

AGROⁱⁿLOG

INTEGRATED BIOMASS LOGISTICS CENTRES FOR THE AGRO-INDUSTRY

Basic analysis of targeted agricultural sectors

D6.2.4 Country Report Ukraine

Project AGROinLOG “Demonstration of innovative integrated biomass logistics centres for the Agro-industry sector in Europe”

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Prepared by: UCAB

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ABBREVIATIONS

UCAB: Association “Ukrainian Agribusiness Club”

SSSU: The Statistics Service of Ukraine

UABIO: Bioenergy Association of Ukraine

IBLC: Integrated biomass logistics centre

IFC: The International Finance Corporation

PARTNERS SHORT NAMES

CIRCE: Fundación CIRCE

WFBR: Wageningen Food & Biobased Research

ZLC: Fundación Zaragoza Logistics Centre

CERTH: Ethniko Kentro Erevnas Kai Technologikis Anaptyxis

RISE: RISE Research Institutes of Sweden AB

CREA: Consiglio per la Ricerca in Agricoltura e L'analisi dell' Economia Agraria

APS: Agroindustrial Pascual Sanz S.L

NUTRIA: Anonymi Biomichaniki Etairia Typopiisis Kai Emporias Agrotikon

LANTMÄNNEN: Lantmännen Ekonomisk Forening

Processum: RISE Processum AB

SPANIS CO-OPS: Cooperativas Agro-Alimentarias de España. Sociedad Cooperativa

INASO: Institutouto Agrotikis Kai Synetairistikis Oikonomias INASO PASEGES

AESA: Agriconsulting Europe S.A

UCAB: Association Ukrainian Agribusinessclub

UBFME: University of Belgrade. Faculty of Mechanical Engineer

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EXECUTIVE SUMMARY

The report analyses the four sectors of the Ukraine’s economy: grain chain, vegetable oil extraction, sugar industry, and feed and fodder. Each sector chapter consists of two main parts: a general sector description and a part concerning sector’s interest from the IBLC concept of view. The grain chain and vegetable oil extraction sectors generate significant amounts of by-products and residues, during the primary production of respective crops, as well as during the later stages of industrial processing. These residues can be used as feedstock for production of solid biofuels (e.g. straw pellets). The demand for solid biofuels has also been growing in Ukraine in the recent years. In the vegetable oil extraction sector exists a constant surplus in processing capacities, which constitutes a potential opportunity for IBLC. Logistics seems to be the main obstacle for further development of this market. Another obstacle is the general low awareness of the possibilities and benefits offered by handling of biomass.

The sugar industry sector also generates residues and by-products, which can be used as biomass feedstock – primarily sugar beet press and molasses. The first, in particular, is used for production of biogas, and the second one for the production of bioethanol. There are some sugar producers in Ukraine, which have experience of using biofuels (biogas, solid biofuels) to power sugar plants. However, those are still isolated cases which rely exclusively on their own supply of biomass and its processing into biofuels. The sugar beet press is very difficult to transport, as it spoils fast. Molasses on the other hand, can be stored and transported much more easily. There also currently exists a surplus in production capacities at distilleries in Ukraine, which in theory could be used to process molasses into bioethanol.

The feed and fodder sector doesn’t seem to offer any biomass related residues, but does also have a significant surplus in processing capacities. These can be used for physical processing (dehydration, granulation etc.) of grain and vegetable biomass feedstock generated by other sectors into solid biofuels.

See Chapter 6 “Summary analysis of the country” for a more detailed summary on every sector.

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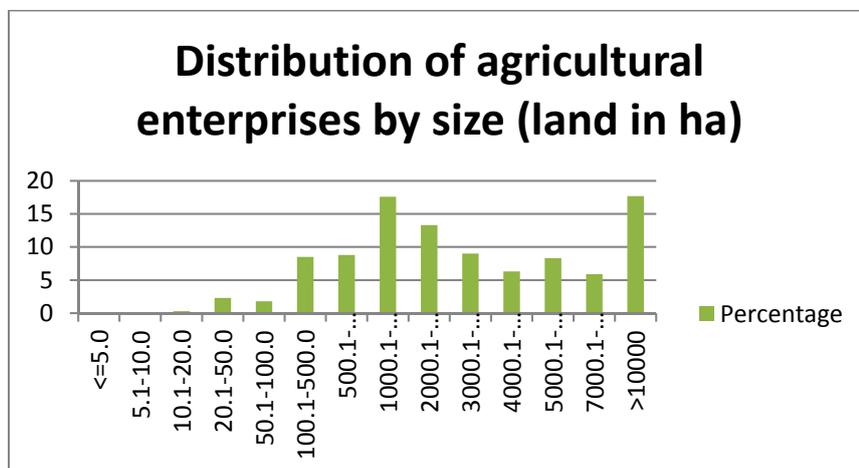
1 INTRODUCTION

This desk-study was written as a part of the AGROinLOG project “Demonstration of innovative integrated biomass logistics centres for the Agro-industry sector in Europe” and is written within the scope of the Task 6.2 “Basic analysis of targeted agricultural sectors”. This report aims at providing an actual overview of the state of a selected number of sectors, as well as with their specifics with respect to the IBLC related topics. The following sectors of the Ukrainian agricultural industry are considered: the grain chain, the sugar industry, the feed and fodder and the vegetable oil extraction. Another goal is to determine, whether there is potential in all or in some of the selected sectors for implementation of the IBLC concept. Therefore, each sector chapter effectively consists of two parts: an overview and an assessment of IBLC opportunities.

The four sectors of the agricultural industry were selected primarily because they are (to a various extent) well developed in Ukraine in comparison to others, and also because they either yield significant amounts of biomass residues and by-products, or are known to have idle production/processing/storage capacities, or both. These, from the IBLC concept point of view, may offer opportunities for potential synergies.

This report is based primarily on the analysis of the available literature, the overview of which is provided in the Annex A, publicly available statistical information, as well as some proprietary information which UCAB as an association of agri-businesses has, additionally it has been also complemented by the feedback received from selected stakeholders – these were the companies and organizations also interviewed for the Task 7.2. Among these stakeholders were represented agricultural producers, in addition to other organizations, such as for example sector-specific associations.

Ukraine differs from other European countries in that Ukraine has many agricultural companies that control a very large land area. Figure 1 illustrates the distribution of companies by the size of the land they work with.



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Figure 1. Distribution of agricultural enterprises in the Ukraine, by size of agricultural land as of November 1, 2015. Source: SSSU, 2015

As figure 1 illustrates, most of the agricultural enterprises work (not own) with a land bank over 1,000 ha. About 17 % of agricultural enterprises work with land banks of over 10,000 ha.

Another important issue is the number of employees in each sector. Although, this information should be provided in the 4th subsection of each chapter, the State Statistics Service of Ukraine doesn't provide specific sector information, but rather the aggregated data for the agricultural industry as a whole. The approximate shares of each sector may then be implied from respective sector sizes. So in 2015 there were 560,300 persons officially employed in agriculture, forestry and fishing. With the following distribution among the enterprises by size.

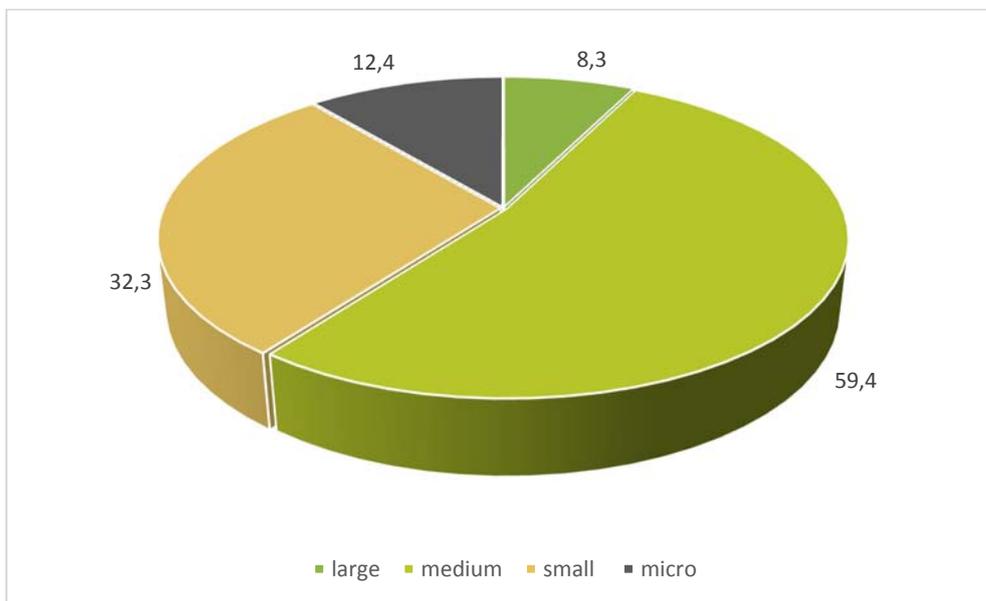


Figure 2. Share of enterprises (%) by size category for employees number. Source: SSSU, 2015.

Figure 2. illustrates that large enterprises employ only about 8.3 % of people working in the agricultural sectors, whereas mid-sized enterprises employ roughly 60 %.

The most significant challenge that has come up during the work on this report, is, undoubtedly, the lack of relevant statistical information. Unfortunately, on the industry-level often no data regarding the residues and by-products is being gathered at all. Some enterprises may be aggregating their own statistics about their operations, but in most cases they are extremely reluctant to share this information for whatever the reasons may be. Most likely, they are afraid that information will leak and it might compromise their businesses or benefit their competitors.

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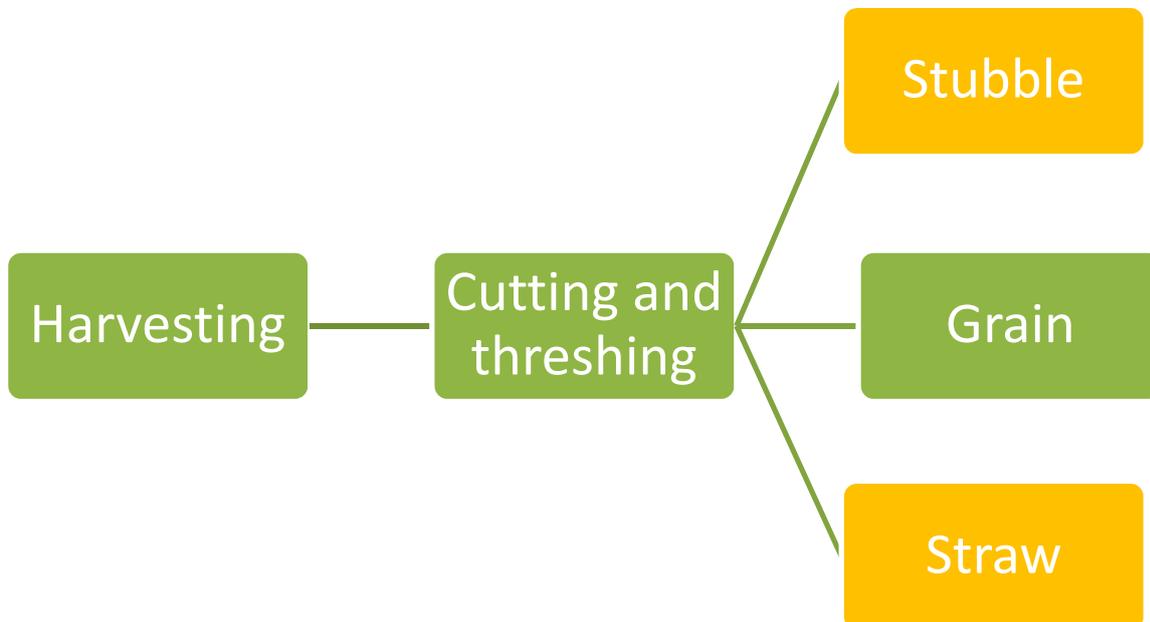
GRAIN CHAIN

2.1. Profile of the grain sector

2.1.1. Production

Understandably, the exact input products, as well as the precise processing technology used vary from grain crop to grain crop. The input products required for production of grain crops usually are: seeding materials, fertilizers, plant protection products, specialized agricultural equipment, fuel and lubricants. Main stages in grain crops production are pre-sowing tillage, seeding, applications of fertilizers, application of plant protection products. Then, harvest, storage and, possibly, processing.

In the case with grain crops, residues occur on the stages of harvesting or processing. This sequence of production stages might be different for various crops. The final products are the respective grains, which may be consumed, exported or processed into other products, but certain by-products are produced as well. For such grain crops like wheat and barley there are possible by-products, which are generated during harvesting: stubble and straw.

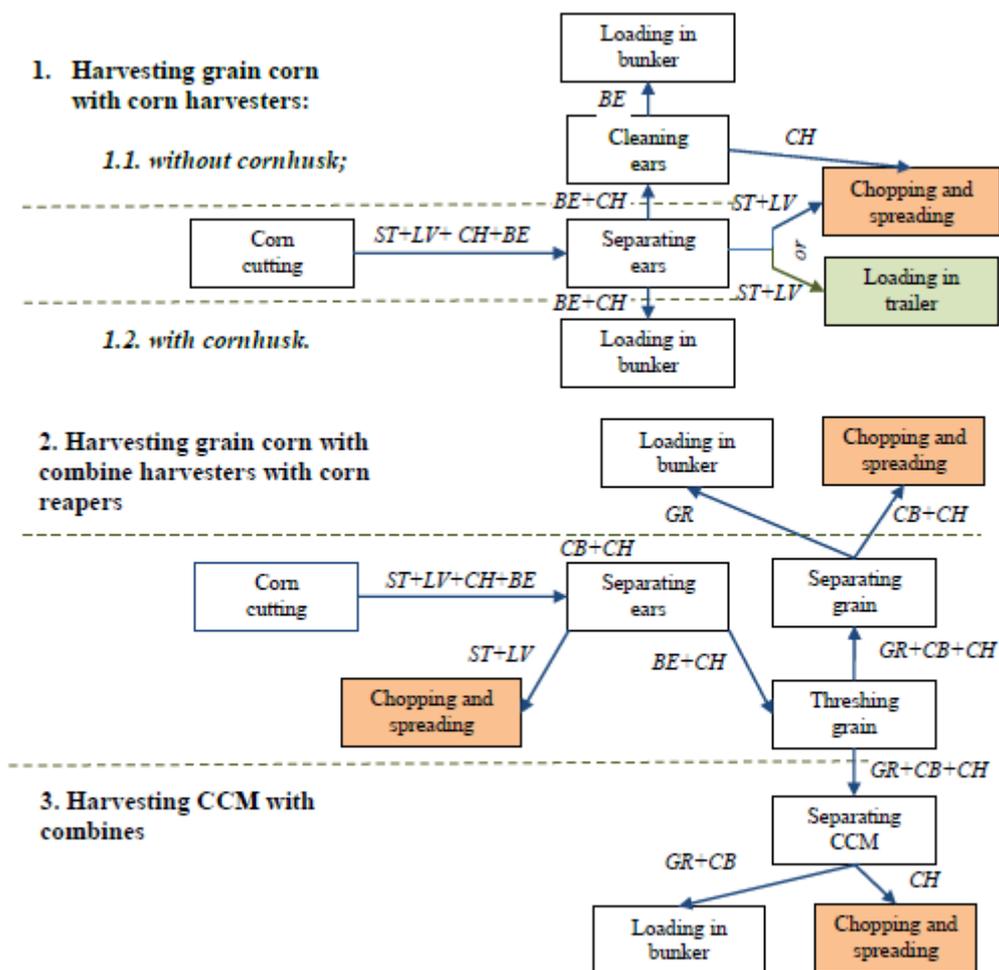


*Figure 3. Generalized scheme of by-products generated by harvesting of main grain crops.
Source: UCAB, 2018.*

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During harvesting, when wheat-ears are cut, stubble is being left on the field. After that, wheat-ears are being threshed inside a combine harvester and grains are being separated. Whereas straw is being thrown back onto field. For barley the harvesting process is the same. For corn, harvesting process is more complex.

