, these figures are 10597 and 12100 thousand tons, for households – 1639 and 1800 thousand tons.

The dynamics of changes in the yield of sunflower x , centners per hectare, in agricultural enterprises can be represented as a function:

$$\hat{x} = -0.034t^3 + 0.232t^2 + 1.228t + 14.436; R^2 = 0.78,$$

where the coefficient +1.228 characterizes the rate of yield growth; 0.232 is the acceleration of its change, -0.034 is the change acceleration growth.

For households, the same dependence has the form:

$$\hat{x} = -0.025t^3 + 0.256t^2 - 0.188t + 13.557; R^2 = 0.41.$$

Short-term forecasts indicate a possible decrease in the yield of sunflower for all categories of farms. It should be noted that the value of the coefficient of determination $R^2 = 0.41$ indicates the low reliability of the results for households. To improve the accuracy of prediction, one can use higher-degree polynomial functions or artificial neural networks.

Almost all sunflower remains for processing in Ukraine, and sunflower oil is exported to more than 120 countries. The main consumers of Ukrainian sunflower oil in the world market in 2017/18 are India (44.7%), EU (26.2%), China (10.1%), Iraq (4.2%). The largest exporter and producer of sunflower oil in Ukraine is the agricultural holding Kernel; it accounts for about 8% of its global production. The holding supplies its products to more than 60 countries of the world. The second position in the ranking of exporters of Ukrainian sunflower oil is occupied by Cargill, a subsidiary of Cargill, one of the world's largest grain traders. The third place belongs to a subsidiary of the global agricultural market giant Bunge Ltd, Santreyd.

Figure 4 shows the share of main categories of farms in the production of crop

by regions in 2017. The number near the name of the region corresponds to the overall ranking in the gross Ukrainian agricultural product in crop production.

