THE BLEYZER FOUNDATION
Turning Transitions Into Prosperity

SigmaBleyzer

Unleashing Ukrainian Agricultural Potential To Improve Global Food Security

August 2016

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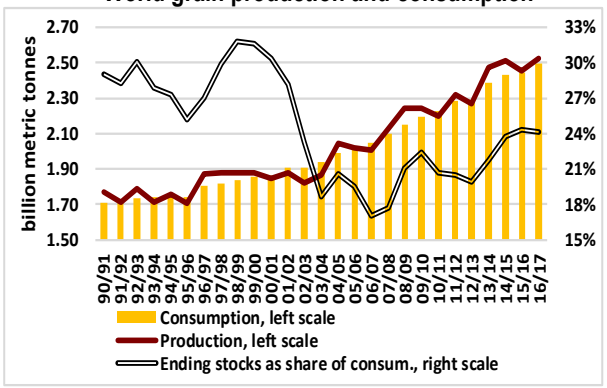
*Definition: Thought this report we apply the term **grains** to refer to wheat and coarse grains (including barley, buckwheat, maize, millet, oats, rye and sorghum) to preserve consistency between the Ukrainian and international statistics. Our definition of grains, however, excludes rice because of its relative unimportance in trade and production of agricultural commodities in Ukraine.*

Unleashing Ukrainian Agricultural Potential To Improve Global Food Security

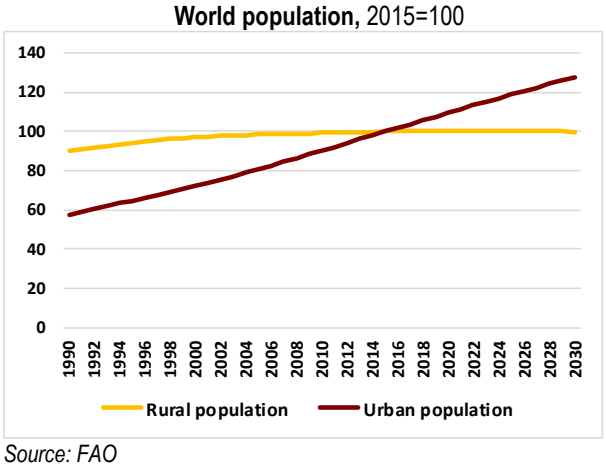
1. Global Agricultural Demand – a Unique Opportunity for Ukraine



Source: USDA

Ukraine – known a century ago as the breadbasket of Europe – today has the potential to become the breadbasket of the World, and to position itself as a major player in global food security. This is a unique opportunity for a country of 45 million located in the center of Europe – one that has been torn over the last two decades between its Soviet past and fledgling democracy. Global agricultural demand over the next several decades will continue to grow and will be affected by four major trends, two of which emanate from major demographic pressures (population growth and urbanization) and two that are consequences of economic development (higher per-capita income in emerging markets and higher demand for bio-fuels). Ukraine is uniquely positioned to capitalize on this growing demand.

(i) Population Growth

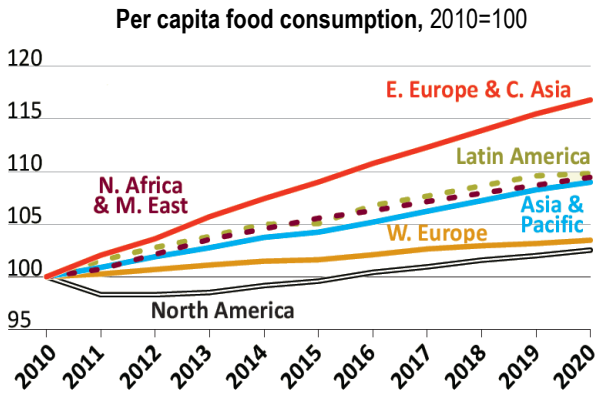


Source: FAO

World population is expected to grow from the current level of 7 billion to over 9 billion by 2050. This increase is equivalent to adding six countries the size of the USA to the current number of Earth's inhabitants. In addition, there will be a need to better feed over a tenth of the current population, which today is undernourished. This is the equivalent to two times the population of the USA. As a result, during the next few decades, there will be an additional need to feed a population equivalent of about eight times the current population of the USA. This will put heavy demands on agriculture.

(ii) Urbanization

The second demographic pressure on agriculture will come from the rapid pace of urbanization in the world. The world's urban population is expected to increase by 20% over the next decade, mostly due to growing cities in the developing part of the world. Due to changes in lifestyle of the urban population, per capita consumption of food will increase, putting additional pressures on food supply.

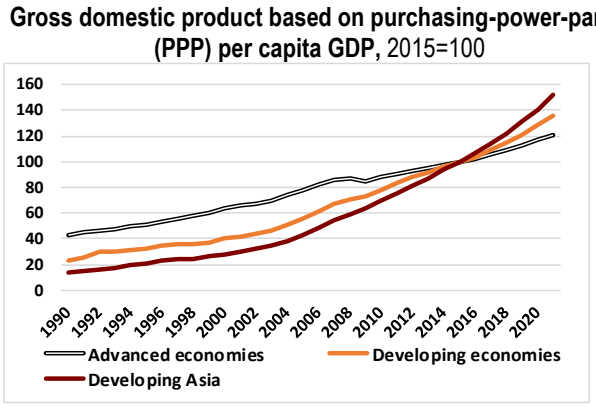


Source: FAO

Furthermore, a diversion of water and land to urban use will undermine sustainability of traditional farming methods. These pressures will have profound implications not only for food consumption, but also for economic development, environmental pollution and utilization of natural resources, most importantly – water and land.

These dramatic demographic trends of population growth and urbanization are just a part of a broader story of intensifying demand pressures on world agricultural markets. Increases in per-capita income and higher demand for bio-fuels are also important, as discussed below.

(iii) Increases in Per Capita Income



Source: IMF

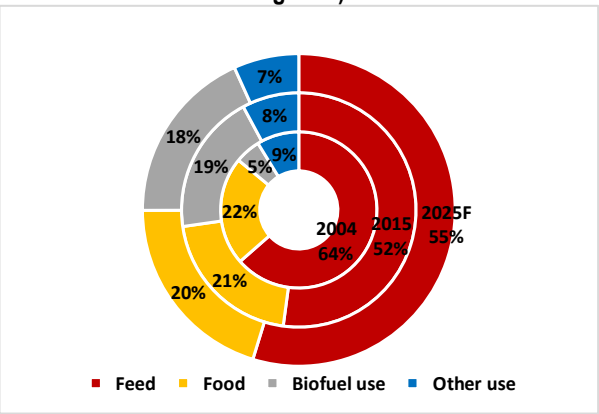
The pace of growth in income per capita in emerging economies will be three times higher than in developed nations. This will continue to drive per capita consumption of foods in developing nations. In fact, as developing countries get richer, they consume more calories as well as go through a dietary shift away from grains to meat, dairy and vegetables – foods whose production requires a more intensive use of land, energy and water. The Food and Agriculture Organization (FAO) estimates that in order to accommodate changing diets in developing countries,

meat production will need to nearly double by 2050 from its current level.[1] This means that the production of soybeans (which is mostly used to feed farm animals) and other types of foods for farm animals will have to double as well.

(iv) Higher Demand for Bio-fuels

FAO estimates that biodiesel production and fuel use of ethanol will grow by about 70%-80% over the next decade. This increasing demand for biodiesel and bioethanol is a big factor behind the recent surge of global demand for corn, sugar cane and vegetable oil – which are used as a feedstock for the production of bio-fuels. This means that more land will be diverted to nonfood crops, leading to tighter supply and higher food prices in the coming years and decades.

Main uses of the world grain production (wheat and coarse grains)



Source: OECD

In summary, population growth, urbanization, economic growth with a shift toward animal protein-based diets, and the requirements of agro resources for bio-fuels will sustain a steady growth in global consumption of agricultural commodities. According to estimates by The Bleyzer Foundation, the European Bank for Reconstruction and Development, and other agencies, these trends imply that potential world's agricultural consumption will increase by about 30% over the next 10 years (see Attachment II for details). World consumption of grains will increase from 2018 tons in 2015 to 2584 million tons by 2025. Clearly, the world faces a serious challenge to supply more agricultural products in a more sustainable manner, as noted below.

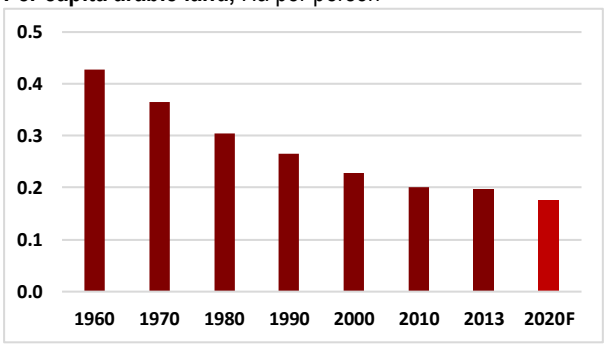
[1] FAO, World agriculture towards 2030/2050, the 2012 revision.

2. Global Agricultural Supply

On the agricultural supply side, the response of agriculture production to increasing demand is being constrained by the global shortage of suitable land, slowing agricultural productivity growth and environmental degradation.

(i) Global shortage of suitable land

Per capita arable land, Ha per person



Source: FAO

Population growth and increasing urbanization are already diminishing the amount of land suitable for agriculture. According to FAO estimates, the global availability of per-capita arable land declined from about 0.4 hectares in 1960 to about 0.2 hectares in 2013 (the latest available data from FAO) and is expected to further decline by 2020. These land limitations mean that future agricultural supply may have to come mainly from productivity increases.

Currently, nearly 38% (4.9 billion ha) of global land surface (13 billion ha) is used for agricultural production, compared to 34% in 1961. The permanent meadows and pastures area has increased most in absolute terms (+281 million hectares), but its growth rate has dropped to around zero after 2000.

Permanent crops increased most in relative terms (+85%), but their share in total area remains marginal. The total irrigated area has grown steadily over 1% per year to reach 324 million hectares currently. The world agricultural area is no longer increasing due to increased competition from other uses (urbanisation, industry, transport infrastructure, nature restoration), low fertility of remaining land and environmental concerns.

World area for the major crops (not including permanent crops, vegetables and permanent grassland) has increased by about 300 million hectares over the last 50 years. The majority of the cropped area is devoted to cereals (about 650 million hectares). Of these cereals, wheat has the largest and most stable share, while maize is the most dynamic, especially in the last decade. Other cereals, such as oats and barley, account for the largest decrease in cropped area.