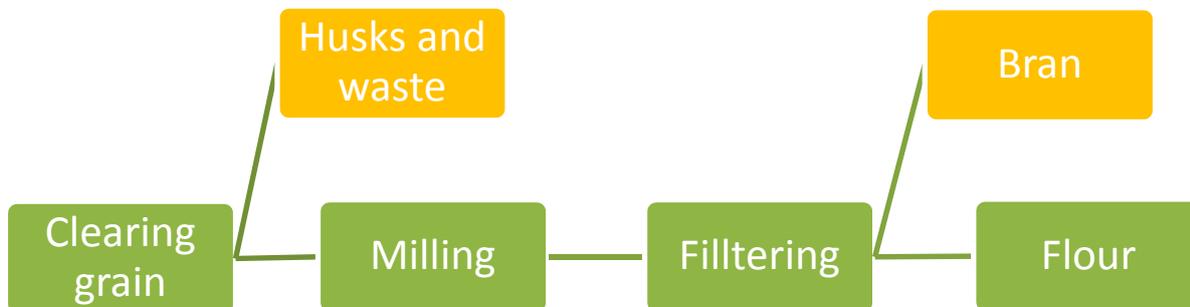
Most by-products, in terms of their ratio to total mass, are generated by corn. In case with corn crop there is, of course, final product in form of corn grains and various by-products: leaves, stalks, corncobs, and cornhusk. By-products are generated by the process of corn threshing, when grain is separated from the rest. Usually, corn threshing is performed directly in the field by a combine harvester. The grain usually accounts for 35-40 % of total mass. (UABIO 2016: 15) The figure below illustrates different harvesting techniques for corn.



GR – grain; ST – stalk; LV – leaves; CB – cob; CH – cornhusk; BE – bald ear (BE = CB+GR)

Figure 4. Harvesting techniques for corn.
Source: UABio Position Paper, N16, 2016

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*Figure 5. Generalized scheme of processing grains into flours.
Source: UCAB, 2018*

The grain crops then are used in agro-processing industry, mainly for the production of flours and groats. The main by-products four-grinding and groats production are bran and husk. Bran is usually further used in food and baking industry, or for production of mixed feeds for farm animals, as bran is highly nutritious. Whereas husk is either wasted or, in some cases, used for production of biofuels.

2.1.2. Volume of the sector

According to the recently published data by the SSSU for the year 2016, the production of grain crops (including leguminous crops) totalled a little more than 51 million tonnes. Grain crops also constitute the biggest sown areas under agricultural crops. According to the official statistics that area was equal to 14.4 million hectares (excluding the area occupied by the Russian Federation - Crimea and the eastern parts of the Donbas region)¹⁾ in 2016.

The main grain crops produced in Ukraine are wheat, corn and barley. Among those corn has a leading position. In the marketing year 2016/17 Ukrainian agricultural producers produced 28 million tonnes of corn. In second position is wheat. In the 2016/17 marketing year 26 million tonnes of wheat were produced. The third in line is barley. In the marketing year 2016/17 in Ukraine more than 9 million tonnes of barley were produced.

¹⁾ If not specified otherwise, all data provided by the SSSU from the year 2014 and on doesn't cover these territories.

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Table 1. Historical production volumes for wheat, corn, barley, 2007 – 2017, in million tonnes.

Source: SSSU, 2017.

Historical production volumes (wheat, corn, barley), in 2007 – 2017, million tonne			
Marketing year	Wheat	Corn	Barley
2016/17	26.0	28.0	9.4
2015/16	26.5	23.3	8.2
2014/15	24.1	28.4	9.0
2013/14	22.2	30.8	7.3
2012/13	15.7	20.9	6.9
2011/12	21.4	22.8	8.3
2010/11	16.5	11.9	8.4
2009/10	20.8	10.4	11.8
2008/09	25.8	11.4	12.6
2007/08	13.9	7.4	5.9

Concerning the number of companies in the grain sector, the SSSU provides data for 2015 meaning it may be different today. In the recent years a trend for scaling in the grain crops sector has been observed, which results in a slight decrease in the total number of agricultural enterprises, but at the same time a higher average number for an enterprise's land bank. In Ukraine, under the term 'land term' is understood not the quantity of land legally owned by an enterprise, but the total sum of arable land it cultivates. Given that the moratorium on selling agricultural land is still in force, most agricultural producers cultivate land they rent, but do not own. In 2015 there were 34,505 companies, large and small, operating in the grain and leguminous crops sector. The largest share of them was growing wheat: 23,562 companies. On the second place are the companies growing corn – in 2015 there were 13,136 companies. The third biggest category are the companies growing barley: 12,774. The following figures 3-8 below illustrate the geographical spreading, or rather geographical intensity of the three main grain crops production in Ukraine, as well the processing of the respective grains.

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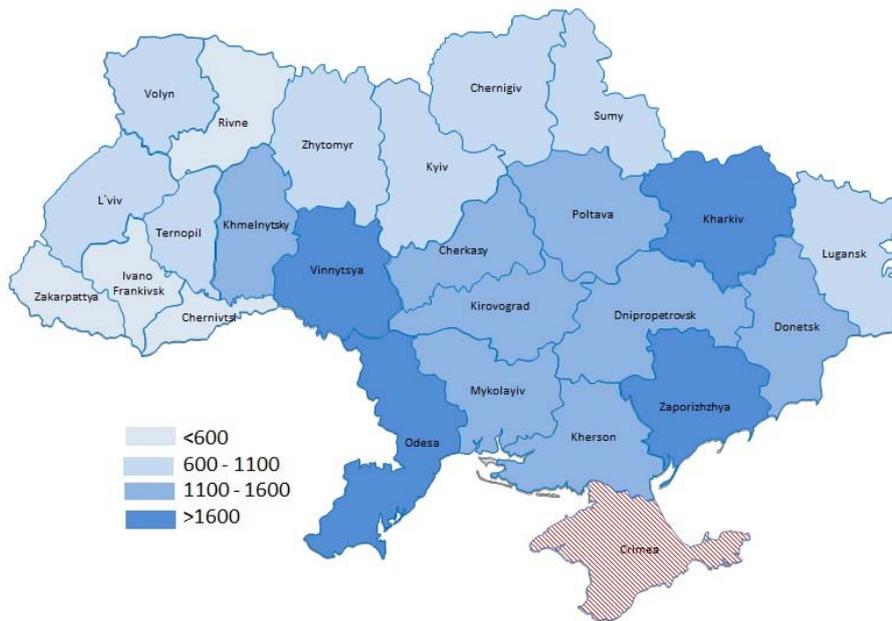


Figure 6. Gross production of wheat in 2016 in different regions, in '000 tonnes.
Source: UCAB based on the SSSU data (2017).

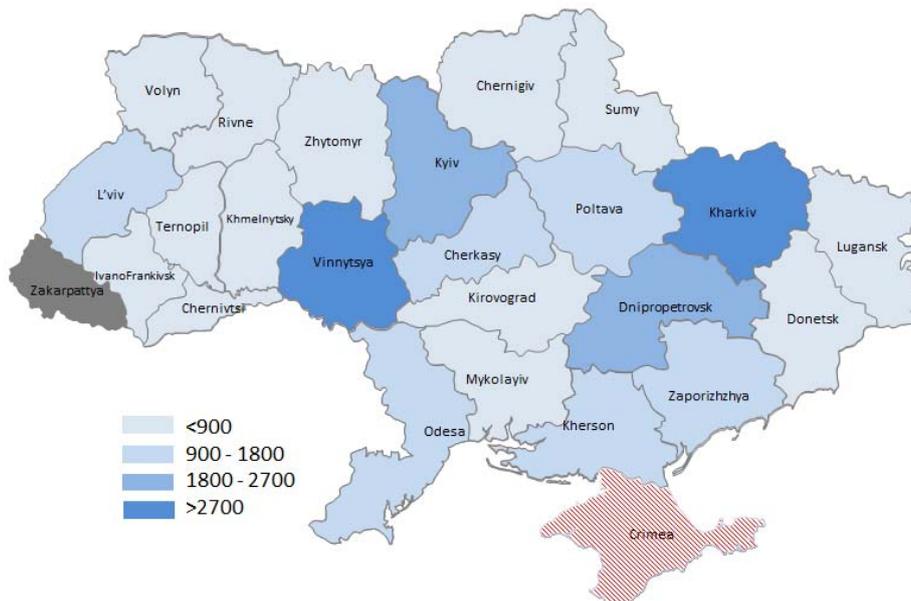


Figure 7. Gross processing of wheat in 2016 in different regions, in '000 tonnes.
Source: UCAB based on the SSSU data (2018).

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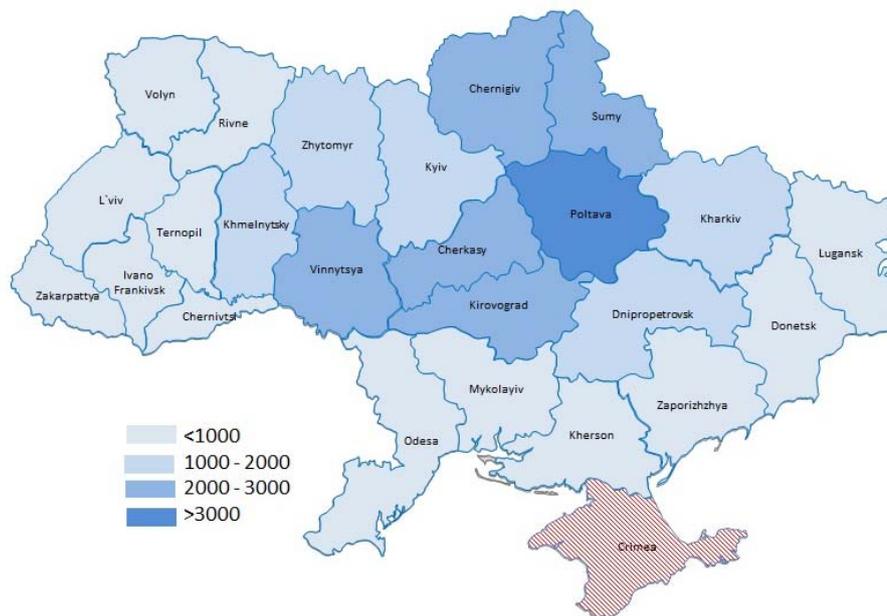


Figure 8. Gross production of corn in 2016 in different regions, in '000 tonnes.
Source: UCAB based on the SSSU data (2017).

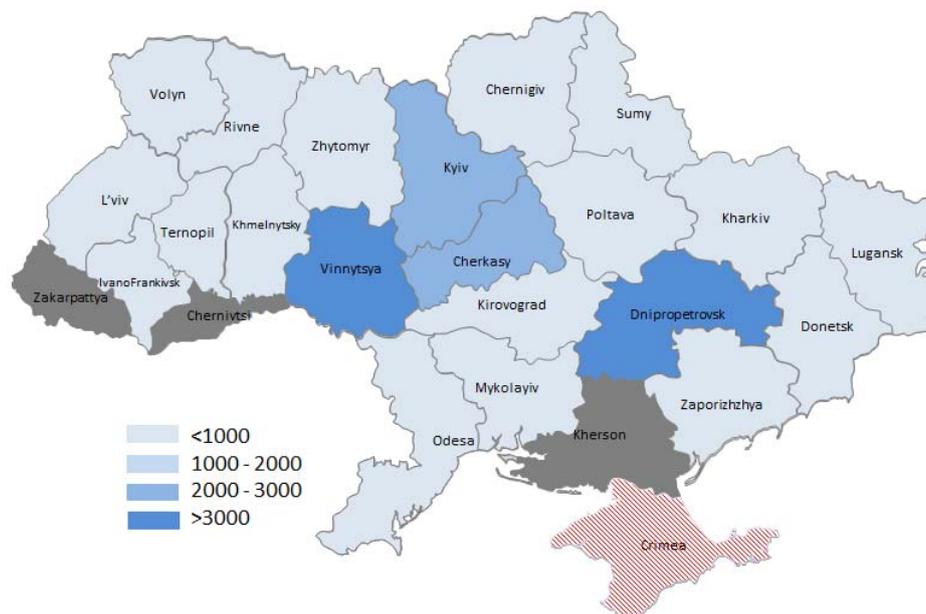


Figure 9. Gross processing of corn in 2016 in different regions, in '000 tonnes.
Source: UCAB based on the SSSU data (2018).

