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Sorghum market development in Ukraine under the impact of global trends

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Abstract: The results of the sorghum market development studies are highlighted, the legislative support initiatives of the sorghum cultivation in some countries are analyzed. It is established that in recent years the sorghum is a common crop in Ukraine and in the world. The results of studies on the sorghum production volumes in the world compared with the production of other crops are given. It is found that world production of sorghum is increasing. Ukraine as an agrarian country is one of the largest producers of crops and sorghum for Ukraine has significant potential. The trends in production and exports of sorghum are considered; the factors of the domestic grain market stabilization are examined. The development prospects of the sorghum production on the basis of international statistics and predictions are evaluated. It is proved that the increasing of the sorghum production in Ukraine is becoming an acute problem that can be solved through the wide usage of the sorghum.

Keywords: sorghum, production, export, market, sales, effectiveness



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1. Introduction. Statement of the problem

Market of agricultural products is very diverse. At the market the plant growing production and the animal husbandry production are presented as the main products and the sideline products. Key and important sense belongs to crop production in the market, without these products the animal production is impossible. Analyzing the world market of the crop products, it can be confidently asserted that the sorghum production is promising in the near future. Ukraine has a great perspective to occupy an important place in the world market for the production and export of sorghum.

2. Analysis of recent research and publications

The efficiency of the crops growing in general and the sorghum growing in particular is studied by such scientists: Arkhipenko F.M., Slusar S.M., Dremlyuk G.K., Maslak O., Pshenichnyy O. [2, 3, 5, 6, 8]. The use of alternative energy resources and market development of biofuels using the sorghum crops are considered in the works of leading scientists Boyko P., Dolishniy M., Dorhuntsov S., Zhovnir M., Mkhitaryan N., Panasyuk B., Poburko Ya. etc.

3. Unsolved aspects of the problem

The systematic measures to improve the economic efficiency of agriculture are important for the sustainable development of the domestic agricultural sector and to solve many current problems; to increase the crop production and to grow sorghum in particular. The research urgency of this culture is evident. The successful resolution of these issues will help to improve the socio-economic situation in Ukraine, to increase the production yields, to make the competitive position of agricultural products at domestic and global markets better.

4. Task formulation

The purpose of the article is to analyse the sorghum market of Ukraine under the influence of global trends and to identify the sorghum export potential.

5. Main material exposition

The sorghum growing is gaining more and more popularity in the world and in Ukraine in particular. Due to drought and salinity resistance of this culture, it is grown in all parts of the world. Previously this culture was a source of green mass necessary to the needs of livestock; now it is interested by the grain producers. The positive trend of the sorghum cultivation is observed in the world. In conditions of drought the grain sorghum significantly exceeds by the yield and the yield of feed units on 1 hectare traditional barley, corn and peas.

According to the data [10] holding "Agro-Soyuz" grows sorghum about 5 years and now this culture occupies about 25% in the crop rotation structure of enterprise. Traditional crops - such as wheat, soybeans, barley in connection with the climate change often do not give the desired results. Therefore, we must pay attention to the culture that does not just support the business and provide an opportunity to develop. In particular, this culture is sorghum. Thus, the sorghum growing is no longer an alternative but a tradition. Sorghum is the only crop that flows into suspended animation when the air temperature is above 35 degrees. And up to 40 days in this state sorghum can expect rains to continue the growing season. So, what to do in the dry year? To grow sorghum. Sorghum is very unpretentious culture. If this place is not grown sorghum, you consider, nothing will grow there. Production of sorghum is more profitable than processing of sunflower and rapeseed. In Ukraine and Russia sorghum is more resistant to disease than in the USA. But there is one big problem of sorghum – the postharvest humidity. This is a worldwide problem because post-harvest grain drying of sorghum reduced to 60% of profits. Sorghum is very hygroscopic and after the harvesting by traditional harvester the humidity of grain and humidity of panicle will summarize. Equipment is capable to solve this problem. Ukrainian farmers are increasingly planning to include sorghum in rotation.

