

The logo for Arzinger, featuring the company name in a white serif font next to a white square icon with a stylized 'Z' or 'A' shape inside, all set against a dark red background.

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A large, central image of an hourglass. The top bulb contains a landscape of rolling green hills and a road. The bottom bulb is filled with various agricultural products including corn, tomatoes, onions, garlic, wheat stalks, and bell peppers. The hourglass is set against a background of green grass with small white flowers.

Agriculture Guide

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INTRODUCTION

The agriculture of Ukraine has become of traditional importance for the country's economy, which is also highlighted by the national flag (the blue sky over a yellow cornfield). Until the year 1991 Ukraine was regarded as the «bread basket of the Soviet Union». Over the following years, the agriculture had been affected by overall economic decay. However, a clear upward trend has been observed in the past few years, as the core implications for the high-yield agriculture – the climatic and soil conditions (the vast black earth terrain) – have remained unchanged. Meanwhile, the sector is also of interest for financial institutions and equity providers which is illustrated by allocation of credits and IPOs amounting to millions. For the time being, giant agro holdings have been formed by means of these and own funds. The constant intensification of agriculture has of course been accompanied by increase in yields. Step by step Ukraine has changed from a net importer to a net exporter having become one of the largest suppliers of agricultural products worldwide. Yet, the animal production cannot reach the efficiency level of the time prior to 1990.

Furthermore, the agricultural conditions provide for an additional market: the energy market. In this respect, biogas and biofuels are the key words. So far as the EU countries can also reach their goals set forth in the Renewable Energies Directive (RED; 2009/28/EG) via importing from third countries, the RED is becoming an interesting link between Ukraine and the EU countries.

At the same time, one of the biggest concerns for agro companies and investors in Ukraine is the moratorium on sale of agricultural land plots, which is valid until January 1, 2012 and until the law on land market and the law on land cadastre (land registry) will be passed by the Ukraine's parliament. As of this report date, both laws have not been passed by the Parliament, which increases the chances of further extension of the moratorium, and impedes further investments in Ukraine's agriculture sector.

This Guide provides the foreign investors with a general overview of the Ukrainian agro market. With regard to this we have also covered the respective legal and economic aspects. The survey on evaluation of the potential (Part II) was drawn up by the Institute for Economic Research and Policy Consulting. Our special thanks go to Dr. Heinz-W.Strubenhoff who took the lead in the preparation thereof. In addition, we would like to thank our staff members Iryna Lishchuk, Olena Verba, Oleksander Plotnikov and Olena Bondarenko who have contributed to Part I of this book.

The Guide does not claim to be complete and is in no case intended to substitute professional counseling on a case-by-case basis.

We hope that you will enjoy reading it!



AGRICULTURAL GUIDE – Legal Part

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1. RIGHTS TO AGRICULTURAL LAND PLOTS

The principal legislation governing land issues, regulating rights to land, defining holders of land and regulating land transactions are the following:

1. Land Code of Ukraine of 25.10.2001 # 2768-III;
2. Law of Ukraine «On Land Lease» of 06.10.1998 # 161-XIV;
3. Law of Ukraine «On State Registration of Property Rights to Real Estate and Encumbrances Thereof» of 01.07.2004 #1952-IV;
4. Order of the State Committee of Ukraine for Land Resources of 04.05.1999 #43 «On Approval of the Directive on the Procedure of Making, Issue, Registration and Custody of State Acts on the Ownership to a Land Plot and the Right to Regularly Use the Land Plot, as well as of Tenancy Agreements»;
5. Order of the State Committee of Ukraine for Land Resources of 02.07.2003 #174 «On Approval of the Provisional Record-Keeping Procedure for the State Land Registry».

The Constitution of Ukraine and the Land Code identify three forms of property: private property, state property and communal property. In addition, the legislation provides for real rights, which exist in other former Soviet republics (ie, the rights of permanent use of land, operational management and full economic management).

The legislation defines the following real rights in land:

- Ownership (private, state and communal)
- Temporary use based on lease agreement (lease)
- Right of permanent use of land
- Right of servitude

Further we will describe in more detail the peculiarities of ownership and lease of agricultural lands as being the most common and popular types of land rights in Ukraine.

1.1 Land ownership

Article 78 of the Land Code provides that ownership to land includes the right to own, use and dispose of land plots. However, the Land Code sets forth certain limitations as to agricultural land ownership, which will be described below.

According to the Land Code agricultural land plots cannot be transferred into ownership to foreign citizens, persons without citizenship, foreign legal entities or to other states.

1.1.1 Limitations of ownership to agricultural land for foreign citizens and legal entities

Agricultural land plots inherited by foreign legal entities, foreign citizens or persons without citizenship shall be subject to alienation within one year.

Therefore, if a foreign legal entity is going to carry out its activities in the territory of Ukraine, which implies acquisition of ownership to a land plot, it is advisable to establish the respective corporate structure with a subsidiary company in Ukraine eligible for potential purchase of land or look for potential purchase of a Ukrainian resident legal entity holding rights to agricultural land.

1.1.2 Moratorium on sale and change of designation of agricultural land plots

A substantial feature of land relations in Ukraine is the current moratorium stipulating a range of limitations regarding sale and change of designation of agricultural land plots and land shares.

In particular, before the adoption of the laws of Ukraine on the State Land Cadastre and on the Land Market, but not prior to 1 January 2012, it is prohibited to.

- to sell and purchase agricultural land plots is state or communal ownership, except for the cases of their buyouts (seizure) for public needs;
- to sell, purchase or otherwise alienate agricultural land plots or to change the designation of agricultural land plots, owned by individuals or legal entities for the purpose of agricultural production, land plots used for conducting individual farming, except for transfer for inheritance, for barter one land plot to another and for transfer of land for public purpose;

- to make contributions to charter capital of commercial companies in form of the rights to land plots (land shares).

Moreover, until 1 January 2015 Ukrainian individuals and legal entities may purchase agricultural land plots with total area of 100 hectares. This area may be increased in case of legal inheritance of land plots.

Any agreements concluded under the effective prohibition in the part of sale, purchase or other alienation of agricultural land plots and land shares and similarly in the part of transfer of the rights for future alienation of these land plots and land shares shall be null and void from the time of conclusion thereof.

1.1.3 Documents certifying the ownership to a land plot

Formerly the ownership to a land plot was certified only by the State Act on Ownership. However, the prolonged procedure for making state acts produced a negative impact on land relations and land market. In this regard, the recently amended Land Code of Ukraine stipulates that the ownership to a land plot acquired from private owner without any changes in the dimensions or designation thereof can be certified either by the respective state act or by the following documents:

- Sale-purchase agreement of a land plot concluded in the order established by the law, provided that the ownership to the land plot is acquired under such agreement;
- Certificate of inheritance.

In case of acquiring the ownership to a land plot on the basis of a sale-purchase agreement or of a certificate of inheritance, the state act on the ownership to the alienated land plot for each case of alienation is attached to the document under which the transfer of the ownership to the land plot took place.

The notary certifying the sale-purchase agreement or issuing the certificate of inheritance and the Department of the State Land Cadastre in charge of state registration of the ownership to the land plot, mark the state act with inscriptions on the ownership to the land plot regarding alienation thereof with indication of the document under which alienation took place. The Department of the State Land Cadastre makes its inscription with respect to registration of the ownership to a land plot on the basis of the document on alienation thereof within 14 calendar days after submission of the document referred to above.

In the event of change of the joint owner or under acquisition of joint ownership rights to a land plot the Department of the State Land Cadastre shall also amend the state act on the ownership to land regarding the joint owners of the land plot.

Alienation of a land plot via allotment thereof into a particular land plot shall proceed only after the state act certifying the ownership to the newly formed land plot has been obtained by its owner. Each state act on ownerships is issued for one land plot.

1.1.4 The issue of the unified registry of rights and limitations (encumbrances) on land plots

One of the substantial disadvantages of land relations in Ukraine is the absence of the unified state registry of rights to land plots and limitations (encumbrances), though introduction and implementation of such a registry is expected in future. Today the following registries regarding land plots are available in Ukraine:

- The State Registry of Deeds for recording legal deeds regarding land plots, subject to notary certification and state registration pursuant to provisions of the current laws;
- The State Land Registry for registration of land lease contracts, state acts on ownership to land plots and on the tenant's rights thereto, and other documents, under which the transfer of the ownership to the land plot takes place;
- The State Registry of Encumbrances for recording information regarding encumbrances of land plots;
- The Unified Registry of Prohibition on Sale of Real Estate for registration of prohibitions on sale or seizure of land plots;
- The State Registry of Encumbrances of Movable Property for recording information on availability or absence of tax pledges regarding land plots.

1.2 Land lease

Land lease is defined by current Ukrainian legislation as a possession and use of a land plot based on agreement, for specified period and in consideration for an agreed payment, that is required by tenant to conduct commercial and other activity.

1.2.1 Holders of lease rights

Holders of land lease rights can be:

- Citizens of Ukraine;
- Legal entities of Ukraine;
- Foreign citizens;
- Persons without citizenship;
- Foreign legal entities;
- International associations and organizations;
- Foreign states.

1.2.2 Lease of publicly and municipally owned land plots

Landlords of community owned land plots are village, settlement and city councils. Landlords of land plots jointly owned by communities are district and regional councils and the Supreme Council of the Autonomous Republic of the Crimea. Landlords of state owned land plots are district and regional, Kiev and Sevastopol city state administrations, the Council of Ministers of the Autonomous Republic of Crimea and the Cabinet of Ministers of Ukraine. Concluding a land lease agreement with the respective authority within its jurisdiction provides for the validity of such an agreement.

State and community owned land plots are, with some exceptions, leased through the land auctions.

The tenant's rights to state or community owned land plot cannot be alienated by the tenant to other persons, nor can it be contributed into the charter capital of a legal entity or pledged.

1.2.3 Essential provisions of land lease contracts

The essential provisions of the land lease agreement are the following:

- Lease object (place of location and area of the land plot);
- Lease period;
- Lease payment with indication of their amounts, indexation, payment forms, ways of their payment and revision as well as liability for non-payment;
- Conditions of use and designation of the leased land plot;
- Conditions of maintenance of leased object;
- Terms and conditions of transfer of the land plot to the tenant;
- Conditions of return of the land plot to the landlord;
- Existing limitations (encumbrances) regarding the use of the land plot;
- Indication of party bearing the risk of accidental damage or destruction of leased object or its part;
- Liabilities of the parties;
- Conditions for pledge of the land lease right or its contribution to charter capital.

Absence of any of such essential provisions may result in invalidity of lease agreement and refusal by authorities to register the agreement.

The following documents should be attached to the lease agreement and form its integral part:

- Plan or scheme of the land plot;

- Cadastre plan of the land plot indicating limitations (encumbrances) of its use and land servitudes;
- Deed on determination of borders of land plot;
- Transfer protocol of the leased object;
- Project of land allocation in cases set forth by law.

The lease period shall be agreed upon by the parties and shall not exceed 50 years.

The Cabinet of Ministers of Ukraine approved a form of standard land lease agreement. This standard form refers to essential provisions of agreement required by law and used in practice.

1.2.4. Registration of land lease agreements

The lease agreement comes into force as of the date of its state registration in due order as stipulated by the current legislation of Ukraine.

Land lease contracts shall be registered with the departments of the State Land Cadastre at the State Committee of Ukraine on Land Resources and shall be entered in the State Land Registry.

2. TAXES AND DUTIES

2.1 Land Payment (Land Tax)

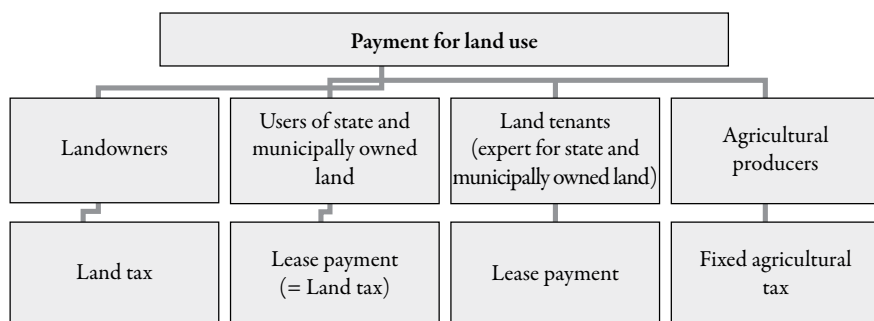
Land use in Ukraine is subject to payment and taxation, which is charged in the form of land tax or land lease payments. The amounts and order of payment for the use of land resources are regulated by the following laws:

1. Law of Ukraine «On Land Payment» of 03.07.1992 # 2535-XII;
2. Law of Ukraine «On Land Lease» of 06.10.1998 #161-XIV;
3. Law of Ukraine «On Fixed Agricultural Tax» of 17.12.1998 #320-XIV.

Land payment is referred to national taxes and duties (compulsory payments) charged in the territory of Ukraine. Currently only land tax (land payment) is charged in Ukraine, however, it is not ruled out that property tax on real estate will be imposed with the enactment of the new Tax Code (see under 6. below).

The following types of taxes and payments for land use are charged in Ukraine:

- Land payment charged in the form of land tax as well as of lease payment for state and community owned lands;
- Lease payment for privately owned land plots leased under an agreement (except for state and community owned lands);
- Fixed agricultural tax paid by agricultural producers in cash form and substituting payment (tax) for land.



Sales and lease operations with land plots, depending on the ownership for land and availability of real estate objects thereon, can be taxable or exempted from VAT (see under 4.2. below).

2.1.1 Land payment: land tax or lease payment?

Payers of the land tax are:

- Owners of land plots and land shares,
- Land users other than tenants and investors – parties to agreements on products distribution.

Payers of the lease payments are:

- Tenants of privately owned land,
- Tenants of state and community owned lands. Lease payments for state and community owned lands let on lease are calculated and paid in the amount, term and order set forth for payment of land tax.

The tax is calculated based on:

- The assessed value of land plots with respect to the adjustment ratio determined according to the order stipulated by law;
- The land plot area if value of land plots has not been assessed.

2.1.2 Payment for agricultural land: calculation

Agricultural land is defined for taxation purposes as the land allocated and/or designated for agricultural production, carrying out research and educational activities in agriculture, construction and allocation of respective production infrastructure.

The land tax for agricultural land is charged per one hectare of agricultural land and is calculated as percentage of its assessed value based on the land category as follows:

- Arable land, hayfields, pastures – 0.1 % per ha
- Perennial plantings – 0.03 % per ha
- Other agricultural lands – 0.1 % per ha

2.1.3 Terms and conditions of tax payment

Land owners and users shall calculate and pay the land tax starting from the day of acquisition of land or of the right to use a state or community owned land plot.

Tax payers (except for individuals) independently calculate the amount of land tax and lease payment every year as of 1 January of the current year. Prior to February 1 of the current year payers submit their tax statements for the current year to the respective tax authority at the location of the land plot.

Land tax as well as lease payment for the current year shall be paid by owners and land users at the location of the land plot monthly in equal shares within 30 calendar days following the last calendar day of the accounting month. Payments for land are accounted into the respective local budgets.

2.2 Lease Payment

Land can be used in Ukraine on terms of land lease. Lease agreements can be concluded on privately (by individuals or legal entities) or state or community owned land plots. The amounts, forms and the terms of lease payments for state or community owned lands are established according to the terms of land payment (land tax). The amount, terms and conditions of lease payments for privately owned lands shall be established under respective lease agreements.

Tenants of land plots are legal entities or natural persons entitled to possess and use the land plot under a lease agreement. Tenants in Ukraine can be, inter alia, non-residents and persons without citizenship, foreign legal entities, international associations and organizations as well as foreign states.

2.2.1 Lease payment for privately owned land plots

For leased land plots owned by individuals or legal entities lease payment is charged:

- In the amount, terms and conditions as specified in the respective lease agreement;
- With adjustment to inflation index;
- Form of payment – in cash, in kind or labour (granting services to the lessor), combi-

nation of forms;

- Written confirmation of payment is necessary if paid in cash or in-kind (expect for wire transfer);
- Review and change of the amount of lease payment – in writing as agreed upon by the parties.

2.2.2 Lease payment for state or community owned lands

Lease payment for state or community owned lands is charged on the following basis:

- Term of payment – as set forth for payment of land tax;
- Monetary payment only;
- For agricultural land – not less than the amount of land tax;
- Yearly lease payment – not exceeding 12% of the assessed value (unless the tenant is defined on a competitive basis);
- Sublease payment – not exceeding the lease payment;
- Written confirmation of payment is necessary if paid in cash (expect for wire transfer);
- Review of lease payment for agricultural land – once in three years.

2.3 Special Taxation Regimes - Fixed Agricultural Tax

Agricultural producers using land shall pay a fixed agricultural tax (hereinafter – the «FAT») instead of land payment (land tax).

FAT:

- Is paid by agricultural producers only;
- Is paid in cash;
- Is not subject to changes during the term established by law;
- Is charged per hectare.

2.3.1 Payers of FAT

Payers of FAT are:

- Agricultural enterprises of various incorporation forms;
- Farming and other enterprises engaged in production (growing), processing and sale of agricultural products;
- Fish-breeding farms, fishing farms and fisheries engaged in fish-breeding, fish-farming or fishing in internal basins (lakes, ponds or water reservoirs),

whereas the income obtained from sale of own agricultural products and processed products for the preceding financial year exceeds 75% of the total gross income.

Payers of FAT cannot be business entities implementing investment or innovation projects:

- in special (free) economic zones;
- in territories of priority development with special regime of investment activities;
- under conditions of technological parks;
- pursuant to the Law of Ukraine “On Innovational Activities”;
- registered as single tax payers for small business entities.

2.3.2 *FAT rates*

FAT rate is calculated per one hectare of agricultural land or water funds expressed as percentage to the assessed value as set forth as of 01 July 1995 according to the Procedure established by the Cabinet of Ministers of Ukraine in the following amounts:

Land Category	Tax Rate: % in terms of assessed value per ha	Comments
— Arable lands, hayfields, pastures	0.15	0.09 (in mountain areas, on woodlands)
— Perennial plantings	0.09	0.03 (in mountain areas, on woodlands)
— Water fund land for fish-breeding, fish-farming or fishing	0.45	Percent of assessed value of a tillage area unit in the regions and the Autonomous Republic of the Crimea

2.3.3 *Calculation and payment of FAT*

The FAT payers independently calculate the amount of FAT for the current year and submit their calculation to the respective tax authority at the payer's location prior to February 1 of the current year.

Tax payments are made monthly within 30 calendar days following the last calendar day of the base month at the rate of one third of the tax amount determined for each quarter of the yearly tax amount, as follows:

- in I quarter - 10 percent;
- in II quarter - 10 percent;
- in III quarter - 50 percent;
- in IV quarter - 30 percent.

Tax payers transfer the tax amount to the respective local budget accounts at the location of the land plot.

2.4 Value Added Tax

As a general rule, the supply of agricultural products, sale-purchase of lands and land lease operations are subject to the value added tax (VAT) in the amount of 20%. However, some special taxation regimes for agricultural producers are stipulated by the Law of Ukraine “On Value Added Tax” of 03.04.1997 # 168/97-BP (VAT Law).

2.4.1 Special taxation regime for agricultural producers

Ukrainian agricultural enterprises conducting their business activities in the sphere of agriculture or fishing and complying with the following criteria, may choose a special VAT taxation regime:

- Basic activities are supply of agricultural products (services) produced (rendered) on own (leased) production facilities as well as on toll manufacturing terms;
- The percentage of agricultural products (services) shall not be less than 75% of total value of all products (services) supplied during the prior twelve consecutive calendar months.

According to the special taxation regime, the amount of VAT accrued by an agricultural enterprise to the cost of agricultural products (services) supplied thereby is not subject to payment to the budget and remains at the disposal of such enterprise for the purpose of reimbursement of the tax amount paid (accrued) to the supplier with regard to the production facilities, and the remaining amount of such tax amount – if available – for other production purposes.

2.4.2 VAT in sale-purchase of lands

Sale-purchase of lands can be subject to or exempt from VAT depending on the proprietary right to land plots and real estate objects located thereon.

- Sale of real estate objects is subject to VAT;
- Sale of a land plot is exempted from VAT;
- Sale of land plots under real estate objects included in their value is subject to VAT.

2.4.3 VAT in lease operations

- Lease of real estate is subject to VAT;
- Lease of state or community owned land is exempt from VAT;
- Lease of privately owned land plots is subject to VAT.

2.5 Special Taxation Regimes for Biofuels

For the purpose of enhancing the production and use of biological types of fuel and in order to develop the national fuel market in Ukraine by introducing biomass as sustainable raw material for manufacture of biological types of fuel, Ukrainian legislation provides for a wide range of allowances regarding taxation of activities connected with the use of biological types of fuel (apart from other alternative types of fuel and energy efficient technologies).

2.5.1 Income tax allowances

The Law of Ukraine “On Company Profit Tax” of 28.12.1994 # 334/94-BP (namely Article 7) stipulates the following allowances:

Temporarily, for the ten years’ term, starting from 1 January 2010 the following shall be exempt from taxation:

- Biofuel manufactures’ profit derived from sale of biofuel;
- Companies’ profit derived from simultaneous production of electric and heat power and/or from the production of heat power with the use of biological types of fuel;
- Machinery, equipment and tools producers’ profit as specified by Article 7 of the Law of Ukraine «On Alternative Types of Fuel» of 14.01.2000 # 1391-XIV for manufacture and reconstruction of technical tools and means of transport including self-propelled agricultural machinery and power plants consuming biological types of fuel received from sales of the machinery, equipment or tools referred to above, which were manufactured in the territory of Ukraine.

Amounts released in connection with the provision of tax allowance shall be directed by tax payers at reduction of prices for products.

2.5.2 Allowances on payment of import customs duties

Pursuant to Article 19 of the Law of Ukraine «On Single Customs Tariff» of 05.02.1992 #2097-XII the following shall be exempt from customs duty payments:

- Within the period from 1 January 2010 till 1 January 2019 machinery, equipment and tools applied for reconstruction of existing and construction of new biofuel production units and for manufacture or reconstruction of technical tools and means of transport for the purpose of consumption of biofuels which are classified according to the UKT ZED Codes (codes of goods groups) specified by Article 7 of the Law of Ukraine «On Alternative Types of Fuel» provided that such products are not being manufactured and have no analogues in Ukraine.
- Technical tools and means of transport, including self-propelled agricultural machinery and power plants which consume biological types of fuel and are classified under UKT ZED codes specified by Article 7 of the Law of Ukraine «On Alternative Types of Fuel», provided that such products are not manufactured in Ukraine.

2.5.3 Allowances for Value Added Tax

The VAT Law provides for exemption from valued added tax with regard to the following transactions:

- On supply of machinery, equipment and tools determined by Article 7 of the Law of Ukraine «On Alternative Types of Fuel», in the territory of Ukraine;
- In similar cases subject to exemption from import customs duties (see 5.2. above).

In the event of violation of regulations regarding the special purpose use of products referred to above, the tax payer is obliged to increase tax liabilities in compliance with the taxation period results in which such violation occurred to the value added tax amount which was due to payment on the date of import of such goods, as well as to pay a penalty charged on such amount of tax in terms of 120 percent of the discount rate of the National Bank of Ukraine as of the date of increase of the tax liability and for the period from the date of import of such goods up to the date of increase of tax liabilities.

2.6 *New Tax Code*

As of 2010 the legislation of Ukraine underwent dramatic alterations caused by change of the President and the ruling coalition party in the Parliament. The tax legislation was not an exception. Thus, the Draft Tax Code of Ukraine (TCU) of 15.06.2010 # 6509 was submitted for consideration to the Parliament of Ukraine on 15 June 2010. On 17 June 2010 it was passed in first reading. The TCU is expected to be adopted in November 2010.

The suggested TCU Draft stipulates a special taxation regime for agricultural producers. For taxation purposes, agricultural enterprises are enterprises with income derived from sale of own agricultural products for the preceding financial (taxation) year exceeding 50% of the total income. Enterprises mainly engaged in production and/or sale of ornamental or wild plants, wild animals and birds, fish (except for fish caught in rivers or closed reservoirs), fur commodities, liqueurs and spirits, beer, wine or wine materials (except for wine material sold for further processing) are not regarded as agricultural enterprises, being subject to taxation on general terms.

The TCU Draft contains a range of changes and innovations regarding taxation of land and land transactions, suggesting the following:

- Taxation of agricultural land allotted for agricultural production, with such production being suspended for over more than three years, with the application of a multiplying ratio which is yearly raised by 20 percent in case of further non-production;
- Limitations on application of reduced land tax rates granted to rail carriers (unchanged – under railway reservation) and mining complexes (unchanged – for mining or extraction of minerals and ores);
- Introduction of allowances regarding land tax for individuals and legal entities;
- Regulations according to which business entities having land plots in permanent use, but not entitled thereto in due order, shall pay a single amount of tax;
- Proprietary rights to a building (part thereof) being transferred, the land tax shall be charged for the land plot under such real estate object as of the date of state registration of proprietary rights thereto.

The question of imposition of the property tax on real estate is still open for discussion.

As far as enactment of the TCU is planned for the beginning of 2011, it is not altogether impossible that further amendments and additions can still be made to the current version of the TCU Draft.

3. FINANCING OF AGRICULTURAL BUSINESS IN UKRAINE

The main legislative acts regulating the issues of agricultural business financing in Ukraine are the following:

1. Civil Code of Ukraine of 16.01.2003 #435-IV;
2. Economic Code of Ukraine of 16.01.2003 # 436-IV;
3. Law of Ukraine «On Collective Agricultural Enterprise» of 14.02.1992 #2114-XII;
4. Law of Ukraine «On Joint Stock Companies» of 17.09.2008 #514-VI;
5. Law of Ukraine «On Business Associations» of 19.09.1991 #1576-XII;
6. Law of Ukraine «On Securities and Stock Market» of 23.02.2006 #3480-IV;
7. Law of Ukraine «On Foreign Investment Regime» of 19.03.1996 #93/96-BP;
8. Law of Ukraine «On Financial Leasing» of 1 6.12.1997 #723/97-BP;
9. Resolution of the National Bank of Ukraine of 17.06.2004 #270 «On Approval of the Regulation on the Loan Obtainment Procedure for Residents, on Foreign Currency Loans from Non-Residents and Residents» Granting Loans in Foreign Currency to Non-Residents»;
10. Resolution of the National Bank of Ukraine #363 of 03.08.2004 «On Setting Interest Rates on External Loans of Non-Residents»;
11. Resolution of the National Bank of Ukraine of August 10, 2005 #280 «On Regulation of Foreign Investment Issues in Ukraine»;
12. Decision of the State Committee for Securities and Stock Market as of July 17, 2003 # 322 «On Approval of the Regulation on the Bond Issue Procedure for Enterprises».