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Figure 10. Gross production of barley in 2016 in different regions, in '000 tonnes.
Source: UCAB based on the SSSU data. (2017)

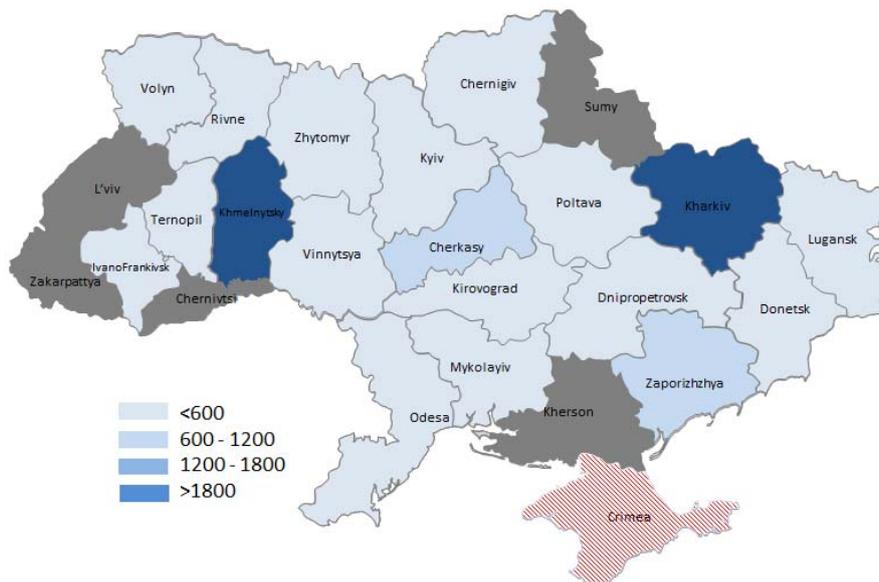


Figure 11. Gross processing of barley in 2016 in different regions, in '000 tonnes.
Source: UCAB based on the SSSU data. (2018)

Let's now take a look a little farther down the value chain, namely the processing stage for the three main grains. According to the most recent data – again, focusing on the 2016/17 marketing year – 3.79 million tonnes of wheat, 0.68 million tonnes of corn and 0.43 million tonnes of barley went into industrial production in Ukraine. These amounts accounted for 14.5 %, 2.42 % and 4.77 % of total

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production volumes of wheat, corn and barley respectively. The rest of the respective commodities was mostly exported or domestically consumed.

The end-products produced by grain industries are flours, groats and other ground products, as well as grain corns processed into flakes, crushed or finely chopped. Only data covering the time period 2013-2015 is currently available on the SSSU website.

Table 2. Volumes of end-products produced by the Ukrainian grain chain industries. Source: SSSU (2016)

Grain chain industries grain products			
Product, in tonnes	2015	2014	2013
Wheat flour, wheat-rye flour	1,068,778	1,126,082	1,265,140
Flour from other grain crops	75,651	90,490	156,903
Groats and ground products from wheat	47,431	41,749	36,875
Groats from other grains and cereals	146,692	170,450	154,101
Grain crops' corns processed into flakes, crushed, finely chopped	24,833	17,892	22,232

2.1.3. State of the sector

Although the Ukrainian soil is considered to be very suitable for agriculture and is one of the most productive in the world, the Ukrainian agricultural yields fall behind in comparison to those in other European countries due to a lack of financing, outdated equipment and the underdeveloped technology. Nonetheless, as from 2016 the grain sector (including the leguminous) has achieved the highest yields in Ukrainian history, averaging at 4.61 tonne per ha. Table 1 presents an overview of the average yields in the grain sector for a ten-year period.

*Table 3. Historical average yield for grains & leguminous.
Source: SSSU, 2017.*

Historical average yield (grains & leguminous), yields for wheat, corn, barley in 2007 – 2016, tonne/ha				
Year	Average yield	Wheat	Corn	Barley
2016	4.61	4.2	6.6	3.3
2015	4.11	3.8	5.7	3.0
2014	4.37	4.0	6.1	3.0
2013	3.99	3.3	6.4	2.4
2012	3.12	2.8	4.8	2.1
2011	3.70	3.2	6.5	2.3
2010	2.69	2.6	4.5	2.4
2009	2.98	3.0	5.0	2.4
2008	3.46	3.6	4.7	3.0
2007	2.18	2.3	3.9	1.3

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Table 4. Receipt for processing by grain chain industries of wheat, corn, barley. Source: SSSU, 2017.

Receipt for processing by grain chain industries of wheat, corn, and barley in 2012 -2016, in million tonnes.			
Year	Wheat	Corn	Barley
2016	24.8	26.5	6.7
2015	21.2	28.2	6.2
2014	19.4	28.7	6.3
2013	17.2	30.5	3.9
2012	16.3	25.7	4.7

Concerning the state of the sector, the SSSU provides data on total amounts of different agricultural crops raw stuff the processing industries have received for processing. The changes in how much of raw commodities actually were sent for processing each year can provide some impression on how the sector – certain segments of it – is doing. As the table above illustrates, the processing of wheat has been steadily increasing during the last 5-year-period, as well as that of barley, whereas processing of corn has first experienced an upswing, but then started to decline and in 2017 may have return to the levels of 2012.

2.1.4. Typical size of the companies

Diagrams showing the number of companies separated into categories by gross production for the three major grain crops is presented below.

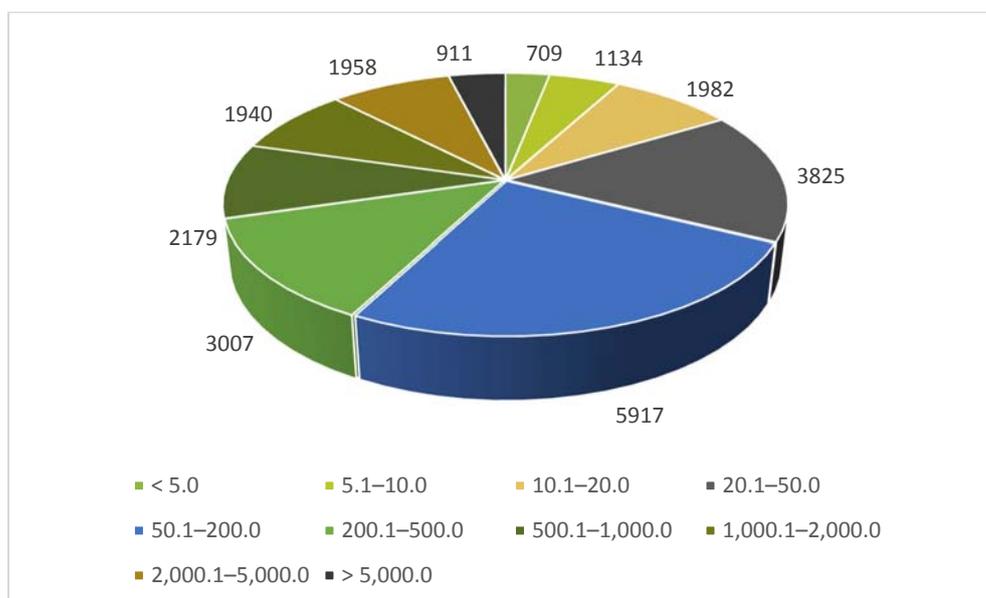


Figure 12. Number of companies growing wheat by gross production (in tonnes). Source: SSSU, 2015.

As we can see from the diagram above, the most numerous categories of wheat producers are enterprises producing between 50.1 – 200 tonnes per year (5,917 enterprises), 20.1 – 50 tonnes

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(3,825) and between 200 – 500 tonnes (3,007). These three categories of agricultural enterprises - 12,749 producers - are producing a little bit over 50 % of all wheat.

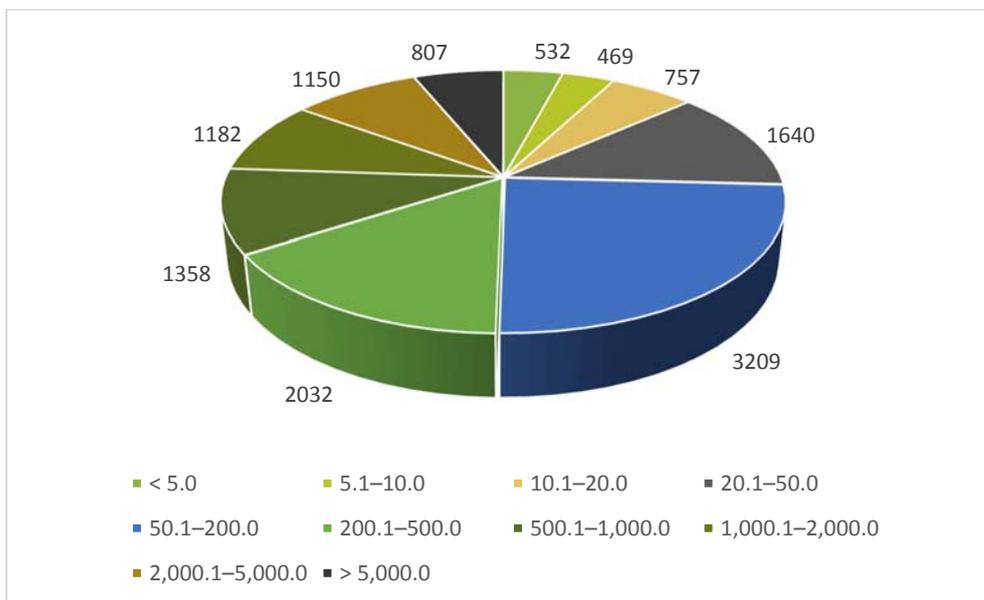


Figure 13. Number of companies growing corn by gross production (in tonnes). Source: SSSU, 2015.

In comparison to wheat production, the production of corn is shifted to the side of bigger producers. The three main categories are the ones producing between 50.1-200 tonnes (3,209), 200.1-500 (2,032) and 500.1-1,000 tonnes (1,358).

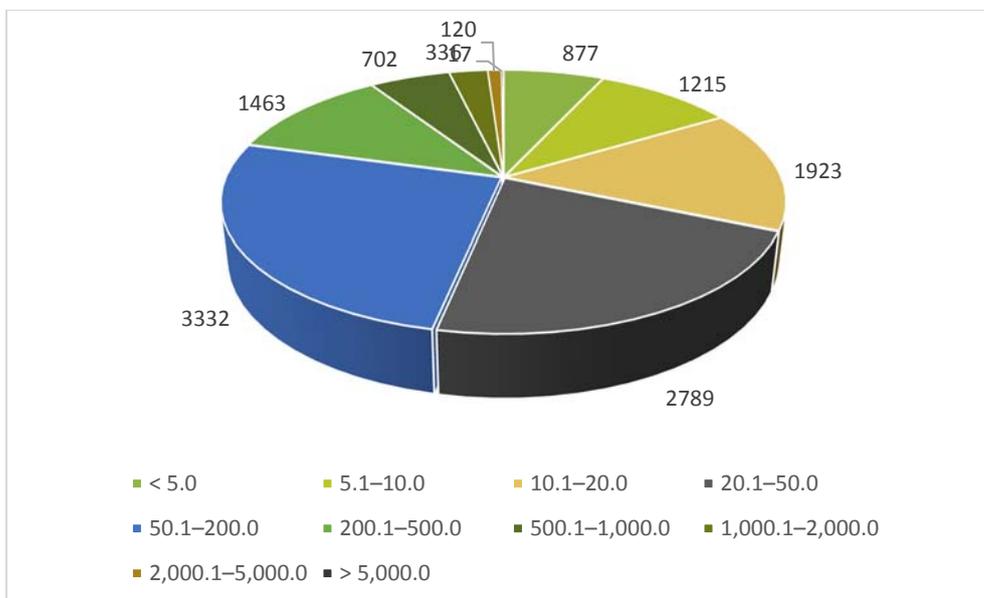


Figure 14. Number of companies growing barley by gross production (in tonnes). Source: SSSU, 2015.

And the barley production is dominated by small agricultural producers. The most numerous categories are the ones with gross yearly production between 10.1-20 tonnes, 20.1-50 tonnes and 50.1-200 tonnes.

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2.1.5. Distinctive facilities of the sector

Grains are mainly processed into flours. Unfortunately, the exact data on industries processing grains into flours is available only for 2014. In that year 15 biggest companies produced about 42 % of total production volume. The biggest grain processing facilities are located in Central and Eastern parts of the country.

Table 5. The top 15 flour producers in Ukraine, 2014. Source: UCAB.

Top 15 flour producers, production share (%)		
Rank	Year	Share
1	KYIVMLYN	6,0%
2	NOVOPOKROVSKYI COMBINAT KHIBOPRODUKTIV	5,0%
3	DNIPROMLYN	4,7%
4	VINNYTSKYI COMBINAT KHLIBOPRODUKTIV № 2	3,8%
5	TOV "COMBINAT KHIBOPRODUCTIV "TALNE"	3,7%
6	DP "CULINDORIVSKYI COMBINAT KHIBOPRODUKTIV"	2,6%
7	TOV COMERZIYNO-VYROBNYTCHA FIRMA "ROMA"	2,5%
8	TOV "TORHIVELNA COMPANIYA "UROZHAY"	2,4%
9	PAT "LUHANSKMLYN"	2,4%
10	PAT "CROLEVETSKYI COMBINAT KHLIBOPRODUKTIV"	2,0%
11	TOV "ENLIL"	1,7%
12	DOCHIRNE PIDPRYEMSTVO "DP AGROSERVIS 2000"	1,5%
13	TOV "KHMELNYTSK-MLYN"	1,4%
14	PAT "VINNYTSYA-MLYN"	1,4%
15	COLECTYVNE PIDPRYEMSTVO "BILOTSEKIVKHLIBOPRODUKT"	1,3%
Total		42,4%

2.1.6. Degree of innovation

The SSSU does not provide any specific industry-level innovation index. The application of innovative technologies probably varies from company to company. When considering innovations in the segment of biomass production, innovation capacities are rather low. Currently, a large part of the crop residues are left in the field to waste. In some cases, crop residues are burned on the field, although this practice is prohibited by law. There are various reasons for that: some farmers consider it as an additional fertilizer, some simply do not have means to collect it from the fields. This is especially the case with corn, because the dominant method of grain harvesting is “the cobs threshing by combine in the field, shredding and spreading truncated mass”²⁾ by using combine harvesters with corn reapers. Although there is technology on the market (combine harvesters) that

² Dragnev, Zheliezna, Geletukha (2016), p. 13

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would allow harvesting corn with cobs, and following stationary threshing and collecting of cobs.³⁾ However, that technology is more expensive and therefore it is hardly used.

Grain chain processing industries generate a substantial amount of residues, which can be used as biomass. This issue is discussed later in the report (see Section 2.2.1.). But it is unknown whether these industries have any experience of handling biomass.

2.1.7. Miscellaneous

The grain chain sector in Ukraine has some sustainability issues, which are getting sounded in public more often nowadays. The first one is common for the whole agricultural industry, namely crop rotation and soil deterioration, meaning that agricultural producers in pursuit of highest possible gains can be short-sighted and tend to ignore crop rotation. This of course has a negative effect in the long run on the soil quality. The issue is also intensified by the fact that most of arable land is rented. The second issue is the one concerning stubble. What should be done with, should be left in the field, should be tilled into the soil? Although it is illegal⁴, in Ukraine stubble will be often burned in the field, which possess significant environmental hazard as well as strengthens soil deterioration, as it destroys the useful bacteria in the soil. The first issue cannot be directly related to the IBLC concept, whereas the second one is relevant, as stubble potential is a very potent source of agricultural biomass. It is unclear, whether are sustainability issue farther up the grain chain.