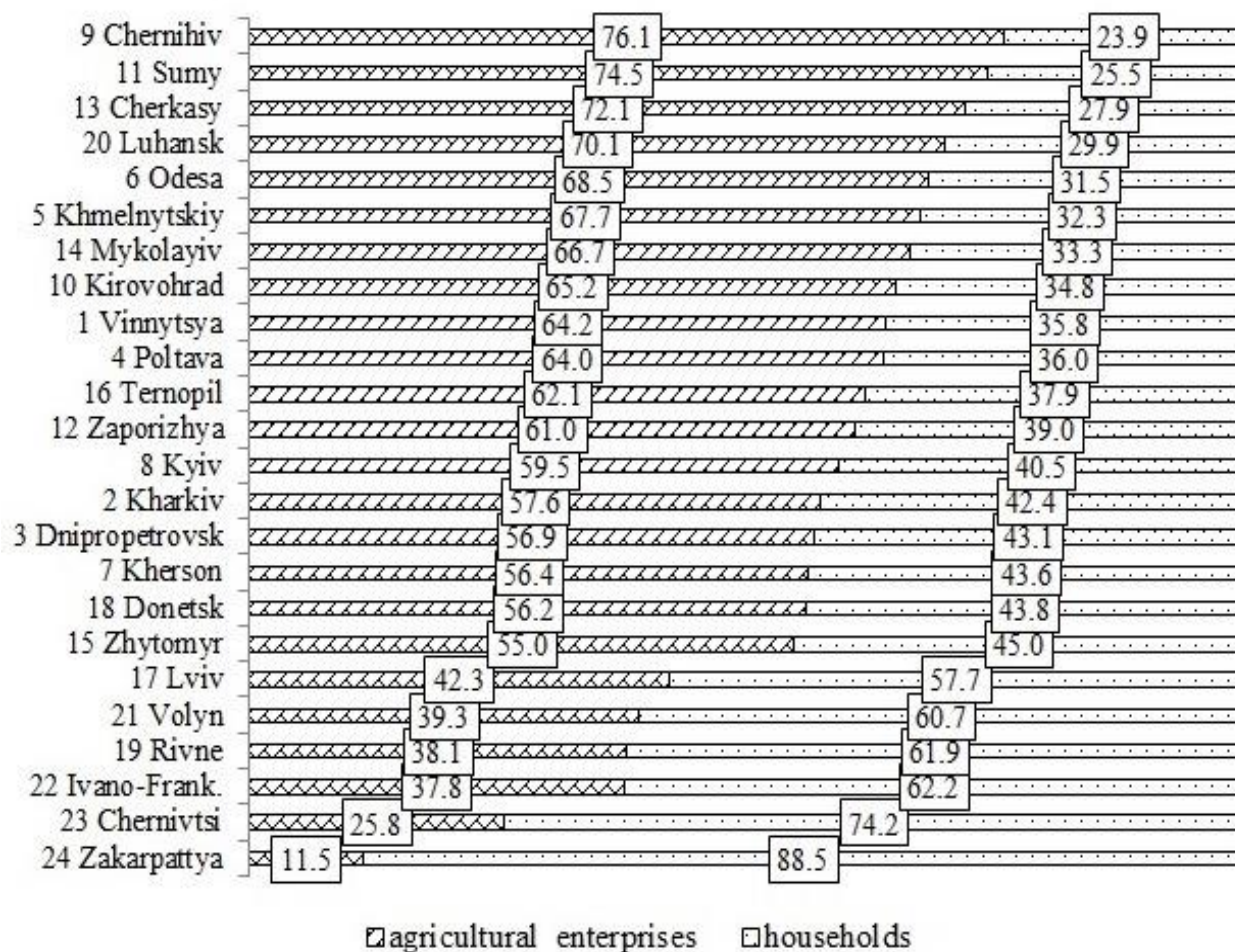


Fig. 4. Share of the main categories of farms in crop production by regions, %

Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

The leading role in its production belongs to agricultural enterprises of almost all regions of Ukraine, except the western ones. The most powerful agricultural enterprises of the crop production area are located in Vinnytsya (8704.9 million UAH), Khmelnytskiy (UAH 7088.1 million) and Odesa (6802.4 million UAH).

The first five agricultural holdings in the world control 34.5 million hectares:

1. S. Kidman & Co Ltd (Australia) – 10.7 million hectares.
2. Australian Agricultural Company (AACo) – 7 million hectares.
3. The North Australian Pastoral Company (NAPCO) – 5.8 million hectares.
4. Consolidated Pastoral Company (CPC), Australia – 5.6 million hectares.
5. China Beidahuang Industry Group Holdings Ltd – 5.4 million hectares.

Ukrainian companies look quite competitive in this case. The largest agricultural holdings of Ukraine are presented in table 6.

The largest number of agricultural holdings was in the following regions: Kyiv (32), Chernihiv (28) and Poltava (26), the lowest – in Zakarpattya (1), Luhansk (5) and Chernivtsi (5) – in the regions that occupy the lowest places of the national rating (Ukrainian Agribusiness Club, 2018b).

Table 6

TOP–5 agricultural holdings of Ukraine in 2017

Name & land bank, thousand hectares	Ukrainian regions	Products & key crops
UkrLandFarming 570	22 regions	plant growing; dairy and meat cattle breeding; eggs and egg products; sugar production; processing, storage and trade of grain and industrial crops, distribution of agricultural machinery
Kernel 550	Ternopil, Odesa, Mykolayiv, Kirovohrad, Cherkasy, Poltava, Sumy, Chernihiv, Kharkiv, Dnipropetrovsk, Khmelnytskiy	the world's largest exporter and producer of sunflower oil; production and export of grain; exports to more than 60 countries
Agroprosperis Group (New Century Holding) 430	Sumy, Chernihiv, Kharkiv, Lviv, Poltava, Mykolayiv, Vinnytsya, Chernivtsi, Zhytomyr, Volyn	wheat, rape, corn, sunflower, soy; one of the largest grain producers, exporters and employers of Ukraine
Myronivsky Hliboproduct 370	Sumy, Kyiv, Vinnytsya, Cherkasy, Ternopil, Khmelnytskiy, Lviv, Ivano-Frankivsk, Dnipropetrovsk	production of poultry meat and growing of cereals: corn, sunflower, wheat, barley; soy and rape; export to the EU
Astarta–Kyiv 250	Poltava, Kharkiv, Vinnytsya, Khmelnytskiy, Ternopil, Zhytomyr, Chernihiv, Cherkasy	sugar beet; corn, wheat, barley; soy; dairy and meat cattle breeding

Source: formed on data from Latifundist.com, 2018a.

