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ENERGY EFFICIENCY OF BARLEY GROWING AT FERTILIZERS AFTERACTION IN THE GRAIN-BEET CROP ROTATION OF FOREST-STEPPE

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Energy efficiency of spring barley growing at the afteraction saturation of fertilizers in a crop rotation of Forest-steppe zone is calculatedVariants of experiment with increased productivity of barley were characterized by the accumulation of energy in the crop. The use of chemicals in crop rotation and it's afteraction is the most energetically cost-based.

Barley, afteraction of fertilizers, energy consumed, energy accumulated, energy efficiency.

Efficiency of production is determined by correlation between the results of economic activity of enterprise and using of material, labour and financial resources for reception its results.

The advantage of energy efficiency of agricultural production is it's estimation in constant value, as opposed to economic parameters in connection with inflationary processes [1, 2].

The energy test of agrosystems gives the chance to define cost-based components of existing technology and to recommend alternative actions and, thus, to reduce anthropogenous influence on agricultural landscape and to raise competitiveness of agrarian production [3].

The understanding of bioenergy of products output and the quantitative accounting and the analysis of processes of free energy transformation gives the chance to define perspective tendencies of agrotechnologies development.

Industrial technologies should provide fuller using of natural energy resources, reduce the expenses of anthropogenous energy on a unit of production and decrease negative action to environment and soil fertility [4].

A research object was accounting of energy efficiency of spring barley growing at the afteraction of fertilizers saturation in the grain-beet crop rotation of Forest-steppe zone.

The researches were made in the stationary trial of Agricultural Chemistry and

Quality of Plant Products department on Separated subdivision “Agronomic Research Station” (NULES, Kyiv) on medow-chernozemic calcareous soil. The level of nutrition supply is middle by mineral nitrogen and mobile phosphorus and is low by potassium. The agrotechnology of barley growing is generally accepted for the area of Forest-steppe zone. The variants of researches are following: without the fertilizers (control); manure (afteraction of saturation 12 kg ha^{-1}) is a background; background + NPK (afteraction of saturation 239 kg ha^{-1}); background + 1,5 NPK (afteraction of saturation 358 kg ha^{-1}); NPK (afteraction of saturation 239 kg ha^{-1}).

Energy efficiency was calculated using methodology developed by Yu. Tarariko [3]. At the calculation were used the flow sheets of spring barley growing. The amount of energy accumulated in the yield was calculated on the basis of its average maintenance in grain. Total energy consumption for growing barley in the variants included the sum of energy which has been spent for concrete technological operations. The coefficient of energy efficiency (Kee) was determined as a relation between energy capacity collected with yield and energy consumed for it growing.

Result of researches. The analysis of modern agroecosystems shows that anthropogenous energy has considerable influence on efficiency of growing up cultures. Cultivation conditions, and especially use of fertilizers, considerably influence on the productivity and the chemical compounds of product. The content of protein and fat changes the quantity of energy in a crop.

Barley - the culture which well responds on the afteraction fertilizers that is shown in change of productivity different variants of trial (fig. 1). The afteraction of the manure saturation (12 t h^{-1}) and afteraction of mineral saturation (239 kg ha^{-1}) had not provided an essential difference between variants. Together application of these system in a crop rotation increased of grain yield at level 1,08 t. The greatest productivity (3,53 t h^{-1}) in middle for years of researches was got in the variant background + 1,5 NPK.