2.2. Opportunities IBLC

2.2.1. Sector related residues

The grain sector generates a variety of residues and by-products, which can be used directly as feedstock for biomass production or pre-processed into secondary products. Almost on every stage of the grain chain – crop harvesting and further crop processing - residues are produced. Among the primary residues are for example wheat straw, corn stems, sunflower husks etc. These represent a cheap and at the same time rich in lignocellulose feedstock for bioenergy generation.⁵⁾

³ See *ibid.*

⁴ See Art. 77-1 in the Code of Ukraine on Administrative Offenses, Art. 16. 22 in the Law of Ukraine “On the Protection of Atmospheric Air”, Art. 27 in the Law of Ukraine “On Flora”, Art. 36 in the Law of Ukraine “On Fauna”

⁵ See Dam van, J.E.G., Elbersen, W., Ree van, R. (2014) Setting Up International Biobased commodity trade chains, p. 55

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Grain crops residues are often used for the production of solid biofuels. Production of briquettes and pellets, which are becoming a popular energy source (fuel for boilers) in rural areas, which is a segment that is developing rapidly.⁶

As for available residues, the Bioenergy Association of Ukraine in one of their recent research papers⁷ estimate that only about 3 % of residues from production of grain crops is being currently used for biomass, based on other estimate that on average 70 % of agricultural residues are being left in the field. Although, as was stated by a stakeholder, the issue of stubble left in the field is a complicated one⁸. Because stubble left in the field provides positive fertilizing effect. So there is obviously a conflict of interests and it is not clear at the moment in which case grain crops stubble would generate a higher utility.

The data on residues and by-products generated by the agro-industry at the moment this country report was written was available for the time frame 2013-2015. The data is published for the three groups and is represented in the table below.

Table 6. Volumes of by-products and residues produced by the Ukrainian grain chain industries. Source: SSSU, 2016.

Grain chain industries by-products and residues			
Category, in tonnes	2015	2014	2013
Bran, waste and other residue from corn	48,059	38,904	51,370
Bran, waste and other residue from wheat	404,440	405,762	447,579
Bran, waste and other residue from other grain crops	31,343	38,326	41,723

As can be seen in table 4, in 2015 the Ukrainian grain chain producing industries generated in total 0.48 million tonnes of bran and other residues. Unfortunately, the official statistics do not specify the shares of separate by-products.

Most of these residues are further processed or used as feed for farm animals. Unfortunately, there is no data available that would allow to make precise statements about what part of these residues is further used and what part is wasted.

2.2.2. Potential synergies & benefits

The IBLC concept assumes that possible synergies may arise through the seasonality effect: meaning e.g. that some industry facilities are underused during specific time period of the year, and thus can be used for storage or processing of biomass. Accordingly, the first step in order to identify such

⁶ See Kalnitskaya, J. (2013): Business opportunities in the bio-based economy in Ukraine, p. 34

⁷ See UABIO (2017): Report “Comprehensive analysis of the Ukrainian biomass pellets market”, p. 64

⁸ See Section 2.1.7

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synergies is to identify seasonality patterns in grain chain industries. The table below illustrates the production volumes of flour and groats for each month for the year 2016.

Table 7. Production volumes of flour and groats in each month of 2016. Source: SSSU, 2017.

Production volumes of flour and groats in Ukraine in 2016 by month					
Month	Flour	Groats	Month	Flour	Groats
January	132,536	18,148	July	148,531	24,624
February	160,795	28,678	August	175,684	33,016
March	166,721	26,795	September	180,625	35,047
April	164,317	24,900	October	180,018	30,836
May	130,778	19,496	November	176,143	34,262
June	132,073	20,137	December	180,227	34,474

As we can see from table 5, the most productive month of the grain chain industry is September, for flour production and groats production alike. To see a pattern, let's convert the numbers above into indices, while setting the September outputs to 100.

Table 8. Production indices of flour and groats for 2016, Sep = 100. Source: UCAB, 2017.

Production volumes of flour and groats in Ukraine in 2016 by month					
Month	Flour	Groats	Month	Flour	Groats
January	73.38	51.78	July	82.23	70.26
February	89.02	81.83	August	97.26	94.20
March	92.30	76.45	September	100.00	100.00
April	90.97	71.05	October	99.66	87.98
May	72.40	55.63	November	97.52	97.76
June	73.12	57.46	December	99.78	98.37

There seem to be two low-intensity production periods, namely in January and in May-July. Especially production falls for groats – almost to half of the 'high-period'. It can be assumed that available biomass residues from the primary grain chain production, such as straw, stems, husk etc., might be used during the 'low-intensity periods' in the grain chain industries for storage or, perhaps, mechanical pre-treatment – for example for grinding or crushing.

This synergy would result in increased volumes in production of biomass, which would lead to higher supply of biofuels and further stimulate ever growing demand for it.

It is difficult to say, whether there would be a significant positive effect on employment. But agricultural producers, small and big alike, most certainly will gladly welcome an alternative economic way of dealing with residues and by-products of primary agricultural production.

2.2.3. Market developments

The Ukrainian market for biomass made of residues of grain crops, primarily for straw pellets, has been developing rapidly in the recent years. In the first six months of 2016 Ukraine has produced

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146,010 tonnes of grain straw-based pellets (about 175,000 tonnes during the whole 2015).⁹⁾ The average growth rate per year since 2013 was 35 %.¹⁰⁾ As of June 2016, there were 65 enterprises specializing in biomass production based on grain crops residues. Whereas production can be characterized as concentrated and specialized, meaning these producers are unequal. So from the total of 65 only 4 companies – Avers-Tech, Bioenergy-Vinnytsya, Win-Peleta and Creative-Agro – produce one third of the whole volume. Accordingly, production of grain-residues biomass is also unequally distributed though the geographic regions of Ukraine. It is concentrated primarily in the centre of the country, and also in the southern oblast of Odesa.

The UABIO estimates the average load factor of producers of this type of biomass to be 0.3-0.4.¹¹⁾ This means that producers are anticipating higher demand in the future, and there is potential to significantly and in short term increase production volumes if needed.

Logistics and the lack of infrastructure seems to be indeed one of the major barriers on the way connecting biomass suppliers-producers-buyers. These three groups of market actors already seem to have developed a certain interest in using biomass, first and foremost as fuel for bioenergy, though unable to find appropriate models of cooperation.

2.2.4. Non-technical barriers

Unfortunately, only a small share – about 30 % - of the mentioned above residues is used as biomass for bioenergy generation, whereas the rest is used as animal feed, soil fertilizer or even simply – illegally – burnt in the field.¹²⁾ Grain stems collection requires specialized equipment, which is often not available.

A survey conducted by the IFC from 2015, has shown that the obstacles most mentioned for implementing biomass/bioenergy projects are “the large initial investment requirements and the lack of government support”¹³⁾. Although about 13-14 % of the surveyed farms consider using biomass either as a solid biofuel or for biogas production (mainly for own consumption), only 2 % of the surveyed farms have moved to actually planning such an investment.¹⁴⁾

Last but not least, is the very low awareness among agricultural producers about what they can do with available biomass, or respectively how could they be using their seasonally idle equipment.

There seem to be no any particular legal or political barriers for IBLC implementation at the time.

⁹⁾ See Dam van, J.E.G., Elbersen, W., Ree van, R. (2014) Setting Up International Biobased commodity trade chains, p. 64

¹⁰⁾ See *ibid.*

¹¹⁾ See *ibid.*, p. 65

¹²⁾ See Kalnitskaya, J. (2013): Business opportunities in the bio-based economy in Ukraine, p. 34

¹³⁾ IFC: Survey findings (2015), p. 25

¹⁴⁾ IFC: Survey findings (2015), p.25

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3. VEGETABLE OIL EXTRACTION

3.1. Profile of the vegetable oil extraction sector

3.1.1. Production

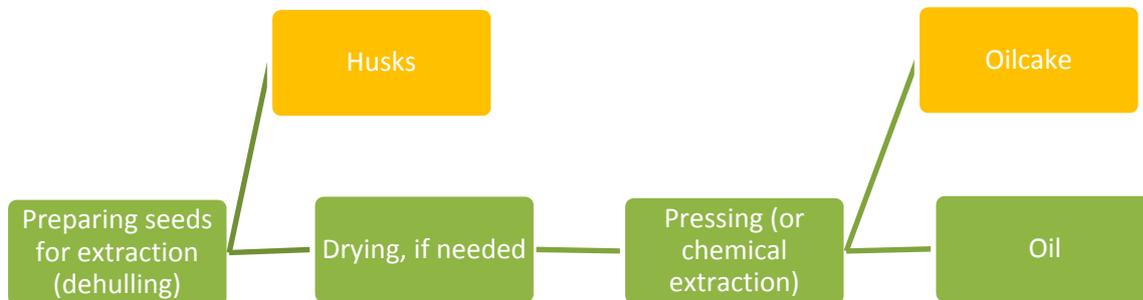
In Ukraine, vegetable oil is produced from the following three main oilseeds: sunflower, soybean and rapeseed. The absolutely dominant oilseed is the sunflower seed. Ukraine is the biggest sunflower oil producer in the world.¹⁵

Two main methods of production of sunflower oil do exist, these are the extraction by using chemical solvents and the extraction by pressing. The end products are refined and unrefined sunflower oils respectively. The primary feedstock is – of course – the sunflower seed. Regardless of which production method is used, sunflower seed has to be separated from husk, as the oil is primarily concentrated in the seed's core. At this stage of dehulling the first residue is produced – sunflower husk. Dehulling is usually achieved through the use of a centrifuge machine, where sunflower seeds are being smashed against each other and inner walls of a cylinder. Then husks are separated from kernels in a flashing machine (filtering machine), which consists of a number of vibrating sieves. After dehulling, the rest is processed and oil is extracted. Another residue is generated – oilcake. (The humidity level and other factors might vary depending on the production method).

The production stages for other vegetables oil are similar. In each case, there is some sort of seed/bean pre-treatment, which generates some residues. As well as there are leftovers after the actual extraction.

¹⁵ See e.g. <http://www.fao.org/faostat/en/#data>

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*Figure 15. Generalized scheme extracting sunflower oil.
Source: UCAB, 2018*

3.1.2. Volume of the sector

Ukraine produces various kinds of vegetable oils. In 2016 Ukraine produced 5.2 million tonnes of vegetable oil. The three main types are sunflower oil, soybean oil and rapeseed oil, with other kinds having insignificantly marginal shares in production. Let us take a closer look on the production of specific vegetable oil and the respective oilseed.

Sunflower and sunflower oil

The sown area of agricultural land under the sunflower was equalled to 6 million ha in 2016. The amount of sunflower seeds produced during the year 2016 was equal to 13.6 million tonnes. The largest part - 9.1 million tonnes¹⁶⁾ or 67 % - was used for sunflower oil production. Actually, about 96 % of all sunflower seed (if we consider a marketing year instead of a calendar year) are processed into sunflower oil. In the calendar year 2016 Ukraine produced 4.9 million tonnes of combined refined and unrefined sunflower oil (0.5 and 4.4 million tonnes respectively). This accounted for around 95 % all vegetable oil produced.

Soybean and soybean oil

The sown area covered by soybean was equalled to 1.8 million ha in 2016. In this year the produced quantity of oil equalled 4.3 million tonnes. Only 664,392 tonnes of soybean went into soybean oil production, or 16 %, which is a considerably smaller amount in comparison with the sunflower seed.

¹⁶ Based on the SSSU data and the UCAB own calculations

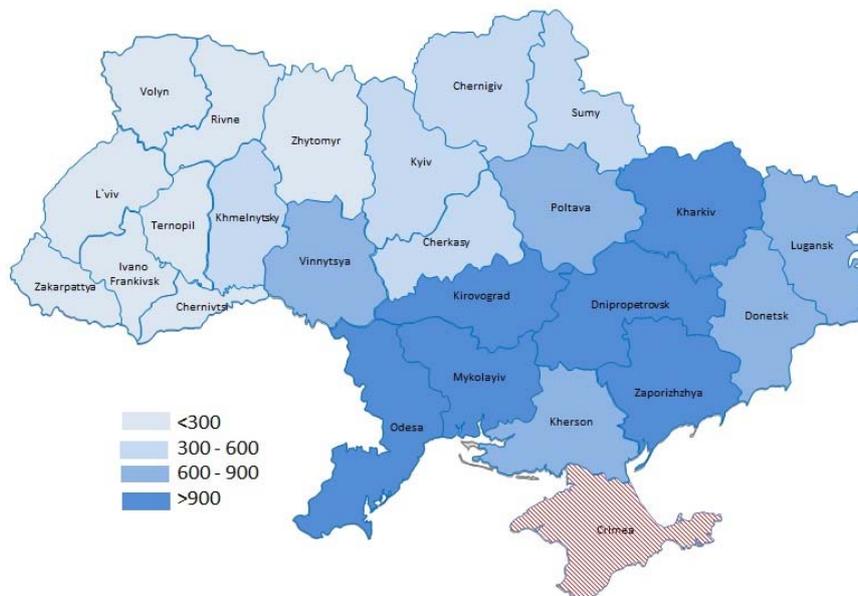
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Ukraine produced 168,240 tonnes of soybean oil in 2016 which has accounted for a little bit more than 3 % of the country’s total vegetable oil production.

Rapeseed and rapeseed oil

The harvest area under rapeseed was 449,000 ha in 2016, with a total harvest of 1.1 million tonnes. From that amount, 127,057 tonnes were used in the rapeseed oil production – making it 11 % of all rapeseed. Around 81,600 tonnes of rapeseed oil were produced. This accounted only for 1.5 % of Ukraine’s vegetable oil production.

According to the SSSU, in 2015 there were 20,317 companies in Ukraine growing sunflower seeds. The following three figures show the geographical intensity of the production of the three main oilseeds in Ukraine.