Sorghum growing is also supported by the legislation in the countries around the world.

In particular the U.S. Department of Agriculture (USDA)'s Agricultural Marketing Service (AMS) announced that sorghum producers and importers voting in a national referendum have approved the continuation of the Sorghum Promotion, Research, and Information Order, commonly known as the Sorghum Checkoff Program. The referendum took place from March 23, 2015, through April 21, 2015. Of the 1,202 valid ballots cast, 1,160 or 96.5 percent favoured the program and 42 or 3.5 percent opposed continuing the program. For the program to continue, it must have been approved by at least a majority of those eligible persons voting

for approval who were engaged in the production and sale of sorghum during the period January 1, 2011, through December 31, 2014.

The goal of the program is to strengthen the position of and to develop and expand the markets for sorghum and sorghum products. The United Sorghum Checkoff Board administers the program and comprises 13 sorghum producers, which includes representatives from the three largest sorghum producing states and four at large members [11].

Majilis deputies propose to encourage the cultivation of sorghum in Kazakhstan. It is proposed to encourage the sorghum cultivation for the fodder supplies of livestock sector. As one of the most pressing problems of the livestock sector development is to ensure all groups of farm animals with forage. High-quality forage should be generated through the internal resources of farm enterprises and it should include the cheapest sources of nutrients. Production increase of quality forage may be due to the drought-resistant crops with the high carbohydrates and energy content; that can provide the yield even in dry years. These species include sorghum crops. It is proposed to consider the possibility for the registration of grain sorghum as forage fodder crop and the appropriate backing from the state; to develop a program of the perspective forage production development of farm enterprises for the accelerated development of meat and dairy cattle-breeding, pigstry and poultry farming; to consider the possibility to organize the production of sorghum seeds (cereals, sugar) [4].

Ukraine plans to obtain European Union's certificates for the sorghum and corn seeds. Also, deregulation activities are conducted to improve the conditions for seed business in Ukraine. In particular, the procedure for the acquisition of rights to produce the seeds and planting stock by economic players is simplified. The foreign investments are important for Ukraine to expand the seed infrastructure [4].

Let's consider the production of sorghum in the world compared to the production of other crops (Table 1). The global production of sorghum is less than wheat, rice, corn and barley. US Department of Agriculture (USDA) estimates that grain production in the 2015-2016 marketing year will be 65.37 million tons. The volume of sorghum trade is quite variable and to a large extent it depends on the growing demand of China, which starts to set the vector of development on the world sorghum market [11].

Table 1. World production of major crops in the 2015/16 marketing year, mln metric tons

Country	World Barley Production	Country	World Corn Production	Country	World Coarse Grains Production	Country	World Rice Production	Country	World Sorghum Production
Algeria	1,500	Argentina	25,000	Argentina	33,745	Bangladesh	35	Argentina	4,500
Argentina	3,700	Brazil	75,000	Australia	12,275	Brazil	8,3	Australia	2,100
Australia	8,600	Canada	12,300	Brazil	77,583	Burma	12,8	Brazil	2,000
Belarus	2,000	China	228,000	Canada	23,85	Cambodia	4,9	Burkina	1,900
Canada	7,700	Ethiopia	7,000	China	234,5	China	146	Cameroon	1,150
China	1,500	European Union	68,340	Ethiopia	13,79	Egypt	4,6	Chad	0,900
Ethiopia	2,040	India	23,500	European Union	159,82	India	104	China	2,600
European Union	58,680	Indonesia	9,600	India	41,35	Indonesia	36,65	Ethiopia	4,000
India	1,850	Mexico	23,500	Indonesia	9,6	Japan	7,9	India	5,500
Iran	3,300	Nigeria	7,000	Mexico	31,975	Korea, South	4,1	Mali	1,300
Kazakhstan	2,600	Philippines	8,500	Nigeria	17,95	Nepal	3,1	Mexico	7,800
Morocco	3,200	Russia	12,000	Russia	37,3	Pakistan	6,9	Niger	1,100
Russia	16,500	Serbia	7,000	South Africa	14,068	Philippines	12,4	Nigeria	6,150
Turkey	7,000	South Africa	13,500	Turkey	13,475	Thailand	19,8	Sudan	5,500
Ukraine	6,200	Ukraine	26,000	Ukraine	33,325	Vietnam	28,2	Tanzania	0,840
Others	9,001	Others	97,371	Others	159,894	Others	40,5	Others	6,984
United States	4,311	United States	346,218	United States	362,81	United States	6,954	United States	11,050
World Total	139,682	World Total	989,829	World Total	1,277,310	World Total	482,104	World Total	65,374

