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INTENSIFICATION OF LAND RESOURCES USING AND FORMING OF OPTIMAL LEVEL OF INTENSITY IN THE AGRICULTURAL ENTERPRISES

The article analyzes the influence of increase of productive costs on material-thing, resultant components and economic effectiveness of intensification of the land resources use and the optimal level of intensity in agricultural enterprises are defined. It was improved, that, than higher indexes of material-thing constituent of intensity of employment of land resources, for identical other terms, the higher resultant and economic effectiveness of intensification are arrived at by agricultural enterprises, and inversely, but on condition that these indexes do not exceed an optimal level. It is found out, that oscillation of exit on 100 hectare of a.-g. lands of gross products on 38.5 %, commodity products – on 34.0 %, clean products – on 8.8 %, profit – on 2.7 % depends on oscillation of productive charges on unit of the land area, the middle size of that in 2014 did not attain an optimal size. As productive charges did not attain a maximum level, then it is suggested to grow them to the optimal values with simultaneous optimization of their structure that will give an opportunity substantially to promote economic efficiency of intensification of employment of land resources of agricultural enterprises.

Key words: *intensification, land resources, agricultural enterprises, productive costs, economic effectiveness, optimal level of intensity.*

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ІНТЕНСИФІКАЦІЯ ВИКОРИСТАННЯ ЗЕМЕЛЬНИХ РЕСУРСІВ І ФОРМУВАННЯ ОПТИМАЛЬНОГО РІВНЯ ІНТЕНСИВНОСТІ В СІЛЬСЬКОГОСПОДАРСЬКИХ ПІДПРИЄМСТВАХ

У статті досліджено вплив підвищення виробничих витрат на матеріально-речовий, результативний складники й економічну ефективність інтенсифікації використання земельних ресурсів. Визначено оптимальний рівень інтенсивності в сільськогосподарських підприємствах за критерієм максимум виходу валової, товарної, чистої продукції та прибутку з розрахунку на одиницю земельної площі.

Ключові слова: *інтенсифікація, земельні ресурси, сільськогосподарські підприємства, виробничі витрати, економічна ефективність, оптимальний рівень інтенсивності.*

Introduction and review of literature. Directions of intensive type providing of economic development of agricultural enterprises examine as directions of

intensification of production in agriculture. Therefore in basis of forming of intensive type of economic development of separate agricultural enterprises conception of the economy growing of production will be realized in separate regions. It means that in every agricultural enterprise there must be the reasonable and realized system of events, that provides the most acceptable on the nearest prospect type of economic development of enterprise taking into state of development of his economy and economic conditions [1]. Because intensification is related to the additional bringing of resources, and resources always limit, then it is needed to decide the problem of optimal intensity of production considering available resources, so as in the real economic conditions [2]. As in agriculture the law of descending return, that consists in that every next unit of costs results in an all less return as an additional volume of products and additional profit, operates clearly, then there is a necessity of such level of intensity of production, and, accordingly, and level of costs, that provides the achievement of maximal economic effect at the optimal indexes of costs [3]. This question is lately investigated by A. V. Kucher [4], O. V. Oliynuk, H. M. Badalov [5], O. V. Ulyanchenko, P. M. Matveev [6], D. V. Shuyan [7], N. V. Ulyanchenko [8] and others. However until now not enough investigational questions of intensification of land resources using of through the increase of productive costs and optimal level determination of intensity, that is why we are put a task to work out this problem by grouping of agricultural enterprises and regression modeling.

The purpose of the article – to investigate influence of increase of productive costs on material-thing, resultant components and economic efficiency of intensification of the land resources use and to define the optimal level of intensity in agricultural enterprises.

Results and discussion. Analyzing the results of grouping in size of productive costs on 1 hectare agricultural lands (table. 1), it should be noted that substantial differences are in agricultural enterprises after the material-thing constituent of intensification of the using of the land resources is found. So, for example, 9.9 % enterprises spent on 1 hectare a to 3000 UAH or on the average 1749 UAH, that is on 72.0 % less than, than on the, at that time as 9.3 % business entities spent an over 9000 UAH or on the average 11732 UAH on unit of the landed area, that to 87.8 % more than average index (6246 UAH/ha). As testify cited data, the increase of the manufacturing expenses took place, mainly, due to the increase of current expenses that in the last group were in 6.6 more than in the first, namely it is possible to assume that in this group the land resources used in so much times more intensive than in the first. Similar differences are observed in distribution of agricultural enterprises in size of the manufacturing and current expenses in a plant-grower on 1 hectare to arable land. Characteristically, that charges on mineral fertilizers in the first group of enterprises presented a 212 UAH/ha, or 27.2 % from a middle index (779 UAH/ha), or 11.6 % in the structure of manufacturing expenses, at that time as in the last group they equaled a 1160 UAH/ha, id est on 48.9 % more than in middle, or 15.1 % in the structure of current expenses. In the context of the investigated ag.-c. cultures there were considerably less differences in the size of manufacturing