*Figure16. Gross production of sunflower seed in 2016 in different regions, in '000 tonnes.
Source: UCAB calculations based on SSSU data, 2017*

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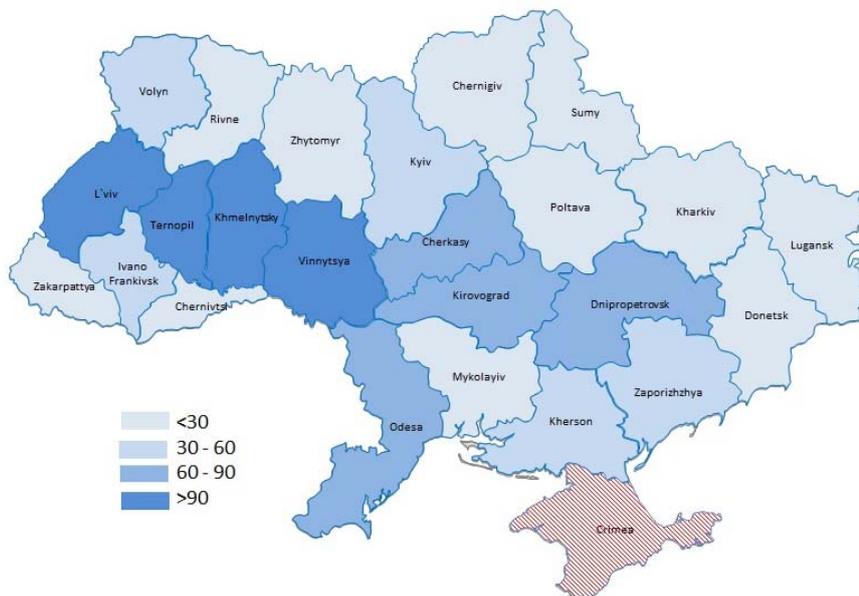


Figure 17. Gross production of rapeseed in 2016 in different regions, in '000 tonnes.
Source: UCAB calculations based on SSSU data, 2017

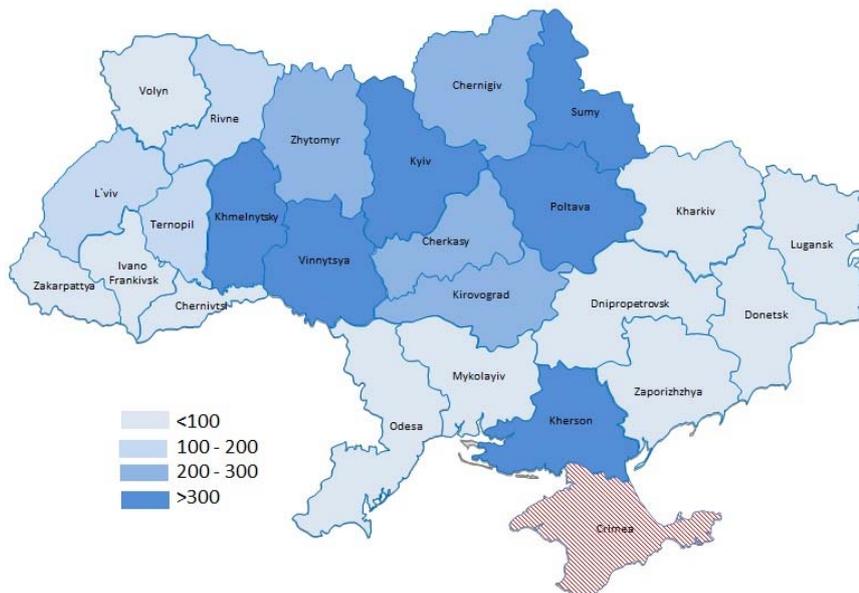


Figure 18. Gross production of soybean in 2016 in different regions, in '000 tonnes.
Source: UCAB calculations based on SSSU data, 2017

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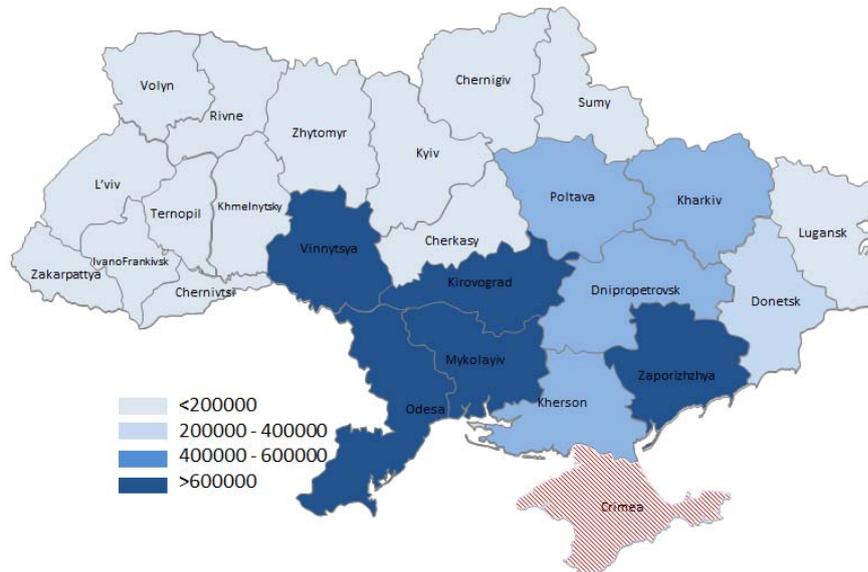


Figure 19. Gross production of unrefined sunflower oil in 2016 in different regions, in tonnes. Source: UCAB calculations based on SSSU data, 2018

3.1.3. State of the sector

There has been a significant increase in the quantities of sunflower seed produced – raising about 20 % from 2015 to 2016. It is difficult to assert unambiguously what exactly has driven the production up so much, but one of the likeliest reasons is a very high profitability in comparison to other cash crops, explained in turn by high prices for sunflower oil on international markets. Higher production of sunflower seed is also the result of the excess in domestic sunflower oil production capacities – sunflower oil producers to keep their facilities working were eager to offer higher prices for sunflower seed and drove the prices up for the crop. In the years before the amounts of sunflower produced were more or less the same. The productivity – average yield in ton per hectare – has grown only slightly.

Table 9. Historical average yields for sunflower, soybean and rapeseed in Ukraine, in 2007-2016 Source: SSSU.

Historical average yields, tonne/ha			
Year	Sunflower yield	Soybean yield	Rapeseed yield
2016	2.24	2.31	2.57
2015	2.16	1.84	2.59
2014	1.94	2.17	2.54
2013	2.17	2.05	2.38
2012	1.65	1.71	2.23

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2011	1.84	2.10	1.60
2010	1.50	1.62	1.70
2009	1.52	1.40	1.65
2008	1.53	1.55	1.80
2007	1.22	-	-

The productivity levels of soybean and rapeseed have been steadily increasing over the last decade, averaging in 2016 at 2.3 and 2.6 tonne per hectare respectively.

Table 10. Historical processing volumes of oilseeds by industries in Ukraine, in 2010-2016 Source: SSSU.

Historical processing volumes, thsd. tonnes			
Year	Sunflower	Soybean	Rapeseed
2016	13140	1530	251
2015	10790	1410	241
2014	10070	1173	97.25
2013	10033	1104	4.89
2012	7974	910	5.02
2011	8080	640	0.46
2010	6697	500	0.52

Although processing volumes of soybean and rapeseed have been increasing over the recent years, the processing industries are still underdeveloped and account for 3% and 1.5% of total vegetable oil production in Ukraine. The processing volumes likely depend not so much on yields rates or production quantities of these oilseed crops, as on their prices on international commodity markets, as most of rapeseed and soybean producers in Ukraine are export-oriented.

3.1.4. Typical size of the companies

As was mentioned earlier, there were over 20,000 companies growing sunflower seeds in Ukraine in 2015. Those can be anybody from small farmers to huge agroholdings, the distribution of sunflower producers may vary drastically from year to year depending on various factors, like sunflower seed prices, crop rotation reasons etc. Whereas concerning the industries producing the sunflower oil, this sector, as will be shown in the next section, is clearly dominated by large producers.

3.1.5. Distinctive facilities of the sector

The Kernel Holding is Ukraine's leading vegetable oil (mainly sunflower oil) producer. The Kernel Holding produces 8 % of total sunflower oil produced in the world. The company has 8 vegetable oil

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production plants. For the first seven months of the 2016/17 marketing year (September – March), Kernel has produced 0.93 million tonnes of unrefined sunflower oil.

Sunflower oil producing companies are concentrated in the Central, Eastern and Southern regions of Ukraine, such as Zaporizhska, Kharkivska, Donetsk, Dnipropetrovska and Odes'ka Oblasts. An oblast is a primary administrative unit in Ukraine. Ukraine is divided into 24 oblasts. The closest English word in meaning would be province. Oblasts are further divided into districts. The table below represents the Ukraine's 15 biggest producers of unrefined sunflower oil.

Table 11. Top 15 biggest producers of vegetable in Ukraine. Source: UCAB, 2016

Top 15 producers of unrefined sunflower oil, production share (%)		
Rank	Year	Share
1	Kernel	27.2%
2	BUNGE	10.3%
3	Violiya	6.9%
4	Optimus Plus	6.5%
5	MHP	5.6%
6	Allseeds Black Sea	4.6%
7	Delta Wilmar	4.0%
8	Cargill	3.9%
9	COFCO-Satellite	3.5%
10	Polohivsky vegetable oil plant	3.2%
11	ADM-Illichivsk	2.2%
12	Kolos	1.8%
13	Gradoliya	1.7%
14	Agroproinvest	1.5%
15	Svativska oliya	1,3%
Total		84.2%

As we can see, the fifteen biggest producers account for nearly 85% of total production volume of unrefined sunflower oil.

3.1.6. Degree of innovation

In this sector, or better to say in certain segments of it, referring primarily to the big agricultural holding companies, which can afford better equipment and are constantly looking for way to optimize their costs, the degree of innovation might be considered high, at least above the average level in comparison to other sectors, as many sunflower oil producing companies install specialized equipment –granulators – for processing the sunflower husk into a solid biofuels in form of pellets and briquettes.¹⁷ There also exists overcapacity in vegetable oil production industries, which in turn

¹⁷ See Kalnitskaya, J. (2013): Business opportunities in the bio-based economy in Ukraine, p. 20

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– at least partially – can be explained with the fact than new processing facilities are being built continuously, because producers want to work with efficient equipment (low costs – high yields), rather than with old facilities and machines, that today become redundant.

3.1.7. Miscellaneous

The vegetable oil sector industries have a lot of experience in handling biomass. The dominant vegetable oil industry – the sunflower oil production – uses sunflower husks to make pellets. The Ukrainian Bioenergy Association estimate that during 2015 the sunflower oil producing facilities used around 750,000 tonnes of sunflower husk for own needs in their own boilers, for instance to generate steam, heat or electricity, whereas the other half was either sold for pellets production or produced into pellets.

3.2. Opportunities IBLC

3.2.1. Sector related residues

Oil containing crops, such as sunflower seeds and rape seeds provide biomass for bioenergy production. The main by-product of sunflower oil production process is the sunflower husk obtained during the sunflower seed crushing. The quantity available per year in Ukraine is estimated at about 10 million tonnes.¹⁸

There are different ways to use sunflower husk for energy generation. Firstly, there is direct burning or burning combined with traditional carbon-based fuels. This is usually done in the sunflower seed processing plant to satisfy own energy needs. Secondly, approximately 70 % of all sunflower husk is used for the production of solid biofuel, such as pellets and briquettes¹⁹. The solid biofuel is often used at the plant as well for energy generation. The surplus is exported to the EU countries, as the local demand is still rather low²⁰.

The Ukrainian Association of Biomass in their latest report have analysed the production of pellets from sunflower husk²¹. According to this report, as of June 2016 there were 169 companies in Ukraine producing this kind of biofuel. Whereas 110 of them exclusively producing sunflower husk pellets, and the rest producing different kinds of biofuels too (e.g. based on wooden biomass, wheat straw etc.). In the first six months of 2016, total production was around 730,000 tonnes of sunflower husk pellets. These pellets are then sold on the market. But Ukrainian Bioenergy Association estimates the ‘inner production’ to be approximately just as big.

¹⁸ See Kalnitskaya, J. (2013): Business opportunities in the bio-based economy in Ukraine, p. 16

¹⁹ See Kalnitskaya, J. (2013): Business opportunities in the bio-based economy in Ukraine, p. 16

²⁰ See *ibid.* p. 20

²¹ ²¹ See UABIO (2017): Report “Comprehensive analysis of the Ukrainian biomass pellets market”, p. 62

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3.2.2. Potential synergies & benefits

There are no official statistics on the processing capabilities in the vegetable oil production sector, but according to an industry insider’s statement, the surplus of processing capacity in the sunflower oil segment in Ukraine may be as high as 40 %. One reason behind such a high overcapacity may be the fact that in such estimates all kinds of processing facilities are accounted for - even the old ones and outdated, which might be just standing idle for years (See Section 3.1.6). Today, sunflower producers prefer to invest in new ones, with modern machinery, which have higher efficiency rates. Another possible reason behind such a high estimate for production capacities underused, might be related to big enterprises – agricultural holdings – which are building large facilities with high production capabilities, aiming perhaps for higher production in the future, as well at securing higher market share by “squeezing out” smaller producers. They do it by securing contracts for processing of large quantities at once. These surplus capacities offer an opportunity of processing biomass into solid biofuels.

3.2.3. Market developments

The vegetable oil sector – especially the sunflower oil – is in good shape, and is likely to stay that way. Higher production of sunflower oil is going to drive sunflower seed production up. The sector’s main biomass product is the sunflower seed husk. This market for sunflower husk-based biofuels is but yet to be developed in Ukraine. It is constrained by a low demand, poor infrastructure (or even absent sometimes) and high logistics costs. The currently active green tariff, as well as ever increasing awareness among consumers and producers alike, would likely lead to an increasing market in the future.

Vegetable oil market is a growing and promising market. Higher production volumes of sunflower can be expected in Ukraine in the next years. For one, the prices for oilseeds and vegetable oil prices remain high on international markets. Another reason lies in the already mentioned surplus processing capacity, because of which vegetable oil industries try to stimulate domestic sunflower production by offering higher prices and signing long-term contracts. Of course, more sunflower means also higher biomass production (by-products and residues).

Similar to other sectors considered above, seasonal availability of sunflower husk, as well as of sunflower oil production residues poses an issue for biomass production, meaning it might be challenging if not impossible in certain cases to organize an uninterrupted production of biomass²².

²² See <http://s2biom.alterra.wur.nl/doc/S2biom---T932---SCS-Ukraine---report.pdf> p. 18 (Accessed 10.08.2017)

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3.2.4. Non-technical barriers

No other barriers could have been identified, which had not yet been mentioned in this chapter.

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4. SUGAR INDUSTRY

4.1. Profile of the sugar industry

4.1.1. Production

In Ukraine, sugar is being produced from processing of sugar beet. Along the chain of sugar production different by-products are generated. A tonne of sugar beet yields on average 17 % of its mass in sugar²³. First, the sugar beet is divided into roots and haulm, then tops of roots are cut off. During the actual industrial processing sugar beets are first grinded and clear water is added. The mass is called diffusion juice, which is then cleared of beet grinds and further processed. The sugar beet grinds (shavings), also called sugar beet press or sugar beet pulp, is a by-product. Often, it is used as feed for farm animals. The diffusion juice is further processed into final product sugar, and another by-product – molasses. The procession of diffusion juice is a multi-stage process on consists of cleaning (defection, saturation, saturation and filtering) operations and thickening (evaporation of diffusion juice and further cleaning of resulting syrup) operations.