Main sorghum production is concentrated in the USA and Nigeria, their part is a quarter of the world crop. The leading producers of sorghum are also Mexico (7.3 mln. tons), India (4.5 mln. tons), Argentina (3.8 mln. tons), Sudan (6.3 mln. tons) Sorghum production growth due to the demand increasing for food and energy resources (Table 2).

Table 2. Dynamics of world sorghum production, mln. metric tons

Country	2011/12	2012/13	2013/14	2014/15	2015/16	Change, %
Argentina	4,2	4,7	4,4	3,8	4,5	107,14
Australia	2,239	2,23	1,107	2	2,1	93,79
Brazil	2,222	2,102	1,89	2	2	90,01
Burkina	1,5	1,924	1,88	1,836	1,9	126,67
Cameroon	1,15	1,1	1,15	1,15	1,15	100,00
Chad	0,648	1,172	0,745	0,9	0,9	138,89
China	2,051	2,556	2,7	2,6	2,6	126,77
Ethiopia	3,951	3,604	4,114	4	4	101,24
India	6,03	5,3	5,54	4,79	5,5	91,21
Mali	1,191	1,212	0,82	1,3	1,3	109,15
Mexico	6,425	6,174	8,5	7,3	7,8	121,40
Niger	0,807	1,376	1,287	1	1,1	136,31
Nigeria	6,9	5,943	6,592	6,7	6,15	89,13
Sudan	4,605	4,524	2,249	6,281	5,5	119,44
Tanzania	0,807	0,839	0,832	0,84	0,84	104,09
Others	7,009	6,676	6,961	6,592	6,984	99,64
United States	5,41	6,293	9,966	10,988	11,05	204,25
World Total	57,145	57,725	60,733	64,077	65,374	114,40

Source: [11].

The world sorghum market will continue to grow at the new season of 2015/16 MY. Experts predict a further increase of the gross sorghum harvest. The growth of this indicator will be contributed with the expected expansion of harvesting areas for the culture; in spite of all this the main increase of areas is expected in the USA, Mexico, Argentina and Nigeria. However, the predicted decrease of the crop yield will not significantly increase the sorghum production in the USA, which is currently forecasted at 11.1 million tons.

Many key sorghum-producing countries will increase the total yield of sorghum crops in 2015/16 MY. Thus, the growth production is predicted in Mexico to 7.8 mln. tons, Argentina - to 4.5 mln. tons, India - to 5.5 mln. tons, Nigeria - to 6.15 million. tons and Australia - 2 1 mln. tons. In China the sorghum yield is expected at the level of last year (2.6 mln. tons). In turn, the reduction trend in gross sorghum harvest can be in Sudan for which this indicator is at 5.5 mln. tons.

