быть принят в качестве основного. При этом величину рассматриваемого показателя необходимо соизмерять с размерами используемой земли. То есть величина доходов или снижения убытков должна определяться в расчете на 1 балло-гектар кадастровой оценки сельскохозяйственных угодий. Это позволяет, с одной стороны, учесть природно-экономические различия хозяйств, а, с другой — обеспечить сравнимость (сопоставимость) получаемых результатов в случае объединения (укрупнения) предприятий. И, в-третьих, величина рассматриваемого показателя отражает одну из важных составляющих достигнутого уровня эффективности производства, который необходимо учитывать при определении победителей в конкурентной борьбе за повышение эффективности сельскохозяйственного производства.

Преимущество применения показателя, характеризующего доходность производства, заключается в том, что увеличение массы получаемой предприятием прибыли или уменьшение убытков предполагает наращивание выручки от реализации товаров (продукции, работ, услуг), а, следовательно, и объемов производимой продукции и повышение ее качества. Это может достигаться путем рационального хозяйствования, которое включает проведение таких мероприятий, как углубление специализации, внедрение достижений научно-технического прогресса, рационализация организации производства и труда, экономия энергетических ресурсов и материальных затрат, обновление материально-технической базы, что обусловливает необходимость в дополнительных инвестициях, материализация которых способна обеспечить повышение уровня производительности труда.

Рассматриваемый показатель (рост прибыли или снижение убытков в расчете на 1 балло-гектар кадастровой оценки сельскохозяйственных угодий) необходимо дополнить показателем роста уровня заработной платы одного работника, поскольку предприятия, ориентируясь на максимизацию прибыли, будут вынуждены снижать не только удельные затраты овеществленного труда, но и стремиться к снижению затрат живого труда, что может привести к необоснованному занижению заработной платы работников.

Таким образом, в основу оценки производственной деятельности сельскохозяйственных организаций по итогам года нами рекомендуется принять два показателя: рост прибыли или снижение убытков в расчете на 1 балло-гектар сельскохозяйственных угодий и рост уровня заработной платы одного работника в конкретном году по сравнению с предыдущим.

ПРОБЛЕМЫ ОРГАНИЗАЦИИ ПРОИЗВОДСТВА И ИСПОЛЬЗОВАНИЯ СЕЛЬСКОХОЗЯЙСТВЕННОЙ БИОМАССЫ ДЛЯ ЭНЕРГЕТИЧЕСКИХ ЦЕЛЕЙ В ТЕХНОЛОГИЧЕСКОМ И ЭКОНОМИЧЕСКОМ АСПЕКТАХ

PROBLEMS REGARDING THE ORGANIZATION OF PRODUCTION AND ACQUISITION OF AGRICULTURAL BIOMASS FOR ENERGETIC PURPOSES IN TECHNOLOGICAL AND ECONOMIC ASPECTS

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В статье рассматриваются проблемы организации, связанные с производством биомассы для энергетических целей. Согласно требованиям ЕС, Польша должна увеличить долю энергии, получаемой из биомассы в энергетическом балансе до 12,8%, 60% из которой должно быть получено из сельскохозяйственной биомассы. Достижение данной цели требует принятия организационных решений как в области прогнозирования объемов производства биомассы, так и в области организации процессов ее производства и их обеспечения энергонасыщенными растениями.

Abstract: The requirements of the European Union towards Poland, require it to increase their share of biomass energy production in the energy balance to the level of 12.8%, within which the agricultural mass should constitute 60%. The realization of this share requires a solution to many organizational problems regarding the forecasting amount of biomass production, as well as regarding the organization of biomass production process and problems regarding the delivery to

power plants. This paper presents the organizational problems connected with biomass production for power industry.

Introduction

The requirements of the European Union order Poland to increase the share of energy acquired from agricultural biomass for energetic purposes. According to the European Union requirements, share of the biomass energy production in the total energy balance in 2010 should be 12.8%, within which the plant biomass should constitute 60%. The realization of this share, according to the Polish government's strategy will be carried out mainly through the use of biomass for the needs of power industry. The achievement of the desirable level of energy production from agricultural biomass, requires solving many problems of organizational character, mainly connected with the acquisition of biomass. These include problems connected with forecasting of biomass production rates, problems regarding the organization of biomass production processes and problems connected with the organization of delivery to power plants. Solving these problems will help develop the base of biomass delivery for the purpose of power industry.