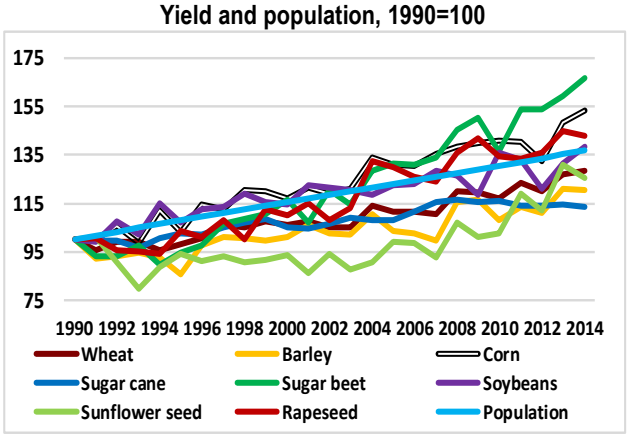
Oilseed area expansion is most explicit, especially for soybean, which has increased more than five-fold. Sugar crops are marginal in the total area, but, within the sugar

crops, sugarcane is most dynamic, with the area quadrupled in five decades, while sugar beet area shrunk. The area of starchy roots, such as potatoes and cassava, has slightly increased, mainly due to cassava in the developing regions. Land use is also influenced by the number of animal heads, which has also increased exponentially, especially for pigs and poultry. The earth is now populated by 1.4 billion pigs and 64 billion poultry birds. Compared to 50 years ago, we now count an additional billion pigs and more than 50 billion poultry birds. Beef and veal did not experience such a huge increase, from a little over 170 million in 1961 to 300 million heads now. It is clear that this expansion of animal heads has drastically transformed our agricultural and cropping landscape. As indicated by Foley et al. (2014), North America and Europe devote only about 40% of their croplands to direct food production, whereas Africa and Asia allocate typically over 80% of their cropland to food crops. Averaged across the globe, 62% of total crop production (on a mass basis) is allocated to human food, 35% for animal feed (which produces human food indirectly, and less efficiently, as meat and dairy products) and 3% for bioenergy crops, seed and other industrial products.

(ii) Slowing Agricultural Productivity Growth

Crop yields have substantially increased since the 1960s. This achievement resulted from a combination of advances made in technology and farm management. Improved seeds, more investments in soil fertility, better pest pressure reduction, irrigation, optimized breeds, economies of scale, better machinery for planting and harvesting, more skilled farmers with access to better data and advisory systems all contributed to higher yields.

On the other hand, the growth of agricultural productivity is already slowing these days. As FAO data shows, global yield growth for wheat slowed from almost 3% per annum in 1962-1989 to 1.3% pa in 1990-2011. Other popular crops also experienced declines in global yield growth during these periods. Although population growth has also decelerated, as shown in the side chart, the rate of population growth exceeded the growth rates of agricultural yields in most commodities over the last 25 years.



Source: FAO

One of the factors affecting agricultural productivity is the fact that the shortage of fertile agricultural land means that marginal and less attractive lands need to be brought under cultivation. These marginal lands are not as productive as older land. Furthermore, improvements in existing farming methods are reaching the point of diminishing returns as manifested by slowing growth of crop yields.

Agricultural productivity is also being affected by growing competition for water. Agriculture, which accounts for about 70% of total annual global water consumption, will be competing for water with cities more aggressively as urbanization increases. In addition, an increasing production of water-thirsty commodities (such as meat and biofuels) will continue to deplete the overall water supply.

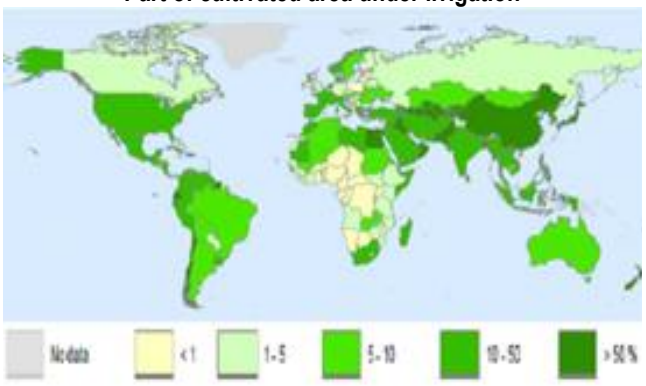
Another factor affecting agricultural productivity is climate change. The International Food Policy Research Institute (IFPRI) believes that climate change will be a major challenge for sustained growth of productivity and yields in agriculture. In particular, the IFPRI estimates that less stable climate conditions will be accountable for half of the overall food price increase in the future. More than that, according to the Global Climate Risk Index, low-income developing countries will suffer most from the consequences of the changing climate.

Global distribution of physical water scarcity by major river basin

Green: Evapotranspiration due to irrigation < 10% of total renewable water resources; Yellow: between 10 and 20%; Orange: >20%.

Source: GAEZ, FAO-IIASA

Part of cultivated area under irrigation



Source: FAO AQUASTAT

(iii) Environmental Degradation

Pollution and soil erosion are already limiting the upside potential for further yield gains in agriculture. They make crops more susceptible to pest damage, while deforestation and extensive use of pesticides are stressing fragile ecosystems.

All of the above constraints to future agricultural supply imply that, in order to meet future food requirements, significant investments in productivity enhancement technologies will be needed. This involves investments in modern agricultural machinery, fertilizers, improved seeds, plant protection, storage, transportation, and other on-farm facilities.

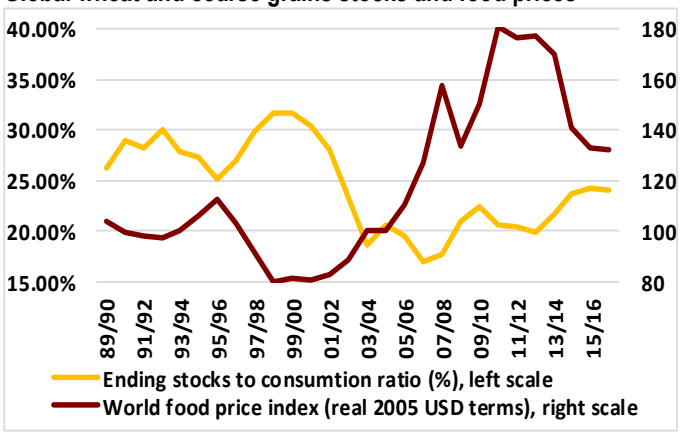
Agriculture accounts for about 70% of total global water use and up to 90% in developing countries (FAO Aquastat). Water is crucial for food production: over the last 50 years, more than 40% of the increase in food was ensured by lands under irrigation. Among those areas were plains and parts of the west coast of the US, parts of the Andes in South America, South Africa and Southeast Australia. Many of these areas are densely populated: an estimated 80% of the world's population currently live in areas with high levels of threat to water security.

Agriculture is also a major source of water pollution, from nutrients, pesticides, soils and other contaminants, leading to significant social, economic and environmental costs in many regions.

3. Global Supply/Demand balances and Agricultural Prices

Since the mid-2000s agricultural and food prices moved to a higher level and in parallel with prices of other commodities – and at times have also been very volatile. These events led to concerns, which, in different ways, brought to the forefront a debate about food security. Both developed and developing countries saw their consumers facing the impact of higher food prices, and their producers feeling the pressure from higher input costs.

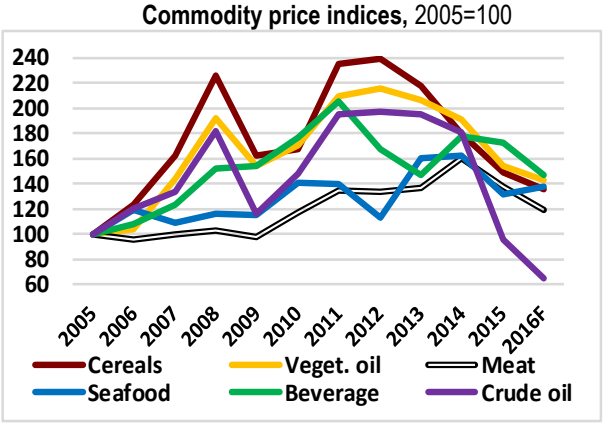
Global wheat and coarse grains stocks and food prices



Source: IMF and USDA

Agricultural production is not elastic in the short-term – farmers cannot respond quickly to demand changes. Thus, grain stocks play an important buffering role in mitigating short-term disruptions between supply and demand, which helps smooth price fluctuations. Under current trends, agricultural stocks are not likely to increase. This means that future disruptions to global agro markets will likely trigger a stronger price increase than in the past.

Commodity price indices, 2005=100



Source: IMF

Prices for crops and livestock products showed similar trends in 2013-2015. Among crops, three years of strong harvests put further pressure on prices of cereals and oilseeds. But the most significant impact on crops prices was the decline in crude oil prices. As the side chart shows, lines for cereals and vegetable oils price indices are of a very similar shapes as the line for crude oil price index proving a very tight correlation. In 2013-15, decrease in crude oil prices was a source of downward pressure on crops prices, principally through their impact on energy and fertilizer costs. At the same time, the decline in crude oil prices was much

more substantial than those of cereals and vegetable oils as high demand for these commodities limits price declines. As for meat, tighter supplies due to factors including herd rebuilding and disease outbreaks supported its high prices. The prices of dairy products dropped steeply from historic highs. Further adjustments to short-term factors are expected in 2016, before the medium-term drivers of supply and demand take hold. In fact, since the beginning of 2016, a series of recent supply shocks led to stabilization of global grain stocks. As a consequence, the FAO Food Price Index moved from 149 in January 2016 to 162 in July 2016, an increase of 8.7% in six months. Cereal prices, however, have remained relatively stable during 2016 due to current high stock levels.

Agricultural prices are projected to remain at levels higher than in the years preceding the 2007-08 price spike and will gradually increase.

The major changes in food demand are in developing countries, where continued but slowing population growth, rising per capita incomes and urbanisation all increase the demand for food. Rising incomes prompt consumers to diversify their diets by increasing their consumption of animal protein relative to starches. For this reason, the prices of meat and dairy products are expected to be high relative to the prices of crops; while among crops the prices of coarse grains and oilseeds used for feed should rise relative to the prices of food staples. These structural tendencies are in some cases offset by specific factors, such as a flat demand for maize-based ethanol.

In Asia, Europe and North America additional agricultural production will be driven almost exclusively by yield improvements, whereas in South America yield improvements and additional agricultural area are projected. Modest production growth is expected in Africa, although further investments could raise yields and production significantly.

Exports of agricultural commodities are projected to become concentrated in fewer countries, while imports become more dispersed over a large number of countries. The importance of relatively few countries in supplying global markets for some key commodities increases market risks, including those associated with natural disasters or the adoption of disruptive trade measures.