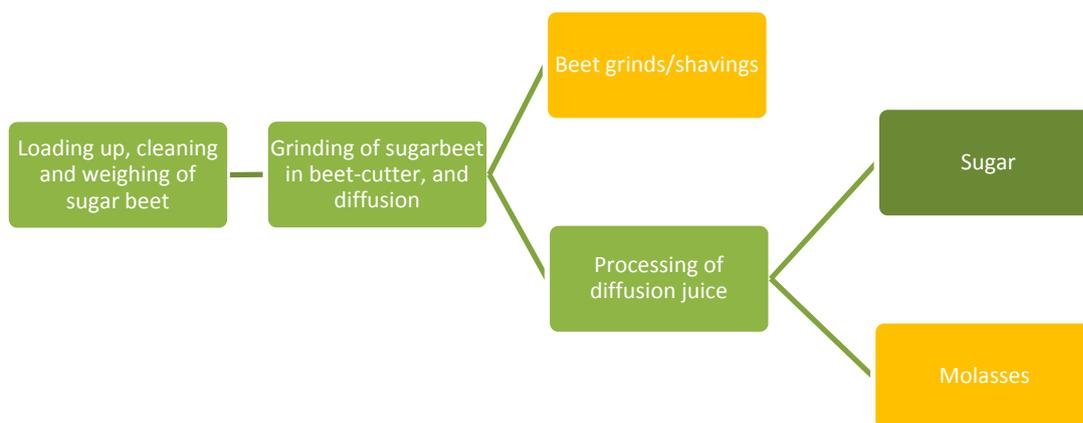


Figure 20. Generalized scheme of sugar production.
Source: UCAB, 2018

²³ <http://agravery.com/uk/posts/show/cukrovij-burak-so-z-nogo> (Accessed on 17.10.2017)

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4.1.2. Volume of the sector

After the break down of the Soviet Union, the Ukrainian sugar industry experienced a massive decline. In the early nineties Ukraine was growing over 42 million tonnes of sugar beet, which then was processed at almost 200 sugar factories into 5 – 5.2 million tonnes of sugar²⁴. Last year’s production of sugar beet in Ukraine amounted only 14 million tonnes. From this amount, 12 million tonnes of sugar beet were processed into 1.7 million tonnes of white sugar²⁵. The reasons for this decline seem to be obvious. For one, it is the fact that all of these sugar plants were operating with outdated Soviet-era equipment and were unable to produce a quality product at a competitive price – before they were supplying the domestic market of the Soviet Union. On the other hand, the inability to attract foreign direct investments - due to the unstable political situation, underdeveloped governmental institutions or weak security guarantees for private property - prevented purchasing modern technology and corresponding know-how. However, in the recent years the situation in the sugar producing sector has started to improve.

The raw material base for the Ukrainian sugar industry is composed of sugar beet. The sown area under the sugar beet was 292,000 ha in 2016.

According to the data published by the SSSU, in 2015 there were 808 companies growing sugar beet. As of the end 2016, there were 42 active sugar production plants.

The following figure illustrates the production of sugar beet in Ukraine’s regions. The figure illustrates, sugar beet is mainly grown in the central part of Ukraine.

²⁴ Ткаченко, Н.М., Кравченко, І. Й (2014): Цукрова промисловість України: минуле і сучасне; шляхи відновлення галузі, р. 8

²⁵ Бондар, В.С. (2017): Тенденції і перспективи цукрового ринку України, In: Цукрові буряки, №1, 2017

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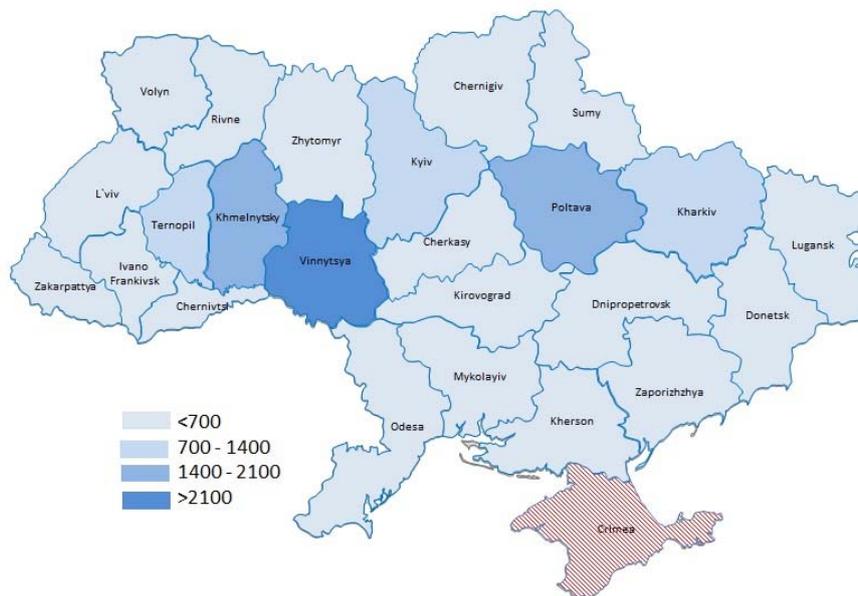


Figure 21. Gross production of sugar beet in 2016 in different regions, in '000 tonnes.
Source: UCAB calculations based on the SSSU data, 2017

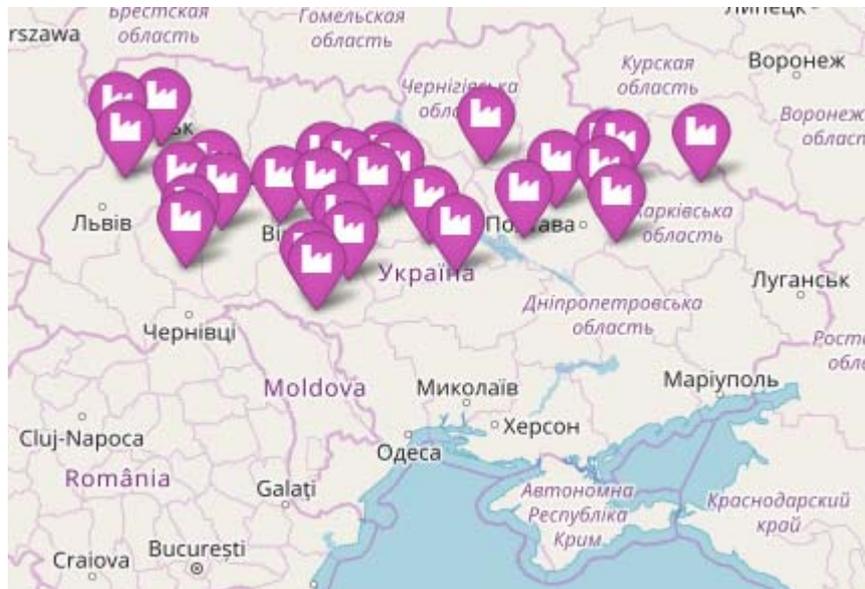


Figure 22. All active sugar production plants as of the end 2016

Source: <http://ukrsugar.com/uk#map> (Accessed: 25.05.2018)

4.1.3. State of the sector

Ukrainian sugar sector, sugar beet production and production of crystalline sugar both, during recent year have been rather sporadic and trendless.

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Table 11. Sugar beet production in Ukraine, 2010-2016. Source: SSSU, 2017

Sugar beet production in Ukraine (million tonnes)	
Year	Production
2016	14.01
2015	10.33
2014	15.73
2013	10.78
2012	18.43
2011	18.74
2010	13.79

As the table above illustrates, the sugar beet production in during the recent years has been up and down, while peaking in the years 2011, 2012. Since then, production has plummeted sharply two times – in 2013 and in 2015. This may indicate, that the production decrease in 2015 was not brought about (to the full extent) by the political and military turmoil of 2014. The high variation in sugar beet production volumes probably can be explained primarily by the variations in the world sugar prices.

Table 12. Historical average yields of sugar beet in Ukraine. Source: UCAB, 2016

Historical average yield (Sugar beet), tonne/ha	
Year	Average yield
2016	48.2
2015	43.6
2014	47.7
2013	39.9
2012	41.1
2011	36.3
2010	27.9

Whereas the consistently growing yield rates of sugar beet in Ukraine, as shown by the figure above, would indicate, that agricultural producers of this crop have been employ new technologies and more efficient production methods.

Table 13. Sugar beet sugar balances. Source: SSSU, 2017

Sugar balances, 2012 – 2016, in million tonnes			
Year	Production	Export	Consumption
2016	1.99	0.50	1.42
2015	1.45	0.15	1.52
2014	2.0	0.04	1.55
2013	1.26	0.16	1.68
2012	2.14	0.17	1.71

The production of sugar has been following a similar pattern with the sugar beet. There have been two drops in production during the recent years – 2013 and 2015. Taking into account that virtually

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all of sugar beet goes into production of sugar, the production of sugar has been simply mimicking that of sugar beet. The exports of Ukrainian sugar have dropped significantly in 2014, probably because of lower production in 2013, but then were growing steadily. Domestic consumption of sugar has been staying relatively on the same level.

Figure 13 shows that there were two significant drops in sugar prices on the world markets, which is consistent with drops in production of sugar beet and, accordingly, sugar.

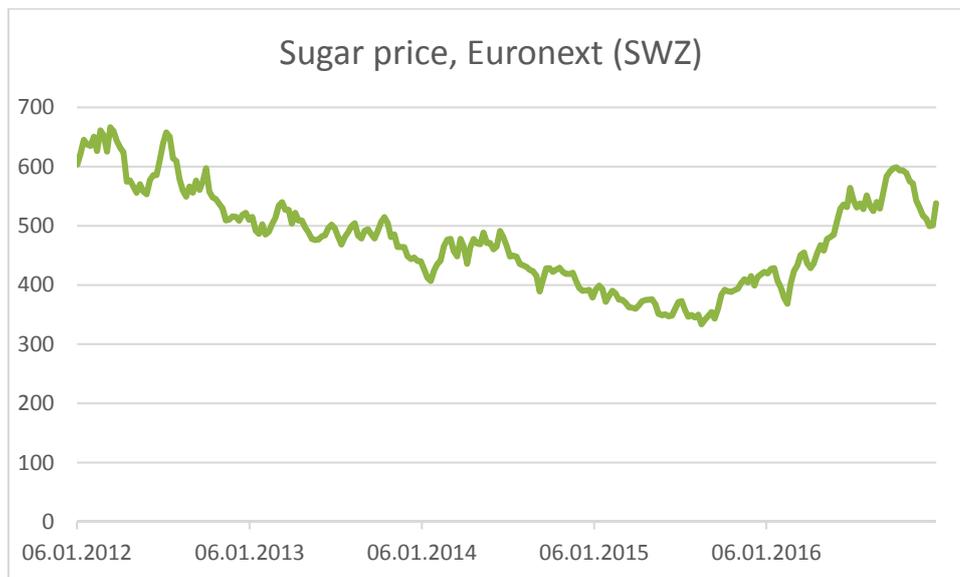


Figure 23. Sugar price, Euronext (SWZ), covering 2012-2016, USD/tonne. Source: UCAB visualization based on the Barchart.com data, 2017

4.1.4. Typical size of the companies

Over the last years agricultural holding companies (big producers) have pushed small and medium size producers aside, controlling about 80 % of the sugar market in Ukraine²⁶.

At the end of 2016 a total of 42 sugar producing plants were operating in Ukraine²⁷.

The Ukrainian National Association of Sugar Producers estimates the daily sugar production capacity in Ukraine at 23,100 tonnes²⁸. The sugar plants operate up to three months per year, given the seasonality of sugar beet production and the fact that sugar beet cannot be stored for longer periods of time cheaply enough. If the sugar production plants would operate whole year long, the maximum production would be around 8 million tonnes (today it is about 2).

²⁶ Бондар, В.С. (2017): Тенденції і перспективи цукрового ринку України, In: Цукрові буряки, №1, 2017

²⁷ National Association of Sugar Producers, <http://www.ukrsugar.com/uk/post/virobnictvo-cukru/pusk-cukrovih-zavodiv-stanom-na-08092016> (23.03.2017)

²⁸ <http://www.ukrsugar.com/uk/post/v-ukraini-vze-vioblono-bilse-900-tis-t-cukru> (18.10.2017)

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For the biggest part of the year, the sugar production facilities are standing idle.

4.1.5. Distinctive facilities of the sector

Sugar producing facilities are located mainly in the Central and Western regions of Ukraine, such as the Poltava and Vinnytsya regions²⁹. Some of the biggest producers in the sugar industry are: Astarta, Galsagro, Cygnet, ED&F, and Pfeifer&Langen.

As was mentioned in the previous paragraph, there is indeed a major overcapacity of sugar producing plants, substantiated by seasonal availability of sugar beet. Although, it is doubtful that these facilities during their idle times can be used for biomass processing, for example for grinding and shredding, because starting a sugar plant, as well then shutting it down is a long and energy consuming process. No mentioning of such cases in Ukraine has been found in the literature.

Two possible technical barriers may be responsible. First, sugar beet has a rough hard texture, whereas grain or sunflower straw not. The equipment might be appropriate for the task.

Secondly, big facilities are usually complex systems, and it is unclear, whether only an intermediate unit of a production chain can be launched independently – it may seem to be too costly to use sugar plants for external biomass processing.

4.1.6. Degree of innovation

Again, as the Ukrainian statistics agency does not compose any kind of an industry innovation index, it is rather difficult to make any accurate statements on the sector's degree of innovation. At this moment the sector, as a whole, does not appear to be particularly innovative. Although, the potential for innovation for processing of sugar by-products and residues into bioenergy is being recognized by industries³⁰.

In 2016, there already were sugar producing plants, which were running on biofuels. For example, the Uzynskyy sugar plant was using pellets, and Globynskyy sugar plant was supplying up to 50 % of its energy needs by using biogas³¹. This last plant is a part of the Astarta, an agricultural holding company and the biggest sugar producer in Ukraine. Biogas is being produced by the situated nearby biogas plant, which in turn uses the sugar-beet pulp produced by the sugar plant. The biogas facility had to be situated in the immediate proximity because sugar beet pulp deteriorates very fast – it cannot be stored for too long or transported for long distances³².

²⁹ See Kalnitskaya, J. (2013): Business opportunities in the bio-based economy in Ukraine, p. 20

³⁰ See Ibid.

³¹ <http://agravery.com/uk/posts/show/energetika-astarti-ak-cukrovomu-zavodu-zaroblai-na-biogazi> (18.10.2017)

³² See *ibid.*

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As noted by the head of the Ukrainian Association of Sugar Producers, Andriy Dykun, many other sugar producers are showing interest in producing biogas or bioethanol from by-products of sugar production, but these projects are yet on the planning phase³³.

4.1.7. Miscellaneous

As was mentioned before, there is some experience with biomass handling in the sector, although, as of today, these are isolated cases and not a mass phenomenon.

Although, there is a significant potential for biomass in the sector. For one, as was mentioned, sugar production generates various biomass by-products; as well as sugar plants, given the recent rise in natural gas prices, may be among the biggest consumers of biofuel.

