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EFFICIENCY OF THE COMPLEX USE OF CORN IS IN BIOENERGETICS

The world indexes of production of corn are resulted in the article, the basic technological aspects of its growing and economic advantages are presented, by comparison to other grain-crops. Priority directions of the complex use of corn are exposed for the production of biological types of fuels in Ukraine, taking into account world experience.

Keywords: *economy, bioenergetics, corn, raw material, bioethanol, hard biofuel, biogas*

Introduction. Agrarian sector of world economy in the last years more attention spares growing of corn areas of which are 20% in the structure of plough-land and provides over 30% gross collection of corn mass. As a result of it, this culture occupies leading positions both after the productivity of grain and after his gross collections. During last half century sowing areas under a corn grew in 1,6 times, productivity – in 3 times, and gross collections of grain – in 4,8 times [1].

Growing of corn on grain plays an antihunt role in the corn complex of country, as in unfavorable for other grain-crops years, its productivity is comparatively high. Technology of growing must take into account ground-climatic features of region, that allows most full to use favourable and weaken or in general remove the unfavorable factors of environment. Advantages of corn consist also in possibility of the protracted collection without losses (to one month) and absence of lie flat on a high background applying fertilizers or fertile soil [2]. Growing of power cultures, in particular corn, from the agrotechnical point of view mainly does not

differ from their cultivation for food industry. A difference consists only in that hybrids or sorts, which are used for power aims, can be transgene varieties with the special properties.

Now a corn is more used as refurbishable raw material for the production of different types of biofuels, that is why it is important enough highly power competitive cereals in Ukraine. Because of prospects of development of source of raw materials for making of biological types of fuel from a corn, there are pre-conditions for becoming of industry of bioenergetics in our country.

Analysis of the last researches and publications. The biological types of fuel are provided by the maintainances of natural resources, improve an ecological situation and create pre-conditions of power and economic independence of the state. The enumerated questions are richly in content probed such domestic research workers, as V. Boyko, V. Bondar, M. Gumentik, V. Guryev, V. Dubrovin, G. Kaletnik, M. Korchemniy, S. Oliynichuk, V. Semenov, S. Stasinevich, A. Ukrainec, L. Khomichak, P. Shiyan, O. Shpichak, S. Cigankov and others.

Thus debatable enough is a question of choice of basic directions of investment policy at the production of biological types of fuels and also determination of the most competitive raw material for their receipt.

Therefore the purpose of the article is a study of effective directions of the complex use of corn for forming of competitive production of different types of biofuels at which this culture must become the cheapest economic decision, due to the most acceptable level of the productivity.

Exposition of basic material of research. An urgent necessity to revise the structures of present energy sources in behalf of technologies which use refurbishable energy sourses appears in the conditions of sharpening of problem of energy consumption of our country. The most favorable direction of decision of problem is become by a search and use of refurbishable energy sources, among which mass distribution is got by the power mediums of biological origin or so-called biofuels which in the near future will provide about 10% world requirements in a fuel.

Taking into account the modern structure of sowing areas, as a result of

becoming of biofuel on industrial basis, possibility of increase of supplying with grain for his production it follows to see in the increase of levels of the productivity of grain-crops, in particular corn which is a leading power culture for the production of ethanol in world practice. In Ukraine in the last few years grew it commodity part in the general volume of realization of grain, and export potential must possibility be increased to 2,5 million tn [3].

In the last years of corn widely used for the production of bioethanol (from 1 tn of grain it is possible to get to 3.94 blb of ethanol spirit). The use of fuel on the basis of bioethanol which overcame considerable part of world market of power mediums, with every year acquires all greater actuality, as experts forecast growth of his production volumes in the whole world. Among the widely in-use biological types of fuels a bioethanol is the important and practically unique effective substitute of oil at global level. The increase of ins production volumes is predetermined by antihunt influence on the power markets of countries which depend on the import of oil products. Also a bioethanol needs to be examined as a ponderable political factor which in a near prospect will play role of active counter-argument against a groundless world price advance on oil products. Many scientists and organizations consider from defence of natural environment, that a bioethanol is a fuel of future generations.

Fully obviously, that power balance of corn at a production from it of bioethanol depends on the productivity of grain from unit of area: with the increase of the productivity of corn efficiency of production of 1 tn bioethanol will grow. Thus efficiency of growing needs the proper ground, an important place in which occupies development of business plan, where the real possibilities of enterprise, prospect of development and facilities of his realization are taken into account in the conditions of unstable market and global financial crisis [4].

In the process of planning maximal of economic and effective productions of fuel ethanol, it follows to take into account not only specific divergences after content of starch but also on the indexes of efficiency of transformation of raw material in an spirit ethanol. Starch of grain is a basic product which under the action of hydrolases

is transformed in an ethanol (from 2.2 lb of starch it is possible to get 1.166 lb or 0,18gal spirit ethanol). Therefore the problem of increase of economic efficiency of production of grain of corn acquires an all greater sharpness.

The best hybrids which are leaders on the exit of starch from grain and can be used for the production of bioethanol is: Clemente, Oriol, MAS 24A, Axell, NK Perfom, Juxing, Rang MS310, KXA 4394 [5].