Overall, trade is expected to increase more slowly than in the previous decade, but maintaining a stable share relative to global production and consumption. At the same time, current and future trends in agriculture indicate that agricultural demand is bound to increase at a fast pace, whereas future agricultural supply faces great uncertainty. This means that major efforts and investments are needed to enable the world to feed itself. These trends also imply that investments in the agro business will deliver above average returns in the foreseeable future.

As noted in Attachment II, the above constraints to future agricultural supply will limit the rate of growth of world production of grains to about 1.15% pa. Accordingly, world grain production would reach 2255 million tons by 2025 (according to OECD-FAO estimates). These numbers fall short of potential consumption of 2584 million tons of grains by 2025, as noted earlier. Therefore, the potential worldwide shortage in grains may reach 322 million tons per year in 2025. In order to meet future food requirements, significant investments in productivity-enhancing technologies will be needed. This involves investments in modern agricultural machinery, fertilizers, improved seeds, plant protection, storage, transportation, and other on-farm facilities. Investment requirements are discussed in the concluding section of this note.

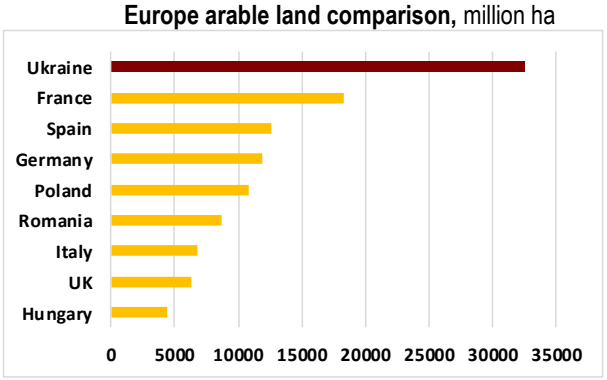
Over the longer term, higher demand and constrained supply mean that the global stocks of major grains will remain low. This should keep world food prices on a steady uptrend over the next few decades, especially taking into account that developing countries, where food consumption growth is faster, are taking on an increasingly more important role as exporters of grains.

4. Ukraine's Comparative Advantages in Food Supply

Ukraine is in a privileged position to play a dominant role in global food supply, offering excellent opportunities for investments in agriculture. After all, Ukraine has a diverse farming industry which can competitively supply the world with many staple agricultural commodities. Indeed, according to the FAO, Ukraine is among the world's top 15 producers in the following commodities: sunflower seed, pome fruit, sour cherries, barley, currants, natural honey, mustard seed, gooseberries, walnuts, oats, raspberries, rye, carrots and turnips, cucumbers and gherkins, vetches, cranberries, eggs, sugar beets, chicory roots, buckwheat, potatoes, cherries, stone fruit, rapeseed, peas, garlic, indigenous rabbit meat, linseed, cabbages and other brassicas, maize, quinces, soybeans, flax fiber and tow, blueberries, apples, indigenous horse meat, plums and sloes, apricots, wheat, tomatoes, hops, strawberries, anise, badian, fennel, and corian.

Ukraine's comparative advantages include: (i) a natural endowment of high quality fertile land that has already enabled large production and exports; (ii) high quality and relatively cheap labor force (compared to other European countries); (iii) a reasonably developed infrastructure; (iv) close location to the world's key agro markets, and (v) a unique potential to generate superior returns on investments with the application of modern technologies.

(i) Ukraine's Agricultural Land

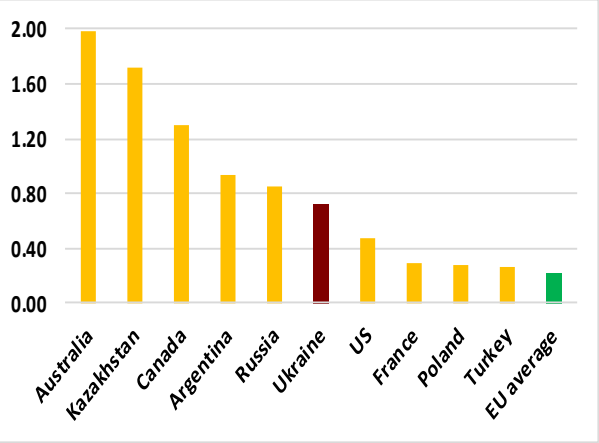


Source: FAO

Ukraine, along with Denmark and Moldova, are the only three countries in the world in which arable land represents more than 50% of total land. Given its large size, Ukraine has more arable land than any other country in Europe with 32.5 million hectares. Ukraine's arable land is about 4 times the size of the arable land of Italy, 3 times the arable land of Germany, 6 times the arable land of the UK, and equal to the combined arable lands of France and Spain. This gives Ukraine 0.71 hectares of arable land per capita, compared to only 0.26 ha for the EU-27.

The country is richly endowed with black soil, one of the most fertile soils worldwide. Black soil contains a very high percentage of humus (3% to 15%) along with phosphoric acids, phosphorus, and ammonia. It occupies 41% of Ukraine's total area and even more of its agricultural land (54%), and plow land (58%). In fact, thirty per cent of the world's black soil is in Ukraine.

Arable land availability, ha per capita



Source: FAO

By virtue of its unspoiled soil, Ukraine is also emerging as a major producer of organic food. Already, hundreds of thousands of acres are devoted to organic farming and agricultural officials and outside experts believe that Ukraine can become a major exporter and help satisfy the increasing demand in Western Europe for such products.

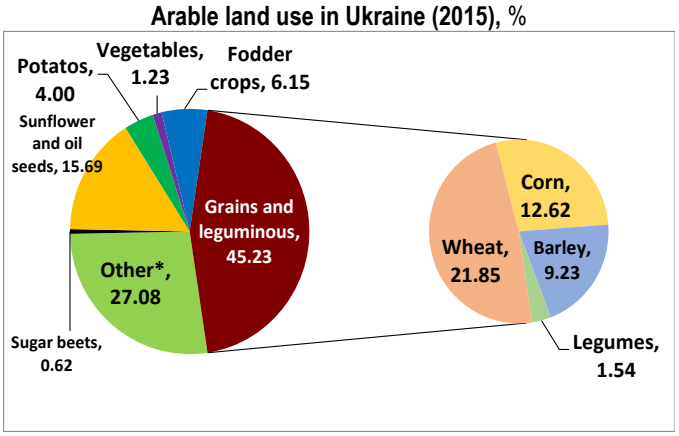
Land structure in Ukraine

	mln ha	%
Total land	60.36	100
Agricultural land	42.73	70.8
Arable land, of which	32.54	53.9
Sown area	24.2*	40.1
Grassland	5.43	9.0
Haymow	2.41	4.0
Other	2.35	3.9

*Excluding sown area of Crimea and temporarily occupied territories of Donbas

Furthermore, Ukraine's arable land is one of the most fertile in the world. The country is endowed with one of the world's largest deposits of "black-earth" soil, known as Chernozem, which is rich in agricultural nutrients and has superior capacity to hold water. In particular, Ukrainian Chernozem has high humus content – the average depth of the humus layer in Ukraine is 40-60 cm versus 5-30 cm in the EU. Ukraine has about one-third of the world's total black-earth soil. Black soil comprises about 60% of all cultivated land in Ukraine.

In addition, most of the Ukrainian agricultural land is in plains, with large and even fields averaging 100-150 ha, compared to much smaller European fields. These large fields should further facilitate the use of modern agricultural equipment and technologies.



*Includes uncultivated land and arable land in Crimea and temporarily occupied territories of Donbas
Source: SLCU, SSCU, The Bleyzer Foundation

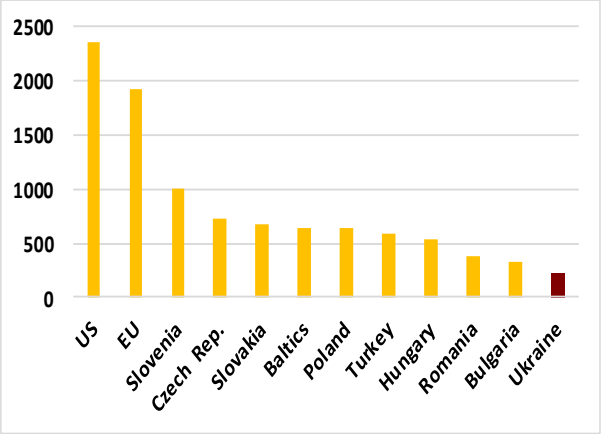
Fertile and abundant land, with a temperate climate and sufficient rainfall, is well suited for the production of grains, oilseeds, sugar beets, and other crops. In fact, most of the territories in Ukraine receive between 500-1,000 mm of annual rainfall, which allows for productive farming without irrigation. Of its total arable land, 48% is dedicated to grains and legumes, 15% to sunflower, 8% to fodder crops, 6% to vegetables, and 8% to other products. About 15% of the arable land is uncultivated. Its rich land and favourable weather conditions have made Ukraine one of the largest agricultural producers and exporters in the world. An additional potential benefit to productivity is that Ukraine is now a non-GMO country (Genetically Modified Food is not allowed). This means that there is a substantial productivity potential in the future if GMO-traits in crops such as corn, soybean, sugar beet and potatoes were to be legalized. The government is now actively considering this possibility.

Yet, despite its highly productive soils, Ukraine still enjoys affordable land prices, which makes the entry into the local agro business especially attractive. Indeed, lease payments and land valuations in Ukraine are significantly lower than in other countries. For example, the minimum rent price of farmland is 3% of the laid-down value of land under effective legislation. As of now the average laid-down value of farmland is equivalent to about USD 1,040 per ha meaning that the minimum rental of farmland should be about USD 31 per ha. Actually, the average annual rental of Ukrainian farmland was about USD 36 per ha in 2015. According to the data of the KSE Project on Support of Reforms in Agriculture and Land Relationships in Ukraine, the market value of farmland varies from USD 1,000 to USD 5,000 per ha in Eastern Europe and from USD 15,000 to USD 30,000 per ha in most Western European countries. The highest value of farmland is above USD 60,000 per ha on Malta and in the Netherlands. As for the rent cost of farmland, it is around USD 200 per ha in most European countries. The lowest rent prices are

in Slovak Republic (USD 26 per ha) and Lithuania (USD 54 per ha), while the highest rent prices are in Denmark, Ireland, and the Netherlands (above USD 600 per ha).

(ii) High Quality and Relatively Cheap Labor Force

Net average monthly wage in selected countries in 2014, EUR



Source: Eurostat. SSCU, The Bleyzer Foundation

Labor intensity in Ukrainian agriculture is relatively high. The sector employs about 5% of the labor force (as per ILO methodology). Including temporary and seasonal workers as well as small farms, the sector employs 15% of the labor force (as per World Bank methodology). One of the reasons for this high employment ratio is the existence – along with large and efficient fields – of many small, privately run farms. On these smaller farms, productivity per worker is low, because many farmers cannot afford better machinery, seeds and fertilizers. This also means that consolidation of small farm holdings is a viable option to boost efficiency and earn decent returns on investments in Ukraine's agro businesses.