Ukrainian legislation provides for the following possible ways of financing agricultural enterprises (AE) in Ukraine:

- Charter capital contributions;
- Provision of loans (either by residents or by non-residents);
- Placement of AE's bonds;
- IPOs;
- Leasing;
- Financing from the state budget.

3.1 Contributions into charter capital of agricultural enterprises

ukrainian or foreign owners of AEs registered in Ukraine can replenish their current assets or extend the logistical base of AEs by contributions into the charter capital of AE. Thereby non-residents of Ukraine can contribute their payments to charter capitals of Ukrainian AEs either in cash or in form of property, and are subject to the foreign investment regime in Ukraine.

Cash foreign investments in Ukraine can be made in freely convertible currency determined by the National Bank of Ukraine (Euro, US Dollar, British Pound Sterling etc.) via investment accounts opened with Ukrainian banks or immediately from non-residents accounts in foreign banks to foreign currency accounts of AEs at Ukrainian banks.

Foreign investment transactions in Ukraine are not subject to compulsory state registration or any other kind of legalization. However, the state registration of foreign investments is possible and advisable, so far as it guarantees legal protection of such foreign investment. The funds received by AE from foreign shareholders as payments to the charter capital can be used by AE for financing its activities without any limitations.

3.2 Provision of loans

the main source of AE's financing in Ukraine is provision of loans. Legislative requirements on provision of loans to Ukrainian companies differ depending on the creditor's country of registration. According to this criterion the following types of provision of loans can be distinguished:

- provision of loans by residents of Ukraine;
- provision of loans by non-residents of Ukraine.

3.2.1 Provision of loans to AE by Ukrainian residents

Loans are mostly provided by Ukrainian banks both in Ukrainian national currency (Hryvnia, UAH) and in foreign currency. Taking into account the seasonal nature of AE's activities, most loans from Ukrainian banks are short-term ones (up to one year). Thus, during the year 2010 (as of mid 2010) AE have obtained loans in the amount of 1982.6 million UAH, comprising of short-term loans in the amount of 1614.3 million UAH (81.4 percent), mid-term loans in the amount of 237.9 million UAH (12 percent) and long-term ones in the amount of 130.4 million UAH (6.6 percent).

Furthermore, the term of loan provision depends on the purpose of the loan. Thus, loans for acquisition of current assets are usually granted for a maximum of one year, while those for acquisition of fixed assets are given for a maximum of 3 years.

The annual interest rates of the banks for the indicated period ranged from 16 to 38 percent.

The following collaterals are usually accepted by the banks:

- Land or real estate mortgage;
- Pledge of securities;
- Third party surety;
- Bank guarantee;
- Pledge of future yield;

- Pledge of livestock;
- Pledge of machinery and equipment.

With regard to the above, attention should be paid to the fact that the main assets of agricultural enterprises, that is agricultural land, cannot be effectively pledged by AEs, as the current Ukrainian legislation prohibits alienation of agricultural land plots at least until January 1, 2012.

3.2.2 Provision of loans of AE by non-residents of Ukraine

Ukrainian legislation provides for the possibility for AE to obtain loans from non-residents, which can be made only via Ukrainian banks having undertaken to service a loan from a non-resident, and are subject to compulsory registration with the National Bank of Ukraine (NBU). Such registration proceeds through territorial administrative bodies of the NBU within 7 working days and shall be accomplished prior to the actual receipt of funds from the non-resident creditor.

Payments under loan agreements with non-residents are restricted by maximum interest rates, determined by the NBU in compliance with the term and currency of the loan as follows:

FOR THE FIXED INTEREST RATE:

Currency	Term of loan		
	Up to 1 year	From 1 up to 3 years	Over 3 years
1st group classifier currency (Euro, US Dollar, British Pound Sterling etc.)	maximum 9.8% p.a.	maximum 10% p.a.	maximum 11% p.a.
2nd and 3rd group classifier currency	maximum 20% p.a.		

For floating interest rate: LIBOR for three month deposits in US Dollars plus 750 basis points.

It is important that the amount of any payments determined for loan use in the loan agreement (including commissions, penalties and other contractual payments, including those applied as sanctions for improper fulfillment of contractual obligations), shall not exceed the amount of loan

payments calculated on the basis of the maximum interest rate determined by the NBU.

Finally, a Ukrainian bank servicing a loan obtained from a non-resident controls the amount of loan payments and may prevent the any payments made in excess of the above limits.

3.3 Placement of bonds

One of the most efficient ways to obtain financing for AEs is placement bonds. Ukrainian enterprises, irrespective of their branch type, are entitled to place bonds only after their authorized capital is fully repaid, and the respective amount shall not exceed the triple amount of the equity capital or the collateral granted to them to this effect by third parties, such as guarantees, pledge or insurance.

The nominal value of bonds can be expressed either in Ukrainian national currency or in foreign currency. However, taking into account the currency legislation of Ukraine, it is necessary to point out that evaluation of bonds in foreign currency is unreasonable, as it might result in additional complications whereas in most cases such bonds in Ukraine are sold for UAH.

Bonds can be placed via:

- Open (public); or
- Closed (private) placement.

Open (public) placement of bonds means supply of bonds to minimum one hundred legal entities and/or individuals. The bonds proposed for open (public) placement are fully tradable – any legal entity and/or individual may become the first and the next holders of such bonds.

Closed (private) placement of bonds means placement of bonds within the previously determined range of persons, which is not to exceed one hundred persons. The bonds proposed for closed (private) placement are considered as such having restricted circulation sphere among the participants of such placement.

According to the criteria, the following types of bonds can be distinguished by:

- the form of issue – registered bonds and bearer bonds;
- the type of eminent's commitments – interest-bearing, purpose and discount bonds;

- availability of additional securitization – common (secured) and unsecured bonds.

Bonds are placed in documentary or non-documentary form.

Accrued interest on bonds shall be paid in the amount and on the date established by the decision on open (public) placement and by offering memorandum of bonds (in case of open placement), or by the decision on closed (private) placement of bonds (in case of closed placement).

Issue of bonds is subject to registration with the State Committee for Securities and the Stock Market.

3.4 IPOs

Notwithstanding all its advantages, IPOs still remains a rather exotic and inaccessible way of obtaining additional financing for most Ukrainian companies, including AEs. The main reasons for that are the high-level requirements to companies intending to implement IPO as well as high costs of the IPO's preparatory stage.

However, leaders of Ukrainian agricultural market have already conducted several successful IPOs on the international stock exchanges, which, to our mind, is evidence of a quite positive prospective for enterprises operating in this sector

Particularly, as a result of IPOs Myronivskiy Khiboproduct OJSC obtained 322.5 million US Dollars, Agroholding «Avangard» LLC obtained 187.5 million US Dollars, and Kernel Holding – 221 million US Dollars.

Taking into account the immense potential of the agricultural market in Ukraine as well as the continuously growing interest of foreign investors to enterprises operating therein, we are convinced that with the lapse of time IPOs will become more popular with Ukrainian agricultural enterprises.

3.5 Leasing

Considering the burning need of AEs for agricultural machinery, leasing remains one of the most convenient and inexpensive means of financing AE activities. Current Ukrainian legislation does not impose any restrictions on AEs regarding lease contracts, including contracts made with non-residents. Moreover, in view of the importance of leasing for agriculture, the State has set up the

Ukragroleasing National Joint Stock Company, with the main objective of leasing agricultural machinery to AEs.

According to the program approved by the Cabinet of Ministers of Ukraine, NJSC Ukragroleasing shall lease agricultural machinery produced only in Ukraine on terms of lessee's prepayment at the rate of 22% of the lease subject value and subject to leasing payments at the annual interest rate of 7% of the uncompensated lease subject value, the lease term being from 3 to 7 years.

Furthermore, leasing transactions in Ukraine are carried out by commercial banks and specialized private leasing companies.

Lately, powerful international financial groups came to the Ukrainian market and set up their leasing companies, such as Raiffeisen Leasing Aval (Raiffeisen Group), Ukrainian Leasing Company (BNP Paribas Group), UniCredit Leasing (UniCredit Group), carrying out dynamic activities in the sphere of leasing of agricultural machinery.

3.6 Financing from the state budget

For the purpose of supporting agricultural producers, Ukrainian legislation sets forth favorable terms for their financing on account of budgetary costs, namely:

- provision of loans from the state budget on the security of grain within the regime of public procurement of grain;
- provision of loan subsidies;
- provision of budget subsidies (bailouts) to livestock producers.

3.6.1 Provision of loans from the state budget on the security of grain within the regime of public procurement of grain

Pursuant to the decision of the Cabinet of Ministers of Ukraine, the Agrarian Fund of Ukraine may grant loans from the state budget to grain producers on the security of grain, which is documented by transfer of warehouse certificates. The loan is granted for the term not exceeding the

marketing period which makes up to one year.

The payment rate for budget loan use is established by the Cabinet of Ministers of Ukraine for each year. As of 2010-2011 the payment for budget loan provided within the regime of public procurement of grain is fixed at the rate of 7.55% p.a. in UAH.

3.6.2 Provision of loan subsidies

The loan subsidy regime consists in compensating part of payment (of interest) for use of loans granted by banks to agricultural enterprises in national and foreign currency.

A loan subsidy is granted von the competitive basis and is applicable to loans granted to agricultural enterprises for the maximum period of 60 calendar months.

The amount of the loan subsidy is determined by the Cabinet of Ministers of Ukraine and constitutes:

- in national currency of Ukraine minimum 1.5 NBU discount rates valid on the date of accrual of interest for loan use, but not exceeding the amounts stipulated in loan agreements;
- in foreign currency – minimum 10% p.a., but not exceeding the amounts stipulated in loan agreements.

3.6.3 Provision of budget subsidies (bailouts) to livestock producers

Budget subsidies are granted to livestock producers by the Agrarian Fund of Ukraine in order to support the level of the effective demand of Ukrainian consumers and to prevent Ukrainian producers from becoming unprofitable, at the rate and in the order established by the Cabinet of Ministers of Ukraine.

On the whole, the state takes measures to support and enhance the development of agricultural enterprises in Ukraine. However, lack of budgetary funds as well as limited financing mechanisms do not contribute to complete satisfaction of demands of Ukrainian agricultural enterprises.

Under such circumstances, independent obtaining of financial resources by agricultural enterprises on both domestic and international financial markets is put in the forefront. In addition to that, unlike enterprises in other branches of Ukrainian economy, most agricultural enterprises are characterized by relatively weak corporate governance system and financial accounting, which considerably impedes effective obtaining of financial resources.

Under such circumstances companies with foreign investments having access to cheaper resources of international financial markets get a head start in competition over Ukrainian AEs which are forced to obtain financing in Ukraine.



AGRICULTURAL ENVIRONMENT

of Ukraine

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INTRODUCTION

Ukraine's agro-climatic endowment provides the basis for a large potential in agricultural production. Agricultural land accounts for nearly 70 percent of the total area in Ukraine. About 32 million hectares are arable land providing an excellent basis for the production of temperate crop and animal products.

The entire territory of Ukraine is divided into three main zones: marshy woodlands and Carpathian zone, Forest-steppe zone, Steppe zone (see Figure 1). The flat parts of the country consist of three geographical belts: Woodlands, Forrest-steppe and Steppe, which differ in terms of each ones climatic peculiarities and vegetation.

Figure 1. CLIMATIC ZONES OF UKRAINE



Source: USAID/Ukraine: Farm reference handbook for Ukraine, 2005

Marshy woodlands and Carpathians zone (Polissia) cover Ivano-Frankivsk, Chernihiv, Lviv, Rivno, Volyn, Zakarpattia, and Zhytomyr oblasts (North). The total area of Woodlands is 113,500 sq. km or about 19 percent of the entire territory of Ukraine.

The climate of the Woodlands is continental with warm and humid summers and mild winters. The average air temperature in July is +17 to +19°C, in January it dips to -4.5, to -7.8°C. The vegetation period lasts from the second ten day period of April to the third ten day period of October. The period with an average temperature higher than +15°C lasts from between 95-125 days. The

period without light frosts on the soil surface totals from between 160 and 180 days. The relief is flat and the annual average precipitation ranges between 550 and 650 mm. The largest amounts of precipitation, ranging between 400 and 450 mm, fall on the Turfy-podzolic and swamped soils, which occupy roughly 75 percent of Woodland territory. Arable lands occupy 33 percent of the entire zone territory that is more than 4 million ha.

Forest-steppe zone (Lisostep) cover Cherkassy, Chernivtsy, Kharkiv, Khmelnytsk, Kyiv, Poltava, Sumy, Ternopil, and Vinnitsa oblasts (Central). The zone area is 202,000 sq. km. and is mainly flat.

The climate of the zone is temperate continental. The average temperature in July in the north-western portion reaches +18°C rising in the south up to +22°C. January's average temperature is between -5 and -8°C. The vegetation period has an average duration of between 200 and 210 days. The period of time with an average twenty four hour temperature higher than +15°C in the west is about 100 days and in the south-eastern part about 120 days. The period without light frosts on surface soil is between 135 and 140 days. The amount of precipitation in the west averages between 550 and 700 mm and in the central part the average is about 500 to 550 mm, in the south-east about 450 mm.

The topsoil is quite diverse with an intermittence of podzolic soils and typical black soils. Agricultural lands occupy 70 percent of the territory including 66 percent of arable land.

Steppe zone (Step) include Crimea, Dnipropetrovsk, Donetsk, Kherson, Kirovohrad, Lyhansk, Mykolaiv, Odesa, and Zaporizhia oblasts (South). The area is roughly 240,200 sq. km. and the relief is mainly flat.

The climate of the zone is temperate-continental. Summers are hot and winters are cold. The average temperature in January is between -5 and -7°C, contrasting with July temperatures up between +21 and +23°C. The vegetation period usually spans between 210 and 245 days and the period with an average temperature higher than +15°C ranges between 120 and 140 days. The average amount of precipitation ranges from between 500mm in the north to 350mm in the south. The maximum precipitation falls during the summer months and often consists of heavy showers. The moistening coefficient in the south of the zone is 0.8 and in the north of the zone is 1.3. Dust storms and dry winds often occur in the southern part.

Chernozem or black soils (about 90 percent of the zone area) prevail in the topsoil. Dark chestnut chernozem (black soils) are typical for the southern part. In this zone lie about 48 percent of Ukraine's arable land.

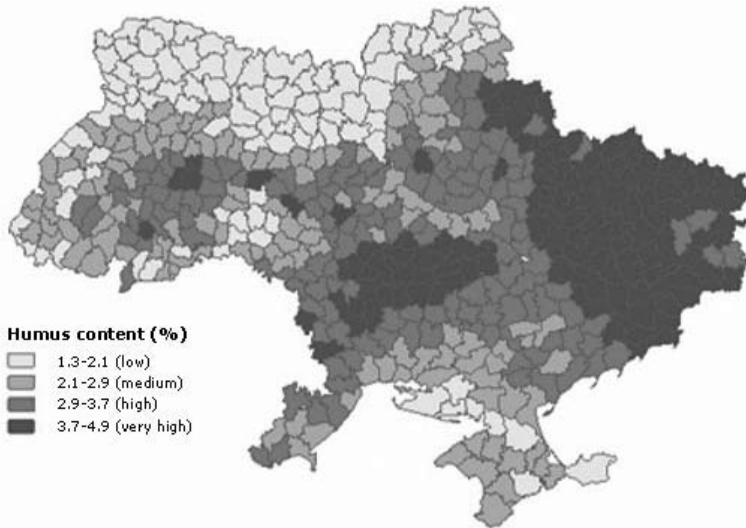
Table 1. KEY FEATURES OF CLIMATIC ZONES

Zone	Duration of period with average daily temperature above +15°C, days	Precipitation level, mm	Vegetation period, days
Marshy woodlands and Carpathians	95-125	550-650	190-200
Forest-steppe	100-120	550-700	200-210
Steppe	120-140	350-500	210-245

Source: USAID/Ukraine: Farm reference handbook for Ukraine, 2005

Over one-half of Ukraine’s arable land is composed of black chernozem soils, ideally suited for field crop production, and roughly one-third of the worldwide stock of these soils is located in Ukraine.

Figure 2. HUMUS CONTENT OF UKRAINIAN SOILS



Source: USAID/Ukraine: Farm reference handbook for Ukraine, 2005

Soil composition (percent of agricultural land) is the following: heavy loam — 27%, light loam — 16%, medium loam — 21%, heavy clay — 3%, light clay — 24% and sand-10%.

Currently, about 27 million hectares of land are cultivated with comparatively low intensities.

Due to Ukraine's relatively low population density¹, acreage-based production potential implies export potential. Although incomes have grown rapidly since 2000, increasing domestic demand for food, Ukraine has the capacity to produce much greater volumes of grains, oilseeds and livestock products than its shrinking population can be expected to consume. Ukraine's agricultural export propensity is supported by additional geographic advantages. The country's Black Sea harbours remain ice-free year round and provide direct access to world markets. The deep sea ports of Odessa, Illichevsk, Yuzhny and Sevastopol are accessible for Panmax ships.

These natural advantages are moderated by several important factors. Precipitation is often a limiting factor for crop production, falling from an average of roughly 700 mm/year in the North-east to as low as 300 mm/year as one moves South and East. Winters can be harsh and are not always accompanied by enough snow to protect winter crops and provide sufficient moisture in the spring. It is fair to say that some combination of drought and winter-kill will have a significant impact on agricultural production every 3-5 years; the last examples of this being the poor and very poor harvests recorded in 2000, 2003, and 2007 respectively.

As agricultural competitiveness is increasingly determined by transformations that take place post-harvest in a complex food chain, the importance of human resources and management is increasing. As the agriculture and food sector is an important branch of the economy the sector attracts finance not only from Ukraine but increasingly from abroad. Structural change in the agricultural sector during the last years led to the emergence of super-large farms of up to 250.000 ha. Most of them are vertically and horizontally integrated holdings covering production, processing and marketing. These structures are increasing because of their ability to raise funds including international capital. About 25 agriholdings are listed at international stock markets. The top 20 agri-holdings are cultivating about 2.5 million ha of arable land. These agriholdings are investing heavily in storage, cleaning and drying facilities. Some of them are exporting grains and oilseeds.

However, the spread between poor and excellent performing companies is very large. Ukraine's most important handicap is that it combines its endowment of high-potential agro-climatic and geographic inputs with insufficient amounts of other key inputs such as finance, human capital, market infrastructure and policy facilitation. This is a big opportunity for foreign investors.

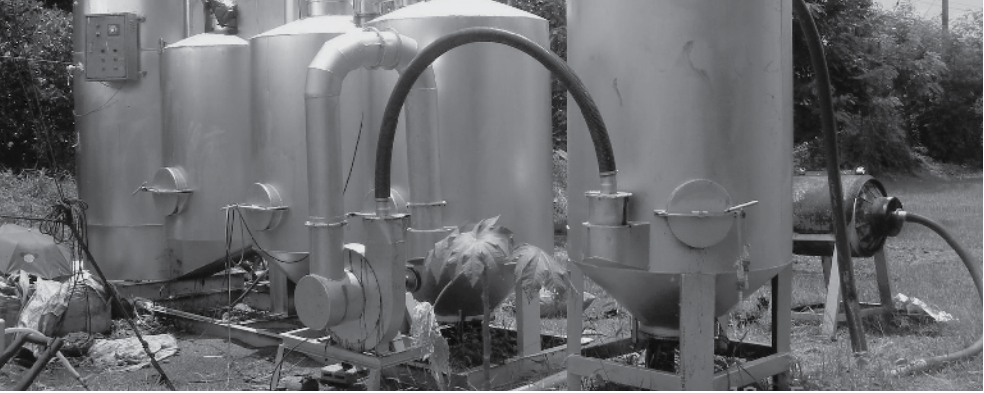
1 *Ukraine's population density is 77 inhabitants/km². Total population is 46.5 million.*

Therefore, many Ukrainian and international grains and oilseeds traders have been investing huge amounts of money into the sector.

The visible results of these investments are increasing exports. Ukraine is the leading world exporter of barley and sunflower oil, number 2 of rapeseed, number 4 of corn and number 3 of combined barley, corn and wheat. Ukraine exported 25 million t of grains in the 2008/09 season and will export about 22 million t of grains in the 2009/10 season .

The growth rates of production, yields and exports will follow world market price developments and the availability of capital, knowledge and production inputs. Yields increased by about 2.5 % during the last ten years with a tendency to accelerate during years of high prices of agricultural commodities. The agricultural sector of Ukraine has a strong growth potential and offers high returns.





POTENTIAL of Bioenergy

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INTRODUCTION

The promotion of bioenergy is high on the political agenda in Ukraine. Government, Parliament and the broader public are interested in its development. It offers interesting future market opportunities for farmers and agribusinesses in a country with potentially abundant raw material supply. Biofuels could be domestically produced, domestically used or traded on international markets. Lobby groups as well as policy and law makers are now discussing and preparing the political and legal framework for future investments and subsidies. In particular biofuels (biodiesel and bioethanol) – heavily subsidised elsewhere – attract a lot of attention in Ukraine. However, with international commodity markets closely linked with energy markets, opportunity costs for biofuel feedstocks (grain and oilseeds) have to be considered.

Ukraine can hardly win the bioenergy subsidy race with the US and the EU to produce first generation biofuels, but it can benefit indirectly from this race. To this end, most economists recommend that the Ukrainian Government reap the benefits of the current situation on international agricultural commodity markets, keep domestic markets and trade competitive and transparent, create predictable framework conditions for investors, and avoid erratic interventions in grain and oilseeds trade in favor of specific interest and lobby groups.

At the same time, however, there are low opportunity cost feedstocks for bioenergy available in Ukraine. These include a.o. manure and communal waste, straw and other agricultural by-products as well as wood. Low-cost bioenergy sources could play an important future role in developing biofuels based on so-called second-generation feedstocks and decentralised energy supply concepts for remote rural areas. However, the interest of energy and agribusiness lobby groups in rural development and decentralised energy supply is currently limited for obvious reasons. The purpose of this policy note is to shed light on the above issues, to provide facts and figures, and to make the available options transparent.

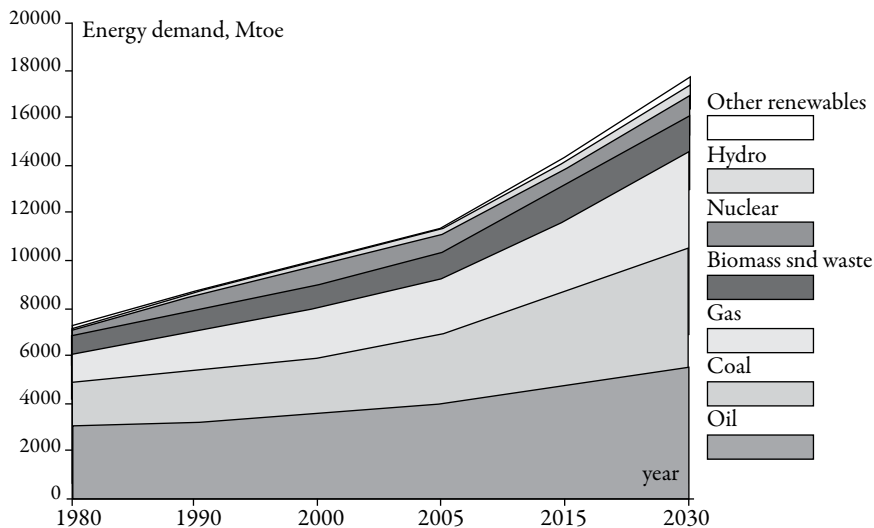
It is evident that rising energy prices will improve competitiveness of bioenergy. Currently, bioethanol production based on sugar cane in Brazil has already reached the switch point of competitiveness. However, at current price ratios of energy and feedstocks, large-scale production of biodiesel production based on oilseeds and bioethanol production based on grains is not profitable without subsidies or mandatory blending. Increasing demand for bioenergy feedstocks – fuelled by support schemes for bioenergy in the US and the EU – has caused significant and sustained price increases of major agricultural products. For Ukraine it is urgent and important to define a bioenergy strategy taking into consideration that Ukraine, as one of the world's top agricultural producers with significant potential for expansion, could benefit from international trends in bioenergy markets and increasing its share in producing and exporting bioenergy feedstocks and selected bioenergy products with competitive advantage.

1. THE GLOBAL SITUATION

1.1. *Current and projected demand for bioenergy in the world*

Demand for energy is rising and will certainly further rise world-wide. There are about 2 billion people with still limited access to modern energy¹. Consumption of energy is forecasted to rise by 71 % between 2003 and 2030². Much of the increase in demand will come from emerging economies in Asia with fast growing economies and population. On the supply side it is projected that oil supplies are constrained and that political risks in oil producing countries will lead to rising oil prices making bioenergy more competitive. However, with increasing use of agricultural commodities as feedstocks of bioenergy relative prices of oil and agricultural commodities mainly determine competitiveness. This is the reason why firm forecasts and recommendations are difficult. Price ratios, technological developments and policy decisions are undergoing major changes. Any bioenergy strategy should take this into consideration to be flexible enough to adapt to changing markets, technologies and policies.

Figure 1: ENERGY DEMAND BY SOURCE: REFERENCE SCENARIO



Source: Own presentation based on IEA forecast, 2006

- 1 IFPRI, Rosegrant et al., 2006
- 2 IFPRI, von Braun, 2007

Biomass has been used for millennia, like wood and charcoal. New biomass sources like bioethanol, biodiesel and biogas are expanding rather quickly during the last years. There are currently more than 60 countries in the world with bioenergy development programs led by Brazil, the EU and the USA.