expenses, for example, middle manufacturing expenses on 1 hectare the analogical index of the first group (3421 UAH/ha) was twice exceeded sowing of grain-growing in the last group enterprises (6829 UAH/ha).

Table 1

Influence of productive costs size on the material-thing constituent of intensification of land resources using in the agricultural enterprises in Kharkiv region, in 2014

Indexes	Groups of enterprises on the size of productive charges on 1 hectare ag.-c. lands, UAH							In the middle
	To 3000	3000.1-4000	4000.1-5000	5000.1-6000	6000.1-7000	7000.1-9000	Over 9000	
Amount of enterprises	50	74	111	101	66	56	47	505
Degree of thrown open, %	86.4	97.4	98.1	98.0	98.5	99.1	95.1	97.2
It is per employee, ha: ag.-c. lands	111.5	76.7	73.1	63.6	60.1	46.6	25.8	53.5
plough-land	96.4	74.7	71.7	62.4	59.2	46.2	24.5	52.0
It is per 1 hectare ag.-c. lands: productive charges, UAH	1749	3626	4502	5524	6485	7889	11732	6246
current expenses, UAH	1660	3373	4150	5142	6152	7408	11023	5852
It is per 1 hectare to plough-land in a plant growing, UAH: manufacturing expenses	1826	3440	4134	4729	5418	6373	7695	5469
current expenses	1775	3331	3984	4688	5637	6569	7700	5095
expenses on mineral fertilizers	212	328	555	760	979	1041	1160	779
Manufacturing expenses on 1 hectare to sowing, UAH: grain crops	3421	3600	4246	4761	5334	6162	6829	5025
sunflowers	3471	4628	5185	5629	6328	6857	7017	5893
potatoes	-	-	-	18250	17550	12220	31700	15329
sugar beets	-	8724	8014	9652	11767	13021	17672	13030

Source: authorial calculations on the basis of form's 50 ag.-c. data.

The analogical exceeding was observed during growing of sunflower, it interestingly thus, that middle charges on 1 hectare in all groups an analogical index was exceeded sowing of sunflower for growing of grain-crops. In both cases there was a clear tendency to the increase of size of expenses in a dynamics from a group to the group, what cannot be said about a potato and sugar beets. Foremost it should be noted that the first three groups of enterprises did not grow a potato in general, in addition, the first group did not grow sugar beets. During growing of potatoes most on unit of the ground area spent the enterprises of the last group (31700 UAH/ha), and least – next to last (12220 UAH/ha). In the growing of sugar beet inlaid most money of enterprise of the last group (17672 UAH/ha), and least are enterprises of the third group (8314 UAH/ha).

With the increase of productive charges on unit of the ground area there was a tendency to the increase of degree of thrown open, indeed, in the last group he appeared some below, than in previous (fig. 1).