On the upside, labor costs in agriculture are relatively low, which helps partly mitigate the impact of lower productivity on competitiveness. In 2012, the average monthly wages in the sector were almost 33% lower than the mean level for the total economy. By 2015, the situation slightly improved as the average monthly wages in agriculture denominated in the national currency grew faster and reached the level of 78% of the mean for the total economy. At the same time, annexation of Crimea and the anti-terrorist operation in Donbas after the Revolution of Dignity led to more than 200% devaluation of Ukrainian currency, while wages saw little growth. In particular, the mean average monthly wage in the economy fell from about EUR 295 in 2012 to about EUR 173 in 2015. This means that the average monthly wage in agriculture denominated in Euro even fell from EUR 196 in 2012 to EUR 135 in 2015.

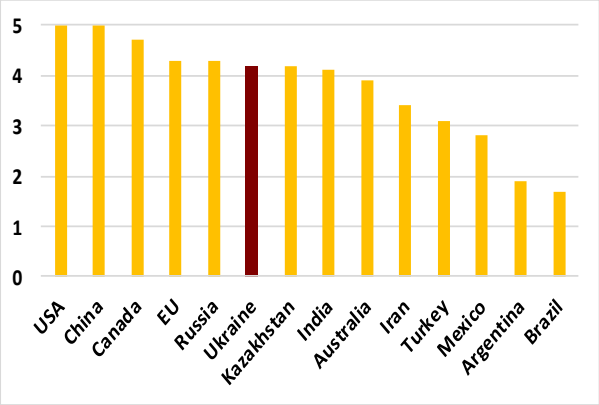
In addition to low cost, Ukrainian agriculture also benefits from a highly educated labor force. According to the World Economic Forum's Global Competitiveness Report 2012-2013, Ukraine has one of the highest tertiary (university) education enrollment levels in the world (10th out of 142 countries). In fact, in 2013 the

tertiary enrollment ratio in Ukraine was about 80%, which was close to the enrollment ratio of the United States (83%) and higher that the ratios in France or Germany (about 61%). It was the fourth highest in all of Europe. This means that there is no shortage of well-trained and relatively inexpensive workers in Ukraine who can operate modern agricultural machinery, perform crop research, adopt advanced agricultural techniques, and manage modern farms.

(iii) Reasonably Developed Infrastructure

Ukraine possesses relatively well-developed infrastructure to support agricultural exports. The total transport network includes 21.7 thousand km of railroads, 165.8 thousand km of roads, 2.2 thousand km of operational river shipping routes with access to the Azov and Black seas. Railroad transport is the main means of passenger and cargo transportation. Ukrainian railroads carry more than 58% of cargo. According to the Global Competitiveness Report 2015-16, Ukraine is ranked 28th out of 140 countries in terms of quality of railroad infrastructure.

Quality of railroad infrastructure in selected countries*



**The railroad quality was assessed from 1 (underdeveloped) to 7 (extensive and efficient by international standards)*
Source: The Global Competitiveness Report 2015-2016

Ukraine also possesses the highest port potential among all countries in the Black Sea region. There are 18 merchant seaports along the coastline of the Black Sea region. Five of those ports, however, are in temporary occupied Crimea. The waterfront and port territories are equipped with about 600 gantry cranes, thousands of lift trucks of different types and other port machinery. The most important Ukrainian ports are those in Odessa, Ilyichevsk and Yuzhniy. These three ports alone account for around 56% of the entire cargo turnover in Ukrainian merchant seaports.

Although Ukraine requires improvement in the quality and efficiency of cargo transportation, as well as customs reform, the infrastructure sector is one of the country's competitive advantages for agricultural exports.

(iv) Geographic Location

Ukraine is located at the crossroads of Europe and Asia. It borders the Black Sea and has a good rail network. As a result, Ukraine has a comparative advantage for exports to its major markets, which are in the Middle East, North Africa and the

European Union. For more distant markets, Ukraine has a number of year-round, ice free Black Sea ports which facilitate the export of grain to the nearby MENA region and beyond that, to Australia's valuable Asian markets.

5. Ukraine's Agricultural Exports and Output

In the 19th century, Ukraine was known as the "breadbasket of Western Europe". In the 20th century, it became the "breadbasket of the Soviet Union" producing about 25% of all agricultural output of the former Soviet Union. Today, Ukraine is the world's third largest exporter of wheat and coarse grains and among the world's top seven producers of these grains.

World's largest exporters and producers of wheat and coarse grains

	Exports, 2015/16 marketing year		Production, 2015	
	million tons	% of the world exports	million tons	Domestic consumption, % of production*
USA	79.0	23.6	422.7	81.4
EU	46.5	13.9	312.4	91.9
Ukraine	38.2	11.4	60.7	43.4
Russia	34.3	10.2	98.4	67.9
Argentina	31.2	9.3	48.2	42.5
Canada	26.5	7.9	53.3	57.0
Australia	22.8	6.8	36.9	34.6
Brazil	18.6	5.6	76.2	90.4
Kazakhstan	7.6	2.3	13.7	71.5
India	1.0	0.3	86.5	148.1
Mexico	1.0	0.3	31.4	160.9
China	0.7	0.2	362.0	130.9

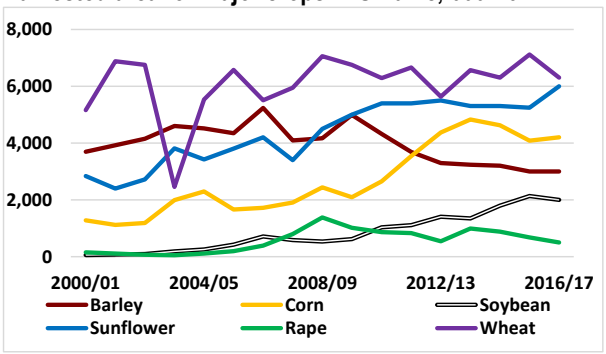
**When domestic consumption relative to production is close to or exceeds 100%, it means the country consumes more grains than it produces. Coarse grains include barley, buckwheat, maize, millet, oats, rye and sorghum.*
Source: USDA

Agriculture in Ukraine represents approximately 10-11% of national GDP and employs a quarter of working population.

In 2015/16, annual production of wheat in Ukraine reached 27 million tons, of which 17 million were exported . In that year, annual production of coarse grains (mainly corn and barley) reached 33 million tons, of which 21 million were exported. Total exports of these grains reached 38 million tons in 2015/16. The entire agricultural production is over 110 million tons. Local needs do not exceed 40 million tons, making around 50-60 million tons available for exports in the sphere of agriculture.

The production of cereal and industrial crops tends to be the focal point for agricultural enterprises. Major cereal crops of grain markets in Ukraine incorporate winter wheat, spring barley and fodder maize. Winter wheat is the core crop for both private farms and agricultural enterprises.

Harvested area for major crops in Ukraine, 000 Ha



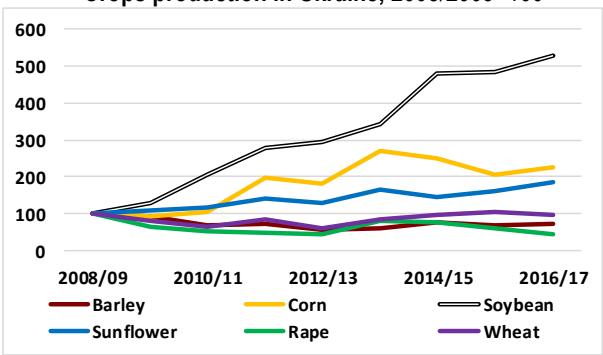
Source: USDA

More than 75% of the arable area in Ukraine is used for crop production, with wheat making up the largest area. For the past 15 years (apart from 2003/04), a relatively stable area has been harvested, fluctuating between 5 to 7 million ha annually. Over the same period, the areas of sunflower, maize, and soybean have increased substantially. By contrast, barley and rapeseed areas have both decreased slightly since 2009/10. The period spanning 2000 to 2015 has seen a 65% total increase in the area of land being cropped, as idle land has been brought back into production.

The significant increase in area sown, together with steady increases in yield, has seen substantial increases in the volume of grain and oilseed produced and then exported by Ukraine, with corn, sunflower and soybeans experiencing particularly rapid growth from 2008/09 onwards.

Corn, soybeans, rapeseed, and sunflower enjoy significantly higher profit margins than wheat, depending on seasonal climatic conditions. These profit incentives have stimulated increased production of these crops, supported by their favourable rates of yield increase and the burgeoning demand for feed grains across the globe in generally and specifically in Ukraine.

Crops production in Ukraine, 2008/2009=100



Source: USDA

In addition, Ukraine has shared in the spoils of the EU biofuel market which has been such a bonanza for Australian rapeseed growers of late. In 2009, the EU published the Renewable Energy Directive (RED), which mandated that by 2020, 20% of all energy used by member states must come from renewable sources instead of fossil fuels. As

a result, a huge biofuel industry, dominated by ADM and Cargill, has sprung up to produce biodiesel for this nascent market. Whilst this directive did not proscribe GM oilseeds per se, due to stringent labelling requirements within the EU, GM rapeseed is rarely used outside of Spain and Portugal. The problem, however, was that the EU produced insufficient quantities of rapeseed to meet the biodiesel demand, necessitating the need to look further afield. Canada, the world's largest exporter of rapeseed, being predominantly GM, was effectively locked out of this market, clearing the way for Australian and Ukrainian exporters to extract sizable premiums in the absence of meaningful competition.

The area sown to rapeseed and soybeans has increased by 24% and 18% respectively, in the period between 2003 to 2013, while the area of sown to sunflowers has increased by about 4% over the same period. Since 2014, with a tightening of credit availability and an escalation of local prices of prices (due to a rapid depreciation of the UAH), some farmers have reduced rapeseed plantings in favour of soybeans and sunflower, despite yield or gross margin advantages, as the higher variable costs of production associated with growing canola can put too much pressure on limited working capital availability. However, this was not a problem shared by the agro-holdings, which were either abundantly funded or were sufficiently sophisticated to have USD hedging in place.

Given Ukraine's population of 45 million people, its low birth rate, low GDP per capita and high income inequality, there is a significant and stable domestic demand for all grains, with the Ukrainian government keen to ensure domestic food security is maintained, especially in drought years when production is very low. The combination of those characteristics of Ukraine and its government's desire for food affordability is that export volumes from Ukraine can be hugely volatile, even when compared against Australia that is renowned for its production variability.