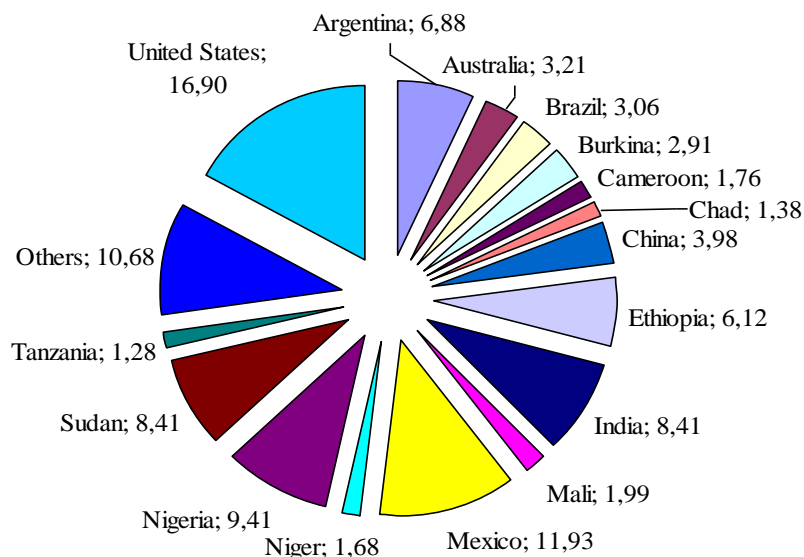


Figure 1. Structure of the World sorghum production in 2015/16 MY, %

Source: USDA, July 2015 [11]

In the United States, Mexico, Chile, Brazil, sorghum is a major crop for bioethanol production, providing alcohol yield to 25-30% more than in corn and wheat. Therefore, one of the main factors influencing on the sorghum price is the cost of oil. In addition, the world sorghum prices are directly dependent on the amount of grain supply on the market.

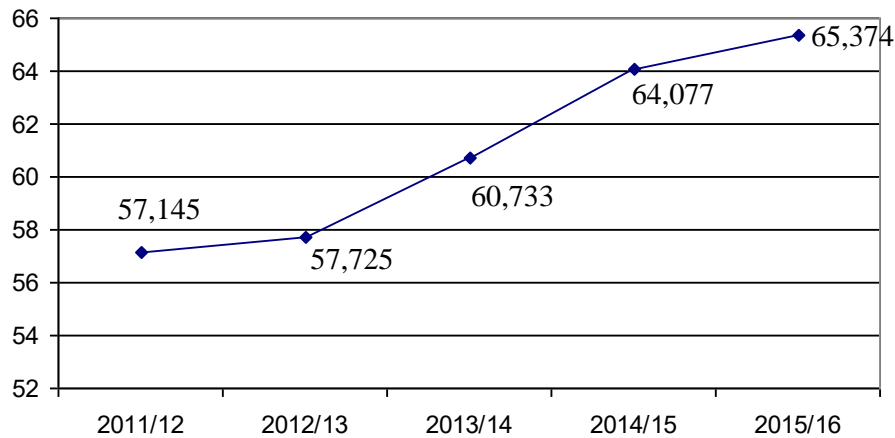


Figure 2. World sorghum production, mln metric tons

Source: [11].

The world sorghum production is increasing (fig. 2). Ukraine as an agrarian country is one of the largest producers of crops and sorghum for Ukraine has the significant potential. The volumes of the world sorghum trade in 2014/15 marketing year sharply increase to 11.1 mln. tons, whereas a year earlier the indicator was 6.5 million tons. And two years earlier it was 7 mln. tons [12].

Increased consumption of sorghum enlivens the world trade. It is expected that the world sorghum trade volumes in 2015/16 MY will continue to grow and provided the competitive price and the subsequent increase of demand (tab. 3). It should be noted that in the new season may be slightly lower US sorghum exports - 8.5 mln. tons. In turn, Argentina and Australia may increase the volume of grain shipments to 1.8 mln. tons and 0.8 mln. tons respectively.

Exports in 2012-2013 marketing year stood at 7.1 million tons, that is 30% more than in the previous season, in 2015-2016, the export is expected at 11.6 million tons, twice more than in 2011- 2012 (Table 3). The USA accounts for 76% of global sorghum sales, Argentina - 12,67%, Australia - 6,76%, Ukraine - 1,27%. The share of other countries is up to 1,58% of total exports. Overall the exports of sorghum relative the consumption is only 11%, due to the use of this grain mainly in the domestic markets of producing countries (Fig. 3).