In general, it can be noted that the rating of regions depends to a large extent on the location of large commodity production. Such powerful holdings as UkrLandFarming, Agroprosperis Group, Myronivsky Hliboproduct, Astarta–Kyiv, Ukrprominvest–Ahro, etc. operate on the territory of the regions – the leaders of the national rating in crop production (Vinnytsya, Kharkiv and Dnipropetrovsk).

Thus, studies show that there has been a polarization in agricultural production nowadays in the agrarian sector – self-employed small-scale forms of management dominate the production of labor-intensive and low-profitable products, while large industrial high-quality agricultural enterprises are highly profitable and low labor-intensive. Agricultural holdings were limited mainly to the production of highly profitable grains and industrial crops; such specialization in low-labor-intensive industries significantly reduces the level of employment of the rural population.

In the livestock sector, households have a lead in milk, wool and honey production, agricultural enterprises – in meat and eggs production (Table 7).

In 2017, the contribution of agricultural enterprises increased in the production of milk, eggs and wool. Annual average milk yield per cow was 6025 kilogram (+6.8% by 2016), annual average wool clipping per sheep – 1.6 kilogram, use of fodders for agricultural animals – 11.5 million tons fodders units in agricultural enterprises; for households the corresponding figures were 4480 (+0.2% by 2016), 3.2 and 18.3. For comparison, we present the milk yield per cow in some countries in

2016, kilogram: USA – 10330; Denmark – 9367; Czech Republic – 8279; Portugal – 8197; Germany – 7746; Belgium – 7316; Canada – 7237 (FAOSTAT, 2018).

Table 7

Production of livestock products by the main categories of farms

Production	Agricultural enterprises / private farms		Households		Share of agricultural enterprises, %	
	2017	% by 2016	2017	% by 2016	2017	% by 2016
Meat, thousand tons	1483.0 / 58.2	99.5 / 103.4	835.2	100.2	64.0	99.8
Milk, thousand tons	2765.7 / 194.8	102.2 / 106.1	7514.8	97.9	26.9	103.2
Eggs, million pieces	8365.3 / –	103.7 / –	7140.5	101.5	53.9	101.0
Wool, tons	255.0 / –	95.9 / –	1712.0	94.8	13.0	101.0
Honey, tons	847.0 / –	94.0 / –	65384.0	112.0	1.3	84.2

Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

In Ukrainian agroholdings there is an increase in milk production volumes: in 2016 – by 5.5%, in 2017 – by 4.8%. In agricultural enterprises, the productivity of dairy production continues to grow, expressed as a centner of milk per 1 cow. Among agroholdings, productivity in 2017 increased by 7.7% compared to 2016, while in other agricultural enterprises – by 3.3%. In the households, the productivity of milk production actually remained at last year's level.

For the period 2010–2017, agricultural enterprises reduced the share of beef in the structure of meat production by 2.8% and increased the share of pork by 2.6%; households increased the share of pork by 2.6% and reduced the share of beef by 3.4%. Figure 5 shows the structure of meat production in the main categories of farms.