Crop production in many grain-producing regions, including Ukraine, is often increasingly influenced by biotechnology. The system for regulating biotechnology in Ukraine, however, is not yet fully developed. The Ukrainian government has signalled its intention to align itself with prevailing EU standards.

Unlike other large grain producing countries, such as China, India, Brazil, Turkey and Mexico, where domestic production is mostly used to supply local markets, only about half of Ukraine's grain output is usually consumed domestically. This makes Ukraine one of the top 3 leading exporters of coarse grain (barley and corn) in the world. Most of the exported grain is destined for the countries of Middle East and North Africa. For wheat and coarse grains, Ukraine is among the top 6 exporters, selling abroad as much as the entire EU 27 and more than Canada or Brazil (see table above).

Ukraine's major grain exports by volume (million tons)

Crops	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Corn	5.5	5.1	5.0	15.2	12.8	20.0	19.6	16.0	17.0
Wheat	13.0	9.3	4.3	5.4	7.2	9.8	11.3	17.0	12.5
Barley	6.4	6.2	2.8	2.4	2.1	2.5	4.5	4.5	4.2
Soybean	0.3	0.3	1.0	1.3	1.3	1.3	2.4	2.2	2.6
Sunflower oil	2.1	2.6	2.7	3.3	3.2	4.2	3.9	4.2	4.8
Rape	2.6	1.8	1.4	1.2	1.3	2.2	2.0	1.4	1.0

Source: USDA

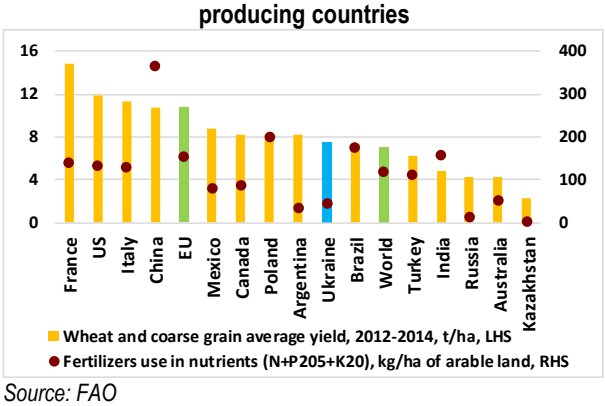
In 2015/16 Ukraine secured following leading positions worldwide:

- 1st exporter of sunflower oil (4.2 million tons);
- 3rd exporter of barley (4.5 million tons);
- 4th exporter of maize (16.0 million tons);
- 6th exporter of wheat (17.0 million tons);
- 7th exporter of soybean (2.2 million tons).

Notwithstanding its strong global position as a producer and exporter of grains, Ukraine still has enormous potential for improvement. This potential can be realized through investments in agro technology, aimed at improving agricultural yields. At present, despite fertile soil and a favorable climate, average crop yields in Ukraine remain significantly lower than in Western Europe and even fall short of world averages.

Over the last three years, Ukraine harvested over 60 million tons of grains with the record high harvest of 63.8 million tons in 2014. Despite this large output, Ukraine's three-year average crop yield of 3.1 t/ha for wheat and coarse grains was about 25% lower than in China, 28% lower than in the US and about 36% lower than in the EU. The respective yields for wheat and coarse grains in France, with which Ukraine is often compared, are about two times higher than in Ukraine.

Grain yields and fertilizers use in the largest grain-producing countries



Source: FAO

This productivity inefficiency results from decades of poor management and under-investment in agro machinery, fertilizers and high-quality seeds. Thus, Ukraine's fertilizer usage is almost 4 times lower than EU-27

and world averages. In addition, Ukraine's harvesting losses are about 15-20%, mainly due to outdated agricultural machinery and poor storage facilities. Furthermore, about 15% of total arable land is not cultivated.

All of this means that, by adopting Western agronomic techniques (agricultural machinery, fertilizers, seeds, and management practices) and bringing uncultivated land back into production, Ukraine could potentially boost its grain production to 150 million tons of wheat and coarse grains per annum (see the Attachments to this note for detailed analysis). Assuming domestic consumption remains relatively unchanged, Ukraine's exports could reach 125 million tons per year, transforming Ukraine into the world's largest exporter of wheat and coarse grains. In fact, Ukraine could surpass today's largest exporter of wheat and coarse grains, the USA, which exports about 80 million tons of these grains. For Ukraine's export potential to be realized, however, significant investments in agro technology, including fertilizers, machinery and infrastructure (such as storage capacities, transportation, sea ports) are required. This will also require improvements in government policies in the agricultural sector, as noted below.

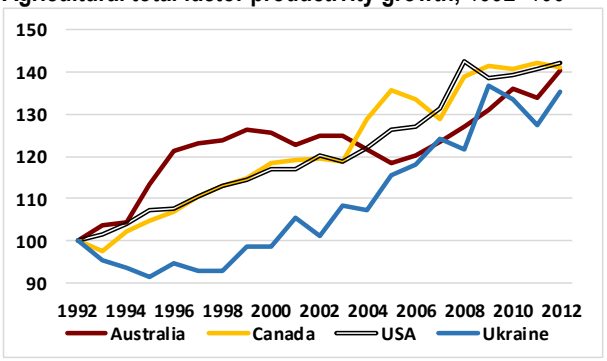
6. Productivity improvements in Ukrainian grain production

Improvements in technical efficiency

Ukraine is becoming more heavily reliant on modern farming systems and technologies, including hybrid seeds, cutting edge herbicides, and modern machinery and equipment. Coupled with recent foreign investments into Ukraine' grain handling and port terminal infrastructure, utilising state of the art farm-based technologies ensures a lift in the technical efficiency of grain production.

The rapid emergence of agro-holdings and their adoption on technology spill-ins has fuelled productivity growth in Ukrainian agriculture. As the side figure shows, agricultural total factor productivity growth has rapidly increased in Ukraine since the mid-1990s.

Agricultural total factor productivity growth, 1992=100



Source: USDA

Yields have increased substantially in Ukraine and are likely to increase further as Ukrainian farming draws on better seeds, improved sowing, more inputs, reduced losses from diseases and insects, better planning, improved timeliness of operations, and improved storage and transport infrastructure. The fact that Ukrainian farmers have massively adopted corn, soybean, and sunflower-growing in recent years indicates their acute awareness of the relative profitability of various crops and the wisdom of crop sequencing. Furthermore, the fact that Ukrainian wheat yields, over the past 15 years, have increased faster than in Australia, USA, Canada, and Europe, indicates that Ukrainian farmers are adopting a range of practice changes.

Ukraine's ability to further increase yield or productivity (and therefore, ultimately, gross margins) has obvious implications for Australian wheat growers and marketers, as there is the distinct possibility that greater production is likely, accentuating the price competitiveness of Ukrainian grain in major markets. Due to fairly stagnant domestic demand growth against the backdrop of a falling population, it is more than likely that any additional volume of production in Ukraine will be earmarked for the export market.

However, it is actually the shape of crop production which is a more relevant statistic, as export markets will largely depend on whether a larger Ukrainian crop is made up

of feed grains such as corn, or milling wheat. Ukrainian farmers have already demonstrated their ability and preparedness to switch into corn, soybean and canola production. How often, and to what degree, Ukrainian farmers switch away from wheat into these other crops has huge implications for wheat growers in Australia and potential purchasers of wheat, in general.

Varietal Improvements

Ukraine has a well-established wheat breeding program which is managed under the auspices of the Ukrainian Academy of Agrarian Sciences, with about 13 institutes located throughout the country, developing new varieties for all the major crops grown in the country. The Plant Breeding and Genetics Institute (PBGI) based in Odessa has a strong history of developing and releasing improved wheat varieties, particularly for the Forrest-Steppe and Steppe zones. The institute obtains about half of its revenue directly from government and about half from seed sales. Reductions in government funding and difficulties in recovering revenue from seed sales have substantially curtailed the activities of the institute in recent years.

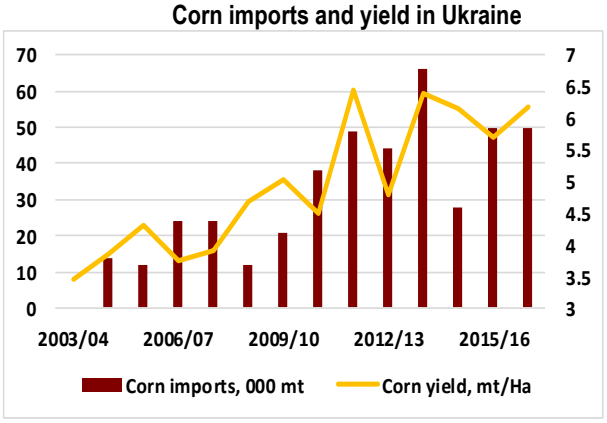
Privatisation of the breeding system is seen by many as the only viable option to ensure the future of crop breeding within Ukraine. However, weak intellectual property law would limit the viability of private breeding companies. It is unlikely that plant breeders rights could be enforced, and subsequently neither an end point royalty system, as in Australia, nor a seed royalties scheme, such as in France, could be implemented in the near term.

Only varieties certified on the State Register of Plant Varieties can be legally distributed and sold. Certification involves three-years of testing supervised by the State Seed Certification Inspectorate and paid for by the breeding institute or company wishing to release the variety in question. At present, about 20% of all wheat varieties on the register are of foreign origin. The constrained budget of the local breeding institutes is making it increasingly difficult for them to afford the testing costs and remain competitive against foreign seed breeders. Local breeding institutes have increased their focus on yield at the expense of grain quality and functionality in order to compete with the high yielding foreign varieties.

Newly-released varieties are sold for about twice the cost of the prevailing grain price, and require a year or two to bulk up to commercial quantities on farm. Varieties are often kept for about five years in progressively modern farms and up to fifteen years on very traditional farms. With the gain in yields attributable to genetics estimated at 5%-10 above currently used varieties at the time of release, this equates to an annual increase through genetics of around 1-2% per annum which is comparable to wheat

breeding achievements in many other wheat-growing regions across the world. However, the adoption rate of new varieties in Ukraine generally is poor, with some farmers indicating that many of the varieties currently used are fifteen to twenty years old.

The Ukrainian process for releasing the new varieties is not as thorough and transparent as occurs in Australia with the GRDC-funded national variety trials. In Ukraine the benefit attributable to a new variety is difficult to ascertain given the nature of the data available on release. The lack of transparency in the testing procedure does not facilitate varietal adoption. Given the lack of transparency regarding the relatively simple to assess attribute of yield, it is unlikely that breeding companies will be able to increase adoption of their grain based purely on quality attributes with the promise of price premiums.