In the technological process of receipt of bioethanol use of grain of corn must be the most cheap raw material. For an example it is possible to point the USA, where today 98% fuel ethanol produced from a corn which is the most important variant in the decision of this problem. If even in the USA, where a corn due to the high levels of the productivity of grain is very cheap, maintenance of profitability of production of fuel ethanol needs state subsidies, for other states of creation of cost-effective process of production (that an ethanol spirit could make a price competition imported oil products) it is possible only at the subsequent substantial decline of prime price of bioethanol.

It is thus needed to carry out necessary introduction of measures on intensification and reduction of prices of growing and collection of raw biomaterial. Obviously, the cost of bioethanol will depend both on the tax policy of the state and from a his production which is dictated technology of receipt cost. In technology of production of bioethanol it is needed to foresee the process of germing – separation of corn germ from grain.

Technology of dry germing includes such basic stages: cleaning of grain; control moistening to 18-20%; rough crushing; division of germ, particles of endosperm and husk. Tailings endosperm, that did not move away from an germ, technological qualities reduce its for the subsequent pressing and receipt of oil and result in the losses of starch which use in production of ethanol [6].

Expected, that in the prospect of increase of the use of grain-growing for the production of ethanol will be instrumental in expansion of sowing areas of corn in a number of countries, including the USA, Canada and China. United States of America – it one of basic countries-producers of grain of corn in the world.

Grow a corn in 40 states from 50, about 90% it gross collection concentrated in 12 states of the so-called corn belt. Experience of growing of corn in the USA and technology from processing of it on a bioethanol as starch-containing of digister Ukraine must adopt in a prospect.

The department of agriculture of the USA came to the conclusion, that an ethanol returns a 134% energy, which was expended in growing, collection and processing of corn. Petrol returns only a 80% energy which is outlaid on its production. But in the global measuring more main all is power independence of the state, which is granted by an ethanol. Due to it the USA plan to 2012 years to shorten the import of crude oil more than on 250 million tons.

Also, as primary power raw material, it can use corn-stalks in an unchanging form for direct incineration. Thus most essential fuel-technological description will be a heating value of stems, which foremost will depend on their humidity.

If at once after collection humidity of corn-stalks is within the limits of 45-60%, the warmth of combustion makes only 5-8 MJ/kg, at humidity 20% – 12,5 MJ/kg, and at drying of stems on air to humidity 15-18% them a heating value will already make 15-17 MJ/kg [7].

However, the greatest gross productivity on a hectare is given by a production a biogas from a corn. Only from one ton of corn silo it is possible to get a from 200 to 400 m^3 biogas., and the exit of biogas from one ton of dry matter of corn-stalks will make 420 m^3. The presence of remontantant forms of corn allows effectively to use leaves and stems mass for processing (fermentations) on a biogas. This biopfuel with high efficiency can be transformed in other types of energy, in particular, at its use as fuels on gazogenes an output-input ratio reaches to 83%.

As a result of production of biogas in the special fermenters, so-called methane-tanks, get high-quality organic fertilizers (biohumus). Due to a generous amount biologically active matters, they carry out the role of universal regenerator of soils.

A specific microflora and enzymes is able to pick up thread “dead soil”, providing all him functional features and giving him properties of high potential

fertility. For the leadthrough of rejuvenation and proceeding in soils it is needed one time in four years to bring in a biohumus the norm of 3-5 tn/ga, mostly during the leadthrough of the system of basic till of soil or preseed cultivating.

On the whole the use of corn on power aims allows to decrease the extrass of hotbed gases at the level of 30%, that is actual enough on the modern stage of development of human society.

Conclusions. Thus, an industrial production of biological types of fuel in Ukraine is an extraordinarily important factor, which will allow not only to decrease the import of power mediums and economize considerable currency resources, and also fix economic independence of the state, improve an ecological situation, create new workplaces, provide development of spirit industry and promote interest of agrarians to growing of agricultural power cultures, in particular corn as primary type of raw material.

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Анотація

Климчук О.В.

Ефективність комплексного використання кукурудзи в біоенергетиці

В статті наведено світові показники виробництва кукурудзи, представлено основні технологічні аспекти її вирощування та економічні переваги, порівняно з іншими зерновими культурами. Розкрито пріоритетні напрямки комплексного використання кукурудзи для виробництва біологічних видів палив в Україні, з урахуванням світового досвіду.

Ключові слова: *економіка, біоенергетика, кукурудза, сировина, біоетанол, тверде біопаливо, біогаз*

Аннотация

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Эффективность комплексного использования кукурузы в биоэнергетике

В статье приведены мировые показатели производства кукурузы, представлены основные технологические аспекты ее выращивания и экономические преимущества, в сравнении с другими зерновыми культурами. Раскрыты приоритетные направления комплексного использования кукурузы для производства биологических видов топлив в Украине, с учетом мирового опыта.

Ключевые слова: *экономика, биоэнергетика, кукуруза, сырье, биоэтанол, твердое биотопливо, биогаз*