4.2. Opportunities IBLC

4.2.1. Sector related residues

Sugar production yields various by-products, which can be used for biomass production - sugar beet press (about 0.2 tonnes per one tonne of sugar) and molasses (about 0.25 per one tonne of sugar³⁴). Sugar beet pulp is suitable for biogas production by means of anaerobic digestion whereas molasses can be used as feedstock for bioethanol³⁵. This type of production is not widespread though, because sugar beet pulp deteriorates very fast, so it must be transported rapidly to a biogas production facility, in order to be fitted for processing. In short – logistics is the problem. Installing equipment for biogas production in a facility itself or in the immediate proximity is one possible solution, as proved by the Globinsky sugar factory³⁶.

Given the fact that in Ukraine during 2016 was produced about 2 million tonnes of sugar, it can roughly be estimated a total amount of residues of 0.4 million tonnes of sugar beet pressed pulp and 0.52 million tonnes of molasses.

4.2.2. Potential synergies & benefits

Sugar plants are operating usually 3-4 months per year. Whether there exist potential synergies is hard to tell. Not least because the process of starting and shutting down is time-consuming and energy-intensive. In Ukraine, traditionally sugar producing companies rely primarily of own supply of sugar beet. In order to keep a high soil quality, there have to be crop rotation on regularly basis. This

³³<http://www.ukrsugar.com/uk/post/v-ukraini-planuut-viroblati-biopalivo-z-vidhodiv-cukrovih-zavodiv?sec=novini-ukraini> (18.10.2017)

³⁴<http://agravery.com/uk/posts/show/energetika-astarti-ak-cukrovomu-zavodu-zaroblani-na-biogazi> (18.10.2017)

³⁵ See <http://s2biom.alterra.wur.nl/doc/S2biom---T932---SCS-Ukraine---report.pdf> (Accessed 10.08.2017), p. 16

³⁶<http://pzp.astartakiev.com/2-uncategorised/48-vp-globinskij-tsukrovij-zavod-tov-tsukoragroprom> (17.10.2017)

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results in that mainly sugar producing companies end up producing as well other cash crop, which they then sell. This means availability of grain crops biomass (like stubble) close to a sugar producing plant. It is not known whether there are any cases in which sugar producing facilities are used for grain biomass.

Another opportunity for IBLC may lie in the production of bioethanol from the molasses – a by-product of sugar production. Bioethanol is currently produced at separate private and governmental distilleries, which current under-utilization is estimated to be as high as 50 %³⁷. Molasses can easily be stored for longer periods as well as transported.

Production of biogas or bioethanol of sugar production residues has a potential to play an important role in improving Ukrainian energy sufficiency, especially given the fact that government does not subsidize natural gas consumption anymore, as well as the rapid deterioration of Russian Federation – the supplier of natural gas.

4.2.3. Market developments

It could be premature to talk about industries of the sugar sector entering new markets, in the sense of supplying biomass or biofuels to external consumers since industries' experience of handling biomass is yet limited to using self-produced biofuels (pellets, biogas) in sugar production in order to minimize energy costs.

The development of this trend to scale which would allow entering new markets is obstructed by several barriers. For one, as was shown previously in this chapter, by unstable dynamics on the sugar markets, meaning that uncertain relation of long-term profitability and dramatically fluctuating price make it a difficult investment decision.

Logistics is the main technical barrier.

4.2.4. Non-technical barriers

Sugar industries, on their way of embracing renewable energy, in particular biomass, are facing non-technical barriers as well. Of course, first of all one should name a cautious attitude of the industry towards biomass. Although the topic is slowly gaining popularity nowadays but there are yet not a lot of practical examples – or success stories – one can rely upon.

Of course, many companies still don't know, or don't completely recognize possible benefits of working with biomass or as a part of something like an IBLC.

And last but not least, industries in this sector, as in many others, tend to be quite isolated and their corporate strategy being built upon the goal of becoming self-sufficient. In this case, this "independence" might stimulate a plant to process the biomass by-products for one's own energy needs.

³⁷ See Kalnitskaya, J. (2013): Business opportunities in the bio-based economy in Ukraine, p. 33

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5. FEED AND FODDER

5.1. Profile of the feed and fodder sector

5.1.1. Production

As feed and fodders for farm animals in Ukraine are used primarily residues and by-products of major crops, specialized technical agricultural crops, as well as concentrated and mixed fodders. Combined feeds are a homogeneous and complex mixture of various refined and grinded feed components. There are three possible stages of processing – physical (e.g. shelling, grinding, pressing, granulation), chemical (e.g. acid or alkaline treatment) and biological (e.g. soldering, fermentation).

5.1.2. Volume of the sector

The SSSU publishes data on the feed and fodder consumption distribution by all types of agricultural producers in fodders units, which measure total nutrition value of fodders. This is a somewhat archaic measure, which doesn't allow making accurate statements about the volumes of different feed and fodder types consumed. Nonetheless, the biggest part of nutrition value in 2016 was provided by mixed and concentrated fodders – 14,445,000 tonne fodders units or 47.4 % of total values³⁸. On the second place there were coarse fodders (15.7 %), followed by the rich fodders (27,6 %) and lastly others – 9.1 %.

Because the data on the feed and fodder consumption is archaic and difficult to interpret it is better to turn to production. In Ukraine, in 2016 were produced 6,231,562 tonnes of combined and concentrated feed.

The fraction of grain crops in the production of concentrated and mixed feeds (prepared feeds) is about 65-70 %. The three major grain crops which are used in concentrated and mixed fodders production are corn, wheat and barley. In the previous year (2016) 1,092,000 tonnes of corn (or 4 % of corn produced), 476,000 tonnes of wheat (2 %) and 64,000 tonnes of barley (1 %) ⁴⁰.

The sown area of agricultural land under the specialized cultures equalled 1,932,000 ha in 2016.

As of green feed, in 2016 Ukraine has produced 6,967,800 tonnes of corn 6,431,900 tonnes of perennial and 2,289,600 tonnes of annual weeds. Mainly in the southern and central regions.

³⁸ See Нікішина, О. (2015): Вітчизняний ринок комбікормової продукції, In: Вісник КНТЕУ, № 2, ст. 134

⁴⁰ The UCAB's calculations

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5.1.3. State of the sector

In the recent years, the feed and fodder has been demonstrating negative dynamics. The figure below illustrates the production output of prepared feeds for farm animal in Ukraine for the time period 2011 – 2016.

Table 14. Prepared feeds for farm animals, 2011-2016, in million tonnes. Source: the SSSU, 2017

Production prepared feeds for farm animals	
Year	Output
2016	6.23
2015	6.71
2014	6.82
2013	6.75
2012	6.36
2011	6.15

As we can see, the production output has been declining since 2015. In this data it is already accounted for the annexed Crimea and separate regions of the Donetsk Oblast. Ukraine produces combined feeds for farm animals exclusively for domestic consumption. Taking this into account, it seems obvious that the reason of the decline in production output of prepared feeds is related to the decline in livestock's herd.

Table 15. Number of livestock and poultry, 2014-2016, in '000 tonnes. Source: the SSSU, 2016

Number of livestock and cattle in Ukraine, 2014-2016 (in '000 tonnes)				
Year	Cattle	Pigs	Sheep and goats	Poultry
2016	3,750	7,079	1,325	203,986
2015	3,884	7,351	1,371	213,336
2014	4,398	7,764	1,500	220,636

The table above illustrates a drop in the livestock during last years. This corresponds with the decrease in production output of prepared feeds for farm animals.

5.1.4. Typical size of the companies

There are about 440 producers of concentrated and mixed fodders in Ukraine. Whereas 350 producers with maximum production capacity less than 75 tonnes of combine and mixed feeds per day and about 90 producers with higher production capacity up to 1,150 tonnes per day⁴².

It is impossible to say how many of them are producers of green fodder (specialized feeder plants), as these are usually grown by the livestock owners themselves.

⁴² See Нікішина, О. (2015): Вітчизняний ринок комбікормової продукції, In: Вісник КНТЕУ, № 2, ст.139

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5.1.5. Distinctive facilities of the sector

It is common that large vertically integrated agribusinesses produce mixed feed and fodder. About 70 % of all mixed and combine fodders is produced by such companies. Some of the biggest producers are the MHP, Uklandfarming, and Complex Agromars⁴⁴. Usually, that such agribusiness produce combined feeds to supply their own needs, using primarily their own input materials. They do not advertise themselves as feed and fodder producers and are not market oriented. But in the case, unfortunately there is no detailed information on production capacities, so it impossible to estimate availability of surplus capacities.

5.1.6. Degree of innovation

The degree of innovation must be rather low judging by the fact that Ukraine does not export prepared feeds and fodders, it is plausible to assume, that the industries are not competitive in comparison to their foreign counterparts, which in turn can be due to either a higher price or a significantly lower quality.

5.2. Opportunities IBLC

5.2.1. Sector related residues

Actually, the feed and fodder sector is in a certain way a competitor sector for the biomass industry. For once, green feeds, which can either be given to farm animals directly or can be used as a feedstock for combined and mixed feeds production, come in two types: specialized plants that are grown specifically as fodder (e.g. fodder beet or vetch), or crops residues, as well as residues of other agricultural industries (e.g. residues of sugar production etc.). The feed and fodder sector generates no biomass related residues.

5.2.2. Potential synergies & benefits

There is a processing capacity (physical processing – grinding, granulating etc.) surplus in the feed and fodder sector. The current underuse of production facilities is estimated at the level of 20-40 %⁴⁶. Following the recent decline in the production output of combined and concentrated feeds the underuse of production facilities today may be even higher.

Considering the fact, that the production of concentrated fodders shares some similar stages with the production of solid biomass, such as for example dehydration and granulation, this surplus capacity may be potentially of interest for an IBLC project.

⁴⁴ See See Нікішина, О. (2015).

⁴⁶ See *ibid*, ст. 135

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5.2.3. Market developments

As we have seen, the production output of combined and concentrated feeds has been falling in the recent years, while following the decline in livestock numbers, as well the tendency of big agribusiness to producer their own feeds and not buy them on the market – demand is low The underused facilities in the sector probably would fit for processing of vegetable biomass. Many agricultural holding companies tend to supply themselves with feed and fodder, there are not many of independent producers, though the exact number is not known. It is possible, that the situation will develop similarly to the sugar sector, as when big integrated companies try to use all the secondary feedstock they produce.

5.2.4. Non-technical barriers

Non-technical barriers are the same as in all the other sectors.

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6. SUMMARY ANALYSIS OF THE COUNTRY

Table 16. Summary of the grain chain sector

Grain chain sector	
Profile	
Production	<ul style="list-style-type: none"> By-products potentially suitable as biomass feedstock are generated during grain production, as well as during grain processing by industries. Main by-products during crops production: leaves, stalks, stubble, cobs etc. During industry processing into groats and flours following by-products are generated: bran and husk.
Volume of the sector	<ul style="list-style-type: none"> In 2016 total production of grain crops (including leguminous crops) was around 51 million tonnes. Grain crops have the biggest sown areas among agricultural crops – 14.4 million hectares. Main grain crops produced in Ukraine are corn, wheat, barley. In the 2016/2017 marketing year was produced 28, 26, and 9 million tonnes respectively. 34,505 agricultural companies producing grain crops in 2015. In the 2016/2017 marketing year 3.79, 0.68, and 0.43 million tonnes of wheat, corn and barley respectively went into industrial processing.
State of the sector	<ul style="list-style-type: none"> In Ukraine, average yield rates fall behind in comparison to those in other European countries. Nonetheless, there have been improving in the recent years. During the last 5-year-period processing quantities of wheat and barley have been steadily increasing, whereas processing of corn has experienced a slowdown.
Typical size of the companies	<ul style="list-style-type: none"> In terms of gross production, about 50 % of all wheat are produced by small and medium-sized enterprises. Corn production is dominated by medium-sized and big enterprises. And most of barley is being produced by small agricultural producers.
Distinctive facilities of the sector	<ul style="list-style-type: none"> Top 15 grain processing companies are listed. These companies account for 42 % of all grain procession. Biggest facilities are located in Central and Eastern parts of the country.
Degree of innovation	<ul style="list-style-type: none"> The degree of innovation in the grain chain sector is rather low, which results in substantial amounts of residues generated during primary production, as well as during industrial processing gone unused (or used inefficiently).

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Miscellaneous	<ul style="list-style-type: none"> The primary production in the grain chain sector has sustainability issues, particularly concerning topics like crop rotation, soil deterioration and stubble, which is often left and burned in the fields.
Opportunities for IBLCs	
Sector related residues	<ul style="list-style-type: none"> The grain chain sector, specifically the primary production segments, generates a lot of residues, which can be used as biomass feedstock for production of solid biofuels. It is estimated, that currently about 3 % of residues are used as feedstock for biofuels, whereas 70 % go “wasted” on the fields. The grain chain processing industries generate about 0.5 million tonnes of residues (such as bran), most are used as feed for farm animals.
Potential synergies & benefits	<ul style="list-style-type: none"> Two low-intensity (production falls almost by half) production periods for grain chain industries have been identified: January and May-July. These seasonally underused facilities may offer opportunities for IBLC.
Market developments	<ul style="list-style-type: none"> The Ukrainian market for solid biomass produced of grain crops residues has been developing rapidly in recent years. Average growth rate in total production output was 35 %. Production is primarily concentrated in the centre and the south of Ukraine. Logistics seem to be indeed the most important barrier.
Non-technical barriers	<ul style="list-style-type: none"> Low awareness. Mentioned lack of initial investment requirements as well as the lack of government support. When considering stubble left in the field as a biomass residue, it should keep in mind the positive fertilizing effect that it provides for the soil. There is obviously a conflict of interests.

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Table 16. Summary vegetable oil extraction sector

Vegetable oil extraction sector	
Profile	
Production	<ul style="list-style-type: none"> Vegetable oil is produced from the three main oilseeds: sunflower, soybean, rapeseed. The dominant oilseed is the sunflower – Ukraine is the biggest sunflower oil producer in the world. The sunflower oil produced either through mechanical extraction or chemical extraction. Main residues: sunflower husk, sunflower oilcake.
Volume of the sector	<ul style="list-style-type: none"> In 2016 total production of vegetable oil was 5.2 million tonnes. About 96 % of sunflower seed produced in Ukraine are used for sunflower oil production – about 13 million tonnes of sunflower. Soybean and soybean oil: 4.3 million tonnes of soybean produced in 2016, only 0.7 million tonnes went into production of soybean oil. Total production of soybean oil was 168,240 tonnes. In 2016, 1.1 million tonnes of rapeseed were produced in Ukraine, thereof 127,057 tonnes were used for rapeseed oil production – resulted in 81,600 tonnes of oil.
State of the sector	<ul style="list-style-type: none"> Average yields of sunflower have been going up and down in the recent years. For soybean and rapeseed – steadily increasing. Since 2015 there have been a significant (around 20 %) in production volumes of sunflower. Due to high profitability of this crop.
Typical size of the companies	<ul style="list-style-type: none"> Concerning the primary production (oil seeds production), in the sector many thousands of companies are active, ranging from small to large. The processing industries are primarily large companies.
Distinctive facilities of the sector	<ul style="list-style-type: none"> The Kernel Holding is producing 27 % of sunflower oil in Ukraine, which is equal 8 % of total world supply. 15 biggest companies are producing around 85 % of sunflower oil.
Degree of innovation	<ul style="list-style-type: none"> In comparison to other sectors analysed in this report, the vegetable oil sector may be considered the most innovative.
Miscellaneous	<ul style="list-style-type: none"> The sector already has experience of handling biomass, mostly in form of producing solid biofuel – pellets – from sunflower husk. It is estimated that about 750,000 tonnes of sunflower husk is used for sector's own energy needs.
Opportunities for IBLCs	
Sector related residues	<ul style="list-style-type: none"> Sunflower husk produced per year is estimated to be at about 10 million tonnes.