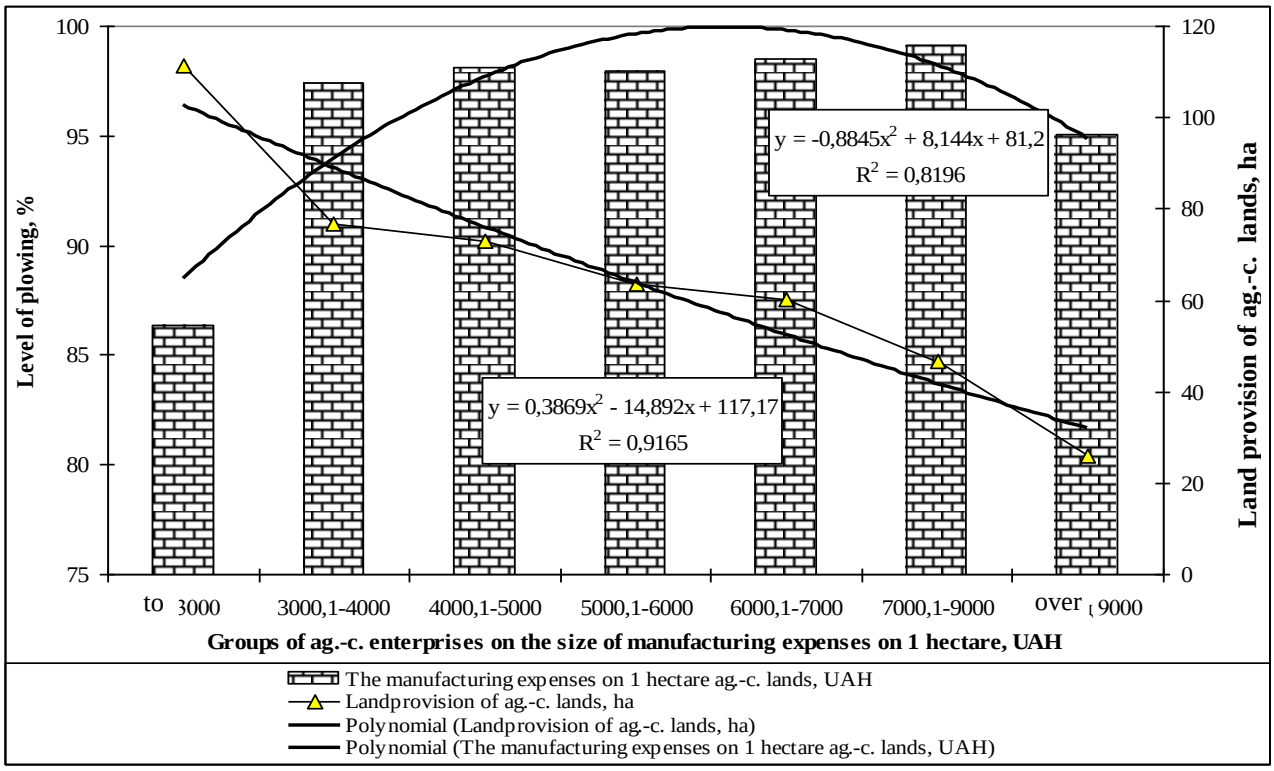

Fig. 1. Degree of thrown open and land provision depending on the size of manufacturing expenses on 1 hectare ag.-c. lands in the agricultural enterprises in Kharkiv oblast, in 2014

Source: built by an author on the basis of data of previous table.

As a result of smoothing it is found out after equalization of parabola of the second order, that the degree of thrown open after the formed groups grew in middle on 1.8 %, however the rates of his increase were slowed on the average on 0.88 %. Unlike the degree of thrown open, there was the clearly expressed tendency to the decline of land provision with the increase of size of manufacturing expenses on 1 hectare ag.-c. lands. For example, area of ag.-c. lands, that is on a 1 worker, diminished on the average on 14.9 hectare, thus the rates of reduction each time were slowed on 0.38 hectare. As a result of it in the last group of enterprises per employee was on the average 25.8 hectare ag.-c. lands, including 24.5 hectare to arable land, at that time, as in the first group these indexes were in 4.3 and 3.9 anymore and presented according to 111.5 and 96.4 hectare. Such tendency, probably, related to the branch structure of ag.-c. productions that confirm these tables up to a table 2, from that a tendency is visible to the increase of indexes of production of goods of stock-raising calculating on unit of the ground area with the increase of size of productive charges. For example, calculating on 100 hectare ag.-c. lands 38.5 centner of increase was mine-out in the last group on the average and 852.0 centner of milk cows, that accordingly in 32.1 and 54.3 anymore than middle indexes of the first group of enterprises.

Table 2

Influence of size of manufacturing expenses is on the resultant of intensification of employment of land resources in agricultural enterprises in Kharkiv oblast, in 2014

Indexes	Groups of enterprises are on the size of manufacturing expenses on 1 hectare, UAH							In the middle
	To 3000	3000.1-4000	4000.1-5000	5000.1-6000	6000.1-7000	7000.1-9000	Over 9000	
Productivity, c/ha: grains	33.3	39.2	42.0	46.6	47.0	49.6	58.6	46.3
sunflowers	20.4	27.4	28.6	29.7	27.7	27.7	28.0	28.2
sugar beets	-	338.9	307.8	435.7	453.3	492.7	401.1	427.9
potatoes	-	-	-	100.0	109.3	72.9	108.0	86.7
It is mine-out on 100 hectare ag.-c. lands, c: live weight of cattle	1.2	1.4	2.4	6.6	5.6	8.6	38.5	9.3
milk	15.7	17.6	37.0	124.0	118.8	180.4	852.0	194.7
wool	-	-	-	0.02	-	0.07	-	0.01
It is mine-out on 100 hectare to arable land, c: grains	1139.2	2176.8	2522.4	2520.9	2533.9	2613.6	2846.0	2470.6
sugar beets	-	322.2	160.1	399.2	898.4	1143.0	1364.3	650.2
pork	1.7	0.6	1.4	2.1	8.4	3.8	15.8	4.9
It is mine-out on 100 hectare to sowing of grain-growing : eggs, thousands of th.	-	-	-	-	0.03	-	-	0.01
to the increase. bird, c	0.06	-	-	0.02	0.01	0.17	0.04	0.04