Source: USDA

Aside from breeding within Ukraine, the other major source of varietal improvement in grains other than wheat has been through imports of newer varieties with improved agronomics. In late 2015, Ukraine's parliament adopted a law to bring seed and seedling legislation in line with European and other international standards. According to some industry experts, previous legislation made importing wheat and barley varieties (but not corn or oilseeds varieties) difficult by creating barriers to entry, presumably to protect Ukraine's plant breeding industry. The new legislation will facilitate cereal seed importation which should accelerate wheat and barley yield advancement in Ukraine.

As an illustration of the advantages of facilitating seed imports, corn and oilseeds production in Ukraine has benefited from not being so subject to the seed importation impediments as applied to cereals. There has been a marked increase in the imports of hybrid seed for corn and sunflower. It has been estimated that imported hybrids now account for around 70% of the total area planted to corn in Ukraine. As shown in the figure above, there is a strong positive relationship between corn yields and use of imported hybrid seed.

A representative of a major US seed company with seed-processing facilities in Ukraine has indicated that if weather during the growing season is favourable, the difference in yield between domestic and imported hybrids is not substantial. However, imported hybrids come into their own in challenging years with higher than average temperatures or drought-related stress.

The area planted to soybeans has doubled over the past five years and this trend shows no signs of abating while soybeans remain such a profitable crop for Ukrainian growers, relative to other spring crops. With strong domestic feed demand from the poultry and livestock sector, along with robust export demand for both beans and SBM (soybean meal), Ukraine's soybean market prices are supportive of further acreage expansion.

Given the potential for increasing yields through improved management practices, Ukraine is likely to continue to improve its crop yields and productivity.

7. Government Policies in the Agricultural Sector

Over the last few years, Ukraine has made progress in implementing major economic reforms in the agricultural sector. In particular, in the mid-1990's, the government liberalized most agricultural prices. Although the government still applies limits on increases in retail prices for some staple food products (e.g., sugar, bread, etc.), in general wholesale and retail prices for food are freely determined by market forces.

Subsequently, in 1999, the Government abolished agricultural cooperatives, transferring ownership of all collective farms to employees, with the temporary constraint that they could only farm or lease the land. The land sale moratorium has been repeatedly extended, with the result that land continues to be farmed by owners or under leases. The land sale moratorium is expected to be lifted in the near future.

In 2001, a new Land Code was enacted in Ukraine, which established the main legal rules for private land ownership and land markets in Ukraine. In particular, the Code defined land ownership as "the right to own, use, and dispose of land"; land can be acquired by private, legal and foreign entities with limitations on sale and purchase of agricultural land.

In 2011, substantial changes were made to the legislation to facilitate the eventual legal sale of agricultural land in Ukraine. The law on the State Land Cadaster was approved in August 2011 and came into effect at the beginning of 2012. This law stipulates the creation of a unified register of all agricultural land plots, which will be available online. Later on, at the end of 2012, the ban on sales of farmland was extended by three years to January 1st 2016 and then at the end of 2015 was further extended to January 1st 2017 to provide the government with more time to pass legislation which will enable a smooth transition towards a market-based exchange of rights to own agricultural land. Subsequently, a draft law on the Transfer of the Agricultural Land was released at the beginning of April 2013. Although, this draft extends the right to own farmland only to citizens of Ukraine, Ukrainian-owned farms, and state and local authorities, it outlines clearer and friendlier rules for all investors in Ukrainian agriculture. More specifically, legal entities and foreigners will continue to have the right to lease land. The draft law also establishes that the transfer of farm land ownership will not forfeit existing lease rights on such land. Equally important, to encourage a speeder adoption of modern commercial farming and enhance the attractiveness of Ukraine's agriculture to foreign investors, this draft law sets rules for more secure farmland tenancy (by establishing a minimum lease term and more preferential treatment of longer term leases) and creates more favorable

conditions for farm consolidation (for example, by placing a limit on the minimum size of a farm).

Several other important legal acts were adopted in recent years. Among those were the Law on Agrarian Subsidies Fund, the Law on Basic Principles of the State Agrarian Policy, and the Law on Grain and Grain Market in Ukraine. The most important legislation was the Strategy for agriculture and rural development in 2015-2020. It was developed in an admirably consultative manner, a product of experienced and skilled working groups, backed by extensive public consultations and a public submission process. It also incorporates recommendations of the IMF and was developed in full compliance with the Association Agreement between Ukraine and the EU. Below are the key objectives of the Strategy:

Key objective of the Ukrainian Strategy for agriculture and rural development 2015 – 2020

Approximation to EU	Approximate Ukraine's laws to those of the EU in accordance with the Association Agreement and relevant international standards in order to ensure a predictable and sound framework for production, processing and to facilitate trade. In particular, this is related to laws on food safety, sanitary and phytosanitary issues and to the measures listed in the Action Plan for the Implementation of the Association Agreement.
Deregulation	Modify or abolish any regulations and administrative acts which have been proven to be not in compliance with EU and international standards or to cause an unjustified cost for the operator. Ensure that the measures taken are correctly implemented and assess their impact, in order to ensure a fair, transparent, stable and predictable production, to improve business climate for the producers and operators, reform state agricultural property and state-owned enterprises to stimulate investment.
Factors of production	Address the main challenges related to factors of production, including land reform, access to finance, modernisation and upgrading of production and processing capacities, infrastructure and logistics, in order to low production costs, increase the competitiveness of the agricultural sector, and to contribute to GDP growth by increasing exports and domestic income.
Agriculture policy and innovation	Respond to producers' and agro-industry needs regarding competitiveness, innovation and value added by reorganising agricultural research and education, establishing vocational training and extension services, and by supporting an efficient agriculture policy in this respect, in order to facilitate the adaptation of the agricultural sector to medium term trends, new markets and opportunities.

Production and market management	Address Food Security, increase the transparency and efficiency of production and market management measures, by reforming the state price regulation and the State Food Reserve and State Agrarian Fund, abolishing export restriction, and promoting the representation and organisation of producers as well as fair and transparent contractual relationships in the marketing chain, in order to establish management tools and business practices adapted to the global challenges and the increasing world price volatility.
State support and taxation	To improve the efficiency of the state support to agriculture by establishing the simplified and targeted support system and to enhance state revenues by the modernisation of the taxation system in a transparent and equitable manner.
Rural development	Develop a rural development programme and implement measures aimed at supporting small farms based on the development of niche markets, quality production, functioning marketing channels, diversification of activities including green tourism, production of non-food products, and improve the quality of life in rural areas while fostering local governance and rural communities, in order to maintain a vital economy including in the most disadvantage rural areas where agriculture is the main source of income.
Environmental resources management	Establish a regulatory framework for the development of environmentally friendly agriculture and production methods by establishing minimum requirements and promoting best practices for management of natural resources, in order to ensure a sustainable growth of the agricultural sector and contribute to tackling global environmental challenges.

Governmental support is provided through mechanisms with direct or indirect impact on agribusinesses, as is done all over the world. Tax privileges and subsidies represent the indirect support mechanisms and are more common in Ukraine covering over 90% of total state support due to lack of financial resources in the state budget for direct financial support of agricultural sector. Until recently, the support was carried out primarily through VAT reductions and flat tax benefits. At the same time, there were some subsidies to agricultural producers, while selective market interventions were made to stabilize domestic prices and promote domestic processing. In fact, agricultural producers in Ukraine had the ability to retain VAT payments to cover operating expenses. Solely in 2015, agricultural producers were able to additionally invest into production around UAH 32 billion thanks to special VAT regimen and simplified taxation regimen.

However, starting on January 1st 2016 the situation changed. Negotiations with the IMF in relation to limiting the state budget deficit and stabilization of public

finance led to obligations of the government on lifting or limiting tax privileges as much as possible. The VAT scheme for agricultural producers was changed leaving them with less support on the side of the government. In particular, the differentiated system of special taxation regimens was introduced. Agricultural producers can use only a share of invoiced VAT payments for their needs. The share they can use varies depending on the type of agricultural production. The lowest share of 15% of invoiced VAT payments was set for grain and industrial crops producers, while the highest share of 80% was set for cattle breeders. Other agricultural producers pay half of their invoiced VAT payments to the budget and another half they leave for themselves. In addition, the unified flat tax rate was raised from 0.45% to 0.81% of the land value. Overall, some experts estimated the negative impact of the mentioned legal changes on the operating assets of agricultural producers to be around UAH 25-30 billion.

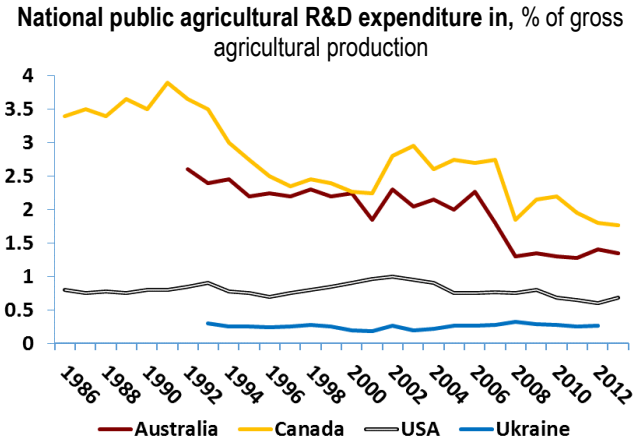
Direct financial support to agricultural producers from the government is not significant. In particular, the Ukrainian government's dearth of financial resources results in Ukraine's *Producer Support Estimate* being very low in comparison to other Black Sea producers and other grain exporting nations (see Table). According to the OECD, the *Producer Support Estimate* (PSE) is *"…an indicator of the annual monetary value of gross transfers from consumers and taxpayers to support agricultural producers, measured at farm gate level, arising from policy measures, regardless of their nature, objectives or impacts on farm production or income."* This means that agricultural producers must resort to their own sources of financing, including the attraction of foreign direct investments.

Producer support estimates (subsidies) as a percentage of gross farm receipts (including support)

	2008	2009	2010	2011	2012	2013	2014	2015
Ukraine	**2.2**	**7.3**	**6.5**	**-1.9**	**1.5**	**-3.2**	**-8.8**	**-7.0**
Australia	4.4	3.1	3.0	3.1	2.0	2.1	1.5	1.3
Canada	13.5	17.2	16.4	14.9	14.1	10.1	9.6	9.4
United States	8.6	10.1	8.6	8.0	8.5	6.9	10.0	9.4
EU28	23.0	23.4	20.0	18.2	19.4	20.1	18.1	18.9
Brazil	4.0	8.1	5.8	5.5	3.5	3.0	3.7	2.6
China	2.7	11.7	15.3	10.3	17.9	19.5	19.5	21.3
Kazakhstan	3.8	13.8	9.4	11.1	15.2	13.3	9.6	14.6
Russia	21.6	22.2	21.8	14.8	14.7	13.8	15.3	n.a.