The bioenergy boom is mainly driven by concerns about energy security leading in most cases policy makers to define targets for shares of bioenergy in the total share of energy use. Farmers and environmental lobby groups supported in many cases these policy targets. Farmers expect additional market outlets and environmental groups are concerned about environmental damages of fossil energy, e.g. GHG emissions. The focus of most programs is on biofuels for transport.

The share of biomass energy in total energy use is considerable already today. In some European countries biomass represents the major energy source among all renewable energy sources. Also, hydro energy plays an important role in particular in those countries with sufficient water resources. The other main renewable energy sources are solar and wind energy.

Table 1: SHARE OF RENEWABLE ENERGY SOURCES AND BIOMASS ENERGY IN SELECTED EUROPEAN COUNTRIES

COUNTRIES (2004)	Share of renewable energy in total energy consumption, %	Share of biomass energy in total energy consumption, %
Sweden	24.7	19
Finland	22.9	21
Austria	21.3	12
Canada	15.7	6
Denmark	13.7	8
Ukraine (2005)	2.7	0.5

Source: Geletukha G.G., Dolinsky A.A. Presentation at Third International Conference on Biomass for Energy (18-20 September 2006, Kiev, Ukraine)

The share of biomass in Ukraine is comparatively low. Most of the renewable energy comes from large hydro power stations constructed during the times of the former Soviet Union. However, it is likely that the share of biomass is underestimated in official statistics. Some biomass sources of energy are difficult to measure, e.g. fire wood in villages.

Table 2: PREDICTED BIOFUEL SHARES IN THE WORLD (%)

	EU	Brazil	USA	India	China	Rest
2005	1	37	2	1	2	0
2010	4	47	3	5	4	2
2015	7	49	3	8	6	2
2020	10	58	4	11	8	2

Source: IFPRI, 2006

A lot of attention has been paid to biofuels for transport purposes with support programs in the EU, Brazil and the USA. World wide demand for biofuels is expected to rise further. Biofuel shares will grow in Brazil, in the EU, in the USA but also in India and China and other countries. Global production of biofuels amounted to 0.8 EJ in 2005 or about 1 % of total road transport fuel consumption.

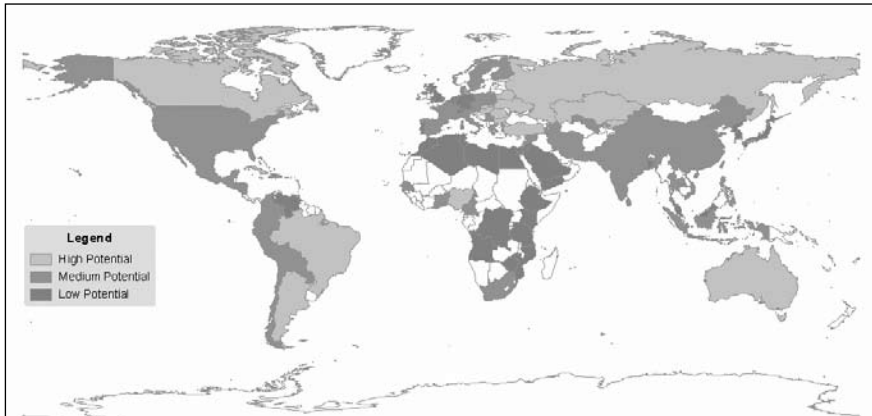
1.2 Current and future production potential of bioenergy in the world

Meeting growing global demand for food and energy will require more suitable arable land. Most of the available land around the world is either too dry, too wet, too cold, too rough terrain, or for other reasons unsuitable and only the remaining is suitable for cultivation. Climate change will most likely add more unsuitable land and aggravate the problem.

Many countries that do not possess suitable arable land for agricultural production, growing demand will force them to import agricultural commodities of biofuels from elsewhere. In the EU, for example, meeting biofuel targets will most likely not be possible without substantial imports of feedstock or finished biofuels. Also, countries in the Near and Middle East as well as densely populated countries in Asia will have to further increase imports.

As shown in the following map, only green areas are best suitable for cultivation of agricultural crops. The highest gap between current production and potential can be found in Latin America and in the Black Sea Region. Ukraine is among those few countries where there are substantial resources of suitable agricultural land. Moreover, most of the agricultural land in Ukraine is not efficiently used and significant increases in yields are attainable given proper use of modern farm management and technology.

Figure 2: POTENTIALS AND RISKS OF BIOFUEL



Source: IFPRI, Joachim von Braun: «Biofuels and global food security», Conference presentation, Berlin, 16-19 December 2007.

Data sources: FAO, 2006 & 2007; IEA, 2007; USDA, 2006; Von Braun, August 2007, Crawford Fund Conference.

Thus, for emerging exporting countries, such as Ukraine, high international prices offer a substantial growth opportunity to agricultural producers. Ukrainian farms and agribusiness could attract significant investments given proper policies. Ukraine could become one of the main exporter of grains and oilseeds and possibly also livestock products.

The OECD estimates that technically, biofuels could provide about 11 % of total demand for liquid fuels in transport by the year 2050³. To reach this amount global biofuel production would have to rise by more than 20 times. This is unrealistic to happen. Already now an intensive debate on the use of potential food products for energy use is taking place.

Second-generation biofuels production costs are expected to be different. By eliminating the competition for feedstocks using agricultural and forest residues, by-products and cellulosic materials the share of biofuel feedstocks in total production costs of biofuels will decrease. The focus will shift to refining and processing costs. Competitiveness of the industry will be less determined by feedstock costs. This is taken into consideration for instance by the US Government's Energy Act 2007 with a sharp increase of cellulosic alcohol use and the European Commission's proposal to count second-generation biofuels⁴ double against 2020 production targets.

3 OECD, 2007

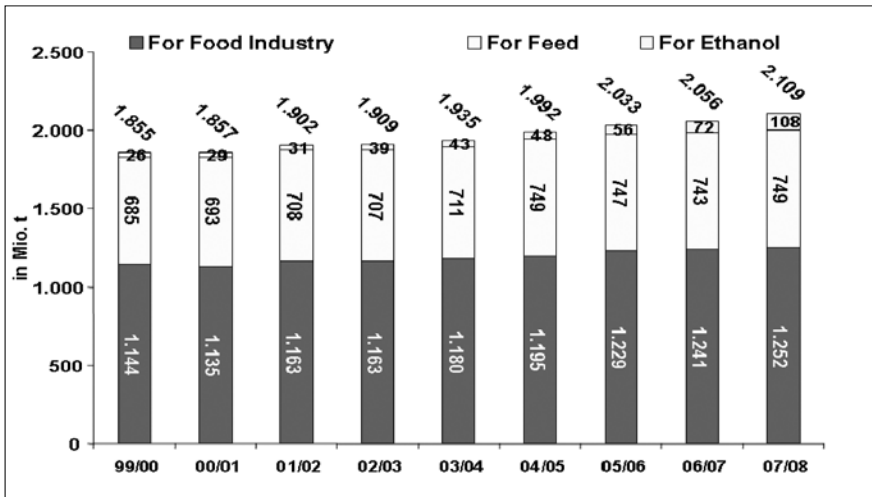
4 OECD, 2007

The OECD estimates that second-generation biofuels may have the potential to deliver an additional 12 % of total transport fuel demand in 2050 avoiding the negative market and environmental effects of first-generation biofuels. However, even with technological breakthroughs there are doubts about the feasibility of this theoretical production target. The technology needs large-scale facilities to become profitable and large facilities need large amounts of feedstock leading to prohibitively large transport costs if the feedstock will not be available on-site.

1.3 Impact of bioenergy demand on agricultural commodity markets

International commodity markets offer exceptional opportunities for producers of raw materials for food, feed and bioenergy. What are the main drivers of these markets on the supply and demand side? On the demand side, there is growing demand for food (particularly for livestock products) due to increase in world population and incomes, especially in Asia with fast growing economies and population (India, China). Increase in incomes stimulates demand for processed food and livestock products.

Figure 3: WORLDWIDE GROWING USE OF GRAIN (mln. tons)



Source: USDA statistics and forecasts analysed and presented by Toepfer

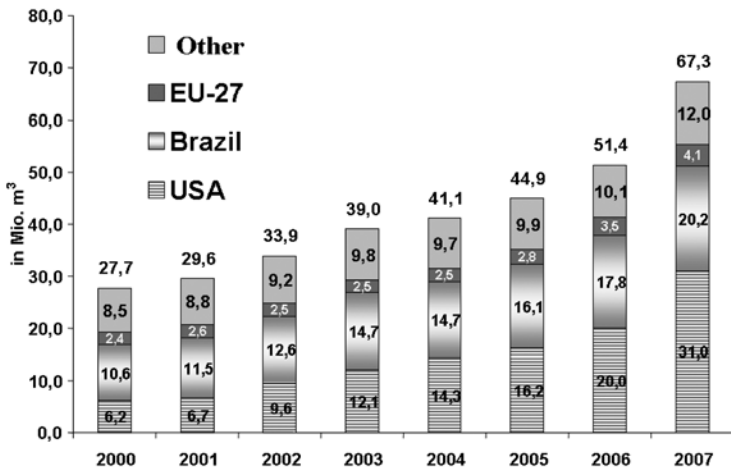
Growing world population and income means that livestock industry consumes greater amounts of grain and other feed ingredients, driving their prices up. This phenomena is valid for both international and Ukrainian markets and it is tempting for Ukrainian policy makers to restrict exports in this situation. However, export restrictions may transfer welfare from producers to consumers and thus ease the pain of growing inflation but cannot actually reverse the trend. Ukrainian commodity markets are actually linked to global trends. Second, there is an increasing demand for feedstock from the politically driven booming biofuels industry, mainly in the USA and the EU. Thus, land previously used for growing food crops is being converted to cultivate crops for the biofuels industry.

On the supply side there are growing costs of production because of rising energy prices and related energy-intensive inputs, e.g. fertilizer. Also, with increasing trade and dependency of world markets on countries with high weather risks (drought, winter kill) supply becomes more volatile. Climate change is increasing risks on the supply side.

CONTRIBUTION OF THE BIOFUELS INDUSTRY

During the last seven years biofuels production significantly increased. Majority of this growth occurred in the United States, European Union and Brazil. In Europe most of it comes in the form of biodiesel from rapeseed, in the US it is ethanol from corn and in Brazil it is ethanol from sugar cane. In this way world food and energy markets are linked and even growing prices for dairy products are partly driven by world growing demand for bioenergy feedstocks.

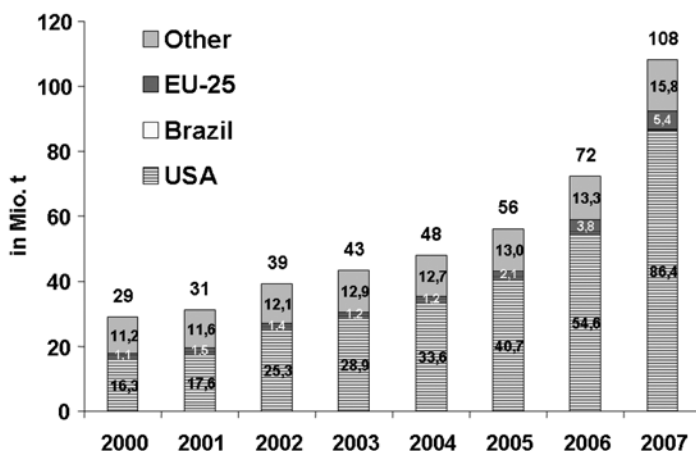
Figure 4: WORLD ETHANOL PRODUCTION (mln. m3)



Source: F.O. Licht; USDA statistics and forecasts analysed and presented by Toepfer

This rapidly developing industry is going to require large amounts of feedstock cultivated by the farmers around the world and will be one of the key factors driving future demand for agricultural commodities.

Figure 5: WORLD GRAIN USE FOR ETHANOL (mln tons)



Source: USDA statistics and forecasts analysed and presented by Toepfer

Moreover, effects related to the development of the biofuels industry will not be limited to the crops that are now directly used for biofuel production, such as corn, rapeseed and sugar cane. Because of substitutability of many agricultural crops and the fact that land previously used for growing food crops is being converted to cultivate crops for the biofuels industry, world biofuels markets will considerably impact agricultural crops that are not directly used as an input in biofuel production. This can be illustrated by looking at the land requirements in a World Energy Outlook scenario where biofuels» share of the transport market grows to 7% (IEA, 2006b, OECD (Doornbosch and Steenblik), 2007). In this case, 3.8% of all arable land in the world would be used for biofuels production. While this increase may seem marginal, even small increases in arable land needs may notably impact agricultural commodity markets.

1.3.1 World biodiesel production and the vegetable oil market

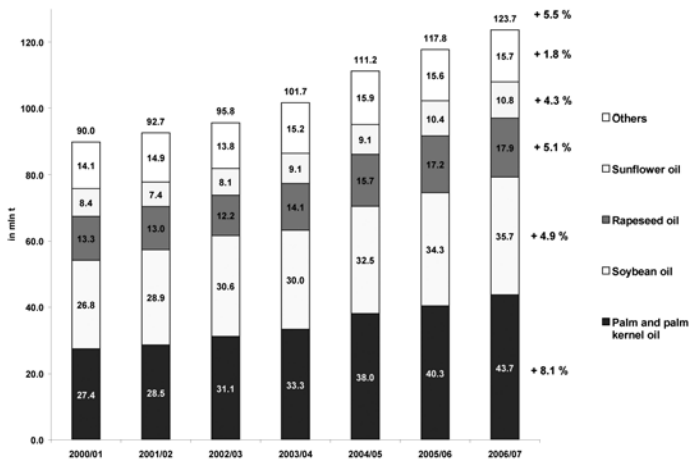
The world vegetable oil market – this comprises the nine most important vegetable oils (oil from soybeans, sunflowers, rapeseed, cottonseed and peanut seed as well as palm and palm kernel oil,

coconut oil and olive oil) – amounts to approx. 124 mln t in the 2006/07 marketing year compared to 118 mln t in the 2005/06 marketing year⁵. This compares to a world production of crude oil of almost 4.3 bln t in 2005/06, of which more than 50 % is used for transport.

Thus, even if all the vegetable oil produced in the world is used for biodiesel production, leaving nothing for human consumption, only 2.8 % of the world oil demand could be substituted with this vegetable oil. In the 2005/06 marketing year, world biodiesel production was 5 to 6 mln t to increase by another 4 mln t in 2006/07. Thus, biodiesel production increased to about 10 mln t in 2006/07, substituting approx. 0.2 to 0.3 % of global crude oil use or 0.4 to 0.6 % of crude oil for transport use.

Among the vegetable oils, palm oil and palm kernel oil account for almost 44 mln t of total vegetable oil production in 2006/07 and their share in world production is 35 %. Soybean oil accounts for 35.7 mln t, or 29 %, rapeseed oil for 17.9 mln t, or 14 %, and sunflower oil for 10.8 mln t, or 9 %. Thus, palm oil and soybean oil together provide a share of almost two thirds of world vegetable oil production, and, most interestingly, this share has increased from approx. 60 % in 2000/01 to 64 % in 2006/07. This has happened despite the boom in rapeseed oil production, which increased by an average of 5.1 % since 2000, and in sunflower oil production with an increase of 4.3 % p.a. In fact, the ever increasing demand for vegetable oil could be met only by rapidly expanding palm oil production of 8.1 % annually since 2000 and soybean oil production of 5 %.

Figure 6: THE WORLD VEGETABLE OIL PRODUCTION



Source: USDA statistics and forecasts analysed and presented by Toepfer

5 Other vegetable oils and oils from animal origin are not included in this figure (sesame oil, corn oil, castor oil, linseed oil, butter fat, lard, tallow and fish oil). The production of all these oils together provides for another 29 (28.1) mln tons. Thus, the total amount of oil produced in the world is between 145 and 150 mln tons.

This huge increase in production of vegetable oils is urgently needed. World use has increased by 5.5 % per annum since 2000. The reason for this increase in demand is the ever increasing use of vegetable oils for food. In China, for example, the growth is unprecedented and every fifth litre of vegetable oil is today consumed in China. But the highest growth rate of oil use is noted in the industry sector. This comprises the oil use for cosmetics, washing detergents and other chemicals, but especially biodiesel. Industrial use has increased by an annual average rate of over 16 % since 2000.

1.3.2 Conclusions for world agricultural markets

Biofuels are part of the energy markets and at the same time part of the agricultural commodity markets. Both markets are highly speculative and volatile although the share of biofuels in fuel markets is quite small.

Prices for agricultural products will be heavily influenced by growing biofuel production. Along the value chain, prices will depend on the maximum bidding price of biofuel producers for these agricultural products. Consequently, all subsidies paid to the biofuel sector will result in higher prices for agricultural products.

Politically motivated biofuel production will further increase in the years to come, and thus, prices of agricultural commodities will depend heavily on energy prices plus all government programs to subsidise or to mandate biofuels. As the demand from the biofuel sector is rather inelastic, agricultural commodity markets are expected to become much more volatile.

Whether the additional demand for agricultural products can be met is very difficult to say. High prices are the most important incentive for farmers to increase production. In most cases economist underestimate supply-side reactions if asked to forecast it. However, it takes some time to mobilize additional land resources in the world, and there is not that much land available which can go into production. Most of the production increase has to be created by intensified production. However, areas with potential for productivity increases are limited mainly to Latin America and the Black Sea Region. Furthermore, water supply is often restricting any additional land use. Productivity can increase due to better farm management and higher input use. But in a year with bad weather conditions this will hardly help to increase production. Thus, world agricultural prices will depend even more on the weather than in the past. Climate change will aggravate this problem.

1.4 International biofuels trade and trade standards

Currently, only small shares of domestically produced biofuels enter international markets as the bigger share is consumed in the country of production⁶. However, trade with biofuels will grow in future due to comparative advantages of trade partners. A large supply potential for international trade is located in the South America and the Black Sea Region whereas the demand is mainly located in regions with higher population densities and hence limited potential for expansion of biofuels feedstock production. Trade is limited today because of uncertainties over biofuels classification and trade standards as well as government measures to protect domestic production. Recently, environmental concerns led to an intensive discussion on biofuels sustainability criteria. Sometimes, environmental concerns and protection of domestic producers lead to interesting alliances between environmental and producer lobby groups.

The biggest import markets for biofuels are the EU and the USA. Brazil is the world's biggest ethanol exporter supplying about 50 % of the global demand⁷.

Table 3: MAIN ETHANOL EXPORTERS IN 2006 (million liters)

Country	Volume of exports
Brazil	3.429
China	1.018
France	319
South Africa	287
USA	200
Spain	186
Germany	149
United Kingdom	142
Ukraine	119

Source: FGV, GV Agro, Centro de Agronegocio, 2007

- 6 According to the Brazilian organization FGV Agro, Centro de Agronegocio, in 2006 a share of 12.5% of the biofuels production was traded.
- 7 International Institute for Environment and Development, 2007, Annie Dufey: «International trade in biofuels: Good for development? And good for environment?»
- 8 CBI (Caribbean Basin Initiative) includes Central American countries.

Other relevant ethanol exporters are Guatemala, El Salvador, Costa Rica and Jamaica (CBI countries⁸), where ethanol is reprocessed and re-exported under a preferential regime to the US.

Table 4: MAIN ETHANOL IMPORTERS IN 2006 (million litres)

Country	Volume of imports
USA	2.740
Japan	502
Germany	430
Netherlands	422
United Kingdom	298
Sweden	257
South Korea	252
Belgium	214
France	143
Italy	136

Source: FGV, GV Agro, Centro de Agronegocio, 2007

However, reliability of biofuels trade statistics is still weak. According to the European Bioethanol Fuel Association Brazilian and European trade statistics are not consistent⁹. Trade in biodiesel is at a less developed stage than trade in bioethanol. Malaysia, Indonesia, Argentina and Ecuador are the main exporters¹⁰.

THE EU

Currently, a comparatively high tariff of EUR 0.19 per litre applies to imported ethanol¹¹ in the EU¹². It is considered as an agricultural product and those tend to have higher protection rates than industrial products in the EU. Biodiesel is classified as such an industrial product and this

9 According to the European Bioethanol Fuel Association statistics in Brazil show significantly higher export values to the EU than the EU imports according to EU statistics. Personal information from R. Vierhout at Biofuels Conference in Kyiv in April 2008

10 International Institute for Environment and Development, 2006, Annie Dufey: «Biofuels production, trade and sustainable development: emerging issues»

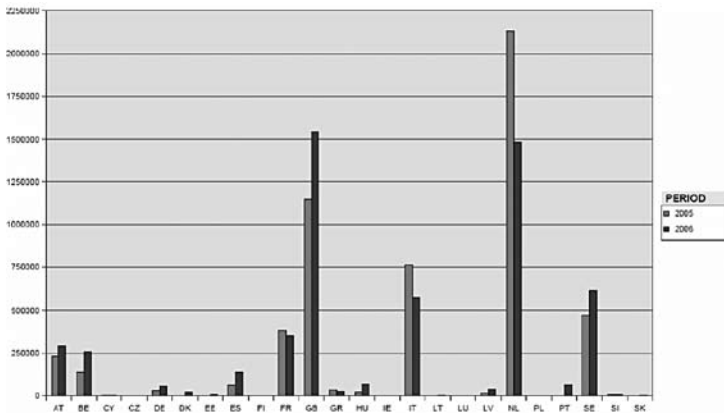
11 Undenatured ethyl alcohol HS 220710 (most fuel-grade ethanol is traded in undenatured form). Denatured ethyl alcohol has a different code: HS 220720.

12 An exceptional case is Sweden that is allowed by the EU Commission to import ethanol (200 mln litres in 2008) at a 6.5 % ad valorem import tariff to be blended under the Processing Customs Control scheme.

explains the relatively low import tariffs of biodiesel. A potential tariff cut for ethanol may result in a fast increase in ethanol import to the EU as its production in the EU is not competitive compared to e.g. Brazil.

In 2006, the EU-25 imported 474 000 tons of undenatured ethanol and 81 230 tons of denatured ethanol. The largest imports came from Brazil, Pakistan, Ukraine and Guatemala. As can be seen below, main importers of ethanol were the United Kingdom, the Netherlands, Germany, Italy and Sweden¹³.

Figure 7: IMPORTS (ORIGIN EXTRA-EU25) OF ETHANOL IN 2005 AND 2006 (100kg)



Source: Comext¹⁴, categories HS 220710 and HS 220720. Countries with extra-EU imports of less than 5000t are not represented.

In contrast to the import tariff on ethanol, the import tariff for biodiesel¹⁵ is low and equals 6.5% or even lower for specific countries with preferential agreements including Ukraine. However, there is not yet significant external trade in biodiesel as the EU itself is one of its biggest producers with sufficient capacity to meet current internal demand. However, the EU during the last years became a net importer of vegetable oils partly due to increased biodiesel demand. The biggest

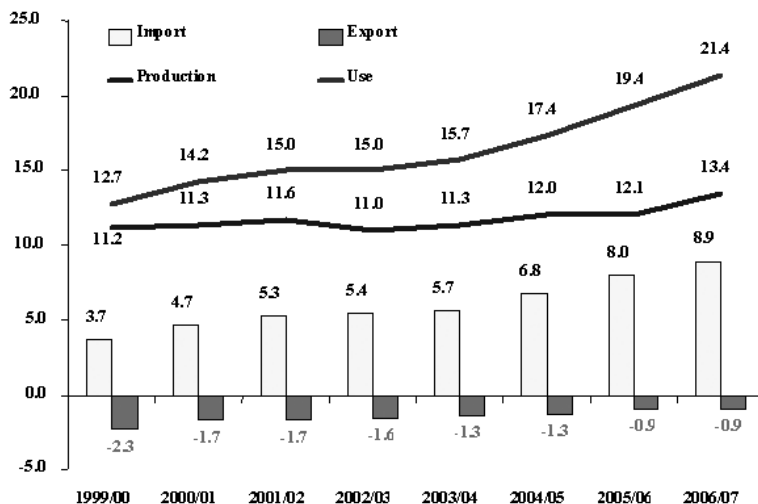
13 In this calculation, temporary ethanol imports under another classification that took place in Sweden in that years are not accounted.

14 From: INRA, 2007, L.Bamiere, J.Bureau, L.Guinde, H.Guyomard, F.Jacquet, D.Treguer: «Prospects of bio-fuels in the EU: imports or local production?»

15 HS 382490

importer is Germany. This tendency offers interesting opportunities for vegetable oil exporting countries including Ukraine. In particular rape seed oil provides the necessary technical features to be processed into biodiesel that can be used in temperate climates in winter.

Figure 8: EU-25 INCREASING IMPORTS OF EDIBLE OIL (in mln. t):
(Palm Oil, Rape Seed Oil, Soy Oil, Sunflower Oil)



Source: USDA statistics and forecasts analyzed and presented by Toepfer

Some countries enjoy preferential treatment when exporting biofuels to the EU. Among them are the ACP¹⁶ countries, least developed countries, GSP plus¹⁷ beneficiaries and Western Balkans. The leading exporter of ethanol Brazil did not receive any tariff preferences. In 2006, the imports of ethanol under preferential regimes accounted for 20% of imports.

It is expected that imports of biofuels will be an important policy tool in order to reach the EU's ambitious goal of a 10% biofuels share by 2020¹⁸ because some member states of the EU do not have the required available area or opt for a more liberal approach in reaching the targets. Some

16 *African, Caribbean and Pacific countries.*

17 *Generalised System of Preferences – special incentive arrangement for sustainable development and good governance. This includes Ukraine.*

18 *Currently, the European Commission prepares a directive to make the 10 % target binding already in 2020*

member states will not be willing to bear the high costs of locally produced biofuels and will import biofuels from competitive countries. This will lead to a considerable increase in imports of biofuels and vegetable oil to the EU.