Source: authorial calculations on the basis of form's data 50 ag.-c.

The increase of size of manufacturing expenses rendered positive influence on the effective constituent of intensification of land resources in ag.-c. enterprises, what the positive dynamics of the productivity of the investigated ag.-c. testifies about, foremost cultures. For example, the productivity of grain-growing grew on the average on 3.1 c/ha, thus the rates of increase each time rose on the average on 0.07 c/ha (fig. 2). The productivity of sunflower rose on the average after groups on 5.2 c/ha, but with each together the rate of increase was slowed on the average on 0.5 c/ha. Less firmness was observed in the dynamics of increase of the productivity of sugar beets and potatoes, that, in particular, it is related to the negligible quantity of ag.-c. enterprises that grew them, and it laid on the imprint on the middle group indexes. For an example, the productivity of sugar beets the greatest (492.7 c/ha) was in the next to last group of enterprises, at that time as in the last group of enterprises that most spent on 1 hectare, she appeared below not only for a few previous groups but also for her middle level (427.9 c/ha). Similar disproportions are characteristic for a potatoes. Wool was produced only in the enterprises of fourth and sixth groups, eggs – fifth group, and a birds was not grown by the enterprises of the second and third groups.

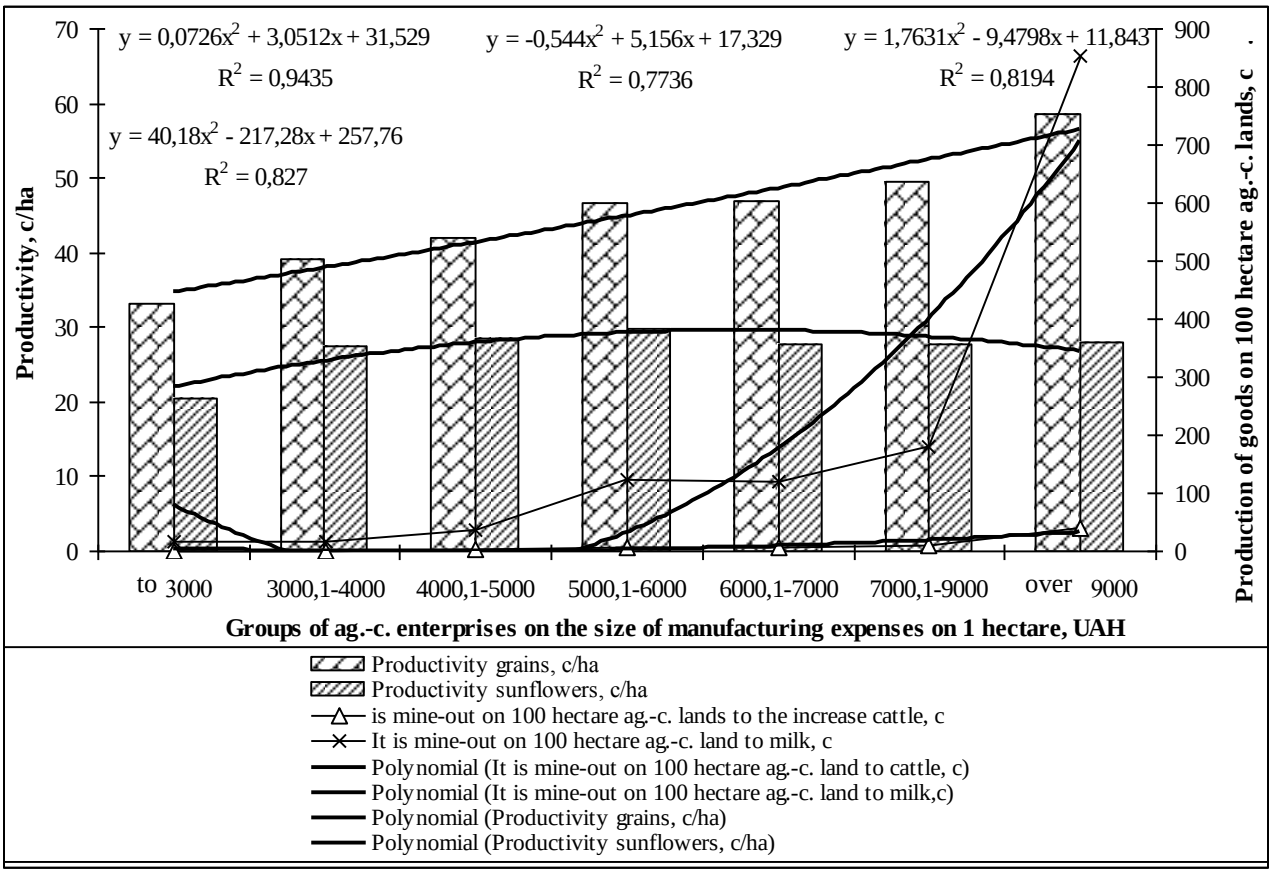

Fig. 2. Resultant of employment of land resources dependently from the size of manufacturing expenses on 1 hectare ag.-c. lands in the agricultural enterprises in Kharkiv oblast, in 2014

Source: built by an author on the basis of data of previous table.

Production of pork on 100 hectare in the last group presented 15.8 c plough-land, that in 3.2 anymore than middle index (4.9 c) and in 9.3 any more than index of the first group (1.7 c). Dynamics of production of live weight of cattle and milk on 100 hectare ag.-c. lands more clearly represents a linear trend, than polynomial, that is why we additionally did smoothing after equalization of straight line, on the basis of what found out, that these indexes had increased on the average on 4.6 c and 104.2 c accordingly. Thus, influence of size of productive charges was farther investigational on economic efficiency of intensification of employment of land resources (table. 3). Analysing cited data, look after two interesting tendencies: firstly, production of gross, commodity and clean goods and profit on 100 hectare ag.