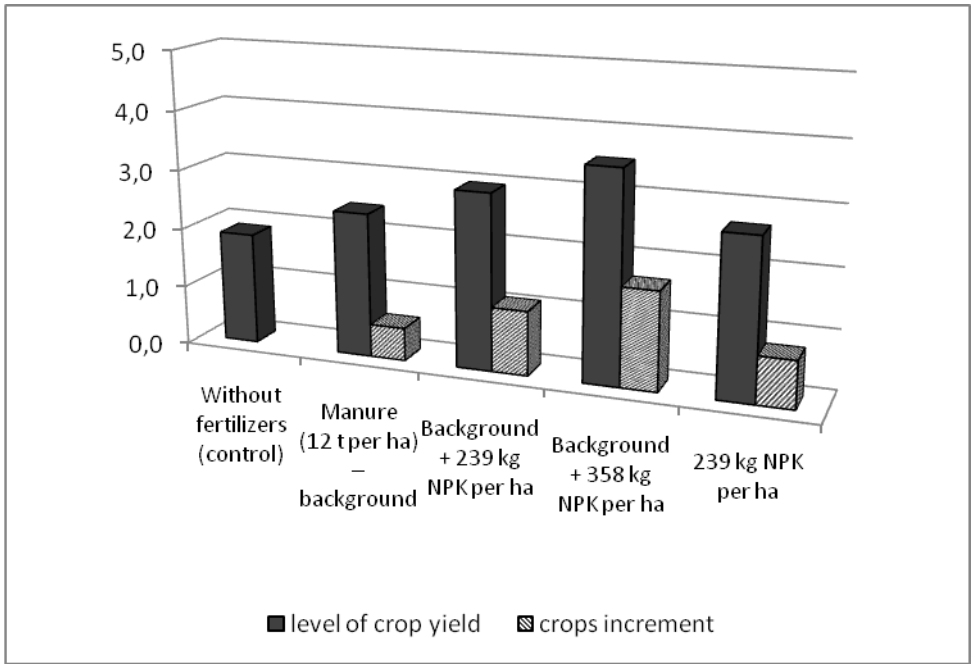

Fig 1. The influence of afteraction of fertilizers saturation to spring barley crops, 2010-2012

The increase of energy production of agricultural good costs requires its estimations. The variants of trial with higher productivity were characterized by accumulation of energy (fig. 2).

In tests, the content of energy collected by yield of spring barley makes from 63,4GJ ha^{-1} (control) to 127,5 GJ ha^{-1} (background + afteraction of saturation 358 kg NPK ha^{-1}). An index of total cost of energy consumption for crop production was got at the level of 10,7-23,2 GJ kg^{-1} and increased with fertilizers saturation of crop rotation.