Table 3. Dynamics of world sorghum trade, mln. metric tons

Exports	2011/12	2012/13	2013/14	2014/15	2015/16	Change, %
Argentina	2,163	3,059	0,953	1,5	1,7	78,59
Australia	1,185	1,425	0,405	0,8	0,9	75,95
China	0,036	0,027	0,011	0,025	0,025	69,44
India	0,132	0,231	0,089	0,05	0,1	75,76
Nigeria	0,075	0,05	0,05	0,1	0,05	66,67
South Africa	0,017	0,013	0,023	0,025	0,05	294,12
Ukraine	0,113	0,124	0,229	0,15	0,15	132,74
Others	0,179	0,228	0,268	0,187	0,13	72,63
United States	1,549	2,136	5,843	9	8,5	548,74
World Total	5,449	7,293	7,871	11,837	11,605	212,97

Source: [11].

The sorghum production increase contributed to realization of export potential of Ukraine. Thus, with the world sorghum exports at 11.6 million. tons, Ukraine managed to increase its share in global exports. And exports in 2011-2015 show a rising trend as volumes and prices. It is explained an active demand for food and energy resources in the world. In the United States, Mexico, Brazil, sorghum is a major crop for bioethanol production; alcohol yield from 1 ton of sorghum is 25-30% higher than from corn and wheat.

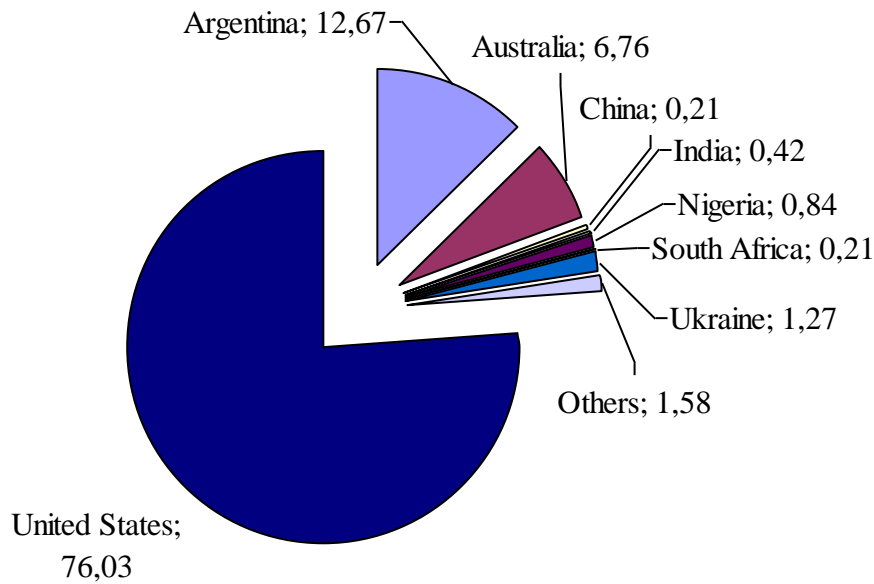


Figure 3. Structure of world sorghum trade in 2014/15, %

Source: [11].

According to the official data [9] in 2014 Ukraine exported 195 000 tons of sorghum, which is 15 000 tons more than in the previous year and 5 times more than in 2010.

Ukraine ranks fourth in the world in volume of sorghum export. This culture is a key to produce bioethanol and it is used as forage crops and in food industry. The main importers of Ukrainian sorghum in 2014 were Italy (51%), Israel (21%) and Spain (12%) [1].

Sorghum is hardly called a priority crop for the domestic sorghum market of Ukraine now. Despite the wide range of possible applications of this culture, especially in the segment of feed consumption, the main priority of increasing production remained active efforts to get out of sorghum on the world market. Currently, there are six countries that consume about 60% of the sorghum. These are Mexico, Nigeria, China, India, the USA and Ethiopia. Among them, in the volumes of sorghum consumption China is the fastest growing market, while China is also the world's largest importer of Sorghum [1]. Disclosure of exports and growing potential of the niche crops such as sorghum can help to maintain the profitability of Ukrainian companies during the crisis and ensure stable foreign trade area. Moreover, the prices of niche cultures are generally higher and have no the price volatility such as traditional grain and oil cultures.