Problems connected with forecasting of biomass production rate

For the power plant, which uses biomass, one of the important things is to know the potential production rates, on which basis, the power plant can make investments within the scope of creating the infrastructure connected with logistics of delivery.

As practise have shown, the forecasting of production rate is effective only, when the necessary information is available and that a reliable and proven methods of forecasting are being used. In case of biomass production rates forecasting, one of the important problems is lack of necessary data, on the basis of which one can make forecasts. This is a result of the fact, that biomass production in Poland is in its initial stage of development and no experience in this matter is present.

The basic problem, which makes biomass production rate forecasting difficult is the lack of reliable premises presenting the sources of biomass. One assumes that the most common source of biomass in Poland is grain straw. Its potential in Poland, which can be used for the energetic purposes is estimated at the level of 7840 tones [Gradziuk, 2003] , although even here there is a lack of reliable information confirming this value, all the more so, because other sources stet the value of 4866 tones [Kuś 2002]. Besides that, it is difficult to determine , which part of this surplus will actually be used for energetic purposes.

Besides the grain straw, the sources of biomass are energetic plants, among others, the most popular ones like: Salix viminalis, Virginia fanpetals, the Jerusalem artichoke and Miscanthus giganteus. Although, on the basis of data regarding the climate and soil need of the plant, a potential cultivation areas of energetic plants were established [Jadczyszyn et al 2008] , but also in this case, there are no premises saying what percent of these areas will be used for the cultivation of these plants. Especially, that as the economic analyses have shown, the energetic plants are not more profitable than traditional plants. [Skudlarski et al. 2009]. Therefore, farmers may rather decide to continue the cultivation of traditional plants than energetic plants.

The tool, which would assist in forecasting of potential biomass production is a decision tree (Kozlovski et al, 2003), which allows to determine which decisions could farmers make, when they could choose a biomass production or cultival.ion of traditional plants in certain economic conditions. On the basis of potential decisions of the farmers, one can determine whether there are chances for development of energetic plantations or not.

The performed analyses on the example of few traditional plants and energetic plants (Salix viminalis, Virginia fanpetals, and Miscanthus giganteus), with taking into consideration the variable probability of low and high sales prices and probability of variable harvest have shown, that farmers would rather choose traditional plants in case of biomass purchase by intermediaries. In case, where the direct recipient would be the power plant, there are chances for development of biomass production, because the profits from energetic plants cultivation would be higher than those from traditional plants cultivation [Osiak et al, 2009].

The condition for biomass market development is obtaining minimal prices for biomass by planters. Performed analyses have shown, that the value of minimal prices depends on the achieved harvest, and in case of grain straw, from grain prices as well. Minimal prices for energetic plants like Salix viminalis, Virginia fanpetals, and Miscanthus giganteus in three harvest variants are presented in the Table 1 below. The following harvest rates were assumed: for Miscanthus: 10, 15 and 20 tone of dry matter·ha^{-1}, for Virginia fanpetals: 14, 20 and 21 tone of dry matter·ha^{-1} and for Salix viminalis 26, 34, 48 t·ha^{-1} (harvest every three years). In case of Salix, the harvest of wet mass was used (directly after harvest), because it is purchased by power plants in such form.

Table 1 – **Minimal biomass prices from the analysed plants [EUR·t^{-1}]**

	Salix	Virginia	Miscanthus
Harvest-variant1	26.30	30.73	53.40
Harvest-variant2	20.11	21.51	35.60
Harvest-variant3	14.24	20.48	26.70

Source: own calculations

The minimal prices for grain straw were presented in Table 2. They were established for the estimated grain and straw harvest, which were following: for rye: 1.8 and 4.5 t·ha^{-1} (straw harvest calculated on the basis of literature (Harsim 1994): 3.5 and 5.6 t·ha^{-1} and for wheat: 2.5 and 5.0 t·ha^{-1} (calculated straw harvest: 2.25 and 4.5 t·ha^{-1}). Additional calculation were made for two variants of grain sale prices. In order to do this, the lowest and highest annual average grain purchase prices were established, on the basis of IERiGŻ information (an institute for agricultural market analyses) from the years 2004-2008 (Rynek rolny 2004-2008). They are as follows: for rye: 88.38 and 181.53 EUR·t^{-1} and for wheat: 113.78 and 215.30 EUR·t^{-1}.

