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## **THE ECONOMIC AND ENVIRONMENTAL ASSESSMENT OF PRODUCTION TECHNOLOGIES GALEGA ORIENTALIS AS BIOENERGY AND FORAGE CROP**

**Introduction.** The problem of improving the efficiency of agricultural production is a determining factor of agricultural activities. Any offered agro technical take or reception technology of growing are defined economic efficiency in the conditions of economic crisis [1]. At the same time, next to the economy of production, the role of ecological validity technologies [2].

Economic efficiency of plant-grower is growing of cultures grows determined by attitude of the got results toward the charges of production and direct labor, and sent to the receipt of maximal amount of products from one hectare of landed area of corresponding quality at the least expenses [3].

Production of forage as industry of plant-grower features in relation of economic efficiency. It is due with that products of productive of forage are used by the stock-raising. Therefore, the choice of the most economical advantageous forage crops, receptions and technologies of their growing are prime price and profitability of products and cost of biological energy depend in forge part.

When growing bioenergy crops and forage crop cost of plant grower production is determined by the forage units. The cost of green forage crops of Galega orientalis and cover crops is determined by the way of transfer of leafy mass in forage units. For a standard take grain of oat, in which 1 kg of forage units corresponds to 1 kg of grain. Price of 1 kg of oats as of 1.01.2010. was 0.8 UAH.

Environmentally of technologies is determined by the implementation of the least of anthropogenic influences that pollute and destroy soil, water and air, and also accumulate toxic substances in biological products [4].

The aim of research was to offer the most economically advantageous and environmentally safe technologies of growing of *Galega orientalis* as highly bioenergy and forage crops.

**Methodology of Research.** Research conducted during the 2008 - 2010 years on common experimental field of Vinnitsa National Agrarian University and Vinnytsia State Agricultural Experimental Station, Institute of forage and agricultural Podillya NAAN of Ukraine.

Experimental work on the program of research was executed out in two experiments that differ in terms of sowing and cover crops. We studied the action and cooperation of two factors: A - Way of growing *Galega orientalis* (under covered, with out covered of cutting weeds with out covered with bringing of herbicide), B - fertilization ( $N_{45}P_{45}K_{45}$ ,  $N_{45}P_{45}K_{45}$  of liming). Experiment 1. "The influence of methods of growing and fertilizer *Galega orientalis* for early spring sowing under the cover, of oats on green forage on the growth, development and yield formation leafy weight and forage efficiency." Experiment 2. "The influence of methods of growing and fertilizer *Galega orientalis* for late spring sowing under the cover of maize on green forage on growth, development and yield formation leafy weight and forage efficiency". Early spring sowing of *Galega orientalis* held in mid-April, late spring – in first ten-day period of May.

On the area from the study of efficiently of liming brought 8 t/ha defecate (60% lime) for a year to sowing of *Galega orientalis*. Annually brought in mineral fertilizers  $N_{45}P_{45}K_{45}$  a folding method, using NPK fertilizer (dog N - 16%  $P_2O_5$  - 16%  $K_2O$  - 16%) with norm of brining of physical weight of fertilizer 281 kg / ha.

Adding herbicides on with out covered crops *Galega orientalis* performed by spraying the preparation pivot is inn dose of 1.0 l/ha in the phase second real leaf of *Galega orientalis*.

Economic evaluation was conducted on the basis of the developed process maps of growing of *Galega orientalis*. Calculation of economic efficiency of growing bioenergy mass of *Galega orientalis* held at the prices of 2010.

**Results of researches.** The structure of direct charges at growing of *Galega orientalis* amounting for three years under covered sowing of materials and equipments accounted for 66% of fuel and lubricants materials - 25% of salary - 7%. When with out covered sowing with the brining of herbicide pivot - respectively 71%, 21% and 6%. The increase in charges of materials and equipments at with out covered due sowing herbicide (Tables 1 and 2).