-c. lands, as well as on 100 hectare to plough-land in a plant-grower, with the increase of size of productive charges grows; secondly, rates of return of all productive charges, including in a plant-grower, had a tendency gross, commodity, clean products and profit to the decline with the increase of productive charges, that, probably, is the result of action of law of descending return. In the dynamics of level of profitability of ag.-c. productions, including plant-growers, clear tendency it was not observed, here the greatest indexes were attained in the second group of enterprises, but most subzero they were in a fifth group.

Table 3

Influence of size of manufacturing expenses is on economic effectiveness of intensification of employment of land resources in the agricultural enterprises in Kharkiv oblast, in 2014

Indexes	Groups of enterprises are on the size of manufacturing expenses on 1 hectare, UAH							In the middle
	To 3000	3000.1-4000	4000.1-5000	5000.1-6000	6000.1-7000	7000.1-9000	Over 9000	
It is got on 100 hectare ag.-c. lands, thousand UAH: gross products in permanent prices in 2010	198.3	447.7	490.4	603.7	607.1	701.5	841.5	590.5
commodity products	230.9	551.4	649.3	747.9	779.1	890.4	1338.2	783.8
clean products	132.2	320.1	364.8	291.8	278.9	415.3	589.0	352.3
profit	64.8	179.4	204.0	108.8	84.9	183.8	257.4	155.6
Rate of return of all manufacturing expenses: by gross products in permanent prices in 2010	1.134	1.235	1.089	1.093	0.936	0.889	0.717	0.945
commodity products	1.320	1.520	1.442	1.354	1.201	1.129	1.141	1.255
clean products	0.756	0.883	0.810	0.528	0.430	0.526	0.502	0.564
profit	0.371	0.495	0.453	0.197	0.131	0.233	0.217	0.249
It is got on 100 hectare to arable land, thousand UAH: gross products of plant-grower in permanent prices in 2010	218.3	446.7	480.7	552.9	542.0	600.7	581.4	520.8
commodity products of plant-grower	249.6	547.9	632.2	701.9	712.5	787.5	926.8	693.4
clean products of plant-grower	148.8	326.7	364.7	282.3	260.3	386.7	491.9	332.4
to the profit of plant-grower	74.5	186.1	207.0	111.6	80.4	179.9	226.6	153.1
Rate of return of manufacturing expenses in a plant-grower: by gross products in permanent prices in 2010	1.163	1.246	1.108	1.093	0.910	0.855	0.701	0.952
commodity products	1.330	1.528	1.457	1.388	1.196	1.121	1.117	1.268
clean products	0.793	0.911	0.841	0.558	0.437	0.551	0.593	0.608
profit	0.397	0.519	0.477	0.221	0.135	0.256	0.273	0.280
Rate of return of current outlays in a plant-grower: by gross products in permanent prices in 2010	1.230	1.341	1.207	1.179	0.962	0.915	0.755	1.022
commodity products	1.406	1.645	1.587	1.497	1.264	1.199	1.204	1.361
clean products	0.838	0.981	0.915	0.602	0.462	0.589	0.639	0.652
profit	0.420	0.559	0.520	0.238	0.143	0.274	0.294	0.301
Level of profitability of ag.-c. productions, %	39.0	48.2	45.8	17.0	12.2	26.0	23.5	24.8
in thereby: plant-growers	42.6	51.4	48.7	18.9	12.7	29.6	32.4	28.3