THE USA

The US biofuels strategy is focused on promoting domestic biofuels production. Still, the USA is the main importer of bioethanol that comes mainly from Brazil and Caribbean countries. Imported ethanol¹⁹ is subject to two duties: a 2.5% ad valorem tax and a secondary tariff of USD 0.54 cents per gallon. The CBI countries together with Mexico and Columbia enjoy preferential access to the US market where, if produced at least from 50% local feedstocks, ethanol may be imported duty free. The secondary import tariff of USD 0.54 per gallon is considered a key component of the US energy policy as it counterbalances the tax credit for ethanol (currently, ethanol in the United States, both domestically produced and imported, receives a tax credit of USD 0.51 per gallon, the so-called Volumetric Ethanol Excise Tax Credit). The American policy makers argue that any reduction in the secondary tariff on ethanol would result in US tax payers further subsidizing imported ethanol beyond the subsidies that are already be given in the country of production²⁰.

Table 5: USA – ETHANOL²¹ IMPORTS VOLUME (1000 hl)

Imports value in 2005 (Jan-Dec)	8206.1
Imports value in 2006 (Jan-Dec)	27402.5 ²²
Imports value in 2007 (Jan-Nov)	19183.5

Source: F.O.Licht

The ethanol imports to the USA are mainly from Brazil, followed by the CBI countries – Jamaica, El Salvador and Costa Rica.

19 *The United States distinguish between ethyl alcohol intended for use as a fuel from ethyl alcohol used for beverages and other end uses. The secondary duty of USD 0.54 cents per gallon is charged on the former.*

20 *Renewable Fuels Association, 2005, «The importance of preserving the secondary tariff on ethanol.»*

21 *Undenatured ethyl alcohol and denatured ethyl alcohol together.*

22 *Increase in imports is a result of the ban on a fuel additive MTBE (methyl tertiary butyl ether), introduced in several US states – ethanol is a oxygenate alternative of MTBE.*

Table 6: THE USA – ETHANOL²³ EXPORTS VOLUME (1000 hl)

Exports value in 2005 (Jan-Dec)	3390.4
Exports value in 2006 (Jan-Dec)	2002.7
Exports value in 2007 (Jan-Nov)	5480.7

Source: F.O.Licht

The US ethanol is mainly exported to Canada, followed by the EU and Mexico. Unlike the import tariff on ethanol, the import tariff on biodiesel is low – 2.5%. In 2004 a Blender Tax Credit for Biodiesel²⁴ was introduced that applies both to biofuels produced on the US territory and abroad.

BRAZIL

Brazil used to have a 20% ad valorem import tariff on ethanol to support the domestic ethanol industry. But in March 2006 the import tariff for ethanol was reduced from 20% to 0%²⁵. As the world's biggest ethanol exporter, Brazil wants the World Trade Organization to reclassify ethanol from a «food commodity» to a «fuel commodity». Classified as a fuel, Brazilian ethanol would be exempt from the import tariffs which are an export barrier to the USA and the EU.

Brazil now supplies about 50% of the international demand for bioethanol. In 2007 its ethanol exports accounted for over 3.5 billion litres, up from 3.4 billion litres in 2006²⁶.

Table 7: BRAZIL – ETHANOL EXPORTS (mln litres)

Country	2006	2007
EU	584	1.017
USA	1.512	844
CBI countries	466	830
Nigeria	43	123
Japan	222	374

Source: F.O.Licht

23 *Undenatured ethyl alcohol HS 220710 and denatured ethyl alcohol together.*

24 *For agri-biodiesel (biodiesel made from first-use vegetable oils and first-use animal fats) the credit is USD 1.00 per gallon and for biodiesel other than agri-biodiesel the credit is USD 0.50 per gallon.*

25 *Global Subsidies Initiative, 2007, R. Steenblik: «Biofuels – at what cost? Government support for ethanol and biodiesel in selected OECD countries». It is the tariff on undenatured ethyl alcohol HS 220710.*

26 *F.O.Licht's World Ethanol and Biofuels Report of 29 January 2008*

In 2007 most of the export to the EU went to the Netherlands (809 mln litres) and to Sweden (128 mln litres). In 2007 direct exports to the US almost halved in comparison with 2006 but in fact the USA imported 1.7 bln litres of ethanol from Brazil in 2007, either directly or through the CBI countries, that is more than half of total Brazilian exports that year²⁷. The recent US Energy Bill of 19 December 2007, which established new RFS requirements,²⁸ provides further export opportunities for Brazil. According to the bill only 15 billion gallons can be made from conventional, i.e. corn based, alcohol, and the remaining 21 billion gallons have to come from alternative sources as sugarcane and cellulosic materials.

The Brazilian biodiesel import tariff is 14%. In 2007 Brazil already achieved the capacity for biodiesel production that exceeds its domestic needs to meet an obligatory 2% mix of biodiesel set by the Biodiesel Program of December 2004. It shows Brazil's export potential in the biodiesel world market in the near future.

BIOFUELS TRADE STANDARDS

Biofuels are not classified consistently and WTO rules related to biofuels trade need clarification. Main discussion points and issues are:

- How should biofuels be classified, e.g. as industrial or agricultural goods?
- How could technical standards be harmonized?
- How should subsidies to promote biofuels production or consumption be considered by WTO? Do they belong to the amber or green box?
- How consistent are domestic support policies with WTO rules on regulations and technical barriers to trade²⁹?

Industrial goods tend to have lower trade barriers than agricultural goods. Ethanol is considered an agricultural good under the harmonized system of classification (HS) used by WTO, while biodiesel is considered as an industrial good. This distinction may have significant implications regarding tariff rates and treatment of subsidies.

27 *F.O.Licht's World Ethanol and Biofuels Report of 29 January 2008*

28 *Renewable Fuels Standards are set at 36 billion gallons a year by 2022.*

29 *Only the first two issues can be covered in this note.*

Ethanol classifications and tariffs may vary a lot according to its water content and whether it is drinkable or undenatured. Some experts suggest to more precisely classify ethanol according to its use.³⁰

Due to the emerging biofuels markets a patchwork of different standards is emerging that makes it difficult to supply different countries. In particular the so-called «sustainability» criteria urgently need international harmonization. In this respect it can be expected that similar certification standards will emerge as for sustainable use of forests and fish.³¹

Recently, technical experts from Brazil, the USA and the EU joined a task force to standardize technical specifications for ethanol and biodiesel. Major differences and similarities among the norms and standards established by each area have been identified.³² The task force will continue to align different standards and evaluate related costs to enable the WTO to develop standardized technical characteristics. The main discussion point will be the mixture of water in ethanol. The discussion will be closely watched in developing countries to avoid setting up standards in developed countries that may be used as a barrier against biofuels from developing countries.

30 See Leslie Parker and Jennifer Haverkamp: *Governments must act to boost trade in biofuels*, September 13, 2007 on www.agritrade.org and www.reilproject.org

31 *In forestry the Forest Stewardship Council and in fisheries the Marine Stewardship Council have been set up to allow consumers to identify sustainable products in the market.*

32 *F.O. Licht, February 12, 2008*

2. UKRAINE'S POTENTIAL AND CURRENT PLANS

*2.1 Ukraine's agricultural production potential for expansion*³³

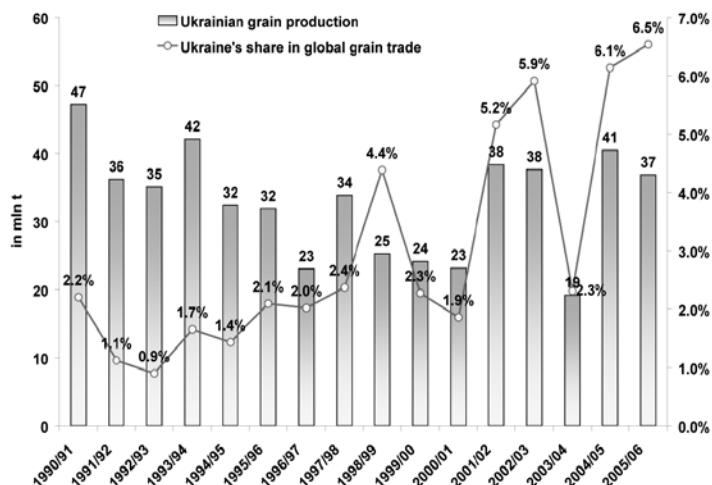
Agriculture accounts for about 8% of Ukrainian GDP, and food processing for about 10% in the year 2007³⁴. Ukraine's agro-climatic endowment provides the basis for a large potential in agricultural production. Over 80 million hectares of agricultural land, of which roughly 33 million hectares are arable, provide an excellent basis for the production of temperate crop and animal products. Over one-half of Ukraine's arable land is composed of black chernozem soils, ideally suited for field crop production, and roughly one-third of the worldwide stock of these soils is located in Ukraine. Due to Ukraine's relatively low population density³⁵, acreage-based production potential implies export potential. Ukraine has the capacity to produce much greater volumes of grains, oilseeds and livestock products than its shrinking population can be expected to consume. Ukraine's agricultural export propensity is supported by additional geographic advantages. The country's Black Sea harbours remain ice-free year round and provide direct access to world markets. Moreover, Ukraine is close to important agricultural import markets in the Middle East, the Former Soviet Union, North Africa and the EU.

33 See IER policy paper # 12: *Comments on the Draft Law of Ukraine №3158 „On biological fuels production and consumption development« and von Cramon-Taubadel, 2007 – mimeo*

34 State statistics office: www.ukrstat.gov.ua

35 Ukraine's population density is 77 inhabitants/km²

Figure 9: UKRAINIAN GRAIN PRODUCTION AND TRADE



Source: USDA statistics and forecasts analysed and presented by Toepfer

These natural advantages are moderated by several important factors leading to specific production risks. Precipitation is often a limiting factor for crop production, falling from an average of roughly 700 mm/year in the Northeast to as low as 300 mm/year as one moves South and East. Winters can be harsh and are not always accompanied by enough snow to protect winter crops and provide sufficient moisture in the spring. It is fair to say that some combination of drought and winter-kill will have a significant impact on agricultural production every 3-5 years. Until now, it remains unclear how global warming will influence rainfall in Ukraine in future.

To fully exploit the potential considerable investments in improved farm practices and farm management are necessary to intensify production and to achieve higher yields.

Table 8: DYNAMICS OF GRAIN YIELDS AND PRODUCTION IN UKRAINE COMPARED TO EUROPEAN UNION, 2003-2008

	Country	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008
Yield (MT/HA)	EU-27	4.26	5.26	4.77	4.67	4.63
	Ukraine	1.87	2.82	2.68	2.49	2.08
Production (1000 MT)	EU-27	243,977	315,289	280,837	265,177	264,756
	Ukraine	19,255	40,550	36,900	33,240	27,415

Source: USDA

Intensification of agriculture needs investments but at the same time more competition and structural change. Land has to move to the best growers in free land markets and administrative procedures to facilitate liquidation of non-performing farms have to be streamlined to accelerate structural change.

Finally, as agricultural competitiveness is increasingly determined by transformations that take place up and downstream in a complex capital-intensive food chain, the importance of vertically integrated holdings with primary production, food processing and marketing facilities is increasing. Natural conditions are an important factor but improved farm and management practices are at least equally important. As agri-food systems become increasingly capital intensive, the comparative advantage implied by such an ample natural resource endowment diminishes. Ukraine's most important agricultural handicap and the essential threat to its competitiveness in agriculture is that it combines its endowment of high-potential agro-climatic and geographic inputs with insufficient amounts of other key inputs such as human capital, market infrastructure and policy facilitation. Due to recent developments on international agricultural commodity markets the agricultural sector becomes more attractive for investors from the food industry and non-agricultural financial holdings. This injection of fresh commercial thinking and money will most likely have a positive impact on agricultural performance in the future.

2.2 Ukraine's energy and food security strategy

Ukraine is a net importer of oil and gas mainly from Russia. Russia is reminding Ukraine and other countries from time to time how dependent the energy importing countries are on the energy-rich countries of the world. For many Ukrainian policy makers, the logical consequence is to broaden the energy supply. One option is to pursue a nuclear energy policy and a further option is to promote biomass and renewable energy. Energy and food security strategies are very much interlinked through bioenergy feedstock markets. So, we are presenting both aspects of these related policies.

The priorities and objectives of energy security in Ukraine are laid out in the document «Energy Strategy of Ukraine till 2030» (referred hereinafter to as the Energy Strategy) of March 2006.³⁶ The Energy Strategy seems to have a «nuclear focus». The Strategy stipulates the construction of 11 nuclear reactor units with a total capacity of 16.5 GW. Nine reactor units to be replaced with a total capacity of 10.5 GW and two green-field reactor units at Khmelnytskyi Nuclear Power Plant

36 «Energy Strategy of Ukraine till 2030», Cabinet of Ministers of Ukraine, March 2006.
See Annex 3 for further details

(NPP) with a capacity of 1 GW each. Renewable energy supply (RES) is predicted at the level of 18.3 m toe by 2030 that is 6% of total primary supply.³⁷

Energy efficiency plays only a minor role in the strategy. Introduction and application of energy-saving technologies are, however, considered essential by many experts to reduce dependency on energy imports.³⁸ Also, the use of domestically produced renewable energy sources could potentially be increased according to experts proposing alternative energy scenarios.³⁹

The above analysis of biofuels feedstock markets shows that there would be a trade-off between food and energy security if the bioenergy production is based on feedstocks that compete with human consumption. This trend is inescapable on world and domestic markets. Therefore, bioenergy production has to differentiate products with high demand for such feedstocks with high opportunity costs and such feedstocks as manure and communal waste, straw, wood and other agricultural by-products at low opportunity costs available on site in Ukraine.

The food security strategy of Ukraine is laid down in the «State Special Program of Ukrainian Rural Village Development for the period till 2015» adopted in September 2007.⁴⁰ The objectives are to ensure food security and food independence. Particularly the target of production of 50 m tons of grain, 25 m tons of sugar beet and 15 m tons of oil crops till 2015 is set in the program. Also, the Program foresees the development of renewable energy sources and alternative biofuels, particularly biodiesel and bioethanol. The Program indicates the necessity of organic agriculture and biofuel production legalization.

ASSESSMENT OF STRATEGIC OPTIONS:

There are four main criteria by which an energy source can be judged.

These are:

- a) does the energy source contribute to energy security?
- b) does the energy source affect food security?
If yes, positively or negatively?

37 *The actual RES share in Ukraine in 2007 is 3 % including large hydro power and less than 1 % excluding it*

38 *See annex 3*

39 *Geletukha, 2006*

40 *«About Ratification of State Special Program for Ukrainian Rural Village Development for the period till 2015» Cabinet of Ministers of Ukraine Decree, 19 September 2007, # 1158*

- c) what environmental costs are associated with the use of an energy source?
For example GHG emissions, biodiversity, impact on water balance, destruction of fragile land etc.
- d) what are the economic costs from the point of view of the whole society?

The interactions between these criteria are obvious and in most cases contradictory. The only certain way of making progress in all directions simultaneously is to increase the efficiency of energy use. It has been amply documented that the Ukrainian economy has an exceptionally high energy intensity.⁴¹ Reducing this intensity would make it possible to produce the same level of economic output in Ukraine using less energy, thus reducing costs and environmental damage while increasing energy security. Alternatively, it would permit continued economic growth without increasing pollution, economic costs and dependency on energy imports.

All other possible courses of action – for example, increasing use of biomass or increasing domestic nuclear power generation capacity will lead to gains in some dimensions, but not all. Nuclear power can reduce greenhouse gas emissions and it might increase energy security, although the latter will not hold if nuclear power generation simply shifts import dependence from fossil fuels to uranium. Furthermore, careful cost comparisons suggest that nuclear power is considerably more expensive than many alternatives.⁴² Such clashes between energy and food security, economic and environmental considerations must be squarely dealt with when choosing the best possible energy strategy for Ukraine.

Bioenergy and other renewable energy sources can lead to significant environmental benefits in the form of reductions in greenhouse gas emissions, although these benefits vary widely among the various types of it. Theoretically, driving for example a car using bioethanol only returns to the atmosphere GHG that had been removed earlier by the plants (e.g. grain) used to produce this bioethanol – in other words, using bioethanol is theoretically GHG-neutral. In practice, however, producing the machinery, fertilisers and pesticides used to produce grain also leads to GHG emissions. Moreover, transporting grain to the factory where they are processed into bioethanol, and building this factory itself, also involve GHG emissions. To what extent net emissions are reduced depends on the type and the exact conditions of its generation.

⁴¹ See annex 3 for further details

⁴² In this regard, note that over the last 25 years, not a single privately owned utility has invested in new nuclear power generation capacity anywhere in the world, unless it has received state support or offtake guarantees (see Hirschhausen and Rumiantseva (2006): *Economics of Nuclear Power Development in Belarus*, publication of the German Economic Team in Belarus – <http://www.ipm.by>).

The same reasoning holds true when comparing the net energy contribution of bioenergy. It must be produced in a way that results in an output of energy greater than the amount of energy used to produce it. That is, they should have a highly positive energy balance.⁴³

While the use of renewable energy sources including bioenergy and more specifically biofuels could clearly improve energy security in Ukraine, the key question is: At what economic cost?

2.3 Stakeholders – common interests and specific interest groups related to bio-energy

Agricultural policy and law making in Ukraine is characterized by interaction of various stakeholders in the public and private sector. It does not much differ from policy making in other countries. However, some features are specific for Ukraine.

1. Agriculture and food are important sectors of the Ukrainian economy. One third of the country's population lives in rural areas, the majority is employed in agriculture. So, agriculture is always high on the political agenda in Ukraine compared to Western European countries with a minor share of agriculture, e.g. about 1 % in Germany or other industrialised countries where the influence of farmers lobby groups is diminishing with the emergence of agricultural ministers without agricultural lobby background.
2. The share of food products in total consumption is fairly high. It may reach 60 % in lower income groups. Rising food prices therefore matter more than in high-income countries. Policy makers are tempted to apply short-term and ad-hoc policy intervention tools instead of long-term growth-enhancing measures.
3. Rural population is poorly represented in the Government and the Parliament. Agribusiness interest groups are in a far better position to express their interests in policy and law making than farmers. Private farmers are fairly well organized. But in particular the majority of corporate farms are underrepresented in the policy making process.
4. Business and politics are well connected. Agribusiness is increasingly able to influence law and policy making through selected representatives in the Parliament and Government. The number of so-called «oligarchs» in agribusiness is increasing.⁴⁴ Non-agri-

43 See annex 1 for further details

44 See list of the richest 130 individuals in the journal FOCUS from February 2008

cultural domestic and foreign capital and capital from agribusiness flows into primary production through establishment of vertically integrated holding structures.

5. Policy making is spread among various stakeholders: the Ministry of Agricultural Policy, the Cabinet of Ministers, the Secretariat of the President, special government bodies, e.g. the State Land Committee, and the Parliament. Complex and sometimes intransparent decision-making processes favor mighty business groups that may afford to spend time and money in lobbying. Small and medium enterprises as well as individual farms are in a less favorable position.

Due to these specific conditions lobbying of farmers and rural population compared to agribusiness is less powerful.

With regard to bioenergy initiatives the above described policy making process could be observed as well. During the last years several biofuel initiatives, investment programs and draft laws have been put on paper although other bioenergies that do not compete with food markets would offer more benefits to the whole society. However, alternative biomass production like straw, wood and organic waste has not been put on the agenda although these alternatives offer promising opportunities in particular for remote rural areas with limited access to gas and fossil fuel supply.

2.4 Prospects for GHG emission reduction projects in Ukraine related to the Kyoto protocol

the entry into force of the Kyoto Protocol in February 2005, and the start of the Joint Implementation (JI) Mechanism in January 2008, raises expectations and hope for fostering investment in energy production from renewable sources in many countries. The newly created carbon markets are an instrument to add value to a public good through limiting its use for industrialised countries. Agriculture has the potential to deliver multiple ecological benefits to the global society, through soil and water protection, maintenance of landscape and cultural heritage, among others. Agriculture plays a key role for mitigation of climate change impacts, through desertification prevention measures, development of drought resistant species, sustainable food production etc. The effect of agriculture to reduce emissions of greenhouse gases (GHG) under the Kyoto Protocol, however, is limited to date. Although there is an enormous potential of using agricultural residues and primary products for energy production and avoiding emissions from dumping of organic waste, the contribution of emission reductions from agriculture currently counts for 3% worldwide only (World Bank 2006).

Agriculture and food are important sectors in Ukraine. So, one would expect that the Kyoto Protocol would provide a fruitful environment to allow for a boom of bioenergy production from agricultural residues in Ukraine. However, among 74 investment projects proposed as JI projects so far, only three are biomass projects.

According to national eligibility requirements, a project must result in 20,000 tCO₂e minimum to be eligible as JI project. The technical potential for emission reductions in agriculture at national level is huge, but the projects are characterised by small per project sizes and scattered distribution. Thus, transaction costs for emission reduction projects in agriculture under JI are considered too big; resulting in a competitive disadvantage of these projects compared to emission reduction projects in other sectors. So, in addition to the JI mechanism a Green Investment Scheme (GIS) may be an option for Ukraine.

For the time being, the Government of Ukraine does not apply selection criteria for emission reduction projects. Basically all projects that save energy and reduce emissions are accepted. The Energy Strategy of Ukraine foresees an increase of non-traditional and renewable sources for energy production by 3.7 times until 2030 (from 15.51 mtce in 2005 to 57.73 mtce in 2030). This would correspond to a growth of bioenergy production of 700% (from 1.3 mtce in 2005 to 9.2 mtce in 2030). Up to the end of 2007 the Ministry of Environmental Protection has issued 74 Letters of Endorsement and 11 projects have obtained Letters of Approval, meaning that these 11 projects will yield ERUs once the national procedure for ERU issuance is in place.

Table 9: PROJECTS WITH LOE AND LOA FROM THE UKRAINIAN GOVERNMENT

Project type	No. of projects	Average size (mtCO ₂ e)	Min. size (mtCO ₂ e)	Max. size (mtCO ₂ e)	Total (mtCO ₂ e)
Projects with Letter of Endorsement (LoE)					
Coal Mine Methane	11	1.89	0.26	8.7	20.83
Energy Efficiency	11	1.25	0.1	8.61	13.72
Waste	18	0.35	0.14	1.24	6.29
District Heating	5	0.52	0.3	0.89	2.62
Biomass	3	0.27	0.22	0.32	0.8
N2O	4	1.85	1.33	2.15	7.4
Cogeneration	12	0.92	0.19	6.09	11.05
Renewables	2	2.23	1.3	3.17	4.47
Other	8	2.29	0.29	8.05	18.29
TOTAL	74				85.47
Projects with Letter of Approval (LoA)					
Coal Mine Methane	3	3.462	0.263	8.705	10.386
Energy Efficiency	3	1.296	0.351	3.1	3.888
Waste	1	0.332	0.332	0.332	0.332
District Heating	3	0.645	0.344	0.887	1.935
Renewables	1	1.3	1.3	1.3	1.3
TOTAL	11				17.841

Source: Ministry of Environmental Protection of Ukraine, Status: Oct. 2007

The largest amount of emission reductions comes from coal mine methane projects (20 mtCO₂e until 2012), followed by energy efficiency projects in the industrial sector (13 mtCO₂e until 2012). Of the total 74 projects in the pipeline, three projects are related to biomass in agriculture and forestry. Two of them are about utilization of sunflower husk for steam and electricity pro-

duction at oil extraction plants in Kirovograd and Pology, one is related to the wood processing industry. In total they will reduce 803,000 tCO₂e until 2012. The two renewable energy projects are wind farms. Above figures show that the average size of biomass projects is with app. 270,000 CO₂e significantly lower than the average size of coal mine methane projects (1.9 mtCO₂e) or energy efficiency (1.2mtCO₂e). The small project size leads to relatively high transaction costs per tCO₂e. As a consequence, project developers and buyers of carbon credits tend to cream off the big and easy projects, before looking into the potential of smaller projects.

Among the projects with Letters of Approval there is so far none related to biomass in agriculture and forestry. The district heating projects foresee switching from fossil coal to fossil gas.

POTENTIAL EMISSION REDUCTION PROJECTS IN AGRICULTURE

According to Kyoto Protocol definitions, project types in agriculture can be divided into two types: (a) fuel-switch projects that replace fossil fuel through fuel from a renewable source, (b) avoided emissions projects that do not produce energy but avoid emissions of greenhouse gases that would have occurred without the project. A combination of both types is possible, e.g. avoided dumping of wood waste from timber processing (sawdust) in open piles (avoided methane emissions) plus burning the wood waste in biomass boilers and replacing fossil fuel. The following project types are identified to be relevant for agriculture in Ukraine:

- Heat (and power) production with biomass boilers (sunflower husk, straw, wood)
- Heat and power production from biogas (at cattle and pig farms)
- Reducing methane emissions (improved manure management, controlled treatment of organic waste from food processing industries, meat production)
- Biofuel production (bioethanol, biodiesel, second generation fuels, energy crops)

Starting with the latter, biofuel projects under the Kyoto Protocol are not efficient, both cost and emission wise. Various calculations have shown that biodiesel and bioethanol production in Ukraine is not yet competitive without substantial subsidies. Revenues from carbon sales will not be enough to fill this financing gap, due to the relatively small emission reductions produced by such project. One litre of biodiesel (from rapeseed) replaces only 0.5l of fossil diesel and one litre of bioethanol (from sugar beet) replaces 0.6l of fossil diesel (OECD 2007). Under the JI Mechanism it is a precondition that the biofuel produced is used in the country of its origin. If the project foresees to export the biodiesel, no revenues from carbon credit sales will occur. Due to comparatively low in-country prices for mineral diesel (0.63 €/liter in November 2007), biodiesel

production for the national market is not yet considered by national investors. Second Generation Fuels are expected to be a cost-efficient alternative in the future, but the technology is not yet sufficiently developed. Growing and processing of energy crops (poplar, willow, miscanthus etc.) may be a good option in the future but are at the research state at this moment and not yet a realistic option.

Methane emissions occur when organic material decomposes under anaerobic conditions, e.g in solid biomass piles or open lagoons (manure, sewage water from food-processing plants etc.). Solid biomass (sawdust, bark, organic household waste etc.) can be burnt or composted under aerobic conditions, both leads to avoided methane emissions (but carbon emissions, which have a smaller GWP potential).