*Table 1.*

**Structure of direct economic charges of the technology depending on process the way of growing and fertilizer of *Galega orientalis* in early spring sowing (2008 - 2010 years)**

Method of growing	Fertilizers	Item of expenses, UAH /ha				Total direct charges UAH/ha
		Materials (seeds, lime, fertilizer herbicide)	Diesel fuel	remuneration of Labor	Other	
Under the cover of oats	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	3685	1390	412	102	5589
	von + liming	4041	1529	453	117	6140
With out covered with cutting weed	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	3395	1366	403	100	5264
	von + liming	3751	1503	443	115	5812
With out covered With brining of herbites. Pivot	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	3849	1227	322	93	5491
	von + liming	4205	1364	362	108	6039

Among the materials and facilities is a significant percent occupies the cost of *Galega orientalis* seed of - 1750 UAH/ha. Mineral fertilizer NPK fertilizer - 900 UAH/ha. Herbicide - 454.30 UAH/ha defecate - 307.60 UAH/ha (Table. 1, 2).

The largest direct charges for three years while growing of *Galega orientalis* for green forage observed of under covered sowing with liming 6140 - 6271 UAH/ha. The lowest direct charges for early spring sowing of without covered with

cutting weeds - 5812 UAH/ha, which is 328 UAH/ha less than out under covered sowing (Table 3).

At under covered sowing get the harvest of cover crops, which is referred to harvest herbs. The largest prier of production for 3 years provides for early without covered sowing with the brining of herbicide pivot and lime - 16696 UAH/ha. The lowest price of products is observed at without covered sowing of Galega orientalis with cutting weeds without liming - 6184 - 6208 UAH/ha. Liming provides the increasing in the price of production by 14.2 - 32.4%.

*Table 2.*

**Structure of direct economic charges of the process according to the way of growing and fertilizer of Galega orientalis in late spring sowing (2008 - 2010 years)**

Method of growing	Fertilizers	Item of expenses, UAH /ha				Total direct charges UAH/ha
		Materials (seeds, lime, fertilizer herbicide)	Diesel fuel	remuneration of Labor	Other	
Under the cover of corn	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	3685	1390	412	102	5589
	von + liming	4041	1529	453	117	6140
With out covered with cutting weed	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	3395	1366	403	100	5264
	von + liming	3751	1503	443	115	5812
With out covered With brining of herbbits. Pivot	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	3849	1227	322	93	5491
	von + liming	4205	1364	362	108	6039

The most income for gain three years of life Galega orientalis - 10657 UAH/ha is provided for early without covered sowing with brining of herbicide pivot and liming of soil. Lower income received in late spring without covered sowing with brining of herbicide and lime - 9753 UAH/ha. Aft sowing Galega orientalis under cover of corn conventionally net profit laid donned conditional 4169 UAH/ha, and under cover use-oat mixtures - for 1053 UAH/ha less. The variant of late spring without covered sowing with cutting weeds secured the lowest income - 2821

UAH/ha. Liming of soil boosted profit laid down conditionally 681 - 3252 UAH/ha, depending on variants.

The lowest prime price of production obtained in early spring without covered sowing of *Galega orientalis* with the brining of herbicide pivot and lime - 289.36 UAH/ton of forage units and 1608.26 UAH/ton of digestible protein. The most high prime price of the getting products observed at without covered sowing with cutting weeds - 511.17 UAH/ton of forage units and 2936.84 UAH/ton of digestible protein. Liming stipulated reduction to the prime price units and digestible protein of 10.4 - 32.9.

The highest level of profitability return - 176.5% provides early spring without covered sowing of *Galega orientalis* with the brining of herbicide pivot and lime, slightly lower - 160.6% - late spring without covered sowing with the brining of herbicide. The lowest level of profitability 17,2-17,5% obtained in early spring without covered sowing with cutting weeds without liming. Level of profitability at wider covered sowing of corn was 66.5% and 50.8% - of-oat. In areas without liming Level of profitability for 3 years by 7.2 - 43.2% lower.