Source: authorial calculations on the basis of form's data 50 ag.-c.

Production of gross goods in permanent prices in 2010 on 100 hectare ag.-c. lands grew on the average on a 139.6 thousand UAH, but this increase was slowed with speed 6.1 thousand UAH (fig. 3), as a result the rate of return of productive charges in the last group presented 0.717 against 1.134 in the first group. Agricultural enterprises that spent an over 9000 UAH/ha were got on the average by a 1338.2 thousand UAH/100 hectare commodity products, that in 4.9 anymore than index of group of enterprises with charges a to 3000 UAH/ha, that is rates of increase of commodity products were below than growth of productive charges (a difference between extreme groups presented 6.7) rates. In the middle commodity products grew on a 93.3 thousand UAH/100 hectare, thus the rates of increase increased with speed 6.8 thousand UAH/100 hectare. However, even such rates did not provide the increase of rates of return of productive charges, although considerably slowed the rates of their decline, but, unlike gross products, in this case coefficients were in all groups more unit.

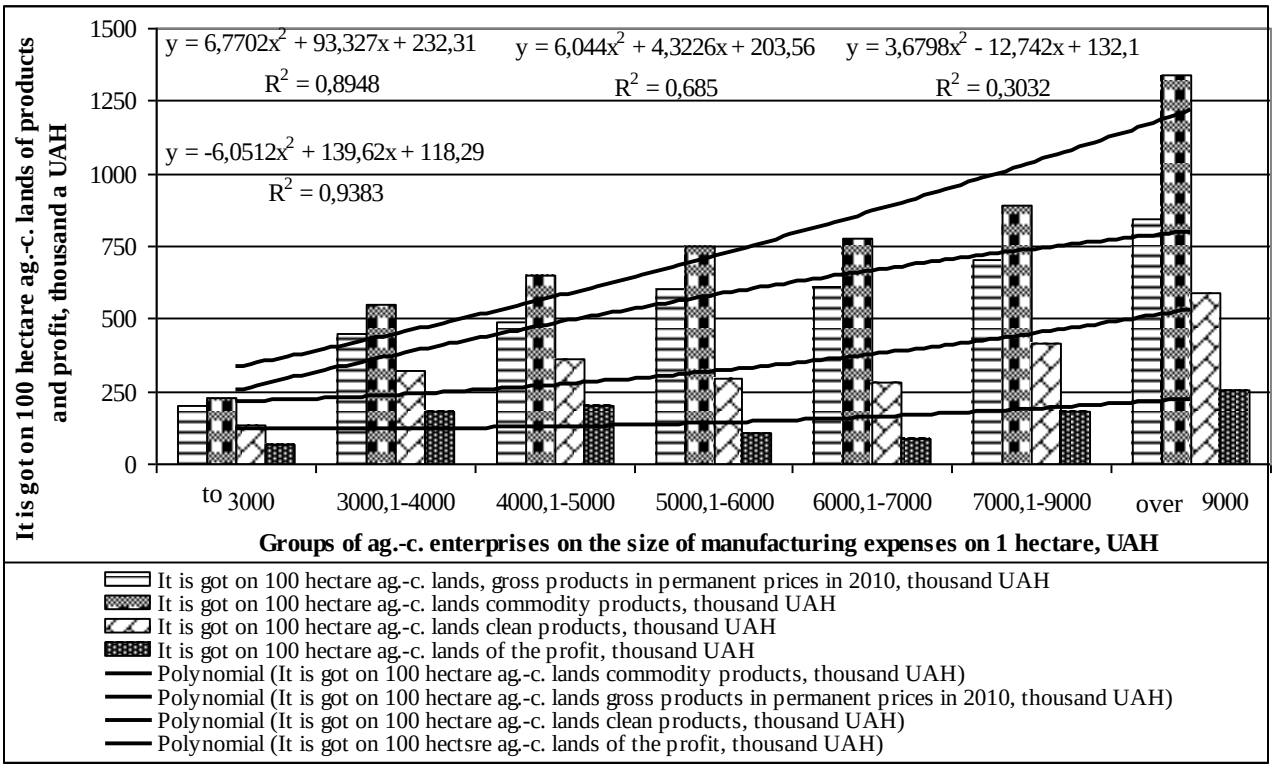

Fig. 3. Economic effectiveness of employment of land resources depending on the size of manufacturing expenses on 1 hectare ag.-c. lands of agricultural enterprises in Kharkiv oblast, in 2014

Source: built by an author on the basis of data of previous table.

The dynamics of clean products is characterized an increase in middle on a 4.3 thousand UAH/100 hectare, thus with every next group the size of increase increased on a 6.0 thousand UAH, as a result in the last group a 589.0 thousand UAH/was got 100 hectare ag.-c. lands, that in 4.5 more than in the first group, however the rates of return in these groups presented according to 0.502 and 0.756. Similar tendency, but with some vibrations, characteristic and for the dynamics of profit mass of that appeared most in a group with most expenses, though level of

profitability here and was not the greatest.

Then we decided on the example of all agricultural enterprises in Kharkiv oblast to build the regressive-cross-correlation models of dependences of gross, commodity and clean product and profit of industry of plant-grower output calculating on 100 hectare to plough-land from the size of manufacturing expenses calculating on 100 hectare to plough-land. The choice of these indexes is predefined: firstly, by the results of the statistical grouping and them economic analysis, that it is set forth above; secondly, by the results of the pair cross-correlation analysis executed after totality of enterprises, that showed that manufacturing expenses on unit of the ground area in a plant-grower had moderate cross-correlation connection with a gross product (r = 0.383) output, high cross-correlation connection with a commodity product (r = 0.804) output, noticeable cross-correlation connection with a clean product (r = 0.578) output and moderate cross-correlation connection with a profit (r = 0.330).

Will begin this analysis with determination of dependence of gross product of plant-grower output on a 100 hectare of arable land from a select factor (fig. 4). In the result of processing of basic data such equalization of regression was got:

$$y = 34.42 + 1.2443\ x - 0.0006\ x^2$$

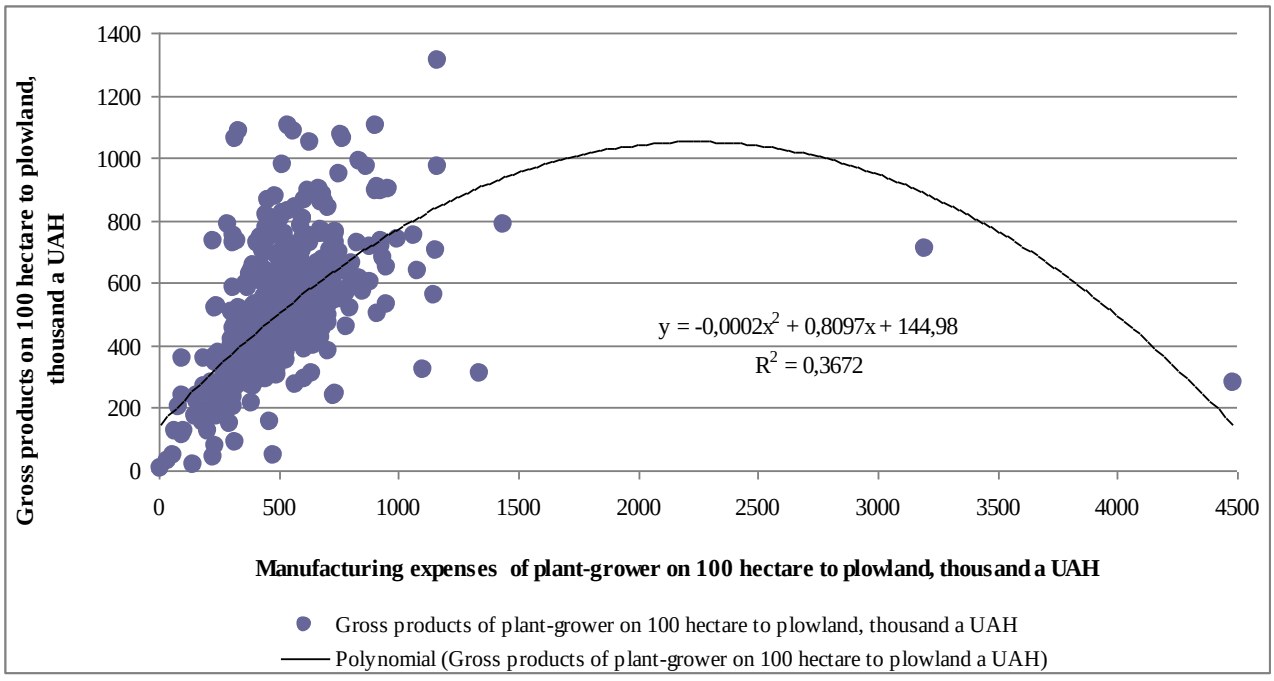

Fig. 4. Influence of manufacturing expenses calculating on 100 hectare to arable land on a gross product of plant-grower output on 100 hectare to arable land of agricultural enterprises in Kharkiv oblast, in 2014

Source: built by an author on the basis of form's data 50 ag.-c.

The results of regressive analysis testify to such: increase of productive charges on a 1000 UAH calculating on 100 hectare assists arable land to the increase of gross product of plant-grower output on a 1244.3 UAH/100 hectare to arable land. A value at the coefficient of regression of x^2 testifies that at the further increase of productive charges there was deceleration of increase of gross product output on the average on

a 0,6 UAH from every additional thousand charges. The coefficient of determination presents 0.3672, id est variation of effective variable on 36.7 % depends on oscillation of factor variable, and on 63.3 % – from other factors. The closeness of connection between the investigated indexes is noticeable – the coefficient of correlation presents 0.620. The actual value of F- of criterion Fisher's (314.8) substantially exceeds him tabular size (3.84) that is the certificate of reliability of the got results.

The functionally educed dependence has the appearance of function of parabola of the second order, that always has one maximum or minimum that mathematically can be defined even, finding the derivative of this function. Carrying out corresponding mathematical operations, the optimum of productive charges – 1036.9 thousand a UAH/is found 100 hectare to arable land, for that it was possible to attain a maximum of gross product output is a 679.5 thousand UAH/100 hectare to arable land.

Analogical researches were carried out on the example of commodity and clean products, and also profit, what it is found out as a result of, that increase of productive charges on a 1000 UAH calculating on 100 hectare assisted arable land: to the increase of commodity product of plant-grower output on a 1562.7 UAH/100 hectare to arable land with middle deceleration a 0.6 UAH/100 hectare to arable land per every