Table 2 – **Minimal grain straw prices [EUR·t^{-1}]**

	min. harvest-min. prices*	max. harvest-min. prices*	min. harvest-max. prices*	max. harvest-max. prices*
Wheat	248,34	135,53	60,96	0
Rye	120,06	53,52	10,15	0

*minimal and maximal purchase prices of grain
Source: own calculations

In case of grains, in situation of high harvest and high grain prices, the cost of cultivation would be covered by sales of grain only, while the sale of straw, even at the minimal price, would additionally increase the profit. Therefore, in the last column of table 2, the minimal price for straw could be EUR 0, so in this variant, if the farmer gives the straw for free, he still gains profit from grain production.

The models, allowing for effective forecasting of biomass production rates should consider algorithms, estimating minimal biomass prices and potential farmers' decision regarding the cultivation of energetic plants.

Problems of the organization processes of biomass production

The acquisition of grain biomass at the production stage, should not cause any organizational problems. Bigger organizational problems are connected with the acquisition of Salix biomass, especially in large-area plantations. In case of this plant, the most problematic is the harvest, especially, that the Salix biomass is moisture and requires additional drying.

Till now, a popular method of Salix harvest in large plantations was the harvest using chaff cutters. However, because of large humidity of the biomass, which makes long-term storage difficult, the chips are directly delivered for combustion. This makes the energetic value of such mass low, but till now there are no effective and cheap methods of drying humid Salix chips [Pasyniuk 2007].

The other method is the harvest of the entire shoots of Salix, their storage in such form, until the achievement of the required humidity and, after drying, cutting it. But, the offer of machine manufacturers for harvest of whole shoots is too limited. Some constructions are still in the implementation stages. Recently, on the Polish market, debuted a special rolling press for Salix harvest, called Bio Baler, which is manufactured by a Canadian company. Harvest of Salix, using this press would resemble the harvest of hay or straw. Whole shoots of Salix would be collected in a form of round bales, stored until achievement of optimum humidity and then cut. The disadvantage of this machine is its high price.

So, in case of Salix, the problem of biomass acquisition process is connected with the selection of the optimal harvest method. In case of selecting the harvest using chaff cutter, another organizational problem is to provide enough number of transportation means, in order to make the cutter work without unnecessary breaks.

Definitely less problems is caused with Miscanthus, Virginia fanpetals and Jerusalem artichoke harvest, because these plants can be harvested like corn, and both Miscanthus and Virginia fanpetals can be harvested like hay: cut with a mower and then use a harvesting press. The second method of harvest should not cause any problems, because the farmers have experience in harvesting hay. While the biomass harvest, using the chaff cutter, requires the proper number of transportation means. This is especially important for Miscanthus, which straw has a very low density, which means that the load capacity of transportation means is used inefficiently, so the continuous cooperation with chaff cutter requires a large number of transportation means.

Problems with the organization of biomass deliveries to power plants

A very important factor, conditioning the functioning of biomass acquisition is the organization of biomass deliveries from farmers-producers to the power plant. The problem is also complicated from another reason. In Poland, the small-area farms are more often, so the supply of biomass in such farms would be rather small. For the minimization of the costs of biomass transportation to the power plant, especially for large distances, one needs solutions, which will receipt smaller portions of biomass and store them in one place, e.g. by establishing local warehouses.

In Poland, there are private warehouses purchasing biomass and delivering it to the power plants. However, because of the operational costs of such warehouses and the need of generating profit for its owners, the prices of biomass purchase are lower than the ones offers by the power plants, which influences the profitability of biomass production and farmers' decisions regarding energetic plants cultivation.

Another variant could be the direct receipt of biomass by power plants. However, this requires the purchase of transportation means and carrying out a schedule of biomass receipt from planters as well as hiring additional personnel. This variant can be expensive, especially in case of small biomass portions receipt from many suppliers.