Liquid biomass can be used in biogas systems to produce heat and/ or power and replace fossil fuel. The size of the system and energy needs of the plant determine the suitable technology. An optimal biogas project under JI combines both carbon components: (1) replacement of fossil fuels and (2) avoiding methane emission from manure decomposition in open lagoons. Due to the high GWP potential of methane (21 times higher than carbon dioxide), the carbon component of avoided methane emissions is by far larger than the carbon component of replacing fossil fuel through producing heat and power from biogas. Since open lagoons for manure are not always common practice in Ukraine, carbon credits can often not be counted for avoided emissions. Under JI, average biogas projects in agricultural enterprises are rather small with max. 15,000 tCO₂e/ year. Thus, bundling of 5 to 10 projects in a portfolio would be needed to make this project interesting to carbon credit buyers (most buyers have a threshold of a minimum production of 50,000 tCO₂e/ year, in order to keep transaction costs per project low). A farm with 20,000 heads of livestock could be suitable to form a single JI project, but these farms are limited in Ukraine.

According to experts» estimates, app. 600 average sized cattle farms have the potential to install biogas plants and app. 90 pig farms⁴⁵. Larger biogas projects are associated to gas extractions at landfills or sewage water treatment plants.

45 SEC Biomass, expert estimate, Oct. 2007.

**Table 10: CHARACTERISTICS OF AVERAGE ER PROJECTS
IN THE AGRICULTURAL SECTOR IN UKRAINE**

Technology	Installed capacity (MW)	Capital requirements (m€)	ER potential (tCO ₂ e/yr)	Project IRR	Payback period
Sunflower husk fired boilers	30	6	50,000	15	5
Wood fired boilers	13	4	23,000	30	3.2
Straw fired boilers	0.6	0.61	575	43	2.2
Biogas production/ cattle farm	0.35	1.2	15,000	19	4.5
Biogas production/ pig farm	0.16	0.55	7,500	19	4.6
Improved manure management (aerobic treatment)	0	1.5	1,000	n. d.	n. d.
Improved manure management (combustion of chicken litter)	25	50	50,000	n. d.	n. d.

Source: Expert estimate of SEC Biomass, n. d. – no data

Ukraine is a large producer of sunflower oil. In 2006, total annual oil production was 1.6m t. Sunflower husk is a by-product of oil production that can be used in biomass boilers or for co-firing. To date it is common practice to dispose the husk on landfills. Only a few plants have installed husk fired boilers for heat production and one plant plans to implement a CHP unit. Sunflower husk boilers or CHP plants operating on husk are a promising option for JI projects in the sector. As shown in the above table, the average size of a JI project in the fat and oil sector can be estimated at 30 MWth with app. 50,000 t CO₂e/year. There is a potential for app. 20 projects of this size in Ukraine.

Another promising project type is the introduction of straw fired boilers. Estimates show that app. 5.6 mtce annually could be obtained from surplus straw. Boilers with an installed capacity of

100-300 kW are suitable for agricultural enterprises and farms with average heat demand. For heating public buildings in the rural area, an installed capacity of 300 – 1,000 kW is required. Again, the above table shows that the implementation of a single boiler is with app. 575 t CO₂e/year far too small to serve as a single JI project. In this case a portfolio of up to 50 small projects is required. It is estimated that in total there is a potential for 5,000 straw-fired boilers in Ukraine⁴⁶.

Wood residues serve as fuel for biomass boilers as well. The average boiler size would be 13 MWth with app. 23,000 t CO₂e/year. A combination of two boilers could lead to volumes that are interesting for carbon credit buyers. For this project type, financing clearly would have to come from the biomass owner (e.g. sawmill).

With regards to improved manure management, two types of projects are possible: (1) aerobic treatment (composting) and (2) combustion of chicken litter. Projects on aerobic treatment are rather small and to constitute a single JI project a portfolio of 40-50 projects are required. Chicken litter combustion is a very expensive technology with an investment of about 50m €, thus experts consider this technology not competitive in Ukraine.

2.5 Strategic options for promoting bioenergy in Ukraine

Producing **biodiesel on the basis of rapeseed** becomes questionable in Ukraine because of high rapeseed world market prices. The better option is to produce rape seed and increasingly rape seed oil and to sell these products on world markets that are driven by subsidies elsewhere.

Producing **bioethanol with grain** brings similar results as for biodiesel. Grain is well traded on world markets and even in most modern plants bioethanol made of wheat or corn can only be produced if it is subsidised at current price ratios. Grain markets reflect also increasing subsidies for bioethanol production elsewhere.

Although sugar world markets are not booming currently, prohibitively high production costs for **bioethanol production from domestically produced sugar beets** indicate that at current price levels this production chain does not offer interesting opportunities. Agricultural raw products are too precious for a competitive ethanol production. Sugar cane is a cheaper raw product and hence more competitive.

⁴⁶ SEC Biomass, expert estimate, Oct. 2007.

Biogas production with organic waste from livestock production could provide new opportunities for some agricultural industries and rural areas. Local energy generation with biogas plants may also improve the energy supply of remote areas where imported energy is especially expensive. The key issues here would be to allow biogas energy producers to use existing energy networks to sell surplus energy and to make the distribution of licences to obtain subsidized feed-in tariffs more transparent.

Using straw for heating systems is cheaper than using agricultural raw products that are traded on high-price-level food and feed markets. Straw is available in most parts of Ukraine and because of the low production costs suitable for decentralized energy production systems.

Wood produced in short rotation coppice and especially fairly unused wood residues from millings are predestined for energy use in Ukrainian households or in production plants to produce renewable energy at low costs. Due to a high energy efficiency wood offers realistic opportunities for rural areas in Ukraine. The promotion of investments in communal heating systems based on wood shows the quickest return on investment.



SUSTAINABILITY REQUIREMENTS FOR BIOFUELS IN THE EU:

implications for Ukrainian
producers of feedstocks

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EXECUTIVE SUMMARY

1. The EU Renewable Energy Directive (RED), called to amend and subsequently repeal existing Bio-fuel and Renewable Electricity Directives, became effective from June 25, 2009. It specified new renewable energy targets and established binding sustainability criteria for certain types of biofuels. The biofuels and biomass that fail to meet the sustainability requirements are not counted towards new ambitious renewable energy targets and are excluded from the EU and national support programs.

2. Rapeseed production in Ukraine increased drastically over the last 10 years matching the timing of the EU biofuel policy initiatives. Significance of the EU regulations for Ukrainian export of rapeseed is proved with recent record of high volumes of trade. Ukraine sold around 2.3 mln tons of rapeseed to the EU with the gross revenue of 1.35 USD billion in the 2008/09 season. This suggests the need to study the new provisions and to explore the role of the Ukrainian government and economic operators as to the best response to the new sustainability requirements.

3. The sustainability criteria cover production of biofuels (greenhouse gas savings requirements) and production of feedstocks (land use restrictions) as well as a wider range of social sustainability issues. New installations operating after January 2008 producing biofuel for transport, electricity, heating or cooling shall secure 35% reduction of green house gas emissions as compared to fossil fuel use. This requirement increases to 50% in 2017 and 60% from 2018 onwards. Biomass cultivation restrictions aim to protect carbon rich lands and lands with high biodiversity value. Special methodologies for calculation of the green house gas emissions savings as well as default values for different production pathways are laid down in the Directive. Rapeseed biodiesel is assigned with a default value of 38% so that the minimum requirement of 35% is met but the targets beyond 2017 are not.

4. Main changes that would affect Ukrainian feedstock suppliers are entailed with the certification process which is to be designed to show the compliance with the required sustainability criteria. Ukrainian farmers would be required to prove that they are producing biomass sustainably by a specific procedure. The Directive obliged member states to ensure that economic operators submit reliable data to prove compliance with the established sustainability criteria. Each EU member has to develop its own certification system to be notified by the EC. The complexity of the certification procedure in Ukraine for an individual farm will depend on the success of the Ukrainian government to sign a bilateral agreement with the EU and on the activities of the traders to diversify international sales of rapeseeds.

5. Based on the EU Directive, Germany has already adopted the necessary Regulations that require certification of biomass from January 1, 2011. Other EU members may fully exhaust the transposition period and have their certification systems adopted by December 5, 2010. Given the current structure of export of rapeseed from Ukraine with a minor export share of Germany, only a small fraction of 2010 harvest is likely to be affected. It is nonetheless very.

INTRODUCTION

European renewable energy policy, and particularly EU biofuels obligation and support programs, has been a source of demand for Ukrainian feedstocks. The production of rapeseeds in Ukraine gradually increased more than 20 times between 2001 and 2008 following the timing of EU biofuel initiatives. Over the last few years, the EU constituted a significant share and remained one of the key destinations of Ukrainian rapeseeds export. Export of around 2.3 mln tons of rapeseeds alone brought the sector 1.35 USD billion gross revenue in 2008/09. This underlines the rationale to take full account of any trade-related provisions imposed by authorities in the countries of destination.

The EU Renewable Energy Directive, called to amend and subsequently repeal existing Biofuel and Renewable Electricity Directives, became effective from June 25, 2009 and established binding sustainability criteria for certain types of biofuels. EU member states are obliged to implement its provisions till December 5, 2010. These measures are forecasted to have a significant impact on European biofuels markets and will affect both domestic and foreign market participants.

The biofuels and biomass that fail to meet the sustainability requirements is not counted towards new ambitious renewable energy targets and is excluded from EU and national support programs. Therefore, unsustainable consignments would disappear from the EU biofuel market and both domestic and foreign suppliers are requested to verify compliance with the new requirements introduced.

In this paper we describe sustainability criteria for biofuels set by the EU Renewable Energy Directive and specify the actions needed from Ukrainian stakeholders: the government, traders, and farmers. We concentrate on rapeseed as a relevant feedstock for biodiesel production and do not cover other crops. We are not trying to evaluate the overall effect of the new laws on the global biofuel market but look primarily at the implications for Ukrainian farmers.

The first section provides a brief overview of EU renewable energy targets and support mechanism applied to promote use of biofuels. It also describes rapeseed production and export flows from Ukraine to the EU markets.

The second section discusses sustainability criteria for biofuels and the verification mechanism as envisaged by the Directive and depicts the development of certification schemes at the member states» level (case of Germany) which are likely to affect 2011 harvest trading.

The third section concludes with the implications for Ukrainian feedstock suppliers and recommends further steps needed from policy makers and industry stakeholders to cope with the challenges.

GLOSSARY AND ABBREVIATIONS

Biofuel — a liquid or gaseous fuel for transport produced from biomass.

Biomass — biological material derived from living, or recently living organisms. In the context of biomass for energy this equally applies to both animal and vegetable derived material.

Bioliquid — a liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass.

Default value — a value derived from a typical value by the application of pre-determined factors that may, in circumstances specified in the Directive 2009/28/EC, be used to show greenhouse gas emissions potential.

Feedstocks — starting products used as the basis for manufacture of another product. In case of biomass, this definition typically covers agricultural commodities used to produce biofuel. Examples include rapeseed, corn, sugarcane, soybeans.

Renewable energy obligation — national support scheme requiring energy producers, distributors or consumers to include a given proportion of energy from renewable source in their production, supply, and consumption respectively.

Typical value — an estimate of the representative greenhouse gas emission saving for a particular biofuel production pathway (performed by Joint Research Center of the European Commission).

BLE — German Federal Agency for Agriculture and Nutrition.

BMELV — German Federal Ministry for Agriculture, Food and Consumer Protection.

EU — European Union.

GHG — green house gas.

FNR — German Federal Agency for Renewable Resources.

ISCC — International Sustainability and Carbon Certification System.

MS — Member State of the EU.

RED — The Renewable Energy Directive, Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, enforced from of July 5, 2009.

UFOP — German Union for Promotion of Oilseeds and Protein Plants.

1. THE EU POLICY TOWARD RENEWABLE ENERGY – DEMAND FOR UKRAINIAN RAPESEED

1.1 Developments of EU renewable energy targets

The Energy policy of the European Union is focusing on creating a competitive internal energy market, on developing renewable energy sources (sustainable energy), on reducing dependence on imported fuels (security of energy supply), and on doing more with a lower consumption of energy (increase in energy efficiency). Having these goals specified, the EU committed itself to specific targets that served as indicators of what has been achieved.

The aim of renewable energy promotion has been viewed as two-fold: first, renewable energy was considered as a part of strategy to cope with climate change challenge and thus satisfy established green house gas emissions reduction requirements¹, and secondly, to reduce dependency from energy imports. For both of these purposes, the EU has developed targets of shares for renewable energy in different energy subsectors and the support mechanisms to assure compliance with those targets both at EU and member state levels.

Development of first specific targets for shares of energy from renewable sources goes back to 1997; the requirements have become more stringent over time.

1 *Currently, EU is obliged to fulfill Kyoto Protocol commitments – 8% GHG emissions reduction by 2012 for EU-15 (with specific targets for different countries distributed in burden-sharing agreements in 2002). EU-27 has no single target, but specific targets are assigned to countries as signatories of Kyoto. Further, EU Energy and Climate Change Package adopted by the Council on April 6, 2009 established a target of 20% reduction of GHG by 2020. Amendments to Fuel Quality Directive 98/70/EC of 13 October 1998 set binding 6% reduction of GHG emission in the use of transport fuels*

Table 1.1: RENEWABLE ENERGY TARGETS IN EU, 1997-2009

Year to reach the target	Target	Binding/indicative	Document	Year of adoption
2010	12% of renewable energy in total energy consumption	Indicative	White paper ²	1997
2010	21% of electricity from renewable sources in total electricity consumption	Indicative	2001/77/EC ³	2001
2005	2% of renewable fuel in transport	Indicative	2003/30/EC ⁴	2003
2010	5.75% of renewable fuel in transport			
2020	20% of renewable energy, 10% of renewable fuel in transport	Binding	2009/28/EC ⁵	2009

Source: Own presentation based on EU legislation

Specific targets for biofuels production have been defined several times since 2001. First targets were agreed in the Biofuels Directive of 2003⁶ and set common to all EU members given virtually equal consumption volumes of biofuels across EU at that time. The targets were set as «reference values» that allowed member states to develop their own targets and mechanisms to ensure «that minimum proportions of biofuels and other renewable fuels are placed on their markets».

The compliance with the targets was ensured through various support schemes which varied across member states. Two main instruments, tax reliefs and biofuel obligations (or mix of the two) have

2 *Communication from the Commission – Energy for the future: Renewable sources of energy – White Paper for a Community strategy and action plan . COM(97) 599, November 1997.*

3 *Directive 2001/77/EC on the Promotion of the Electricity Produced from Renewable Energy Sources.*

4 *Directive 2003/30/EC on the Promotion of Use of Biofuels and Other Renewable Fuels for Transport.*

5 *Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Note that the targets have been agreed in earlier legal acts in 2007-2008, but mandatory targets for each member states as well as supportive mechanism has been endorsed by this directive.*

6 *Directive 2003/30/EC on the Promotion of Use of Biofuels and Other Renewable Fuels for Transport.*

been applied to promote the use of biofuels in the EU (so-called general support instruments)⁷.

Many specific support measures are introduced in certain countries as subsidies related to agriculture such as production of feedstocks and to industry where necessary operations to achieve the intermediate and finished product are performed. The consumption side implies measures related to distribution of biofuels, purchasing and maintenance of cars using biofuels, green public purchases, and campaigns to increase public awareness⁸.

EU level support mostly targets primary stage of the supply chain. Feedstock producers received support since the 2003 reform of the Common Agricultural Policy introduced an energy crop premium. It granted, on top of producer's decoupled payments, a payment of EUR 45 per hectare to growers of energy crops, including crops grown for the production of biodiesel and bioethanol for a maximum guaranteed area of 2 million hectares. Also, the revised CAP allowed farmers to grow energy crops on set-aside land if the use of the biomass is guaranteed either by a contract or by farmers⁹. In the framework of rural development policy investments in bioenergy on or near farms (e.g. in biofuels processing) are eligible for support¹⁰.

Producers of biofuels, distributors, private and public consumers are mostly supported at a national level.

The first and the second biofuels progress report of the European Commission¹¹ showed that the production of biofuels for transport has increased drastically but with only a few countries reporting a success in meeting their own targets (See Annex A). Together with a slowdown in 2008 and 2009, many estimates show (within a certain range) that EU would fail to achieve its 2010 target.

The lag between the target and actual shares suggested the EU authorities to establish a new figure. The Renewable Energy Directive of 2009 established 10% of renewable fuels in transport

7 *Tax privileges are any kind of exemption of general taxation applicable for conventional fuels (excise tax, ecological tax). Biofuel obligations are legal instruments requiring fuel suppliers to include a given percentage of biofuels in the total amount of fuel they sell on the market.*

8 *See Staff Working Document adopted together with The Renewable Energy Progress Report. Communication from the Commission, COM (2009) 192.*

9 *Health Check of CAP established that energy crops premiums and set-aside obligations shall be abolished from 2010.*

10 *Additionally, under the sugar market reform inefficient sugar producers are eligible to receive EU funds to convert sugar factories into ethanol plants that use either sugar beet or grain as inputs. Finally, there is distillation crisis aid paid to transform wine into alcohol to be used in the production of ethanol.*

11 *Biofuels Progress Report. Communication from the Commission, COM (2006) 845. The Renewable Energy Progress Report. Communication from the Commission, COM (2009) 192.*

and 20% of renewable energy in total energy consumption in 2020 as binding (not indicative as before) commitments. 20% of renewable energy remains as EU-level target (still obligatory) with different individual targets for member states. The states that fail to meet their GHG savings targets faced relatively more stringent requirements as to increase their share of renewable energy (See Annex B). By contrast, 10% of renewable fuel is the common target for each member state. This target refers to all forms of transport and all types of renewable fuel (biofuel, green electricity, hydrogen). Second-generation biofuels and green electricity were set privileged.¹²

1.2 Support of biofuels production and consumption in the EU: the case of Germany

Germany's biofuel promotion policy started with the emphasis on taxation as biofuels (pure and then blends) were fully exempt from the fuel tax¹³.

In 2004, this exemption enhanced price competitiveness of biofuels and was put valid for all blends with conventional fuels in a way that the biogenous share was taxed with a zero rate¹⁴. As the fuel tax is comparatively high in Germany this led immediately to a significant stimulation of investments in biofuels. Increased investments led to decreasing tax income in the following years so that the government changed its policies in 2006.

In 2006 Germany introduced energy tax on biofuels (still lower than for conventional fuels) intending to equalize the tax for biofuels and conventional fuels till 2012. Both overall and fuel-specific (biodiesel and ethanol) mandates based on energy content were adopted claiming the intent to have 10% blend of ethanol standard adopted into gasoline in 2008¹⁵. The Bio Fuel Quota Law (Biokraftstoffquotengesetz, BioKraftQuG) enforced the quota from January 1, 2007.

-
- 12 *The consumption of bioelectricity in electric road vehicles shall be considered 2.5 times of energy content of the input of electricity from renewable energy sources (Article 3 (4), point c); the contribution made by biofuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material shall be considered to be twice that made by other biofuels (Article 21 (2)).*
 - 13 *See Biodiesel initiatives in Germany. Final Report by PREMLA Heidelberg, May 2005.*
 - 14 *For the different biofuels, the following facts are valid: biodiesel is assumed to be 100 % biogenous, other fuels or additives like biogenous ETBE or MTBE are classified depending on the biogenous share, e.g. ETBE is said to be 47 % biogenous. From this, for the example ETBE 53 % of the tax on petrol are due.*
 - 15 *Introduction of blends requires adoption of corresponding fuel quality standards. See The Bio Fuel Quota Law.*

In 2009 a new law passed the German Bundestag¹⁶ stipulating significant changes in the promotion principles from 2015. The use of biofuels will not be put dependent on the obligation to observe quotas but on the necessity to reduce green house gas emission. The following changes have been made:

- The total quota valid from 2009 onwards was reduced to 5.25% (instead of 6.25% agreed in 2006) and to 6.25% in 2010-2014 (instead of 6.75%-8.0% agreed in 2006);
- The quota for bioethanol in petrol will be reduced to 2.8% from 2010 (instead of 3.6%);
- The shares of biofuels will be replaced by climate protection quota to reduce GHG emissions from biofuels by 3% from 2015, 4.5% from 2017 and 7% from 2020;
- Biofuels have to satisfy climate change contribution (green house gas emissions savings compared to conventional fuels set in the EU Renewable Energy Directive).

These policy changes reflect three waves of biofuels support in Germany:

1st wave: 2004-2006	promotion of biofuels by tax exemptions under Chancellor Schroeder;
2nd wave: 2006-2009	reduction of tax benefits and setting of blending quotas under Chancellor Merkel;
3rd wave: 2009-onwards	binding support policies to green house gas reductions.

Currently, there is a broad consensus among policy makers in Germany and the EU that the specific contribution to green house gas savings should be the most important criteria for biofuels support policies.

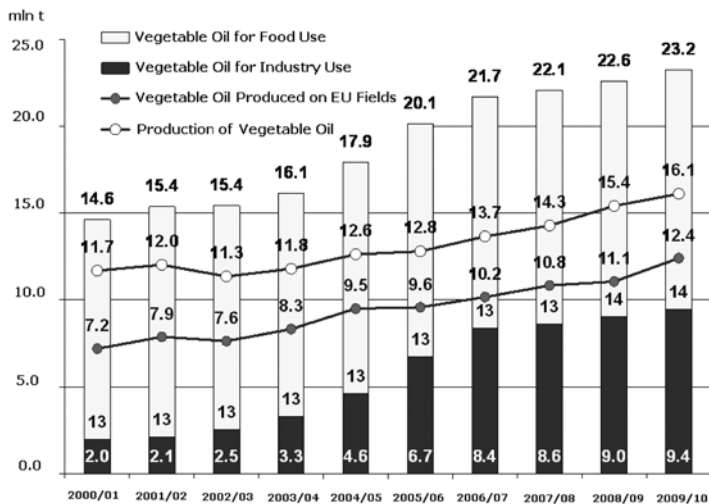
16 *Gesetz zur Änderung der Förderung von Biokraftstoffen (BioKraftFÄndG). The Law Amending the Biofuels Promotion Act, enforced from July 2009.*

1.3 Dynamics of export of rapeseed to the EU from Ukraine

The EU biofuels obligations and support programs created opportunities for suppliers of feedstock as production and consumption of bioenergy increased. The EU grew into one of the largest importer of feedstocks for the biofuels industry¹⁷.

Since biodiesel accounts for around 75% of EU biofuels markets, vegetable oils are used as primary feedstock for production. Rapeseed oil (and thus rapeseed) dominates among possible feedstock oils due to EU biodiesel standards. Figure 1.1 shows that the EU is a large importer of vegetable oils and that only 50% of the vegetable oil consumed in the EU is obtained from the fields of the EU.

Figure 1.1: VEGETABLE OIL BALANCE IN THE EU-25, 2000-2010



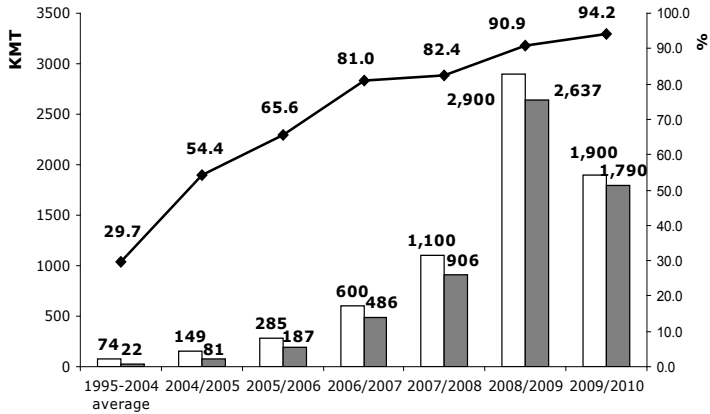
Source: Toepfer

Development of biofuel targets and government support programs contributed to higher demand for feedstocks in the EU. The ratio between food and industrial use of vegetable oil changed mainly reflecting increased biofuel production (See Figure 1.1)

17 According to EC estimates around 30% of feedstock needed to reach 2020 targets for biofuel in transport will be imported.

Due to increasing demand, Ukrainian producers increased production volumes of rapeseed that matched the timing of EU biofuels initiatives. Figure 1.2 proves gradual significant increase in the production and export volumes of rapeseeds.

Figure 1.2: PRODUCTION AND EXPORT OF RAPESEED IN UKRAINE, 1995-2010



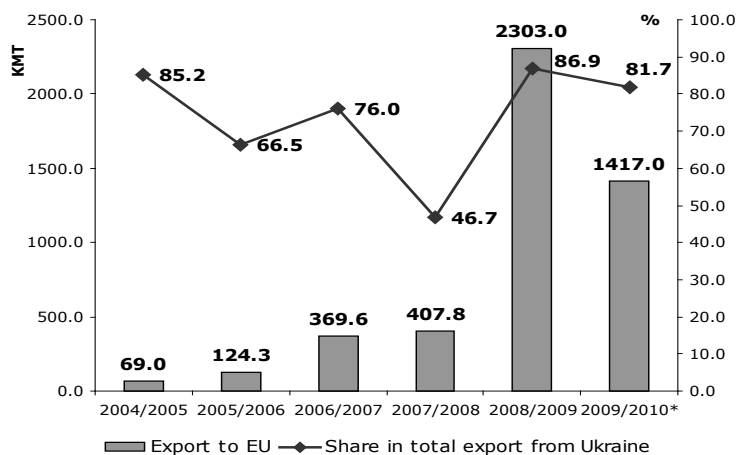
Note: 2009/2010 – forecast. Source: USDA

Prior to 2004/2005 the production and exports of rapeseed were low and then expanded more than twenty times by 2008/2009 season.

Domestic consumption remained negligible due to limited domestic demand. The share of export increased to more than 90% last season. Figure 1.3 shows the importance of EU markets as a destination of Ukrainian rapeseed.

Except for 2007/2008 season, when nearly half of the export went to Asian and Middle and Near East countries for food use, the EU accommodated more than two-thirds of Ukrainian export of rapeseed.