As for environmental point of view brining of herbicides on without covered sowing can cause pollution of soil, water, air and vegetative mass of *Galega orientalis*. Therefore, safer way to create grass of *Galega orientalis* is under covered or without covered sowing with cutting weeds. Brining mineral nave fertilizer negative impact on the environment soil of as *Galega orientalis* is a long-term nitrogen fixing legume crop, its growing will assist providing of soil on nitrogen, organic matters, prevent washing off at soil and improve its physical properties. Liming is a good technique that improves agrochemical soil properties. Liming is a positive reception that improves agrochemical properties of soil. So, environmental point of view *Galega orientalis* is necessary to grow without brining herbicide with as for soil liming of and substantial reduction of norms of mineral fertilizers.

Table 3.

**Economic evaluation technologies of Galega orientalis for green forage depending on sowing time, method of growing and fertilizer (2008 - 2010 years)**

Method of growing	Fertilizers	Yield t/ha		Cost of products UAH/ha	Direct expenses, UAH/ha	Conditionally net income UAH/ha	Prime price, UAH/t		level of profitability %
		forage-units	Digestible protein				forage-units	Digestible protein	
early spring sowing									
Under the cover of oats *	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	10,03	1,556	8024	5589	2435	557,23	3591,90	43,6
	von + liming	11,57	1,914	9256	6140	3116	530,68	3207,94	50,8
With out covered with cutting weed	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	7,73	1,277	6184	5264	920	680,98	4122,16	17,5
	von + liming	11,37	1,979	9096	5812	3284	511,17	2936,84	56,5
With out covered With brining of herbits. Pivot	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	15,86	2,747	12688	5491	7197	346,22	1998,91	131,1
	von + liming	20,87	3,755	16696	6039	10657	289,36	1608,26	176,5
late spring sowing									
Under the cover of corn*	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	10,18	1,580	8144	5722	2422	562,08	3621,52	42,3
	von + liming	13,05	2,177	10440	6271	4169	480,54	2880,57	66,5
With out covered with cutting weed	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	7,76	1,404	6208	5295	913	682,35	3771,37	17,2
	von + liming	10,83	2,047	8664	5843	2821	539,52	2854,42	48,3
With out covered With brining of herbits. Pivot	N <sub>45</sub> P <sub>45</sub> K <sub>45</sub> – von	15,26	2,736	12208	5523	6685	361,93	2018,64	121,0
	von + liming	19,78	3,701	15824	6071	9753	306,93	1640,37	160,6

\* Note With harvest cover crops.

**Conclusions.** Consequently, it was found that the most economically advantageous is technology of early spring without covered sowing of *Galega orientalis* with the brining of herbicide pivot and lime. The least advantageous in an economic plan is without covered sowing of *Galega orientalis* with cutting weeds.

Early spring without covered sowing *Galega orientalis* with the brining of herbicide pivot and lime on a background  $N_{45}P_{45}K_{45}$  provided the highest conditional net income - 10 657 UAH/ha, and the highest level of profitability - 176.5%.

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### **Анотація**

**Ткачук О.П.**

***Економічна та екологічна оцінка технологій вирощування козлятнику східного, як біоенергетичної і кормової культури***

*Проведено економічну оцінку технологій вирощування козлятнику східного, як високопродуктивної біоенергетичної та кормової культури. Визначено структуру прямих витрат при вирощуванні культури за різних технологій. Встановлено вартість основних матеріалів та вегетативної маси козлятнику східного. Запропоновано найбільш економічно вигідні технології вирощування козлятнику. Проведено екологічну оцінку технологій.*

**Ключові слова:** козлятник східний, економічна ефективність, технологія вирощування.

### **Аннотація**

**Ткачук А.П.**

**Экономическая и экологическая оценка технологий выращивания козлятника восточного, как биоэнергетической и кормовой культуры**

Проведено економічну оцінку технологій вирощування козлятника восточного, як високопродуктивної біоенергетическої і кормової культури. Визначено структуру прямих витрат при вирощуванні культури при різних технологіях. Встановлено вартість основних матеріалів і вегетативної маси козлятника восточного. Предложено найбільш економічно вигідні технології вирощування козлятника. Проведено екологічну оцінку технологій.

**Ключевые слова:** козлятник восточный, экономическая эффективность, технология выращивания