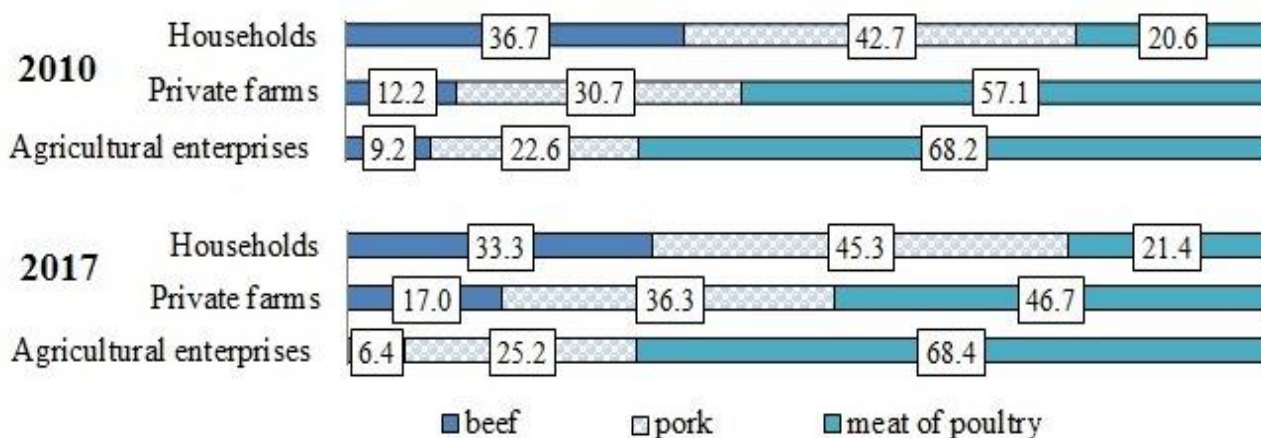


Fig. 5. Structure of meat production in the main categories of farms, %

Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

Figure 6 shows the share of main categories of farms in the production of livestock products by regions in 2017. The number near the name of the region corresponds to the overall ranking in the gross Ukrainian agricultural product in livestock production.