Figure 1.3: EXPORT OF RAPESEED FROM UKRAINE TO EU, 2004-2010



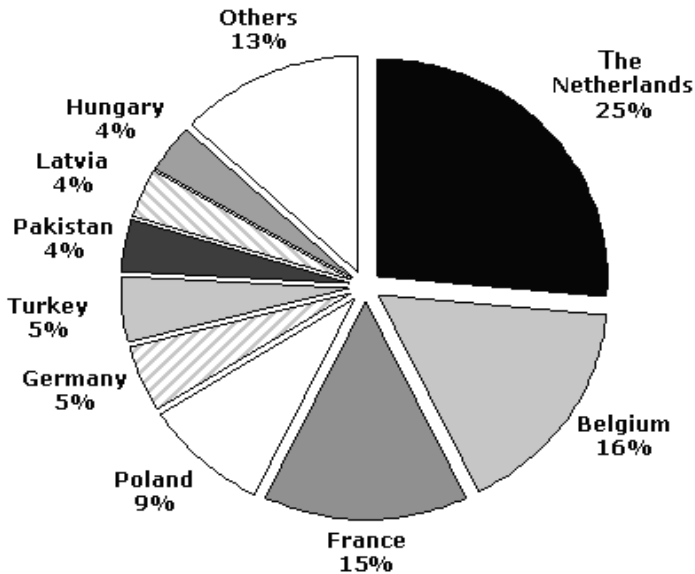
*Note: * Jun-March*

Source: UkrAgroConsult

According to Ukrainian Agribusiness Club estimates, export of rapeseed to the EU amounted to 1.35 billion USD in 2008/2009 which approximates to 4.85% of all export revenues gained from trade within 1-14 HS codes (all products of animal and plant origin)¹⁸. The geographical scope is large, but as many as four countries accommodate more than 65% of the exports (See figure 1.4)

18 Total export revenue referred is 27.82 billion USD, State Statistics Committee of Ukraine

Figure 1.4: EXPORT OF RAPESEEDS FROM UKRAINE
BY DESTINATIONS, 2008/09



Source: UkrAgroconsult

The benefits from international trade with rapeseeds translated into support for farmers through higher farm-gate prices. According to the State Statistics Committee, agri companies have expanded the areas under rapeseed dramatically and in the 2008/2009 crop year rapeseed constituted around 4% of the total arable land. Farmers reported that rapeseed production in 2008 and in 2009 was one of the most profitable enterprises in crop production.

The income from rapeseed production and sales has been realized partially due to the EU trade policy that kept zero import rates for third countries¹⁹. The introduction of new sustainability criteria for biofuels and new requirements for feedstocks imported from third countries to the EU as well as development of certification schemes should therefore be appropriately considered by farmers, traders, and the Ukrainian government.

19 According to Customs Union database, import of rape seeds (1205 HS code) is imposed to zero rate taxation.

2. EU DIRECTIVE ON SUSTAINABLE BIOFUELS – NEW CERTIFICATION REQUIRED

2.1 Definition of sustainability criteria for biofuels

Higher social costs of biofuels production in the EU have been justified with their advantages compared to conventional fuels, primarily in terms of environmental friendliness. Though hardly measurable, certain methodologies and indicators have been proposed to properly compare biofuels to their fossil fuel substitutes and to rank different types of biofuels to advocate their eligibility for state support programs.

The set of these indicators and their values emerged into so-called «sustainability criteria» – specially designed measurements allowing to secure acceptable levels of environmental, social and other characteristics in the process of biofuels production and distribution.

The Renewable Energy Directive establishing sustainability criteria for biofuels came into force on June 25, 2009 specifying the transposition period for member states to implement it into the national law till December 5, 2010.

The Directive specified sustainability criteria for (a) biofuels for transport and (b) bioliquids for other sectors (electricity, heating and cooling)²⁰, but also envisaged that the Commission should report on requirements for a sustainability scheme for biomass other than biofuels and bioliquids. Consequently, there will be several stages of development and implementation of sustainability requirements and certification schemes that would cover all types of biomass.

Article 17 of RED lays down that irrespective of whether feedstocks were cultivated inside or outside the EU, energy from biofuels and bioliquids shall be counted towards renewable energy targets and receive financial support for the consumption of biofuels only if they fulfill sustainability requirements.

20 See Glossary and abbreviations in this paper for exact definitions as referred in the Directive.

This formulation does not prohibit the production of unsustainable biofuels as such, but rather excludes unsustainable biofuels from state support programs and, in turn, from expected market price premiums. To receive the benefits, producers of feedstocks and biofuels shall provide enough evidence of compliance with the relevant sustainability requirements.

Sustainability requirements defined in the Directive concern all the issues critically attributed to biofuels: greenhouse gas emissions, land use changes, biodiversity preservation, social impacts of biofuels production such as adverse impact on food prices and employment (See table 2.1).

Certain requirements are put very specific with exact reference values and implementation mechanisms (as to green house gas emissions savings); others are left as general prescriptions to be supplemented with further regulations and guidance (as to social impact of biofuels as well as soil, air and water pollution issues).

Table 2.1: SPECIFIC SUSTAINABILITY REQUIREMENTS SET BY RENEWABLE ENERGY DIRECTIVE

Sustainability criterion	Description	Implementation remarks
1. Green house gas emissions savings (Article 17 (2) of RED)	<ul style="list-style-type: none"> at least 35% for installations established after 23 January 2008, at least 50% from 2017, at least 60% from 2018 for installations put in operation from 2017. 	The detailed methodology for calculation of GHG savings is given in the Annex V of the Directive. In case of biofuels produced by installations that were in operation on January 23, 2008, 35% GHG savings applies from April 1, 2013.
2. Land use restrictions (Article 17 (3) – 17 (5) of RED)	<p>Raw material for biofuels cannot be produced from the land with the defined status:</p> <ul style="list-style-type: none"> high biodiversity land (forest and wooded land, land designated for nature protection purposes, highly biodiverse grassland), high carbon stocks land (wetland, forest land with defined coverage of canopy), peatland. 	In many cases additional evidence about the preservation of certain land characteristics may help farmers to overcome the prohibition of use of land with the defined status.
3. Good agricultural practice (cross compliance) requirements (Article 17 (6) of RED)	Cross compliance rules defined for farmers to be eligible for state support schemes under common agricultural policy hold for biofuel raw materials cultivation	The cross compliance requirements are relevant only for feedstock producers inside the EU.
4. Social sustainability of biofuels (Article 17 (7) of RED)	Biofuels policy should not adversely affect availability of foodstuff, should respect land-use rights and other wider development issues in the EU and in third countries	Development issues cover labour norms referring to obligation to adopt and enforce the Conventions of International Labour Organization specified in the Directive.

Source: Directive 2009/28/EC of 23 April 2009 «On the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC»

Green house gas emission savings requirements are the reduction of emission from use of biofuels as compared to the use of conventional fuel. The methodology for calculation of green house gas impact of biofuels is laid down in Article 19 of the RED. (See Annex C for the general description of this methodology). The reduction is shown in percentage.

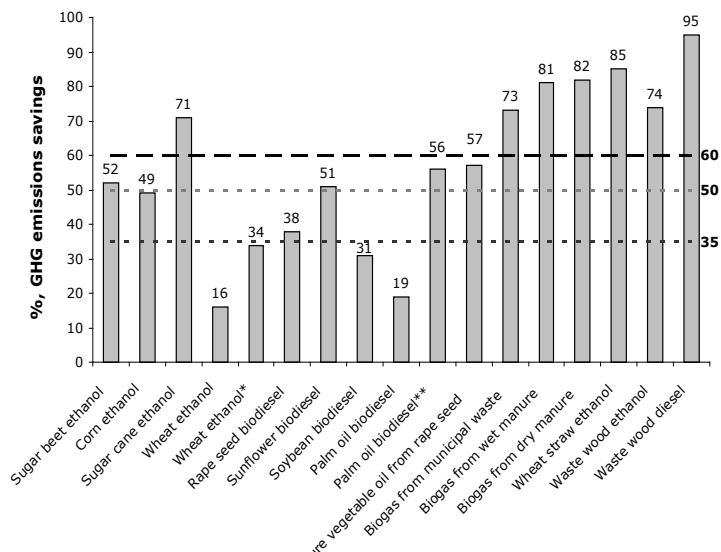
Several options have been established for green house gas calculations:

- to use actual values of green house emissions saving (that is, specifically calculated by the methodology provided in the Directive);
- to use default (predefined by the Commission) values²¹ of green house emissions saving. Default values are those calculated by the Commission for typical production pathways and are allowed to be used with no additional support documents;
- to use mixed approaches, that is to use disaggregated default values for some production factors or stages of production (e.g. cultivation of raw materials, processing, transportation, distribution) and actual values for other production factors or stages of production.

In general, default values and disaggregated default values reflect the relative advantages of biofuels in terms of GHG emissions but do not cover indirect land-use effects. Nonetheless, considering direct effects only, these values together with GHG savings requirements provide clear signs whether specific biofuels will be considered sustainable in the future.

21 *Default values are calculated by Joint Research Center of European Commission and International Climate Panel using representative firms.*

Figure 2.1 DEPICTS DEFAULT VALUES FOR SELECTED PRODUCTION PATHWAYS AND GHG SAVINGS REQUIREMENTS



Note *natural gas as a process fuel in conventional boiler, **process with methane capture at oil mill

Source: Annex V, Renewable Energy Directive

Figure 2.1 illustrates the most endangered types of biofuels in terms of their compatibility with green house gas emission saving requirements. Clearly, first generation of biofuels fails to meet the requirements in most cases and the risk of such failure increase with the obligation uphold from 35% to 50% and further to 60%. The default values vary not only across feedstocks but also across the production technologies (wheat ethanol and palm oil diesel meet the 35% target in case of specific technology applied). This suggests shifting the attention to alternative technologies and second generation of biofuels (see values for straw and wood ethanol), especially after 2017.

In case of liquid biofuels, it has been shown that the largest part of GHG is emitted on biomass production stage. This suggests possible technology changes in farming, in particular shift to no-tillage or other land-use practices that proved great potential in terms of carbon sequestration and thus would allow farmers to meet future GHG requirements²².

22 For example, calculations by P. Smith, D. Powlson, M. Glendining, J. Smith suggest that 100% conversion to no-till agriculture in Europe could mitigate all fossil fuel-carbon emissions from agriculture in Europe. See Preliminary Estimates of the Potential for Carbon Mitigation in European Soils Through No-Till Farming, *Global Change Biology* 4:679-685 (1998)

A supplier using GHG saving technologies in farming could calculate actual values to provide evidence that his specific biofuel would have higher GHG emission savings. Moreover, default values are only valid for production pathways that do not cause carbon emissions from land-use change. In presence of such emissions, actual values should be provided.

The Directive recognizes the necessity to reconsider default values as new technologies emerge or new reliable statistics are available. This holds both for default values for the whole value-chain as well as disaggregated values for feedstock cultivation.

By March 31, 2010 the Commission will write a report evaluating the possibility of definition of areas in third countries where typical green house gas emissions savings are lower or equal than the default values defined. Furthermore, the Commission is to review the impact of indirect land-use change²³ and make a proposal till the end of 2010 about the methodology to calculate this effect.

Further provisions concern sustainability criteria for feedstocks:

According to Article 17(3)-17(5) to fulfill sustainability requirements biofuels shall not be made from land with high biodiversity value, land with high carbon stock, and peatlands, namely the land that has or had one of the following status:

- 1) primary forest and other wooded land, namely forest and other wooded land of native species, where there is no clearly visible indication of human activity and the ecological processes are not significantly disturbed;
- 2) area designated by law for nature protection purposes or for the protection of ecosystems and species recognized by international agreements unless the evidence is provided that the production of raw materials did not interfere with those nature protection purposes;
- 3) highly biodiverse grass land (natural or non-natural);
- 4) wetlands, namely the land that is covered with or saturated by water permanently or for a significant part of the year;
- 5) continuously forested areas, namely land spanning more than one hectare with trees higher than five meters and canopy cover more than 30% or trees able to reach those thresholds in situ;

23 *The change of carbon stock caused by food crops shifted to new cultivation areas being substituted by biofuel feedstock crops production.*

- 6) land spanning more than one hectare with trees higher than five meters and a canopy cover of between 10% and 30%, or trees able to reach those thresholds in situ, unless evidence is provided that carbon stock before and after conversion is such that green house gas emission savings requirements are fulfilled;
- 7) peatland as of January 2008, unless evidence is provided that the cultivation and harvesting of raw materials does not involve drainage of previously undrained soil.

Land use restrictions rely on the status of the land it had in or after January 2008. However, the status of certain areas, namely the criteria and geographic ranges for grassland, are pending definition with further regulation needs by the Commission. The three groups of land restricted to use for feedstock cultivation are often accompanied with «unless evidence is provided...» that leaves certain degrees of flexibility for producers.

Additional provisions are expected as to definitions of severely degraded and highly contaminated land²⁴.

Good agricultural practice requirements refer to Council Regulation 73/2009 of January 19, 2009 establishing common rules for direct support schemes for farmers under common agricultural policy (cross-compliance rules). The list of obligations is quite extensive and further refers to additional regulations that define environmental friendly land management, preservation of habitats, biodiversity, water use and mitigating climate change. There are no specific provisions in the Directive on Good Agricultural Practice requirements outside the EU. However, future reports of the Commission may contain proposals to address these issues specifically (namely, measures for soil, water and air protection as stated in Article 17 (7), Article 18 (9)).

Social sustainability of biofuels concerns the issues of competition with food crops, possible adverse effects on labour conditions, land rights, biosafety, and other broader development aspects. For that purpose, the countries supplying feedstocks or biofuel to the EU must ratify and implement a set of Conventions of the International Labour Organization as well as the Cartagena Protocol on Biosafety and the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

As regards sustainability criteria for other types of biomass, no EU-level binding regulations have been justified so far. Instead, the Commission in its report²⁵ proposes certain schemes to be imple-

24 *GHG savings bonus amounts may be assigned to those lands provided raw materials are cultivated there.*

25 *Report from the commission on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling. COM(2010) 11*

mented at national levels. In the absence of harmonized rules at the EU level, member states are free to put in place their own national schemes for solid and gaseous biomass used in electricity, heating and cooling guided by the sustainability criteria similar to those established for biofuels.

In this way, EU authorities hope to minimize the risk of the development of varied and possibly incompatible criteria at national level, leading to barriers to trade and limiting the growth of the bio-energy sector.

2.2 Verification of compliance with sustainability criteria

Article 18 of the Directive obliges member states to implement measures to ensure that economic agents provide reliable information on the compliance with sustainability criteria for biofuels. This implies that the development and implementation of certification schemes falls under responsibility of member states. However, the Commission is to define the list of appropriate and sufficient information for this purpose avoiding «excessive administrative burden for operators», including small farmers, producer organizations and cooperatives.

Three options are available to show compliance with sustainability criteria:

- a) EU-level recognition of voluntary schemes that address one or more of the sustainability requirements;
- b) bilateral and multilateral agreements with third countries; and
- c) by member states national verification methods.

The Commission may decide that voluntary national or international standards for the production of biomass contain sufficient information to verify the compliance with sustainability criteria. Such a decision may be made only if the scheme in question meets reliability, transparency and independent auditing standards. In such cases all member states will have to accept those standards as proof of compliance with those requirements. Individual member states are permitted to benchmark and approve standards that cover one or more of the RED mandatory sustainability requirements. In such cases other Member States do not necessarily have to accept those standards. The decision by the Member State could also be overruled by an EC decision on the same standard.

Different biomass production standards have been known in member states prior to the adoption of the Directive. The Netherlands, UK, and Germany have taken active steps to develop such schemes. National governments endeavor to estimate the compatibility of the schemes in operation or in development with the criteria defined in the Directive and to make the adjustments or introduce a completely new schemes if needed²⁶.

The general principle of certification is based on mass balance system. The mass balance method of verification is based on the assumption that the mass of the input matter equals to the output matter (matter could not be created or destroyed) so the sustainability characteristics are assigned to the physical mass of biofuel (biomass). Once granted compliance for a certain physical mass, an operator could claim the compliance for this mass when it passes the biomass (even when it comes from another consignment) to the next operators. This allows for mixture of consignments with different sustainability characteristics. A trader, for example, would have to prove to the registry in European port that the consignment originates to 70 per cent from certified farms and 30 per cent from other resources. A European refinery could then purchase 70% (in mass) of the consignment and booked its share as sustainably produced.

However, given the complexity of «mixture» and «consignment» definitions (as to appropriate scale) and high intensity of mixing at each stage in the value chain (risk of excessive burden), the Commission intends to develop other verification methods «in which information about sustainability characteristics need not to remain physically assigned to particular consignments or mixture» (Article 18 (2)).²⁷

Article 18 (4) allows for bilateral and multilateral agreements with third countries that would contain provisions on sustainability criteria. These agreements may serve as evidence of compliance with sustainability criteria defined in the Directive. In this case the EU is ensured by a third country that it takes all necessary measures for soil, water and air protection, indirect land use changes, restoration of degraded land, avoidance of excessive water consumption (the requirements that are not specifically described in sustainability criteria definition). The recognition of the schemes and the agreements requires a separate decision of the Community, which is valid for five years.

26 *In many cases such standards do not cover green house gas emissions saving or another RED criterion. See, for example, review of existing standards in Development of Feedstock Sustainability Standards. Renewable Fuel Agency Report, November 2009.*

27 *See European Biodiesel Board Position: Practical Implications Of The Mass Balance System For The Biodiesel Industry for a discussion of appropriate interpretations of mass balance system. February 26, 2010*

The data on states of affairs with sustainability criteria compliance and broader questions regarding soil, water, air pollution should be made public on the transparency platform²⁸, specially designed source for the latest developments in the implementation of the provision of the Directive.

As noted above, member states shall implement the Directive into national law and inter-alia introduce certification schemes till December 5, 2010. The majority of the member states seem to fully exhaust this period. However, certain countries already announced their intention to introduce certification regulations earlier. Moreover, national action plans covering the information about the policies towards sustainability criteria and verification of compliance are to be submitted by the end of June 2010. This suggests short-run implications both for producers of biofuels and feedstocks suppliers.

2.3 Introduction of first certification schemes: the case of Germany

Germany has pioneered the introduction of sustainability criteria for biofuels. In its Biomass Sustainability Regulation drafted back in 2007²⁹, the country already defined a set of sustainability criteria which were not enforced due to superiority of EU level legislation on the issues that were not yet agreed at that time. The Regulation envisaged certain minimum requirements concerning sustainable cultivation of agricultural areas as well as natural habitat protection. Biofuels were supposed to possess a determined «green house gas reduction potential» in future (30% and 40% from 2011) that had to be proved via new certification³⁰.

After the RED had been enforced from July 5, 2009, Germany was again the first to start the development of its own mechanism of the implementation of sustainability-related provisions. In 2009, two Regulations on biofuels for electricity³¹ and sustainable biofuels for transport³² translated the Directive into national German law. The documents set common sustainability criteria in accordance with the EU directive and required certification of biomass both from domestic and foreign producers as the way of verification of compliance.

28 Available at http://ec.europa.eu/energy/renewables/transparency_platform/transparency_platform_en.htm

29 The document referred as *BioNachV* was drafted on December 5, 2007.

30 For more detailed discussion of the provisions of the Regulation in 2007 see *Commentary Paper for the Draft on the German Biomass Regulation from December 5, 2007 by Union for the Promotion of Oilseeds and Protein Plants*, 2008.

31 *Bioelectricity Sustainability Regulation (BiomassestromNachhaltigkeitsverordnung – BioSt-NachV)* from July 23, 2009. Available at *Bundesgesetzblatt www.bgbl.de online (Official Journal)*. Enforced from August 24, 2009

32 *Biofuels Sustainability Regulation (BioKraftstoff-Nachhaltigkeitsverordnung – BiokraftiNachV)* as of 30 September, 2009. Available at *Bundesgesetzblatt online www.bgbl.de (Official Journal)*. Enforced from 2 November, 2009

In addition to GHG reduction and good agricultural practice requirements (see table 2.1), the new legislation implies that there would be no use of biomass grown in areas deemed of high-level nature conservation. This includes:

- regions which are already conservation areas or are protected under the terms of international agreements;
- grasslands encompassing significant biological diversity;
- carbon-rich areas, e.g., moors, wetlands or permanently wooded areas;
- areas deemed turf moors on January 1, 2008 as the reference date.

The new regulations stipulate that biomass could be used for energy purposes without verification until December 30, 2010 (the deadline shifted in April 2010)³³. From January 1, 2011 biofuels suppliers would have to either prove the origin from the 2010 harvest or pass through sustainability certification. Certification is set to cover each stage of the supply chain separately applying the mass balance method and can be performed via various certification systems that are currently developed³⁴.

Feedstocks and biofuels importers will have the opportunity to receive a sustainability certificate from the International Sustainability and Carbon Certification (ISCC) system³⁵, being approved as the first certification system for sustainable biomass and bioenergies describing the rules and procedures for certification.

ISCC works as follows: certificates are issued at each interface between steps in the biomass supply chain, such as traders or cooperatives, oil mills and refineries which process liquid or gaseous biomass to end use quality. The certificates are supervised through approved certification bodies. At the last interface, i.e. the last processing step, a proof of sustainability is issued for the transport or liquid biofuel. This document is then used to claim the public subsidies. Certificates are issued by a certification body which must be governmentally approved (as must the certificate itself). Certificates are valid for 12 months. The typical certification process is described in the Annex D.

33 See press-release by Bundestag Coalition at http://www.peter-bleser.de/front_content.p?idcat=100&idcatart=991

34 *The Biofuel Sustainability Regulation set the requirements for these systems and empowered Federal Agency for Agriculture and Nutrition (BLE), subordinate to – Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) to approve such systems and certification bodies.*

35 *For details on how the system operates see <http://www.iscc-system.org>. Other similar systems (RED-Cert) are under development for German and EU energy crop producers.*

The pilot phase of ISCC ended in January 2010, and ISCC received a preliminary approval from the German Federal Agency for Agriculture and Nutrition (BLE). After the certification bodies have also been approved, the first regular certification can begin. Audit experience has already been gathered through pilot projects in the EU, Argentina, Brazil and Malaysia. These tested procedures now have to be transformed into a workable system on a global scale. As an example, this means to transfer electronic registers of certificates, certification bodies and members of the ISCC certification system into a database which can be accessed worldwide.

Germany outpaced EU authorities in issuance of the guidelines for sustainable biomass production. The document³⁶ published by the German Federal Agency for Agriculture and Nutrition (BLE) in particular envisaged the form of the self-declaration from agricultural producers (separate statements for EU and third countries farmers) that would verify the sustainable production of biomass. Annex E provides unofficial translation of the required forms. The main rationale behind the declaration design was to simplify the process of verification by letting farmers declare the sustainability by themselves (though staying ready for any auditions against the fraud). Currently, 3% (inside the EU) and 5% (outside the EU) of the producers are expected to be controlled by independent auditors. As other EU member states develop their own certification schemes³⁷ a consensus would be needed to agree on the compatibility of documentation all around EU. This implies that uncertified suppliers of biofuels (as well as feedstock) will soon lose the opportunity to sell on EU markets. This calls for timely response from third countries willing to supply their products to the EU.

36 *Leitfaden Nachhaltige Biomasseherstellung. Available at www.ble.de under «Kontrolle und Zulassung».*

37 *As of March 2010, no member state except for Germany has adopted legal acts that implement binding sustainability criteria and certification schemes. However, many systems are under development. See Annex F for details.*

3. IMPLICATIONS OF NEW REQUIREMENTS FOR UKRAINIAN PRODUCERS

3.1 Necessary government action

Given new requirements imposed, Ukraine as country of significant source of feedstock for bio-fuels is to recognize the need of verification of compliance with sustainability criteria and to take full account of verification mechanisms envisaged in the Directive.

The most urgent task for the government appears as member states develop their certification schemes. It would be necessary to appropriately monitor the specific requirements imposed and to facilitate their implementation in practice. For this purpose, the government may initiate a working group comprising industry stakeholders. Establishment of such group would ensure that the information from trading partners is timely collected and disseminated directly to the parties affected by relevant regulations. Members of the group would be business associations, traders, farmers, experts, and officials that would benefit from developing a single position in the interactions with trading partners. In addition to norms regulating agricultural practices, the government of Ukraine and the European Commission would also have to agree on the recognition of certification bodies and on other aspects of the certification process to minimize the costs and to ensure maximum resistance against fraud (See section 3.4).

Both the EU and Ukraine should be interested in lowering the possible administrative burden to avoid halts in trade flows and thus may consider signing a bilateral agreement to prove the compliance according to Article 18 (4). Such an agreement would not exclude economic operators from submitting appropriate data of the certification procedure. However, it would help the EU to recognize existing and developed norms of good agricultural practice regulating production of biomass applicable in Ukraine and controlled by governmental bodies (Ministry of Agriculture, State Committee of Land Resources) that would lower the burden for farmers and traders. This implies that the control process of sustainable production of rapeseed from certification bodies would be addressed to the officials responsible for land resources data storage based on the statement of individual farms.

Criteria relevant for biomass production that are established in the Directive and that would appear in the national laws of Member states (though with possible minor modifications) in 2010 refer to many land status definitions (arable land, grassland, areas under protection, wetlands, wooded land) to restrict land use due to different environmental concerns and ensure good agri-

cultural practice in biomass cultivation. Additionally, the Article 18 (4) shows that the EU would most likely include in any bilateral agreement a wider range of environmental issues as well as water, soil, air pollution, and land protection concerns (that may be stated as binding requirements in the future as the Article 18 (9) of the Directive informs). In this sense, the cross-check of Ukrainian legal acts and European norms is likely to be the primary issue during such bilateral negotiations.

Currently, the basic framework that regulates the issues of good agricultural practice in Ukraine is quite extensive. The most important laws are the Land Code of Ukraine of October 25, 2001, the Law of Ukraine #962-IV «On land protection» of June 19, 2003 and the Law #1264-XII «On the environment protection» of June 25, 1991, the Law of Ukraine #86/95 «On pesticides and agrochemicals» of March 2, 1995. The law on Land Cadastre that is to assign certain land statuses to each specific land plot is still under development. If compared to RED provisions, Ukrainian law contains only minor discrepancies in land status definitions. Norms that govern agricultural practice are restrictive enough to conform to stringent EU requirements.

Moreover, Ukraine has ratified each of the International Labour Conventions specified in the Directive and joined the Cartagena Protocol on Biosafety and the Convention on International Trade in Endangered Species of Wild Fauna and Flora. This suggests no need for significant legislative efforts to prove the compliance in the area of social sustainability.