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Potential synergies & benefits	<ul style="list-style-type: none"> • It is either used for production of pellets or exported (mainly to the EU country). • In 2016, there were 169 producing pellets.
Market developments	<ul style="list-style-type: none"> • The surplus in processing capabilities of the vegetable oil sector is estimated to be as high as 40 %. • That big a surplus offers an opportunity for an IBLC. • Energy generation from sunflower husk offer a viable alternative to natural gas imports from Russia and a way to minimize the country's dependence on it.
Non-technical barriers	<ul style="list-style-type: none"> • The vegetable oil sector is demonstrating positive dynamics. The markets for sunflower oil and for sunflower seed are likely to continue to grow in the future. • Despite the green tariff, the market for sunflower-husk based biofuels is yet to be developed. • Main restrictions: low awareness, low demand, poor infrastructure, seasonal availability of feedstock etc.
	<ul style="list-style-type: none"> • When generating energy by burning sunflower biomass (e.g. pellets) one should consider the emissions issue.

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Table 17. Summary sugar industry sector

Sugar industry sector	
Profile	
Production	<ul style="list-style-type: none"> • In Ukraine, sugar is produced primarily from sugar beet. • A tonne of sugar beet yields on average 17 % of its mass in sugar. • Main by-products: sugar beet press (pulp) and molasses.
Volume of the sector	<ul style="list-style-type: none"> • In 2016, 12 million tonnes of sugar beet produced, sown area 292,000 ha. • Those were processed into 1.7 million tonnes of white sugar • 42 active sugar plants.
State of the sector	<ul style="list-style-type: none"> • The development of the sector, concerning primary production of sugar beet, as well as production of white sugar, has been sporadic and uneven in the recent years. • The average yield rate of sugar beet was at its highest in 2016 – 48.2 million tonnes. • The domestic consumption of sugar remains stable – averaging at 1.5 million tonnes; • Ukrainian export of sugar started to grow since 2015.
Typical size of the companies	<ul style="list-style-type: none"> • The sector is dominated by big producers. • 42 sugar plants are producing about 80 % of sugar. • Sugar producing facilities are located mainly in the central and western regions of Ukraine. • Daily sugar production capacity is estimated at 23,100 tonnes. • But sugar plants are active on average for three months per year.
Distinctive facilities of the sector	<ul style="list-style-type: none"> • Some of the biggest producers are: Astarta, Galsagro, Cygnet, ED&F. • Sector’s production facilities remain idle for the most part of the year, though it is unclear, whether these facilities could be used as a part of an IBLC.
Degree of innovation	<ul style="list-style-type: none"> • The sector does not appear to be particularly innovative. • In 2016, there already were sugar producing plants, which were running at least partially on biofuels – pellets and biogas.
Miscellaneous	<ul style="list-style-type: none"> • There is experience of handling biomass. Mainly for own consumption as fuel. But as of today, these are only isolated cases, and not a mass phenomenon.
Opportunities for IBLCs	
Sector related residues	<ul style="list-style-type: none"> • Per 1 tonne of sugar 0.2 tonnes of sugar beet press and 0.25 tonnes of molasses are produced. • Both main residues are suitable feedstock for biofuel production: solid biofuels (pellets) and biogas.

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<p>Potential synergies & benefits</p> <p>Market developments</p> <p>Non-technical barriers</p>	<ul style="list-style-type: none"> • Total volume of residues for 2016 can be estimated: 0.4 million tonnes of sugar beet press and 0.52 million tonnes of molasses.
	<ul style="list-style-type: none"> • Although big sugar producers tend to have various residues from grain or oil crops, but it is unclear whether idle sugar producing facilities can be used for processing of this biomass. • An opportunity for IBLC may lay in production of bioethanol from molasses, produced by sugar plants, and different private and government distilleries, which current under-utilization is estimated to be as high as 50 %.
	<ul style="list-style-type: none"> • The international price for sugar is very volatile, thus the production of sugar has been very uneven in the recent years – there have been no clear long-term trend. It is difficult to predict how the industry will develop in the future. • The sector’s experience of handling biomass has been limited as well. But it is likely the number of sugar plants using biomass to satisfy – at least partially - own energy needs will grow in the future.
	<ul style="list-style-type: none"> • Cautious attitude of the industry towards other stakeholders. • Low awareness. • Particularly in this sector, companies are striving to be self-sufficient.

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Table 18. Summary feed and fodder sector

Feed and fodder sector	
Profile	
Production	<ul style="list-style-type: none"> As feed and fodders for animals in Ukraine are used primarily residues and by-products of major crops, specialized technical agricultural crops, as well as concentrated and mixed fodders.
Volume of the sector	<ul style="list-style-type: none"> The biggest part of nutrition value in 2016 was provided by mixed and concentrated fodders. In year 2016 6,231,562 tonnes of combined and concentrated feed were produced. The fraction of grain crops in the production of concentrated and mixed feeds (prepared feeds) is about 65-70 %. In year 2016 1,092,000 tonnes of corn (or 4 % of corn produced), 476,000 tonnes of wheat (2 %) and 64,000 tonnes of barley (1 %) went into production of combined and mixed feeds. The sown area of agricultural land under the specialized cultures equalled 1,932,000 ha in 2016.
State of the sector	<ul style="list-style-type: none"> The sector can be considered to be in stagnation – the production of combined and concentrated feeds has been declining for the few recent years in a row. That is most likely due to the fact, that the number of big farm animals - cattle, pigs, sheep and goats – has been declining as well.
Typical size of the companies	<ul style="list-style-type: none"> 440 producers of combined and mixed feeds for farm animals in Ukraine. 350 of them have maximum production capacity less than 75 tonnes of final product per day, and 90 with a production capacity above – up to 1,150 tonnes per day.
Distinctive facilities of the sector	<ul style="list-style-type: none"> 70 % of all mixed and combined feeds are produced by big integrated companies. Some of the biggest producers are: MHP, Ukrlandfarming, Complex Agromars.
Degree of innovation	<ul style="list-style-type: none"> Degree of innovation is rather low. Most of feeds and fodders produced are for own needs of agribusiness business and are not being brought to the market.
Opportunities for IBLCs	
Sector related residues	<ul style="list-style-type: none"> Sector generates no biomass related residues.
Potential synergies & benefits	<ul style="list-style-type: none"> There is a processing capacity surplus (physical processing - grinding, granulating etc.) in the sector. The current underuse of processing facilities is estimated to be at the level of 20-40 %. Due to the fact, that the production of concentrated fodders shares some similar stages with the production of solid biomass (e.g. dehydration and

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Market developments Non-technical barriers	granulation), this surplus capacity may be potentially of interest for an IBLC.
	<ul style="list-style-type: none"> • The market has been shrinking during the recent year due to decline in livestock numbers.
	<ul style="list-style-type: none"> • Not identified so far.

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8. REFERENCES

Dam van, J.E.G., Elbersen, W., Ree van, R. (2014). *Setting Up International Biobased commodity trade chains. A guide and 5 examples in Ukraine*. Netherlands Enterprise Agency.

Dragnev, S., Zheliezna, T., Geletukha, G. (2016). *Opportunities for harvesting by-products of grain corn for energy production in Ukraine*. UABio Position paper N16

IFC – International Finance Corporation (2015). *Market conditions for biomass-to-energy projects in Ukraine*. Survey findings 2015.

Kalnitskaya, J. (2013). *Business opportunities in the bio-based economy in Ukraine. Assessment of opportunities for collaboration on Biobased Economy in Ukraine and the Netherlands*. Pro Marketing Ukraine, BBE.

UABIO – Bioenergy Association of Ukraine (2017). *Report “Comprehensive analysis of the Ukrainian biomass pellets market”*.

Бондар, В.С. (2017) *Тенденції і перспективи цукрового ринку України*. In: Цукрові буряки, №1, 2017

Ткаченко, Н.М., Кравченко, І. Й (2014). *Цукрова промисловість України: минуле і сучасне; шляхи відновлення галузі*

Agravery: Цукровий буряк: що з нього роблять? <http://agravery.com/uk/posts/show/cukrovij-burak-so-z-nogo> (Accessed on 17.10.2017)

Agravery: Енергетика «Астарті»: як цукровому заводу заробляти на біогазі <http://agravery.com/uk/posts/show/energetika-astarti-ak-cukrovomu-zavodu-zarobliti-na-biogazi> (Accessed on 18.10.2017)

АСТАРТА-КИЇВ: ТОВ ІПК «Полтавазернопродукт» <http://pzp.astartakiev.com/2-uncategorised/48-vp-globinskij-tsukrovij-zavod-tov-tsukoragroprom> (Accessed on 17.10.2017)

National Association of Sugar Producers: Пуск цукрових заводів 2016/2017 МР, <http://www.ukrsugar.com/uk/post/pusk-cukrovih-zavodiv-20162017-mr-onovleno> (Accessed on 23.03.2017)

National Association of Sugar Producers: В Україні вже вироблено більше 900 тис. т цукру, <http://www.ukrsugar.com/uk/post/v-ukraini-vze-virobleno-bilse-900-tis-t-cukru> (Accessed on 18.10.2017)

National Association of Sugar Producers: В Україні планують виробляти біопаливо з відходів цукрових заводів. <http://www.ukrsugar.com/uk/post/v-ukraini-planuut-viroblati-biopaliwo-z-vidhodiv-cukrovih-zavodiv?sec=novini-ukraini> (Accessed on 18.10.2017)

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9. ANNEX A – LITERATURE OVERVIEW

Please note that the main data sources for this desk-study was the State Statistics Service of Ukraine (SSSU) and the UCAB’s own statistics. Concerning the official statistics, the SSSU usually makes publications once per year covering the data from the year before the publication, e.g. reports published in 2017 would contain statistics for 2016. The timing of this desk-study is somewhat not optimal, because the current year’s reports have not been published yet, and often (not in all cases) the 2016 reports had to be used with numbers from 2015. I would also like to specify that if no explicit source is cited or indicated the official statistics from the SSSU is used.

In the recent years, a lot of scientific literature on the topic of biomass production in Ukraine has been published. A substantial amount of it has been produced either by or in cooperation with various research institutions from the European Union. The S2Biom project⁴⁸⁾ (2016) which was funded by the European Commission and lasted for 3 years is an example of such a project. It covered the EU28, as well as Western Balkans, Moldova, Turkey and Ukraine. It provided a solid overview of lignocellulosic biomass production in Ukraine. Amongst others are for example: the study by the IFC (2016); ordered by the Dutch Biorenewables Business Platform (BBP) and conducted by the ProMarketing Ukraine study (2013)⁴⁹⁾; the paper by Janda and Stankus (2017)⁵⁰⁾, which focuses primarily on biofuel, but covers the feedstock and biomass production in Ukraine as well.

Ukrainian academics and scientists have been occupied with the topic of biofuel production in the recent years too, while primarily focusing on the biofuel’s unexploited economic potential, as well as its potential for establishing Ukraine’s energy security, e.g. Kaletnik (2013)⁵¹⁾, Scrypnitchenko (2014)⁵²⁾ and Sinchenko et al. (2014)⁵³⁾. Here are some of the recent publications describing the state of the relevant agricultural sectors: Kozak and Gryschenko (2016)⁵⁴⁾ on grain sector; Dankevych

⁴⁸ About the S2Biom project - <http://www.s2biom.eu/en/about-s2biom.html> (Accessed on 10.04.2017)

⁴⁹ Kalnitskaya, Y. (2013): Business Opportunities in the Bio-Based Economy in Ukraine

⁵⁰ Janda, K., Stankus, E. (2017): Biofuels Markets and Policies in Ukraine

⁵¹ Калетнік, Г. М. (2013). Біопаливо: продовольча, енергетична та екологічна безпека України. Біоенергетика (2), 12-14.

⁵² Скрипниченко, В. А. (2014). Інноваційні перспективи виробництва біопалива в Україні. Науковий вісник Національного університету біоресурсів і природокористування України. Серія: Економіка, аграрний менеджмент, бізнес, (200 (1)), 291-298.

⁵³ Сінченко, В. М. та інші (2014). Класифікація видів біопалива та перспективи їх виробництва в Україні. Біоенергетика, (1), 5-6.

⁵⁴ Козак, О. А., & Грищенко, О. Ю. (2016). Розвиток зернової галузі України на сучасному етапі. Економіка АПК, (1), 38-47.

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(2014)⁵⁵ on feed and fodder sector; Tkachyuk (2014)⁵⁶ on vegetable oil; and Bondar (2017)⁵⁷ on the sugar industry. Unfortunately, publications by Ukrainian authors are not usually published in English.

There is an issue that Ukrainian and European publications on this topic tend to have in common. They often rely on the same data source, namely the State Statistics Service of Ukraine (SSSU). Though it might very well be a reliable source of statistical data per se, the problem is the already mentioned delay in publications. It is common to come across a recently published paper which analyses a certain sector, however, based upon outdated data. And since data sources are sparse, there is kind of a cascading effect: many different papers – Ukrainian and European alike – often effectively rely upon and quote the same outdated numbers. On the other hand, the biomass sector develops dynamically. This is especially relevant in the case of the Ukraine, because political and economic factors can change rapidly in the country. Other factors, like technology level and know-how - while boosted by the ever growing FDI influx into the sector - can change rapidly as well. As a result, it is difficult, if not impossible, to get an up-to-date overview of the biomass and biofuel production sector.

⁵⁵ Данкевич, Є. М.(2014). Кормовиробництво як необхідна складова стратегії розвитку міжгалузевої інтеграції.

⁵⁶ Ткачук, В. І. (2014). Тенденції розвитку ринку олійних культур в Україні.

⁵⁷ Бондар, В. С. (2017). Тенденції і перспективи цукрового ринку України (До підсумків роботи галузі в 2016 р.). Цукрові буряки, (1), 4-5.