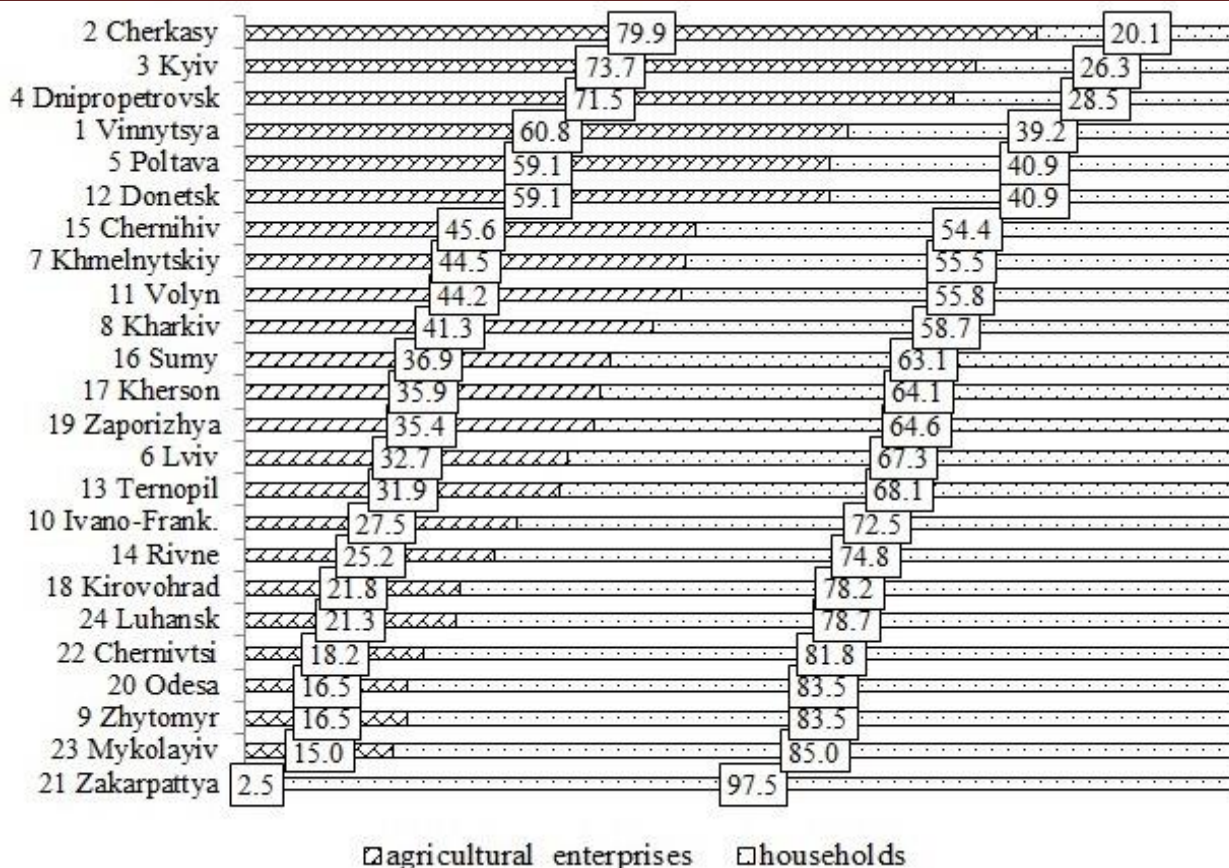


Fig. 6. Share of the main categories of farms in livestock production by regions, %
 Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

The most powerful livestock enterprises operate in Cherkasy (4524.7 million UAH), Vinnytsya (4198.1 million UAH) and Kyiv (4120.8 million UAH). The rating of regions depends to a large extent on the location of large commodity production (Table 8).

Table 8

TOP-5 meat producers in Ukraine in 2017

Name of company	Ukrainian regions	Market share, %	Meat production volumes, thousand tons
Myronivsky Hliboproduct (MHP)	Sumy, Kyiv, Vinnytsya, Ternopil, Khmelnytskyi, Ivano-Frankivsk, Dnipropetrovsk, Cherkasy, Lviv	45.5	670–680
TOV Complex Agromars	Kyiv, Kharkiv, Zhytomyr	8.6	126–130
APK-INVEST	Donetsk	5.1	75–80
Agro-Oven	Dnipropetrovsk	4.0	59–60
TOV Ptakhokompleks Dniprov's'kyy	Dnipropetrovsk, Zaporizhyya	4.0	59–60

Source: formed on data from Latifundist.com, 2018b.

Such powerful holdings as Myronivsky Hliboproduct, TOV Complex Agromars, Agro-Oven etc. operate on the territory of the regions – the leaders of the national

rating in livestock production (Vinnytsya, Cherkasy and Kyiv). So, the main advantages of MHP are a vertically integrated business model and intensive investments in the development and construction of new production facilities with a high level of efficiency. The enterprises of the holding company are ones of the most modern technically equipped in Ukraine and in the world. For 10 years, the company has been increasing its chicken and grain production capacity (as well as vegetable oil and chicken products) and is currently selling own products to 63 countries. TOV Complex Agromars is a highly productive holding company with a closed production cycle, which allows controlling all stages of its business from growing crops, producing mixed feed, growing breeding and broiler poultry, to processing meat and selling it through its own franchise network.

Agribusiness is one of the most promising in Ukraine. The country occupies such places in the world food market: 1 – production of sunflower seeds and sunflower oil, export of sunflower oil; 3 – export of rapeseed and export of honey; 4 – export of corn, production and export of barley; 5 – export of wheat, production of honey; 7 – production of rapeseed, export of soybean. In 2017, Ukraine produced more sunflower oil than olive oil in all countries of the world combined: 6.4 million tons (35% of world production) of sunflower oil versus 2.5 million tons of olive oil. Global rapeseed exports amounted to 16.5 million tons in 2017/2018 MY. Canada is in the first place (67 %), in the second – Australia (16 %), Ukraine ranked third (13 %). The share of other countries was 4%, therefore, Ukraine exported three times more than all of them together (The World Bank, 2018).

Agricultural production provides 12.1 % of GDP and serves as a powerful source of currency flow through export opportunities. Table 9 shows agricultural products that are among the TOP-10 goods exported by Ukraine in 2017.