Let's consider the domestic production of sorghum. In Ukraine sorghum is grown mainly in the steppe zone. Among the factors hindering the expansion of sorghum acreage in other areas, there is insufficient amount of effective temperatures during the growing season. The value of Ukrainian agricultural exports of major crops is shown on Figure 4. Since 2015, Ukraine has significantly increased the volume of agricultural exports, particularly into the European Union.

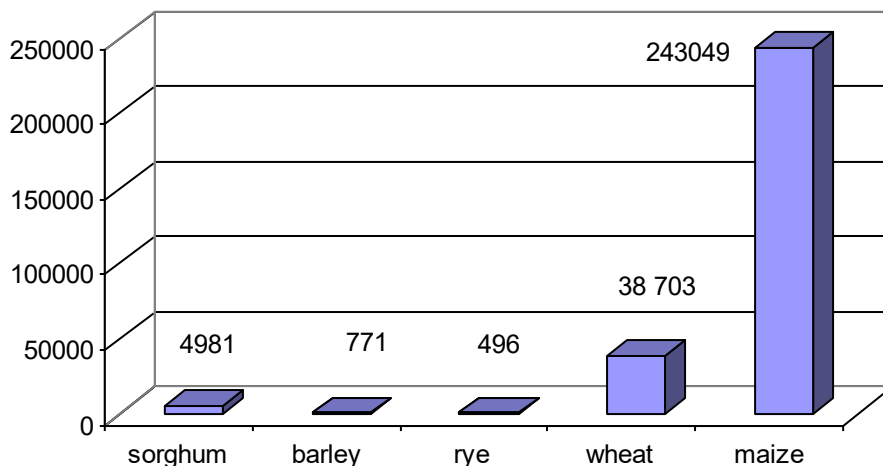


Figure 4. The gross proceeds value of Ukraine from the export of major crops into the EU, ths. USA dollars

Source: [9].

The value of agricultural crops exports into the EU countries in January-February 2015 accounted 288 630 thousand dollars. The sorghum export in early 2015 was 31,527 tons. Ukraine received 4981 thousand USA dollars. Mainly due to the trade with Italy, this brought 98% of earnings. In 2015, Ukrainian barley in the EU is bought by the UK, the Netherlands and Slovakia, its total amount was 771000 dollars.

At the beginning of 2014 and 2015 Ukrainian rye was imported only by Lithuania and Latvia. The cost of purchased rye by Lithuania was amounted 414000 dollars, which is significantly more than 79000 dollars in the beginning of last year. At the trade with Latvia on the contrary there is a significant decline of 82 000 dollars in 2015 against 487000 dollars in 2014.

Oats is one of the few crops that in January-February 2015 was exported more than in the same period of 2014.

Italy was the main buyer of Ukrainian wheat at the first two months of 2015. In January-February 2015 the real volume of wheat exports to the EU countries was amounted 195,813 tonnes (38,703 thousand dollars.). The main direction of wheat exports for this period was Italy, which was sent 131,727 tons, that is 67% of the total. Also large shipments were made to Spain - 29 674 tons (5411 thousand dollars), to UK - 16 244 tons (3879 thousand dollars), to Greece - 11 604 tons (2139 thousand dollars) and to the Netherlands 4955 tons (1242 thousand dollars).

Spain and the Netherlands the most bought Ukrainian maize in the early months of 2015. In January-February 2015 the maize exports to the EU brought into Ukraine 243049 thousand dollars, which is 85% of income from exports of all crops into the region. The main countries-partners are Spain 480715 tons (77048 thousand dollars), the Netherlands 450 686 tons (73 903 thousand dollars), Italy 219418 tons (35783 thousand dollars), Portugal 137 850 tons (21179 thousand dollars), Germany 81,170 tons (12,886 thousand dollars), Ireland 81,724 tons (12,767 thousand dollars) [9].