Once signed, the bilateral agreement would facilitate trade flows through less administrative burden at least for five years, that is, the period for which the relevant decision of the Commission about recognition the agreement as a verification method is valid. It would clearly define the sources of control, harmonize definitions, clarify responsibilities and facilitate a permanent dialogue with the European Commission on relevant further developments.

3.2 The role of the traders

Traders are economic operators that directly interact with importing partners. This implies that any new requirements as to products certification would be primarily imposed on them. In turn, they would pass the obligations to local suppliers. In this chain, traders are responsible for tracking the reliable data and earning buyer's trust. Irrespective of particular certification scheme applied, traders are to acquire the latest possible information about the particular requirements effective in different EU countries and to disseminate it among the suppliers of their products.

Some member states have already started to monitor the country of origin of feedstock for their

biofuels trying to capture carbon and sustainability requirements. As sustainability concerns tighten across EU member states, the importers are likely to have a more careful look at the origin of the products they purchase and to ask for more information to be provided by traders.

More than 130 companies documented export of rapeseeds from Ukraine in the last two seasons (and around 10 companies with more than 1 per cent shares in total export). This suggests high level of competition and thus ensures incentives for the companies themselves to provide all the necessary information requested from member states.

For this purpose, the companies would need to build a reliable system of information storage and traceability of data received from the farmers to serve appropriately as a point in the chain of custody. The establishment of such system also entails companies» readiness to accept independent audit practices or develop their own schemes to be recognized by importers. The work incurs costs that may reflect in changes in farm-gate prices.

Although the current approach in EU member states allows biofuel suppliers to have certain amount of products unverified (as a fraction in mass balances), inability to accept independent auditing or to build a reliable data storage system may endanger trade flows stability. Uncertified quantities of feedstocks will possibly receive lower prices that may again translate into lower prices for farmers. Competition with verified rapeseed suppliers from other countries (CIS) will most likely increase.

This suggests that traders should play a key role in putting the new requirements into practice.

Even if certification effectively starts in Germany from July 1, 2010, the traders always have two main options to diversify exports (and thus guarantee certain level of farm-gate prices). Sustainability criteria cover only feedstocks for biofuels in the EU. It means that companies may sell non-certified rapeseed for food use to the EU and to third countries outside the EU not yet involved in sustainability certification.

3.3 What rapeseed producers have to know

Short-run perspective

Exclusion of uncertified biofuels from financial support programs implies that uncertified consignments would face lower demand in the EU. To export rapeseeds, Ukrainian suppliers would have to pass through a certification process that would ensure broad export opportunities.

Certification is scheduled to start from January 1, 2011 in Germany. Other EU member states shall adopt their certification schemes till the end of 2010. This implies that the rapeseed that goes to Germany and also to Netherlands and Belgium where it is processed into oil to be further delivered to Germany biodiesel plants would be primary affected. From 2011 onwards rapeseed supplied to the entire EU market would be subject to sustainability requirements.

The magnitude of increase of costs due to certification would depend on the level of administrative burden caused by particular features of the new certification systems developed. A bilateral agreement of the Ukrainian Government with the European Commission EU may reduce the transaction costs for individual farms.

Pilot certification schemes adopted in Germany will likely serve as a benchmark and suggest a self-declaration approach to verify compliance with sustainability criteria. This implies that individual farmers would need to fill in the required form stating basic characteristics of his biomass production (See Annex E). The self-declaration serves as enough evidence in Germany (due to cross compliance rules). However, whether the declaration would also serve as enough evidence for companies outside the EU is left under risk management considerations of particular certification systems³⁸.

Point 1 of the German form for producers outside the EU contains information on whether biomass has been grown on arable land. The aim is to show that this land was considered arable before January 1, 2008 and was not converted from land with any other status (woodland or area under conservation). Common practices applied by farmers in Ukraine prove that rapeseed is grown on arable land. Thus, evidence on the first point could be understood as in Article 51 of the Ukrainian Law «On land protection».

Point 2 refers to areas under protection. This definition corresponds to that stated in Article 61 of the Ukrainian Law «On environmental protection» and again should not bring any special concerns.

Point 3 asks for land parcels location and specific documents to verify this. In this case, the guidelines suggest application of polygonometric method (or similar method) of land parcels identification. Currently, Ukrainian rapeseed producers keep relevant schemes of their land plots with geographic identification approved by the Department of Land Resources of local administrations. However, extended maps may be required.

Point 4 suggests using default values for GHG savings calculations. As long as rapeseed-based biodiesel meet minimum requirements of 35% (current default value is 38%), no efforts are needed to show any additional calculations³⁹.

38 See paragraph 2 (a) of Chapter IV of BLE Guidelines Leitfaden Nachhaltige Biomasseherstellung

39 However, there is a need to monitor possible adjustment of the default values as described in section 2.1

In the self-declaration of the producer, he has to explicitly recognize that auditors may control the validity of the provided information. Currently, the German authorities expect a control level by independent auditors of 3% of the production inside the EU and 5% outside the EU.

Medium and long-run perspective

The EU aims to increase its share of renewable energy and renewable fuels in particular. However, biofuels from rapeseed and soybeans are defined as those severely lacking greenhouse potential (See Figure 2.1). Special treatment of biofuels from waste, residues, non-food cellulosic material, and ligno-cellulosic material (their contribution towards national renewable energy targets is considered twice that made by other types of biofuels)⁴⁰ as well as 2.5 times of energy content counted from electricity consumed in road vehicles outlines the future shift towards more sustainable types of biofuels.

This shift would result in lower demand for first generation of biofuels and the relevant feedstocks. To get higher prices from selling sustainably grown biomass in the medium and long run perspective (beyond 2017 the rapeseed based biodiesel fails to meet GHG saving requirements if measured with current default values) Ukrainian farmers should consider application of more carbon-friendly technologies such as zero-tillage (some rapeseed producing farms already have the experience of application this method). These technologies do not necessarily imply additional costs.

3.4 Certification process and certification bodies

the main challenges for the biofuels industry from establishment of sustainability requirements would originate from the design of the certification process.

A Directive (as opposed to a Regulation) issued by the European Commission has to be implemented by national law in each member state. In case of new requirements imposed by RED, sustainability criteria and certification systems will have to reflect these changes in the national law of 27 EU members. A typical certification process (as proven by German certification schemes) involves several certification systems (administered by different organizations) each of which comprises several certification bodies (to be accredited by a governmental institution). Given the intent to certify the product at each step in the value chain (so-called interface) every production

40 *Article 21 and Article 3(4) of the Directive*

season, the certification process would involve a large number of interactions between different institutions and economic operators. According to BLE, eight certification bodies have been approved in Germany by April 2010 (See table 3.1).

Table 3.1: APPROVED CERTIFICATION SYSTEMS AND CERTIFICATION BODIES IN ACCORDANCE WITH BIOFUELS SUSTAINABILITY REGULATION (BIOKRAFT-NACHV) AND BIOELECTRICITY SUSTAINABILITY REGULATION (BIOST-NACHV) IN GERMANY

Certification systems

Registration number	Name of certification system	Date of approval	Approved according to	Approved until
DE-B-BLE-BM-10	ISCC System GmbH	18.01.2010	Biokraft-NachV	17.01.2011

Certification bodies

Registration number	Name of certification body	Date of approval	Approved according to	Approved until
DE-B-BLE-BM-ZSt-100	SGS Germany GmbH	24.02.2010	Biokraft-NachV	23.02.2011
DE-B-BLE-BM-ZSt-101	DQS GmbH	24.02.2010	BioSt-NachV	23.02.2011
DE-B-BLE-BM-ZSt-102	TUV SUD Industrie Service GmbH	24.02.2010	Biokraft-NachV	23.02.2011
DE-B-BLE-BM-ZSt-103	Global-Creative-Energy GmbH	01.03.2010	BioSt-NachV	28.02.2011
DE-B-BLE-BM-ZSt-104	GUT Zertifizierungsgesellschaft mbH	24.02.2010	Biokraft-NachV	23.02.2011
DE-B-BLE-BM-ZSt-105	Peterson Control Union Deutschland GmbH	01.03.2010	Biokraft-NachV	28.02.2011
DE-B-BLE-BM-ZSt-106	Agrizert Zertifizierungs GmbH	31.03.2010	Biokraft-NachV	30.03.2011
DE-B-BLE-BM-ZSt-107	Agro Vet-Lebens- und Umweltqualität Sicherung GmbH (AUSTRIA)	21.04.2010	Biokraft-NachV	20.04.2011

Note: Certification system and certification bodies possess «preliminary» state of approval

Source: the German Federal Agency for Agriculture and Nutrition, BLE

The structure of the certification process adopted in Germany covers all economic operators involved in the biofuels supply chain but in a different manner. The operators defined as «interfaces» are obliged to have a certificate (proof of compliance). The last interface in the production chain issues the proof of sustainability which is then used by a supplier of the biofuel to qualify for public subsidies. Interfaces are:

- companies that receive biomass from the growers of such biomass for purposes of further processing (referred to as first gathering points);
- oil mills, and
- refineries that process liquid and gaseous biomass to the required quality to use as a biofuel or produce biofuels from the biomass used.

The other operators downstream the production chain (agricultural companies, traders, storage facilities) are subject to inspections (control checks) carried out by certification bodies while deciding on a particular interface (they are not obliged to have a certificate by themselves, see Annex E).

Agricultural companies are required to submit self-declaration forms (See annex D) and undergo relevant inspections if they occur. According to § 50 of the German Biofuels Sustainability Regulation (BioKraft-NachV) at least 5 percent of the relevant companies outside the EU must be checked per year. The self-declaration form is to be submitted for all crops that are to be traded as sustainable biomass and is applied to just one harvest.

Suppliers (operators upstream in the supply chain) keep proofs of sustainability with the Sustainability Regulations (issued by the last interface) and partial proofs of sustainability with the Sustainability Regulations (issued by competent authority on the consignments for which proofs of compliance have been already issued by an interface) from the last manufacturer over the entire supply chain and can then sell the amount specified to a customer.

The certification process of an interface comprises the following stages:

- 1). signing a contract between pertinent certification body and an interface;
- 2). first inspection and subsequent issuance of a certificate (denial);
- 3). surveillance inspection and subsequent decision of the certification body.

After the contract is signed, the first inspection determines whether the applying enterprise (the interface) has the «structural prerequisites» for fulfilling the legal requirements. Legal requirements can differ substantially depending on the position of the company in the supply chain. However, at this stage the inspection only checks if the company will be able to document a flow of goods qualified as sustainable biomass in a mass balance system. This means that only «structures» and not actual operative movements are monitored. If these are shown to meet the requirements, the certification body issues a certificate.

According to § 27 of the German Biofuels Sustainability Regulation (BioKraft-NachV), certificates should contain the registration number of the certification body and certification System (See table 3.1) and is valid for 12 months from the date of issuance. The certificates are then passed on with the delivery note to the client. The last interface must register all issued proofs of compliance with sustainability regulations with the BLE.

Surveillance inspection takes place upon the expiry of six months after the first audit at the latest. This inspection checks whether the structures and processes inspected at the first stage are actually implemented in practice, that is, whether the flow of biomass has been properly documented and verified. After the data has been verified, spot checks on the interface's structure as well as the units connected with it (farmer, transport, storage facilities) are made.

After all relevant assessments are completed, the certification body issues and communicates its decision to the applicant that may be appealed. The inspection is repeated annually.

Germany recognizes all certification bodies and certification systems that have been recognized by the EC or in a bilateral agreement between the EU and a third country. If this is maintained by other member states in their regulations, third countries would benefit from an easy-to-get recognition of certificates across the EU.

RECOMMENDATIONS

- 1). The Ukrainian government should use the opportunity to sign a bilateral agreement with the European Commission specifying the recognition of Ukrainian regulations with regard to the Directive. Once signed, this agreement would lower administrative burden for farmers to supply necessary documents for control missions of auditors;
- 2). For the purpose of monitoring of specific requirements imposed and facilitating their implementation in practice the establishment of a working group may be initiated. Such working group would comprise business associations, traders, farmers, experts, and officials that would benefit from developing a single position in the interactions with trading partners in the EU and ensure that the relevant information is timely collected and disseminated directly to the parties affected by relevant regulations;
- 3). Interested rapeseed producers should be involved into pilot certifications with accredited certification bodies this year. This would allow all parties to get experience with the certification process in Ukraine and to introduce relevant adjustments before a mass certification begins in the following years.

LIST OF USEFUL DOCUMENTS AND LINKS

1. EU Directive:

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. Available at <http://eur-lex.europa.eu/en/index.htm>;

2. German Regulations:

Bioelectricity Sustainability Regulation (BiomassestromNachhaltigkeitsverordnung – BioSt-NachV) from July 23, 2009;

Biofuels Sustainability Regulation (BioKraftstoff-Nachhaltigkeitsverordnung — Biokraft-NachV) as of 30 September, 2009. Available at Bundesgesetzblatt online www.bgbl.de (Official Journal).

3. BLE Guidelines:

Leitfaden Nachhaltige Biomasseherstellung. Available at www.ble.de under «Kontrolle und Zulassung».

4. Articles and presentations:

Strubenhoff, H-W. «Nachhaltigkeit und internationaler Agrarhandel. Ukrainer produzieren nachhaltiger als Deutsche». Agrarzeitung, Ausgabe 15 / 16. April 2010;

Bockey, D. «The German Sustainability Decree-A Blueprint for the EU Biofuels Sector?». F.O. Licht. World Ethanol and Biofuels Report, Vol.8 February, 2010;

Strubenhoff, H-W and S. Kandul «New sustainability requirements for biofuels in the EU: what Ukrainain farmers should know » (in Russian). Presentation for Round Table discussion at the Ministry of Agriculture Policy of Ukraine, April 28, 2010.

5. Webpages:

European Biodical Board. <http://www.ebb-eu.org>;

German Federal Agency for Agriculture and Nutrition, BLE. <http://www.ble.de>;

German Federal Agency for Renewable Resources, FNR. <http://www.fnr.de>;

International Sustainability and Carbon Certification System, ISCC. <http://www.iscc-system.org>.

Annex A

NATIONAL SHARES AND TARGETS FOR SHARES OF BIOFUELS CONSUMPTION IN THE EU

Member state	Market share of biofuels						National targets			
	2003	2004	2005	2006	2007	2008	2009	2010	2015	2020
Austria	0.06	0.06	0.93	3.54	4.23	5.48	-	5.75	-	10.00
Belgium	0.00	0.00	0.00	0.00	-	-	-	-	-	10.00
Bulgaria	-	-	-	0.00	-	-	3.50	5.75	8.00	10.00
Cyprus	0.00	0.00	0.00	-	0.11	1.94	2.50	2.50	-	10.00
Czech Republic	1.09	1.00	0.05	0.50	-	1.77	3.42	5.75	-	10.00
Germany	1.21	1.72	3.75	6.32	7.35	5.84	5.25	6.25	-	10.00
Denmark	0.00	0.00	-	0.15	-	0.20	-	0.75	-	10.00
Estonia	0.00	0.00	0.00	0.12	0.06	-	-	5.75	-	10.00
Greece	0.00	0.00	0.01	0.75	-	1.47	-	5.75	-	10.00
Spain	0.35	0.38	0.44	0.53	-	-	-	5.75	-	10.00
Finland	0.11	0.11	-	0.02	0.04	-	4.00	5.75	-	10.00
France	0.67	0.67	0.97	1.77	3.57	5.71	6.25	7.00	10.00	10.00
Hungary	0.00	0.00	0.07	0.28	-	-	-	5.75	-	10.00
Ireland	0.00	0.00	0.05	0.09	0.60	1.62	-	5.75	-	10.00
Italy	0.50	0.50	0.51	0.46	0.46	0.59	-	5.75	-	10.00
Lithuania	0.00	0.02	0.72	2.29	4.35	4.30	-	5.75	-	10.00
Luxembourg	0.00	0.02	0.02	0.03	-	-	-	-	-	10.00
Latvia	0.22	0.07	0.33	0.22	0.14	0.17	-	-	-	10.00
Malta	0.02	0.10	0.52	0.58	1.08	-	-	1.25	-	10.00
Netherlands	0.03	0.01	0.02	0.30	2.00	3.26	4.50	5.75	-	10.00
Poland	0.49	0.29	0.47	0.92	0.68	-	4.60	5.75	-	10.00
Portugal	0.00	0.00	0.00	1.02	2.54	-	-	10.00	-	10.00
Romania	-	-	-	0.00	0.80	2.33	-	3.30	-	10.00
Sweden	1.32	2.28	2.23	3.10	4.00	3.50	-	5.75	-	10.00
Slovenia	0.00	0.06	0.35	0.28	0.83	-	2.00	3.00	5.00	10.00
Slovakia	0.14	0.15	-	1.04	2.59	2.65	-	-	-	10.00
United Kingdom	0.03	0.04	0.18	0.45	0.84	2.04	3.00	4.00	-	10.00
EU-27	0.50	0.70	1.00	1.76	2.31	2.62	-	5.75	-	10.00

Source: Union for Promotion of Oilseeds and Protein Plants, Berlin, 2009.

Annex B

NATIONAL OVERALL TARGETS FOR THE SHARE OF ENERGY FROM RENEWABLE SOURCES IN GROSS FINAL CONSUMPTION OF ENERGY IN 2020

Member State*	Share of energy from renewable sources in 2005,%	Target for share of energy from renewable sources in 2020,%	Increase, 2020 to 2005, percent points	Lag between GHG targets and GHG emissions, 2012 to 2007, percent points**
(1)	(2)	(3)	(4)	(5)
United Kingdom	1.3	15	13.7	5.5
Denmark	17	30	13.0	-17.1
Ireland	3.1	16	12.9	-11.5
Germany	5.8	18	12.2	1.4
Italy	5.2	17	11.8	-13.4
Netherlands	2.4	14	11.6	-3.4
Spain	8.7	20	11.3	-37.2
Greece	6.9	18	11.1	1.8
Belgium	2.2	13	10.8	2.4
Austria	23.3	34	10.7	-24.3
Portugal	20.5	31	10.5	-9.1
Cyprus	2.9	13	10.1	N/A
Luxembourg	0.9	11	10.1	-26.1
Malta	0.0	10	10.0	N/A
Finland	28.5	38	9.5	-10.3
Sweden	39.8	49	9.2	13.3
Slovenia	16.0	25	9.0	-9.8
Hungary	4.3	13	8.7	28.2
Lithuania	15.0	23	8.0	41.9
Poland	7.2	15	7.8	23.2
Latvia	32.6	40	7.4	45.4
Slovak Republic	6.7	14	7.3	26.8
Estonia	18.0	25	7.0	40.3
Czech Republic	6.1	13	6.9	14.4
France	10.3	23	6.7	5.8
Romania	17.8	24	6.2	37.3
Bulgaria	9.4	16	5.6	35.0

*Note: *Member states are sorted by the increase of shares of renewable energy (column (4)) **GHG targets and emission are calculated as decrease of GHG emissions from the base year (1990). «+» sign implied that a country exceeded its GHG saving target (2012) in 2007*

Source: Renewable Energy Directive, Directive 2009/28/EC; GHG Inventory Summary 2009.

Annex C

METHODOLOGY OF CALCULATION OF GREENHOUSE EMISSIONS SAVINGS

(General principle, detailed prescription is to be found in part C of Annex V of the RED)

Green house gas emissions from the production and use of transport fuels, biofuels and bioliquids shall be calculated as:

$$E = e_{cc} + e_i + e_p + e_{td} + e_u + e_{sca} + e_{ccs} + e_{ccr} + e_{ee}$$

Where

E = total emissions from the use of the fuel

e_{cc} = emissions from the extraction or cultivation of raw materials;

e_i = annualized emissions from carbon stocks changes caused by land-use change;

e_p = emissions from processing;

e_{td} = emissions from transport and distribution;

e_u = emissions from fuel in use;

e_{sca} = emissions savings from soil carbon accumulation via improved agricultural management;

e_{ccs} = emissions saving from carbon capture and geological storage;

e_{ccr} = emissions savings from carbon capture and replacement;

e_{ee} = emissions savings from excess electricity from cogeneration.

Green house gas emissions from fuels, E, shall be expressed in terms of grams of CO₂ equivalent⁴¹ per MJ of fuel, gCO_{2eq} / MJ

Green house gas emission savings from biofuels and bioliquids shall be calculated as:

$$\text{SAVING} = (E_F - E_B) / E_F$$

Where

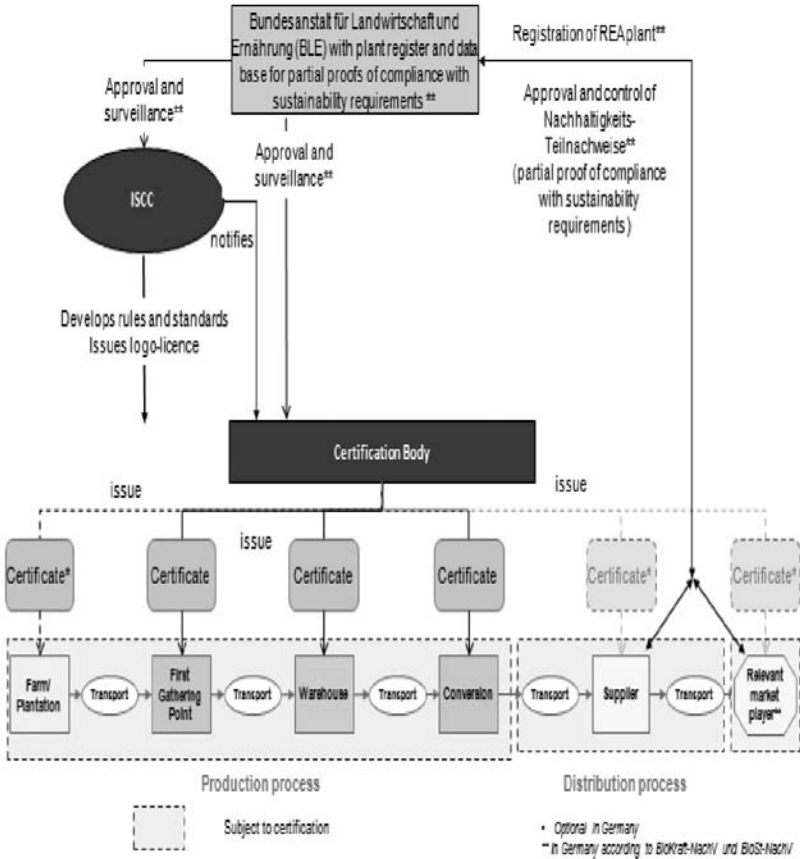
E_B = total emissions from the biofuel or bioliquid

E_F = total emissions from fossil fuels comparator

The fossil fuel comparator shall be the latest available actual average emissions from fossil part of petrol and diesel consumed in the Community as reported under Directive 98/70/EC. If no such data available, the value used shall be 83.8 gCO_{2eq} / MJ

⁴¹ CO₂, NO₂ and CH₄

TYPICAL CERTIFICATION PROCESS OF SUSTAINABLE BIOFUEL SUPPLY, ISCC



http://www.iscc-system.org/about_iscc/processes_and_responsibles

Annex E

THE FORM FILLED BY AGRICULTURAL COMPANY VERIFYING SUSTAINABLE PRODUCTION OF BIOMASS BASED ON THE BIOFUELS SUSTAINABILITY REGULATION AND BIOELECTRICITY SUSTAINABILITY REGULATION – PRODUCTION OUTSIDE OF THE EU

This is to verify that the biomass grown and supplied by my farm complies with the requirements set by Sustainability Regulations with relevant evidence available (please mark the appropriate field):

1.	<input type="checkbox"/>	Biomass has been grown on an arable land that had this status before 01.01.2008. Besides, it has been grown on that land that is not classified as conservation areas (paragraphs 4 – 6 of Sustainability Decrees), that was converted into arable land after 01.01.2008.
2.	<input type="checkbox"/>	Biomass has been grown in the protected regions allowed for cultivation. The conditions relevant to protected regions status are met.
3.	<input type="checkbox"/>	The documents indicating the place of cultivation of biomass (verified with polygonometric motion method in accordance with paragraph 26 of Sustainability Regulations or with another similar method of arable area and land parcels identification)
	<input type="checkbox"/>	available at my farm at any time upon request
	<input type="checkbox"/>	available at fist stage buyer of the biomass grown by me.
4.	<input type="checkbox"/>	For green house gas emission balance default value will be applied (paragraph 8 and Annex 2 of Sustainability Decrees).

Note: This self-declaration confirms that the agricultural producer recognizes that auditors certified by Federal Agency for Agriculture and Nutrition are allowed to check the compliance of the information provided with the requirements envisaged by paragraphs 4-7 of Sustainability Regulations.

Place, date, signature

Federal Agency for Agriculture and Nutrition blank

Source: Guidelines for sustainable biomass production, the Federal Agency for Agriculture and Nutrition

**) The form for producers inside the EU contains an additional question fro self-declaration: «cross compliance» rules.*

**DEVELOPMENT OF SUSTAINABILITY STANDARDS FOR BIOFUEL
FEEDSTOCKS IN THE WORLD**

Standard	Description	Geographic scope	Compatibility with RED	
			Biodiversity	Carbon stock
Assured Combinable Crops Schemes (ACCS)	UK standard for combinable crops started in 1998. Covers wheat, barley, oilseeds, pulses, sugar beet and other crops. Main focus on food safety, includes environmental criteria	England and Walse	Yes	Partial
Better Sugar Cane Initiative (BSI)	Global non-profit initiative dedicated to reducing the environmental and social impacts of sugarcane production. The standard under development (due 2010)	Members are key sugarcane producers including Brazil, Australia, India and Dominican Republic	Not accessed	Not accessed
Forest Stewardship Council (FSC)	International NGO promoting responsible management of the world's forest. Founded in 1993. Covers a large area and volume of certified forest. Will be relevant for 2nd generation of biofuels	National working groups in more than 50 countries	Yes	No
Linking Environment And Farming (LEAF)	Supplementary standard focusing on sustainable agriculture (certification possible after global standard like ACCS has been met). Launched in 2003	18 countries worldwide (Europe, Africa, the Americas and Asia)	Partial (no reference dates)	No
Roundtable on Sustainable Palm Oil (RSPO)	Criteria adopted in 2005. Certification and accreditation procedures adopted in 2007. from 2008 – working group on GHG, voluntary implementation of GHG recommendations	Operates in Indonesia, Malaysia and Papua New Guinea. Work is underway to extent its cover to Ghana, Thailand, the Solomon Islands, Colombia and Brazil	Yes	Partial
Roundtable on Responsible Soy	Founded in 2006. A «field testing Version» published in May 2009. Feedback and certification system is planned for June 2010	Field test are carried in Argentina, Brazil, Paraguay, and India. In the medium term target countries are China, the US, Uruguay and Bolivia.	Partial (reference date May 2009)	No
Sustainable Agriculture network / Rainforest Alliance (SAN/RA)	Coalition of independent non-profit conservation organizations that promote social and environmental sustainability of agricultural activities by developing standards. In April 2009 a standard addendum was issued to cover palm oil, sugarcane, soy, and sunflower. To get a certificate a plantation must meet 14 critical criteria and 80% of the SAN's other criteria	19 countries, including South and Central America, Africa, SE Asia	Yes	Partial

Source: Development of Feedstock Sustainability Standards. Final report of Renewable Fuel Agency, November 2009.