Table 9

Place of agricultural products among TOP–10 goods exported by Ukraine

№	Subject of sale	Volume of exports, billion USD	Increase compared with 2016, million USD	Percentage in total structure, %
1	Sunflower oil	4.304	597	9.9
2	Corn	2.989	336	6.9
3	Wheat	2.760	–	6.4
...
9	Soy	1.060	–	2.5
10	Rape	0.882	489	2.0

Source: own calculations based on data from State Statistics Service of Ukraine, 2018.

It should be noted that an essential raw material orientation of export production can strengthen the position of the country in the world food markets as a supplier of agricultural raw materials. A positive example of the transition to the export of high technological reprocessing is to increase the production of sunflower oil, due to the high yield of sunflower and the effect of the export duty. Only due to the processing of grown agricultural products Ukraine has the opportunity to significantly strengthen its position in world markets, especially grain, and improve economic development indicators (Dankevych, 2018).

The agrarian sector is one of the most responsive to innovation. Evidence of this is the introduction of the latest technologies in agriculture, crop production and livestock, which are used by leading agribusinesses in Ukraine. Among innovations of the agrarian and industrial complex, the first place is occupied by new and improved technologies of production, second and third places – by new varieties of crops, crossbreds, lines and breeds of animals, as well as technologies of efficient processing of agricultural products and improvement of agricultural machinery, mechanisms and equipment. In domestic agriculture, progressive technologies of minimal soil cultivation and precision agriculture, an integrated high-tech agro management system that includes a wide range of innovations, such as: Earth remote sensing (ERS), the global positioning system (GPS), geographic information systems and technologies (GIS) and engagement of unmanned aerial vehicles, are increasingly being used. The introduction of innovations leads to increased productivity, cost savings, production cost reductions of agricultural food products, increasing volumes and improving the efficiency of agricultural production, which generally contributes to attracting investment.

At present in Ukraine, it is possible to note the low provision level of rural households with various types of machinery for farm work. In 2017, they owned only 19% of their total (State Statistics Service of Ukraine, 2018). Households had the largest share, %: plows – 31.3, harrows – 29.3, tractors – 23.7, hulling mills – 21.6; the lowest was the supply of trucks – 3.1 and combines – 1.7 (100% – households with machinery).

One of the main components of effective agricultural production is soil conservation, which promotes the use of high-tech equipment. The use of low-level logistics in households can lead to significant depletion of natural resources and cause low productivity, but their resource efficiency is quite high. Thus, households, in comparison with agricultural enterprises and farms, use land resources most effectively. Small farms are gradually losing competitiveness due to the lack of proper access to foreign markets for agricultural products and low-cost lending. It is reasonable to assume that the possible way to increase the efficiency of rural household activity will be interaction with agrarian enterprises and intensification of inter-farm relations: land sharing, joint production, mutual services, assistance in agricultural production, transfer of production infrastructure objects, provision of material resources and advanced technologies (Samarets, 2016; Vasyliieva, 2016). To ensure the further development of households, it is necessary to develop their cooperation in creating simple organizational structures, agricultural service cooperatives and family farms (Malik and Shpykuliak, 2018).

In order to preserve rural areas and the employment of its population, it is necessary to involve state mechanisms for supporting the viability of rural households. So, in Germany, a key element in stimulating the development of agriculture is direct payments as a tool to hedge the risks and incomes of agricultural enterprises and to mitigate the effect of sometimes significant fluctuations in the prices of agricultural products. Direct payments serve as financial compensation for

“high standards” because farmers in Germany (and other EU countries) must adhere to much higher environmental and consumer rights requirements than farmers in some non-EU countries.

However, there are other forms of support, for example, reducing the tax burden for small forms of management, creating certain incentives for rural youth in the form of “relocation allowance”, etc. Andriichuk and Sas (2017) noted, that introducing into practice the gradation of agricultural producers by their size will allow justifying the differentiation of economic preferences of the state on the principle: smaller enterprises receive higher rates of preferences compared to large, that will create more favorable economic conditions for the development of medium-sized and small businesses in rural areas.