The increase of sorghum production in Ukraine is becoming an acute problem which can be solved through the wider usage of sorghum potential. Search of the alternative energy sources is steadily increasing in the world. Modern biogas plants have become one of the best inventions of this kind. Biogas is a mixture of methane, carbon dioxide and small amounts of impurities. Methane content in biogas determines its energy value and it differs depending on the type of substrate – the material from which biogas is obtained. Therefore, to assess the potential is not used the amount of biogas, and the amount of methane of the biogas origin – biomethane is used. The animal waste (manure, dung), crop waste (straw), agricultural products processing waste (tops and marc of sugar beet, milk plant's waste, sparging) are commonly used as substrate. A promising substrate source is also energy crops (corn silage, sorghum, topinambour), which are grown specifically for biogas production [9].

6. Conclusions and recommendations for further researches

As climate changes require a revision of crop rotation in favour the drought-resistant crops, the sorghum is a promising crop for cultivation of grain, green fodder and especially for the production of alternative fuels - biofuels. The grain sorghum and silage sorghum are mainly grown in Ukraine, which is a valuable fodder crop for arid areas. The main task of breeding is creation of the early ripening varieties and hybrids with high productivity, resistant to diseases and pests.

The sorghum crop production problem is successfully solved in case it will not be separated from the general economic context and it will be treated systematically. And it is necessary to scientifically justify the volume of grain sorghum production and technological costs based on systematization and restoration of gene pool of the sorghum cultures.

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Розвиток ринку сорго в Україні під впливом світових тенденцій

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Анотація. Висвітлено результати досліджень з вивчення розвитку ринку сорго, проаналізовано законодавчі ініціативи підтримки вирощування сорго в деяких країнах світу. Встановлено, що сорго є досить поширеною сільськогосподарською культурою в останні роки в Україні та світі. Наведено результати досліджень щодо обсягів виробництва сорго в світі в порівнянні з виробництвом інших культур. Встановлено, що світове виробництво сорго невпинно зростає. Україна як аграрна країна є одним з найбільших виробників сільськогосподарських культур, і сорго для України має значний

потенціал. Розглянуто тенденції у виробництві і експорті сорго, чинники стабілізації вітчизняного зернового ринку. Оцінюються перспективи розвитку виробництва сорго на основі матеріалів міжнародної статистики і передбачень. Доведено, що збільшення виробництва сорго в Україні на сьогодні стає гострою проблемою, яка може бути вирішена за рахунок ширшого використання можливостей сорго.

Ключові слова: сорго, виробництво, експорт, ринок, обсяг продажу, ефективність.

Author details (in Russian)

Развитие рынка сорго в Украине под влиянием мировых тенденций

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Аннотация. Представлены результаты исследований по изучению развития рынка сорго, проанализированы законодательные инициативы поддержки выращивания сорго в некоторых странах мира. Установлено, что сорго является довольно распространенной сельскохозяйственной культурой в последние годы в Украине и мире. Приведены результаты исследований по объемам производства сорго в мире по сравнению с производством других культур. Установлено, что мировое производство сорго неуклонно растет. Украина как аграрная страна является одним из крупнейших производителей сельскохозяйственных культур, и сорго для Украины имеет значительный потенциал. Рассмотрены тенденции в производстве и экспорте сорго, факторы стабилизации отечественного зернового рынка. Оцениваются перспективы развития производства сорго на основе материалов международной статистики и предсказаний. Доказано, что увеличение производства сорго в Украине на сегодня становится острой проблемой, которая может быть решена за счет более широкого использования возможностей сорго.

Ключевые слова: сорго, производство, экспорт, рынок, объем продаж, эффективность.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <http://sepd.tntu.edu.ua/images/stories/pdf/2015/15dniogt.pdf>

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