Source: OECD.Stat

The picture is similar when we look at the Ukrainian government's direct financial support for agricultural R&D. Between 2006 and 2010, Ukraine's average annual spending on agricultural R&D was only USD 36 million, which equates to research intensity (R&D expenditure as a percentage of the gross value of agricultural production) of only 0.33%. Such level is significantly lower than in other large exporters of agricultural goods.



Government spending on agricultural R&D in Ukraine is low by global standards, significantly lagging behind the other major grain exporters such as Brazil, USA, Canada and the EU. However, this may change as governments in Australia and Canada become complacent or budgetary-constrained, diverting funding away from GDP-positive agricultural R&D to other political or economic priorities. As Ukraine's economy develops and its volume of agricultural production increases, greater government funding of agricultural R&D may occur, further fuelling productivity and production growth in Ukraine. Nevertheless, Ukrainian agricultural producers must attract FDI to finance R&D activities.

Overall, the state support of agricultural producers is far below the level observed in developed countries but they still managed to raise their total factor productivity in recent years. In monetary terms, state support of Ukrainian agricultural producers is estimated to be below EUR 40 per ha and mostly indirect support, while such support varies from EUR 175 per ha to EUR 1343 per ha in the EU (EUR 345 per ha in the neighbouring Poland) and its mostly direct financial support. However, despite a very low direct financial support and financing of R&D in agriculture, Ukraine's annual growth in its total factor productivity for agriculture has greatly outstripped that of Canada and even the USA in 2000s. Ukraine has clearly benefited from the inflow of foreign direct investment and technology into its agricultural sector since the early 2000s which continues unabated (although tempered somewhat by recent economic uncertainty).

Average annual rates of growth in total factor productivity in key grain exporting nations in different periods (% per annum)

	1961-70	1971-80	1981-90	1991-00	2001-10	2001-12	2003-12
Ukraine	n.a.	-0.3	1.0	-0.3	3.2	2.7	2.6
Canada	0.3	-0.5	2.3	2.3	2.1	1.8	1.6
USA	0.4	1.7	0.9	2.0	2.2	2.0	2.1

Source: USDA

7. Conclusions and Investment Prospects

Current global trends indicate that food security will be a major issue for the world over the next few decades. Global demand for food is likely to continue increasing at a fast pace, whereas food supply faces a number of constraints. As noted earlier, world grain scarcity may reach 322 million tons by 2025. In addition to possible food scarcities, the prices of agricultural commodities are likely to remain high. This means that food security may be a source of social and political instability in the most vulnerable regions of the world.

Ukraine is well positioned to play a major role in alleviating the problem of global food security. The country has tremendous potential for producing agricultural products and becoming the world's leading agricultural exporter. In fact, Ukraine may be able to cover about 50% of the global food shortage envisaged for 2025. This could be achieved through more intensive use of modern agricultural technology, better management and improved infrastructure.

All of this provides for attractive investment opportunities in the sector. Several local agencies (The Bleyzer Foundation, National Academy of Agrarian Sciences, Ukrainian Grain Association) and international agencies (World Bank, European Bank) have estimated that Ukraine will need a total of about USD 50 billion to USD 80 billion of investments to realize its agricultural potential (see Attachment II for details). These sums include investments in agricultural machinery, fertilizers, plant protection, storage, transportation, and other on-farm facilities. Under the assumption that agricultural output could increase by about 10% per year, it would take about ten years for Ukraine to realize this potential, with investments of about USD 5-8 billion per year. This level of investment will require significant contributions from large foreign and domestic investors.

In order to undertake these large investments in the agricultural sector, foreign and local investors will require a supportive investment climate for the country as a whole, with adequate incentives and predictable risks. Since the breakup of the Soviet Union, over the last 20 years, the country has made progress in improving its business environment and in creating a free and competitive market. In fact, today, Ukraine can show many areas of progress: (i) its 1996 constitution guarantees private property and market based principles for the country's economy; (ii) it is now a member of the World Trade Organization; (iii) it has been recognized by the US and Europe as a functioning market economy; (iv) it has a largely free international trade system; (v) most domestic prices are un-regulated – except for some food items; (vi) except for a handful of "strategic" public enterprises in energy and large infrastructure, most public companies have already been privatized; (vii) about one third of the banking sector is now foreign

owned; (viii) a new Tax Code has been enacted that reduced the total number of taxes, the basic corporate tax rate reduced to 18% today; (ix) a new Customs Code has been enacted to make customs procedures more in line with European standards; (x) it has made some progress in business de-regulation by eliminating a number of licenses, reducing the number of inspections, and simplifying procedures for starting new businesses obtaining the 83rd ranking in the latest Doing Business report prepared by the World Bank Group; and (xi) the Association Agreement with the EU, including a Free Trade Agreement, was ratified by all the EU members except for the Netherlands and came into full force (temporarily until final ratification from the Netherlands). As a result of these policy changes, since the breakup of its planned economy, the Ukrainian private sector has developed to that extent that it now generates over two thirds of GDP. GDP per capita in US Dollar terms has increased from slightly above USD 400 in 1992 (after Ukraine gained its independence) to a current level of above USD 2,000 (actually it peaked at around USD 4,200 in 2013 but than dropped due to sharp depreciation in 2014 and 2015 caused by annexation of Crimea and armed conflict in Eastern Ukraine). Improvements in the country's business climate allowed it to attract significant amounts of Foreign Direct Investments, which reached a total stock of almost USD 43 billion at the end of the first quarter of 2016.

Despite the progress made in Ukraine's investment climate, additional policy reforms are needed to create a more transparent, predictable, and even level playing field for all enterprises. The Bleyzer Foundation, along with international organizations and other NGOs, have identified many of the policies areas where reform is needed. In particular, there is a need to (i) improve the workings of the legal system to make the Judiciary more effective, transparent and accountable; (ii) deal effectively with corruption; (iii) improve the efficiency of public administration; (iv) further de-regulate business activities by reducing the number of permits needed for registering property, starting a business, carrying construction activities, and securing utility provision; (v) eliminate threats to property rights; (vi) facilitate the paying of taxes and reduce inconsistencies in the administration of taxes; and (vii) improve the country's international image.

The Bleyzer Foundation (TBF) has been playing an important role in assisting the governments of Ukraine to improve its business climate and attract larger amounts of investments. The Bleyzer Foundation is an international economic policy-oriented think tank that started its activity in Ukraine in 2000. Since then, it has published a number of documents relating to policy measures required to improve the business environment. It has worked with the US-Ukraine Business Council, the Grain Association of Ukraine and other NGOs to identify measures to

remove constraints to investments. It actively cooperates with the Presidential administration, the Cabinet of Ministries, the Ministry of Economic Development and Trade, the Ministry of Finance, the National Bank, and number of other government and non-government institutions in formulating effective economic policies. TBF is involved in a number of new economic initiatives in the country, including those are related to agro sector development. TBF activity in agro matters includes: (i) organizing public discussions such as conferences and round tables on the most important topics of the future of Ukraine's agro sector; (ii) participating in government and non-government working groups and other initiatives on matters related to the country's agro sector; (iii) active cooperation with the US-Ukraine Business Council, AmCham, European Business Association, and other business oriented associations on agro matters; and (iv) publications in Ukrainian and international media on agro topics.

ATTACHMENT I

Factors Influencing Agricultural Yields in Ukraine

Although, soil quality and climatic conditions greatly influence crop yields, productivity in agriculture is mostly driven by adequate use of fertilizers, investments in modern machinery and irrigation systems, and effective farm management. Indeed, despite favorable climate and fertile land, Ukraine often falls behind its European peers in cross-country comparisons of grain yields. After all, fertilizer use in Ukraine is much lower compared to many developed countries: farmers in the EU apply almost four times more fertilizer per hectare versus Ukrainian farmers. For instance, the National Academy of Agrarian Sciences of Ukraine (NAASU) argues that the annual requirement of inorganic fertilizer nutrients in Ukraine amounts to about 250 kg per Ha. In reality, local farmers apply just a third of this norm (on average, the use of fertilizers stood at roughly 70 kg per Ha in 2012). This insufficient addition of fertilizers results in an excessive loss of nutrients in the soil that leads to farmland exhaustion and low grain yields in the future. Meanwhile, the annual use of organic fertilizers remains at just 0.6 tons per Ha versus the required level of about 8-10 tons per Ha.

Second, productivity growth in Ukrainian farming is constrained by the shortage of capital spending on modern agricultural machinery. In fact, countries with mature and highly productive farming, such as France, Canada, Australia, and the U.S. have a much higher level of capital investments per Ha compared to Ukraine. On the upside, there are signs that Ukrainian farmers are starting to upgrade their machinery and equipment by, for example, replacing old tractors and harvesters with fewer, but more productive, units. Having said that, harvesting losses in Ukraine (according to reports of the National Academy of Agrarian Sciences of Ukraine) vary around 15-20%, even though by international standards they should not exceed 3-5%.

These huge losses do imply that many farmers still lack adequate access to financing to buy modern agricultural equipment. According to the NAASU, Ukrainian farmers will need about USD 3 billion a year over the next five years to fund capital replacement costs. Meanwhile, harvesting losses are eating up over USD 1 billion annually as farmers continue using outdated machinery.

Lastly, weather conditions in Ukraine are suitable for highly-productive commercial agriculture without extensive irrigation. Irrigation is mostly used in the dryer southern regions of the country, while the highest total irrigated area was recorded in Ukraine in 1990-1992 at 2.6 million hectares, or around 7% of all cultivated land. Although, by mid 90s the irrigated area decreased sharply by about 70%, the use of irrigation systems has since been almost fully restored.

Currently, about 2.4 million hectares are under irrigation in Ukraine, which is about 50% of the land potentially suitable for irrigation. According to FAO estimates, with adequate investments, Ukraine could irrigate 5.5 million Ha of agricultural land, which would produce considerable gains in grain yields. Indeed, agricultural research and practical experience indicate that a properly irrigated farmland can help double grain yields while vegetable yields may jump by 3-5 times. However, enlargement of irrigated territories would require significant investments to prevent and minimize soil erosion. After all, bad irrigation systems expose farmland to underflooding, salinization, leaching of nutrients from the soil, and deterioration of water quality. These factors as well as substantial capital costs may explain a rather limited expansion of irrigated farmland in Ukraine.

Potential Crop Yields in Ukraine

Obsolete agricultural machinery, insufficient application of mineral and organic fertilizers and pesticides severely restrain the ability of Ukrainian farmers to capture the full genetic potential of Ukrainian crops (see table below).