Biomass transportation is also very important, which, because of the large distances will require more transportation means and generate much higher transportation costs. Therefore, the localization of energetic plants fields is so important. Also important is the amount of transported load, depending on the form of biomass.

Table 3 shows calculations for variants of biomass transportation in a form of round and rectangular bales.

Table 3 – **Biomass transportation cost [EUR·t^{-1}]**

	Round bales			Rectangular bales		
	30 km	50 km	100 km	30 km	50 km	100 km
Virginia fanpetals, Miscanthus	4.05	6.75	13.50	2.70	4.50	9.00
Grains (straw + grain)	2.70	4.50	9.00	2.03	3.38	6.75

Source: Own calculations

Large distance increases the transportation costs substantially. In comparison to the production costs, the transportation costs increase the cost of 1 GJ of energy by about 0.25 EUR in case of grains and about 0.50 EUR in case of Virginia fanpetals and Miscanthus.

The alternative of biomass in the form of bales is to process them into, e.g. briquettes. Briquetting allows for the increase of load capacity of the transportation means, but increases the costs of acquired biomass.

As the analyses have shown, the briquetting costs of grain straw and Miscanthus straw using a briquetting set of the productivity of 800 kg/h is – depending on the amount of the annually briquetted biomass – from 48.21 (1000 tonnes of straw per year) to 62.88 EUR·t^{-1} (4000 tonnes of straw per year), therefore the cost 1 GJ of energy would increase by 3 to 4 EUR·t^{-1} [Skudlarski, Izdebski 2010].

The selection of the form of biomass delivery to power plants depend on the economic effects of selected variants. Because the biomass production in Poland has just started to develop, it is difficult to point the best organizational variant of biomass delivery.

Summary

Biomass acquisition for the needs of power industry is connected with solving many organizational problems connected with forecasting of the biomass production rate, biomass production organization and the organization of biomass deliveries to power plants. The selection of organizational forms is important for the biomass energy production costs, therefore it must take into consideration the technological and economic aspects. The current state of knowledge does not allow for the selection of optimal forms for production and deliveries, which requires the continuation of economic analyses.

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ОБРАЗОВАНИЕ КАК ПРЕДПОСЫЛКА ИННОВАЦИОННОЙ ДЕЯТЕЛЬНОСТИ В АПК

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Реализация мероприятий по техническому переоснащению сельскохозяйственного производства позволит обеспечить рост производительности труда не менее чем в 1,4 раза, снизить удельный расход материальных и энергетических ресурсов в 1,1–1,15 раза, существенно повысить комфортность работы механизаторов.

Общий объем финансирования технического переоснащения сельскохозяйственного производства в 2005–2010 годах составляет 5,5 трлн. рублей.

Повышение образовательного и квалификационного уровня сельских работников, таким образом, лежит в основе дальнейшей реализации инновационных процессов в системе АПК. Вместе с тем во всех учебниках, излагающих тему инновационных ресурсов, вполне убедительно и широко рассматривается роль науки и научных работников в решении данной проблемы. К сожалению, роль подготовки и переподготовки работников как непосредственных пользователей инновационных средств, освещается недостаточно. И совершенно умалчивается роль школьного среднего образования как изначальной основы формирования таких пользователей и тех же научных работников.

На практике все обстоит иначе. Без учета необходимости повышения школьного уровня образования, затем среднего специального или высшего образования, подготовки и переподготовки специалистов, и, наконец, самих научных кадров в деле реализации инновационных процессов не обходится ни одна государственная программа социально-экономического развития республики.

Так, в Государственной программе возрождения и развития села на 2005–2010 гг. предусмотрено открытие для учащихся, проживающих в сельских населенных пунктах, образовательных учреждений нового типа (47 гимназий, 10 лицеев, 31 профессиональный лицей), создание условий для обучения детей из других населенных пунктов данного района в учреждениях образования нового типа, организация подвоза детей и детей-инвалидов к месту обучения на специальном транспорте либо обеспечение их интернатом; развитие в старших классах профильного обучения, позволяющего раскрыть индивидуальные творческие способности учащихся; осуществление с 2005 года льготного набора в учреждения образования специализированных групп студентов по подготовке кадров для работы в сельской местности; реструктуризация сети образовательных учреждений с учетом демографических