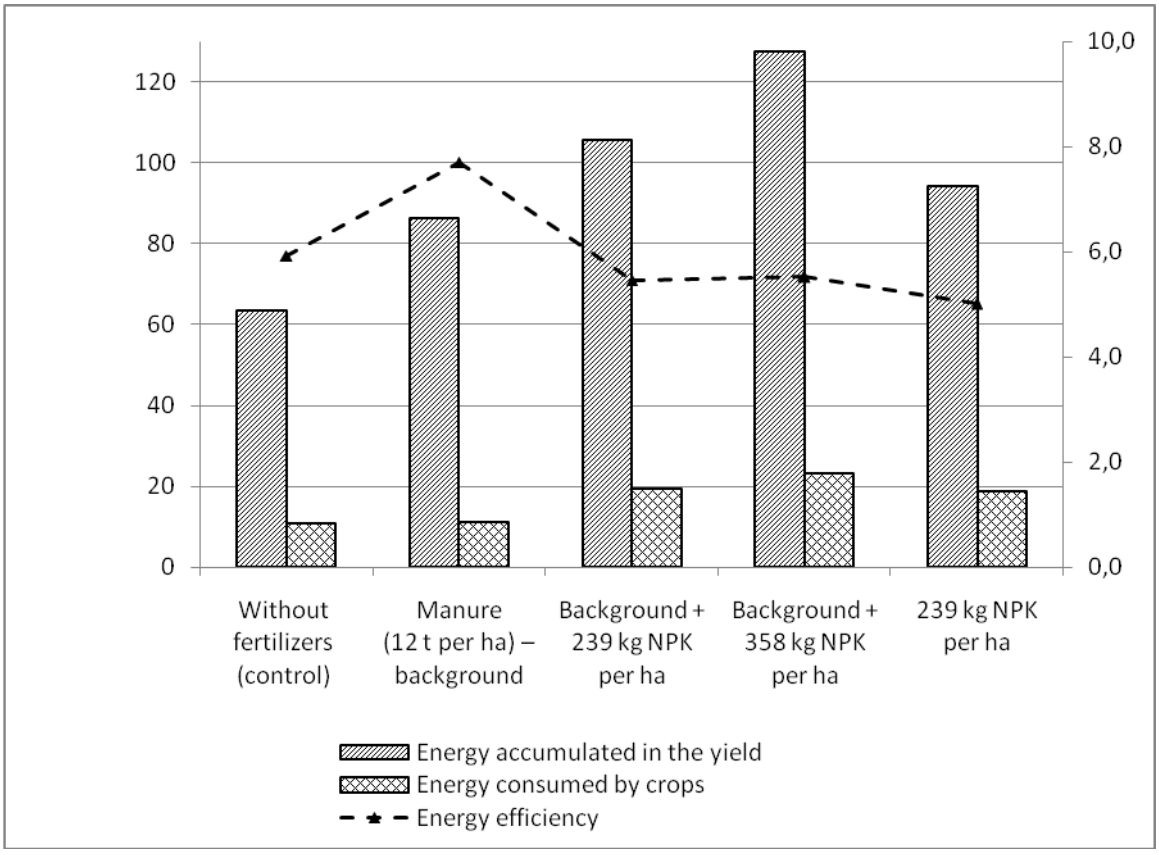

Fig. 2 - Energy efficiency of spring barley growing, 2010-2012

The study results show that the highest coefficient of energy efficiency (7,68) was observed on a variant of afteraction of saturation 12t ha^{-1} manure, the least (5,02) - on a variant of afteraction of single norm of mineral fertilizers saturation (239 kg ha^{-1}). Combination of these systems of fertilizer was provided the Kee at the level of 5,50 units.

The energy consumptions for technological operations at barley cultivation on variant background + saturation 358 kg NPK h^{-1} are shown (fig. 3).

The production expenditures for using fertilizers, chemical weed and pest killers are the most power-consuming element of barley growing technology.

The underestimated results of energy efficiency are connected with absence of direct cost on fertilizers application in experiment; it provided high coefficient of energy efficiency of traditional technology of spring barley growing.

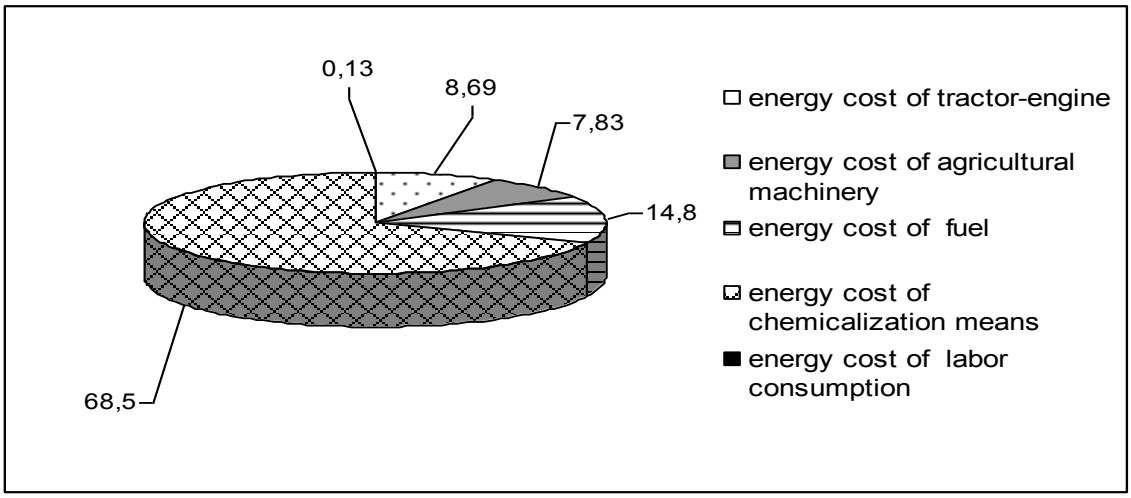

Fig 3. - The allocation of energy consumption by technological operations (background + afteraction of saturation 358 kg NPK ha^{-1})

Conclusions. The analysis of energy efficiency of barley cultivation shows that the use of chemicalixation means are the most energy cost-based. The increase in productivity of barley grain at a variant of background + 358 kg NPK ha^{-1} has provided accumulation of energy in a crop at level of 127,5 GJ ha^{-1}. It has ensured the coefficient of energy efficiency at level of 5,50 units.

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