Genetic potential of Ukrainian crops

Crop plant	Genetic potential, t/Ha	Actual average yields compared to genetic potential, %
Winter wheat	10-11	30
Barley	10	25
Corn	12-13	53
Sunflower	3.5-5	46
Sugar beet	50-60	61

Source: The National Academy of Agrarian Sciences of Ukraine, USDA, The Bleyzer Foundation

According to the data on genetic potential of wheat, barley and corn, Ukraine can produce as much as 180 million tons of grains on all suitable arable land. For example, to investigate the potential grain yields in Ukraine, the NAASU runs agricultural experiment stations in six natural and climatic zones of Ukraine, where winter wheat is cultivated with strict compliance with all technological requirements, such as fertilizers and pesticides use. Four years of these experiments showed that wheat yields varied from 8 to 9 tons per Ha or about 75% to 85% of this crop's genetic potential. This is more than twice the yields currently achieved by Ukrainian farmers (or about 2.5-4.0 tons per Ha).

Achieving similar results for other staple grains (such as barley and corn) would imply improving grain yields in Ukraine to the best levels in the Western Europe. This means that Ukraine could potentially produce around 120 million tons of

wheat, barley and corn (48 million tons of wheat, 18 million tons of barley, and 54 million tons of corn) per year just by increasing fertilizer use and enhancing crop protection. This is in case, if the distribution of the future crop rotation resembles the current distribution of the harvested area and all the currently uncultivated arable land is put back into the cultivation of the most productive grains. Finally, better harvesting and agro machinery will help cut harvesting losses to the international norm of just 5%, which may push the total grain harvest to about **150 million tons, which is 83% of the genetic potential.** On this basis, Ukrainian grain exports may reach 125 million tons, given that domestic consumption is likely to stay at 25 million tons.

ATTACHMENT II

Unique Grain Export Potential of Ukraine

Food security is poised to remain the most urgent issue on the policy agenda of many governments in the future. Indeed, the table below reveals the extent of food shortages that may emerge in 10 years.

Projections of World Grain Consumption and Production

(Wheat and Coarse Grains, million tons)

		2015	2025
World Population, billions		7.35	8.14
OECD-FAO	Production	2018	2262
	Consumption	2019	2255
TBF	Consumption	2019	2584

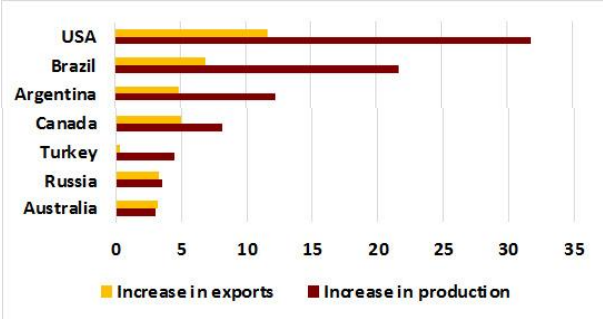
OECD-FAO forecasts that future expansion of global grain production will be limited by the scarcity of arable land and technological constraints. Thus, world grain production is projected to grow from 2018 million tons in 2011 to 2262 million tons by 2025, or by about 1.15% pa, compared to about 2.0%-2.5% pa achieved over the past 10 to 50 years. On the grain consumption side, OECD-FAO projections simply assume that the world will consume whatever is produced. However, this assumption may conceal potentially large food scarcities in the future, a situation recognized in the OECD-FAO report. Alternatively, The Bleyzer Foundation calculates "potential" world grain consumption (or desired consumption) based on continued rapid income and population growth in the emerging world, continuation of migrations of rural population to urban areas as well as higher demand for bio-fuels. On this basis, global grains consumption during the next decade will increase at least at the same rate as in the past 10 years, or by about 2.5% pa, reaching 2584 million tons by 2025. This means that by 2025, there will be a deficit of 322 million tons of grains per year.

Countries with Large Potential to Increase Grain Exports

As noted in Attachment I above, Ukraine could export about 125 million tons in about 10 years, if adequate investments are made in agriculture, modern farming technologies are widely adopted, farm consolidation continues, and more arable land is used to grow crops for which Ukraine has a substantial comparative

advantage, such as wheat and coarse grains. This would represent an increase of almost 85 million tons in exports during the next 10 years. This increase in grain exports would make Ukraine the largest grain exporter in the world.

Countries with the largest increase in wheat and coarse grains production and exports, million tons



Source: OECD-FAO

In fact, a recent analysis carried out by OECD-FAO shows that other large exporters of grains have more limited potential for growth. As noted in the side chart, based on current conditions and trends, OECD estimates that the USA, which is today the world's largest exporter of grains, has the potential to increase grain exports by only 12 million tons. Other large exporters, such as Brazil, Argentina, Canada, Russia and Australia have even more limited export potential ranging from 3 to 7 million tons.

Although these countries (such as USA, Brazil, and Argentina) would expand grain production in the next decade, exports will be limited by their higher domestic consumption, with little surplus available for exports. In particular, The USA can increase grain production by over 30 million tons, but the surplus for exports would only be 12 million tons. Brazil will continue to be a large grain producer and net exporter, but it will also use the bulk of its production increases for domestic use, with relatively negligible increases in exports. Kazakhstan will use half of its grain production increases for domestic consumption. In the recent past, Kazakhstan was able to increase production due to higher yields (from a very low base) and area expansion into marginal lands. However, according to FAO, this trend is not expected to continue at a significant pace, due to a number of limiting factors, including dry climate and risks of drought, geographic location with high transportation costs, poor infrastructure and lack of ports, saturation of Central Asian grain markets, and inadequate management capabilities.

Other countries face similar constraints. For instance, Egypt's potential to increase grain production and exports is limited by the fact that it is already using intensive agriculture, with yields comparable to the EU, thanks to its fertile land along the Nile. Yields for other African countries are low, but yield increases are likely to be limited by the quality of land. Exports from the EU are not expected to growth, but to decline by 5 million tons in the next five years.

Similarly to these countries, most emerging countries will also face constraints to expansion of grain exports due to arable land limitations, growing populations and poor infrastructure or technologies already in use in farming. In fact, most other countries of the world will have negative balances.

Although OECD-FAO projections for these countries may be rather conservative (since they are based on the status quo assumptions of continued moderate improvement of yields and a gradual expansion of harvested area under grains), the above numbers show that indeed Ukraine can become the key player in the world to meet the growing global requirements for food in the future. Ukraine should be able to increase yields to levels comparable to EU levels, due to the quality of its "chernozem" black soil, which is rich in agricultural nutrients and has a superior capacity to hold water.

Required Investments in Agriculture

As discussed earlier, over the longer term, Ukraine can export three times more grain than the amount it is currently exporting (up to about 125 million tons of grains/year), provided that suitable investments in agriculture are made. In fact, Ukraine is using only about 30% of the capital per hectare in agriculture that is used by the EU, as noted in the chart on the next page:

Capital per hectare in agriculture, USD (2005 prices)

	2000	2001	2002	2003	2004	2005	2006	2007
Ukraine	1448	1491	1467	1445	1429	1416	1410	1405
European Union + (Total)	4245	4324	4360	4409	4352	4397	4393	4427

Source: FAOSTAT

The fact that capital stock per hectare in agriculture in Ukraine is about $3,000 lower than in the EU allows us to estimate investment requirement of the Ukrainian farming which will help boost yields to European levels. We assume that in order to close the gap between the yields in Ukraine and EU by 50%-75% in 10 years, Ukraine will need to raise its capital stock in agriculture by about the same proportion or by USD 1,500 - USD 2,500 per hectare. Thus, considering that Ukraine has over 30 million hectares in arable land, the agro industry may need about USD 50 billion within the next decade.

Thus, assuming that (i) Ukraine can potentially reach grain yields that are similar to the best in Western Europe, and (ii) arable land use is shifted toward crops with the highest competitive advantage (more specifically, we base our projections of the future land use in Ukraine on the current land distribution of the best farms in

Ukraine, which means that production of some other crops will go down), Ukraine can produce of 150 million tons of grains, including 125 million tons for exports, as calculated in the table below:

Ukraine agricultural production

	2015 production, million tons	2015 consumption, million tons	2015 sawn area, million Ha*	Future sown area (based on best practices), million Ha	Yields			Future production	Future consumption	Future exports
					Ukraine current	75% of genetic potential	Ukraine future			
Grains (wheat and coarse grains)	59.4	25.2	14.2	22.2				150	25	125
Wheat	27.3	12.5	7.1	10.5	3.8	8.2	6.1	64	14	50
Corn	23.3	8.0	4.1	6.2	5.7	9.8	9.6	60	6	54
Barley	8.8	4.7	3.0	5.5	2.9	7.5	4.7	26	5	21
Legumes	0.7		0.5	1.0				2.0		
Sugar beets	10.3		0.2	0.2				11		
Sunflower and oil seeds	11.2		5.1	5.1				12		
Potatoes	20.8		1.3	1.5				23		
Vegetables	9.2		0.4	0.5				10		
Fodder crops (fruits and berries)	2.2		2.0	2.0				2.5		
Total agriculture	113.8		24.2	32.5				210.5		

* Excluding sown area of Crimea and temporarily occupied territories of Donbas
Source: SSCU, USDA, the Bleyzer Foundation

If Ukraine were to use even better farming techniques, it is feasible to achieve yields of about 75% of the grain's genetic potential, given its superior soils and land configuration. Based on these assumptions, Ukraine will be able to produce about 190 million tons of grains and export 165 million tons of grains, which may be possible over the long-term if there were to be a widespread adoption of the best farming methods.

Yet, even under our baseline scenario, Ukraine will be the world's biggest exporter of wheat with 50 million tons per year, compared to other wheat exporters in the 2025 FAO-OECD projections, namely United States (27.8 million tons), Russia, (27 million tons), EU-27 (31.7 million tons), Canada (22.9 million tons), Australia (20 million tons) or Argentina (8.5 million tons). Ukraine will also be the largest exporter of coarse grains (mainly corn and barley) with 75 million tons per year versus other coarse grain exporting countries: United States (57 million tons), Brazil (31.5 million tons), Argentina (24 million tons), EU-27 (12.9 million to ns), Canada (7.4 million tons), and Australia (7.4 million tons).

Lastly, most net exporting countries such as Kazakhstan, Turkey and Brazil, have the potential to increase output and will also require large investments in farming on par with Ukraine. Yet their production and export surpluses will be significantly less than in Ukraine. Furthermore, in such big countries as Turkey and Brazil, the bulk of the grain harvest is likely to be used domestically. **Only Ukraine has a large potential to increase grain exports and to meet the requirements of enhancing global food security and contribute significantly to securing food supplies for countries with the fastest growing demand for foods, principally in the GCC region, Africa and Asia.**