According to the data of the FAO (2017), “supportive public policies and investment are a key pillar of inclusive rural transformation. The second pillar is the development of agro-industry and the infrastructure needed to connect rural areas and urban markets. The third pillar of inclusive rural transformation is a territorial focus in rural development planning, designed to strengthen the physical, economic, social and political connections between small urban centers and their surrounding rural areas”. The development policy of rural areas of Ukraine should be based on applying the progressive achievements of foreign countries. The experience of the countries of the European Union should be especially useful for the economy of Ukraine in the context of European integration.

Powerful knowledge development channels, relevant local services and the conviction of agricultural producers in the effective benefits of innovation are needed for the introduction of modern technologies. Research is being conducted in Ukraine to set up an electronic advisory system using the conceptual approaches of the US eXtension system to support agricultural producers, population and rural development. The development of the agricultural advisory system in Ukraine is an integral part of the European integration process.

Conclusions. Agricultural enterprises and households occupy their important places in Ukrainian agricultural production. Various studies show that larger farms, in particular in countries in transition and developing countries, have better access to financial and productive resources, sell crops with higher margins due to volume, replace the labor force with large machinery, introduce new technologies and diversify risks. However, a clear answer to the question of who are more productive – large farms or small farms – the researchers do not yet give. Management plays a key role in the issue of efficiency and productivity.

Agricultural holdings play a significant role in the capitalization of agriculture, increasing the scale of production of agricultural products and foodstuffs, and ensuring the country’s food security. They are able to generate large sums of cash flow, increase exports of agricultural products and foodstuffs, and achieve a high level of economic efficiency of production.

The growth of holdings is not in the least due to the accumulation of a limited resource “land”, therefore objectively there is competition for it with other forms of

management. Among the advantages of agricultural holdings in comparison with small farms, one can mention the following:

1) agricultural holdings create modern systems of labor motivation, which include not only higher salaries, the corresponding social package, but also the possibility of upgrading skills for employees;

2) absence of the necessity to monitor the labor force in family farms when introducing modern monitoring technologies and systems of economic security agricultural holdings is no longer an advantage. Modern technologies level off the advantages of the small farmer as an expert on weather conditions and soil characteristics in their region;

3) due to high competition and limited human and financial resources, it is very difficult to engage in parallel activities, which explains the lower level of involvement of small owners in solving social problems of a village. But large producers use the benefit of scale, better access to financial resources and the ability to diversify their activities.

Thus, the study of trends and the current state of the activities of the agro-industrial sector of Ukraine was further developed. In particular, the assessment of the dynamics of agricultural production in the main categories of farms in 2010–2017 was carried out, the share of the main categories of farms in crop and livestock production in the whole country and by regions was determined, the rating of regions of Ukraine for crop and livestock production was compiled.

Studies show that there has been a polarization in agricultural production nowadays in the agrarian sector – self-employed small-scale forms of management dominate the production of labor-intensive and low-profitable products, while large industrial high-quality agricultural enterprises are highly profitable and low labor-intensive. Agricultural holdings were limited mainly to the production of highly profitable grains and industrial crops; such specialization in low-labor-intensive industries significantly reduces the level of employment of the rural population. Households have a lead in potatoes, vegetables and fruits & berries production, agricultural enterprises – in grain & leguminous crops, sugar beet and sunflower production, soy and rape. In the livestock sector, households have a lead in milk, wool and honey production, agricultural enterprises – in meat and eggs production.

Conducted studies have shown that one of the leading places in the crop production is sunflower cultivation due to its high profitability. The established trend lines of its main indicators made it possible to calculate the corresponding short-term forecasts, which can be taken into account when justifying alternatives to the future development of agricultural enterprises. The calculated regression dependences showed that the average coefficient of elasticity of sunflower production by yield is 1.5.

Cultivating grains and oilseeds and their processing are an important source of foreign currency in the country and profits of agricultural producers. Agrarian holdings play a significant role in shaping the export of these crops. Further research will be focused on the analysis of trends and the current state of the oilseeds market in Ukraine and the contribution of the main categories of farms to it.

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