additionally inlaid thousand; to the increase of clean product of plant-grower output on a 722.7 UAH/100 hectare to arable land with middle deceleration a 0.4 UAH/100 hectare to arable land per every additional thousand; to the increase of exit of profit in industry of plant-grower on a 561.4 UAH/100 hectare to arable land with middle deceleration a 0.4 UAH/100 hectare to arable land per every additional thousand. An optimum of productive charges is a 1302.3 thousand UAH/100 hectare to arable land, for that it was possible to attain a maximum of commodity product output is a 1027.6 thousand UAH/100 hectare to arable land. A maximum of clean product (416.1 thousand UAH/100 hectare to arable land) output can be attained at productive charges at the level of 903.3 thousand UAH/100 hectare to arable land, and for profit (221.5 thousand UAH/100 hectare to arable land) maximization optimal were productive charges in a size 701.7 thousand UAH/100 hectare to arable land.

Conclusions. So, it was improved, that, than higher indexes of material-thing constituent of intensity of employment of land resources, for identical other terms, the higher resultant and economic effectiveness of intensification are arrived at by agricultural enterprises, and inversely, but on condition that these indexes do not exceed an optimal level. It is found out, that oscillation of exit on 100 hectare of a.-g. lands of gross products on 38.5 %, commodity products – on 34.0 %, clean products – on 8.8 %, profit – on 2.7 % depends on oscillation of productive charges on unit of the land area, the middle size of that in 2014 (6246 UAH/ha) did not attain an optimal size that on a criterion at most presented a 10369 UAH/ha gross product output and, commodity products, are a 13032 UAH/ha, clean products are a 9033 UAH/ha, to the profit are a 7017 UAH/ha. As productive charges did not attain a maximum level,

then it is suggested to grow them to the optimal values with simultaneous optimization of their structure that will give an opportunity substantially to promote economic efficiency of intensification of employment of land resources of agricultural enterprises.

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