**DEVELOPMENT OF SUSTAINABILITY STANDARDS FOR BIOFUELS
IN THE WORLD (CONTD.)**

Standard	Description	Sustainability criteria				
		Bio-diversity	Carbon	Soil, water, air	Social	Indirect land use change
Roundtable on sustainable biofuels (RSB)	Started in August 2008. Steps are being taken towards creating a risk-based certification system. The first certificates scheduled for 2010. covers all biofuels	Yes	Yes	Yes	Yes	No
Global Bioenergy partnership (GBEP)	Started in 2005 and aimed at provision of relevant, practical, science-based, voluntary sustainability criteria...» covers all bioenergy. Under development	Yes	Yes	Yes	Yes	Yes
European Committee for Standardization (CEN)	A major provider of European Standards and technical specifications. Covers all feedstock for energy application. CEN has a working group on «indirect effects which pending a decision whether the standard will cover only sustainability criteria of RED or will have a broader scope.»	Yes	Yes	No	No	No

Source: Development of Feedstock Sustainability Standards. Final report of Renewable Fuel Agency, November 2009. European Committee for Standardization. Brussels, 2009.



BIOGAS AND «GREEN TARIFFS» IN UKRAINE – A profitable investment?

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EXECUTIVE SUMMARY

1. The Ukrainian government encourages investments into the establishment of bioenergy facilities offering privileges for producers. Among these privileges is a higher tariff for electricity generated from alternative sources of energy – the so called «green tariff».
2. The «green tariff» is a feed-in tariff differentiated for 1) each company that produces electricity from alternative sources of energy, 2) each type of alternative energy and 3) each single facility. The green tariff for electric energy from biomass is 1.6135 UAH/kWh including VAT. The difference between the «green» tariff and retail energy tariff gives biogas producers an opportunity to realize higher earnings than other energy producers.
3. Ukraine has a biogas feedstock potential, that under current market conditions could allow to substitute 4-7% of annually produced electricity in Ukraine. The calculation of biogas potential from animal waste is done by using the conservative methodology of volatile substance, which takes into account dry manure. Numbers based on fresh manure amounts slightly differ from the results obtained by this methodology. In the case of corn silage the evaluation of the potential was based on the assumption that we substitute the total amount of corn export of the country with biogas production.
4. To assess the profitability of biogas production in Ukraine we are differentiating between three feedstocks (pig and cattle manure, chicken dung and corn silage) and three scales of plants (installed electrical capacities of 0.5, 1 and 3 MWe).
5. For the analysis of costs and benefits of biogas production we divide costs¹ into 2 groups: 1) production (purchase of equipment and construction land; personnel, electricity and water consumption), 2) operation and maintenance costs (costs to regularly provide biogas plant with raw materials and annual maintenance and repair costs of this equipment). The benefits can be obtained from the sale of electricity (produced from biogas and sold by green tariff) and from the sales or own use of bio fertilizers. After estimations of costs and benefits, we calculate the internal rates of return (IRR), payback periods (PP) and net present values (NPV). These indicators show the level of profitability of the biogas plants.
6. The results show that biogas plants operating on pig and cattle manure are the most attractive for investors by all the plant scales. Biogas plants working on chicken dung and corn silage are profitable only if their capacity is 1 MWe and above.

1 *We include only those costs that are equal for all producers, excluding additional administrative and transaction costs, that might be case specific.*

7. If the government fulfills its obligations to finance the «green tariff», thus ensuring investors stable framework conditions and levying the administrative functions of the involved state authorities, biogas production in Ukraine would be profitable. However, due to current state budget constraints it is likely that the growth rate of biogas production in Ukraine may be lower than in other European countries with feed-in «green tariffs».

GLOSSARY

Biogas – a gas produced by the biological breakdown of organic matter in the absence of oxygen. Biogas originates from biogenic material and is a type of biofuel.

Volatile Substance (VS) – Volatile organic compounds (VOCs) are organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere. $VS = DM - (1 - ASH)$, where VS is volatile substances (kg per head for 24 h), DM is dry manure (kg per head for 24 h), ASH is share of ashes in manure (coefficient).

Net present value (NPV) – is the total present value (PV) of a time series of cash flows. NPV is an indicator of how much value an investment or project adds to the firm.

Internal rate of return (IRR) – is the annualized effective compounded return rate that can be earned on the invested capital.

Payback period (PP) – period of time required for the return on an investment to «repay» the sum of the original investment.

Cogeneration – is the use of a heat engine or a power station to simultaneously generate both electricity and useful heat

Green tariff – special differentiated tariff for electricity generated at the power plants that use alternative sources of energy.

National commission for electricity regulation of Ukraine (NERC) – state authority, empowered to control the working out and implementation of state policy for development and existence of the wholesale energy market as well as markets for gas, oil, and oil products.

MWel – installed electrical capacity of the plant, Mega Watt.

INTRODUCTION

Energy from renewable resources is a hot topic in Europe and all over the world today. Whereas bioethanol and biodiesel production cause more debate and the cost of the technologies is high, the boost of the number of biogas plants in the EU in the last five years is impressive. For example in Germany from 2000 to 2009 the number of biogas plants increased by more than 6 times and almost reached 5000 with the overall installed electrical capacity of 1600 MWel.² Biogas production in the EU is multi-purposed — it can be used as a substitution for natural gas, so as for heat and electricity generation. However, this rise of the production capacities was mostly conditioned by the legislative activity of the Governments, providing support to the producers of energy from renewable resources

The overall attention of the Ukrainian Government to the alternative sources of energy is mostly targeted at the increase of the energy security of the country and reduction of the imported natural sources of energy. Ukraine is in the very beginning of its way of introduction of renewable energy and until recently its legislative framework in the sector was general. Last year the Government introduced the legislative novel aiming to support production of energy from alternative resources — «green tariff» and offered producers of energy from alternative resources some more privileges such as tax exemptions and import duty exemptions for import of equipment. These government measures are expected to motivate investments and increase production of energy from biomass.

In this paper we assessed different opportunities for biogas production in Ukraine and its profitability under the newly introduced «green tariffs». In the first chapter we estimate biogas potential based on feedstocks of animal and plant origin – silage corn, chicken dung and pig and cattle manure. The amount of raw materials of animal origin is based on official statistics, whereby potential of the corn silage is estimated upon the assumption of substitution of land areas under the exported corn with sowing of silage corn for biogas production. In the second chapter we give an overview on the existing legislative framework for biogas production. The next section represents the profitability analysis of biogas production in Ukraine under the «green tariff» according to nine scenarios depending on three different feedstocks for production (corn silage, cattle and pig manure, chicken dung) and three different installed electrical capacities of the plants (for production of 0.5 MWel, 1 MWel and 3 MWel). Finally, we assessed the number of plants that might be built in Ukraine. The fifth section presents the calculations of financial state support, required by the assumption of the full realization of biogas potential in Ukraine for three types of plants and three types of feedstocks.

2 <http://www.fjn.de>

1. ESTIMATION OF THE BIOGAS POTENTIAL IN UKRAINE

Biogas originates from bacteria in the process of bio-degradation of organic material under anaerobic (without air) conditions. This type of biogas comprises primarily methane and carbon dioxide.³ The energy content of biogas is directly dependent on the methane content. The higher the content of substances such as fats and starch that easily break down in the fermented mass, the greater the gas yield.⁴

There is a wide range of organic substrates for biogas production such as cattle and pig manure, chicken dung, various wastes (from plants, slaughterhouse, food industry, waste water, etc.), silage, rotten or brewer's grain, malt remnants, marc, distillery slop, sugar beet and fruit pulp, sugar beet tops, fiber and other starch and treacle production, milk whey, flotation sludge, dewatered flotation sludge from municipal waste water treatment plants, algae and others. Most of the raw materials can be differently combined in the production process.

Ukraine with its good agricultural basis has promising potential for biogas production. In our analysis we concentrate on the yields of biogas that can be generated in Ukraine from cattle manure, pig manure, chicken dung and silage corn as the most available agricultural sources.

1.1 Biogas of animal manure origin

Cattle, pig manure and chicken dung are especially suitable feedstocks for biogas plants because of the methane producing bacteria already contained in the stomach of animals. The specific gas production, however, is lower and the content of methane is around 60-65% because of prefermentation in the stomach.⁵

Collection and removal of cattle and pig manure and chicken dung from farms is the subject of state regulation according to the State norms of technological designing.⁶ The type of the removal (mechanical or hydraulic) also influences the content of the manure and its further energy charac-

3 <http://en.wikipedia.org/wiki/Biogas>

4 *Biogas-and introduction. FNR 2008.*

5 *Biogas Digest. Volume II. Biogas – Application and Product Development. Information and Advisory Service on Appropriate Technology. GTZ. <http://www.gtz.de/de/dokumente/en-biogas-volume2.pdf>*

6 *БНТІІ-АПК-02.05, БНТІІ-АПК-01.05, БНТІІ-АПК-04.05, БНТІІ-АПК-09.06*

teristics. Furthermore, these State norms also define the values of output of excrements by cattle, pigs and chicken per day. In our analysis we take these values as the main source for defining biogas potential based on the number of livestock of agricultural enterprises in Ukraine.

In 2008 there were about 5.1 mln heads of cattle, 6.5 mln heads of pigs and 177.6 mln heads of poultry in Ukraine. A big number of cattle and pigs is still held by private households. Besides, there are a lot of small-scale agricultural enterprises that have a few livestock but cannot be considered as reliable suppliers of raw material because of complexity to collect animal waste from them. When we disregard private households in our estimation of potential, agricultural enterprises, which can be regarded as potential suppliers of raw materials (animal waste) for biogas production in Ukraine, account only for approximately 34% of cattle, 42% of pigs and 50% of poultry.

In order to ensure supply with raw materials for biogas plant with the installed electrical capacity of 0.5 MWe1, at least 2 thd of (milk) cows, or 25 thd of permanent pig herd, or 250 thd of hens-layers (or 500 thd of broilers) are needed.⁷ As of January 1, 2009 only about 3% of all agricultural enterprises in Ukraine had enough livestock to ensure biogas production with own raw materials. In particular, 107 agricultural enterprises had livestock herds above 2 thd heads; 199 had poultry herd above 50 thd heads and 65 had pigs herd above 6 thd of heads.⁸ Other agricultural enterprises can be regarded as potential suppliers of animal manure for biogas production only if their output is grouped. In this case animal manure becomes a good with a certain monetary value on the market. Besides, a biogas producer should bear significant logistical costs to collect and deliver this manure to the biogas plant.

By March 20, 2009 Ukrainian agricultural enterprises in total had about 3.1 m t manure of cattle origin, 0.874 mln t of pig manure and 0.558 mln t of poultry dung.⁹ On average manure can contain 75% of water depending of the type of its collection and the type of the livestock. Therefore, it is more accurate to use data based on dry manure to calculate potential biogas yields. The quantity of manure given by an animal also depends on its age. Taking all this into account, we calculated dry manure output per different age groups of cattle and pigs (see Table 1).

7 *According to the calculations of the biogas plant construction company*

8 *It is unknown how many of 199 poultry producing enterprises or of 65 pig producing enterprises have a herd size above 250 thd of hens or 25 thd of pigs respectively. It is only known that 199 poultry producing enterprises all together keep above 85 mln of poultry heads and make up the largest portion of agricultural enterprises involved in poultry production. 65 pig producing enterprises keep together 936 thd of pigs.*

9 *According to the data of the Ministry of Agrarian Policy of Ukraine from March 2009.*

Table 1: CALCULATION OF BIOGAS POTENTIAL IN UKRAINE BASED ON AMOUNT OF VOLATILE SUBSTANCES (VS) ¹⁰

	Number of animals in agricultural enterprises, thd heads (as of 2008)	Amount of VS per head, kg/24h	Total amount of VS in Ukraine, tons/24h	The degree of fermentation of VS, units	Biogas yield per kg of VS, m ³ /24h	Total biogas yield, thd m ³ /24h
	A	B	C=A*B	D	E	F=C*D*E
Total cattle	1720.1		5890.32	0.35	0.4	824.644
Cows	624.3	5.29	3302.55			
calves under 1 year	425.2	0.88	374.176			
cows of 1-2 years	85.2	3.02	257.304			
cows from 2 years and older (sired)	85.8	5.29	453.882			
cows from 2 years and older (un-sired)	46.9	5.29	248.101			
bulls-producers	2.5	4.7	11.75			
other cows and bulls	450.2	2.76	1242.55			
Total Pigs	2730.9		1442.71	0.4	0.8	461.67
Main sows	226.7	0.93	210.831			
Sows that are being checked	92.7	0.75	69.525			
Remount piglets over 4 months	135.6	0.65	88.14			
Piglets under 2 months	647.4	0.041	26.5434			
Other pigs	1628.5	0.643	1047.67			
Hens and cocks	85720	0.036	3085.92	0.45	0.9	1249.8
Total			10418.9			2536.1

Source: Own calculations based on National Agrarian University and State Statistics Committee of Ukraine data.

10 $VS = DM - (1 - ASH)$, where VS is volatile substances (kg per head for 24 h), DM is dry manure (kg per head for 24 h), ASH is share of ashes in manure (coefficient).

Total dry manure potential that could be obtained from all livestock of cattle, pigs and hens in Ukraine is 12.5 thd tons per 24 hours. Total crude manure potential is 84.8 thd tons per 24 hours (for details see Annex E). The humidity of crude manure and the manure used in biogas plants differs. Therefore, our calculations are based on the conservative methodology of volatile substances, which takes into account dry matter of the substrate. Thus from the existing amount of dry matter of manure in Ukraine could be produced 2.5 mln m³ of biogas per 24 hours. Another approach to calculate potential biogas yields is shown in Annex E.

Given herd number and age structure of animals in 2008¹¹ Ukrainian annual potential of biogas produced from cattle and pig manure and chicken dung will make up 926 mln m³. When 1 m³ of biogas could be converted to 1.5-3 kWh of electricity¹², 926 mln m³ can be transferred to about 1.39-2.78 bn kWh of electricity, around 1% of current electricity production in Ukraine.¹³

1.2 Biogas of plant origin

There are a lot of substrates of plant origin that can be effectively used for biogas production. Moreover, energy crops have higher methane contents, than animal waste. In Comparison of silage corn with other energy crops, it has advantages in lower costs of growing and storing, possessing almost the same methane content (52%). Furthermore, biogas from corn silage implies the highest reductions in greenhouse gas emissions and the highest savings of fossil fuels. Also corn being ensiled can be preserved on the field up to one year with little losses in dry substance.¹⁴ Due to these characteristics, we analyze the potential of generating biogas from silage corn in Ukraine rather than from other plants.

Corn for silage, green fodder and hay were planted on 512.9 thd ha with the harvest level of 9.2 mln t in 2008 in Ukraine. According to the State Statistics Committee of Ukraine average yield of corn silage is 17.9 t/ha and varies from 10 t/ha in Odessa region to 25 t/ha in Sumy region as well as upon the efficiency of production. Almost all the silage corn grown in Ukraine is directed to

11 *It should be noted that structure and number of animals is constantly varying, thus calculated biogas potential can be viewed as a reference point, and some deviations from it are possible. Also, taking into account that different age groups of pigs and livestock give different amount of manure, we received much lower values of biogas yield per animal head and much higher biogas yield per manure amount in comparison with averages.*

12 *FNR (2008). Biogas – an introduction.*

13 *In 2008 Ukraine produced 192.6 bn kW of electricity http://ukrstat.gov.ua/control/uk/localfiles/display/operativ/operativ2009/pr/etgv/etgv_u/elbal_u.html*

14 *Thyø K. and H. Wenzel (2007). Life Cycle Assessment of Biogas from Corn silage and from Manure. Report, Institute for Product Development.*

animal feed. Thus, as for today there is no corn for silage, green fodder and hay in Ukraine to use for biogas production.

In contrast, harvested area of corn for grain is almost 5 times higher and its total harvest in Ukraine is 1.3 times higher than by silage corn. In particular, the average yield of corn for grain in Ukraine was just 4.8 t/ha in 2008 that brought 11.5 mln t harvest from 2.4 mln ha of sown area. We should also note, that more efficient companies obtained 7,2 t/ha.¹⁵

To evaluate the biogas potential in Ukraine from silage corn, we keep the sown area under this crop unchanged and assume that:

- Grain corn that is not consumed in Ukraine will not be exported (for grounds please see Gross margin analysis of production of grain and silage corn in the Chapter 4)
- Land, that is used under the exported corn, will instead be used for silage corn for further biogas generation.
- Carry-over stocks remain constant¹⁶

15 *Market information taken from agroholdings.*

16 *Digesting corn-cob-mix, corns only or maize without corn and cob gives 43 – 70 % less methane yield per hectare, on which the biogas yield is dependent. Biogas should thus be produced from whole corn plants (for details see Amon T., V. Kryvoruchko, B. Amon, W. Zollitsch, E. Pötsch. Biogas Production from Corn and Clover Grass estimated with the Methane Energy Value System. University of Natural Resources and Applied Life Sciences and 3Federal Research Institute for Agriculture in Alpine Regions).*

Table 2: CALCULATION OF BIOGAS POTENTIAL IN UKRAINE
FROM CORN IN 2008/2009 MARKETING YEAR

Indicator	Quantity
Production, thd t	11400
Total Consumption, thd t	6250
Exports, thd t	4500
Share of Exports in Production, %	39%
Area Harvested under the Exported Share, thd ha	936
Yield of Corn for silage, green fodder and hay, t/ha	17.9
Potential Harvest of Corn that can be used for Biogas Production, thd t	16754.4
Biogas Yield m ³ /t of silage corn	250*
Potential Biogas Production, mln m ³	4188.6

* Dy Matter content in silage corn is 35% and the biogas yield is the average yield from figures, build into specifications of biogas equipment proposed on Ukrainian market, that are 200-300 m³/t.

Source: Own calculation based on USDA, State Statistics Committee of Ukraine, equipment provider data.

Therefore, as can be seen from Table 2, the potential of biogas production calculated on the base of the amount of corn that has been exported from Ukraine in 2008/2009 MY could be 4.19 bn m³ if the land, used to grow this grain corn would be instead used for growing silage corn with the average yield of 17.9 t/ha for silage corn instead of 4.7 t/ha for grain corn. Taking into account that 1m³ of biogas on average could be converted to 1.5-3 kWh of electricity, using the estimated potential Ukraine could get 6.28-12.57 bn kWh of electricity annually. It is 3-7% of current Ukrainian electricity production.

However, under this assumption each farmer would have to estimate the opportunity costs of silage corn for biogas production. A pragmatic method to assess opportunity costs is the calculation of gross margins for each alternative use: a) grain corn for sales, b) corn silage for biogas production, and c) corn silage for feeding animals. In this case we compare the alternatives a) and b) (see Chapter 4).

2. LEGAL FRAMEWORK OF BIOGAS PRODUCTION IN UKRAINE

There are two main laws, which set the framework for biogas development in Ukraine — the Law of Ukraine «On the alternative types of liquid and gas fuels» (2000)¹⁷ and the Law of Ukraine «On alternative sources of energy» (2003)¹⁸. The first one gives the basic definitions and characteristics of the alternative fuels, sets the main principles of the state policy in the area, which includes i.a. support of the entrepreneurship in the sphere of alternative arts of fuels, as well as defines administrative and economic stimulus for production and consumption of alternative fuels. The Law «On the alternative sources of energy» regulates the state administration and regulation in the field of alternative energy resources, organizational support, standardization and some general peculiarities of the use of the alternative energy resources. On March 15, 2006 the Cabinet of Ministers approved the Energy Strategy of Ukraine till 2030¹⁹, which sets the goal to reduce the natural gas consumption in the country and increase the use of the renewable resource in the energy production. All the abovementioned documents are very general and don't introduce any clear and specific measures in the sector.

The first practical measure to promote the generation of power from alternative sources of energy was set in the Law N 601-VI «On amending some laws of Ukraine with regard to the introduction of a green tariff»²⁰ adopted by the Verkhovna Rada on September 25, 2008. The Law introduced amendments to the existing laws – «On electricity» and «On alternative sources of energy». According to the law the subject of the green tariff regulation is electricity, generated from the alternative sources. The definition of the «green tariff» is given in the amended Law «On electricity»²¹ and says, that «green tariff» is a special tariff for electricity generated at the power plants that use alternative sources of energy (except blast-furnace and coke gases; with regard to hydropower – at small plants only, i.e. with capacity up to 10 MWel)²².

Further, the amended Law «On electricity» obliges the Ukrainian wholesale electricity providers

17 *Law of Ukraine «On the alternative types of liquid and gas fuels» from January 14, 2000 N 1391-XIV with amendments introduced by the Law of Ukraine from May 21, 2009 N 1391-VI*

18 *Law of Ukraine «On alternative sources of energy» of 20 February 2003, No 555-IV with amendments introduced by the Law of Ukraine from September 25, 2008 N 601-VI*

19 *Order of the Cabinet of Ministers from March 15, 2006 N 145-p*

20 *Law «On amending some laws of Ukraine with regard to the introduction of a green tariff» from September 25, 2008 N 601-VI*

21 *Law of Ukraine «On electricity» of 16 October 1997, No 575/97*

22 *Comment on the Law of Ukraine No 601-VI «On amending some laws of Ukraine with regard to the introduction of a green tariff» by Justyna Jaroszewska*

to purchase electricity generated at the power plants that use alternative sources of energy through the green tariff. The green tariff was planned as a double average tariff for traditional electricity²³ sold on the Ukrainian wholesale market in the year preceding the year of the tariff decision. The precise tariff rate is to be specified by the National Commission for Electricity Regulation (NCER) on a year basis. Also, the amended Law «On electricity» provides for a possibility for the power plants to sell electricity from alternative energy sources through the green tariff directly to consumers. In this case, consumers shall only receive a special document that would confirm their purchase of such electricity and would not lead to any other consequences.

Besides, according to the law the producer may also sell the electricity generated from alternative sources of energy at contractual prices to final consumers or to the energy supplying companies (Oblenergos). However, Ukrainian by-laws set administrative limitations on Oblenergos to buy the electricity at prices, which are higher, than the wholesale tariff. It is also explained by the fact, that there is no mechanism in Ukraine to compensate higher costs for Oblenergos for buying electricity through «green» tariff and thus to avoid price distortions, that may arise in regions with high amount of «green» power plants. So, there is no consistent legislative framework for Oblenergos to buy electricity from alternative resources directly from producers.

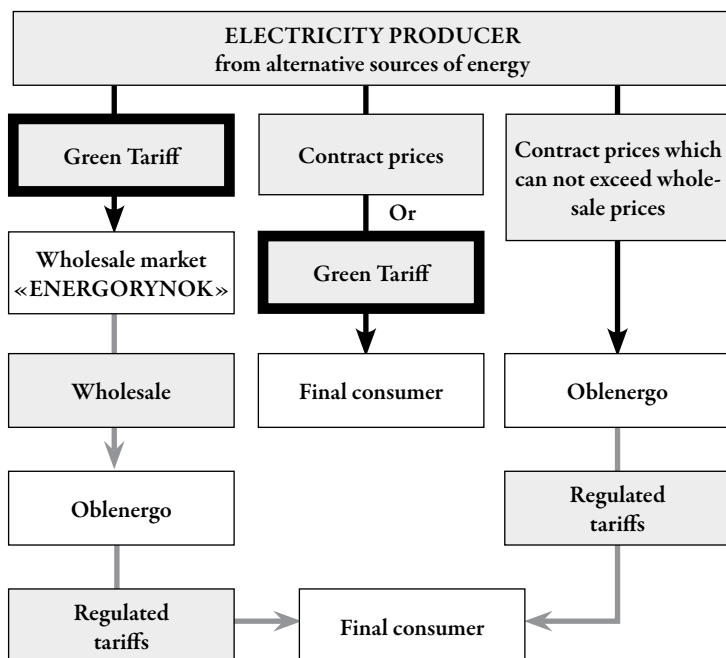
Final consumers may buy electricity from alternative resources directly from power plants either under the contracted prices or under the «green» tariff. However, there is no incentive for consumers to pay the «green» tariff except own environmental concerns. Power plants with higher capacity and lower production costs will be more flexible in terms of electricity sales prices and could go for contractual prices lower than «green» tariffs.

Figure 1 shows the existing mechanism of electricity sale under the green tariff. Green tariff actually becomes a consumer burden, as it will be paid by final consumers when the regulated tariffs are raised in the consequence of the rise of wholesale prices. Energy wholesale market «Energoynok» estimates the average wholesale prices for all the electricity bought from different generators. However, when the regulated tariff is raised, Oblenergo's margin will decrease as a consequence of growing average wholesale prices.

Figure 1 shows the current mechanism of electricity sale from alternative resources of energy in Ukraine.

23 *E.g. on September 25, 2008, this tariff for electricity was 0.251 UAH/kWh.*

Figure 1. «GREEN» TARIFF MECHANISM IN UKRAINE



Source: Own presentation based on Ukrainian legislation.

In the beginning of 2009 the Cabinet of Ministers of Ukraine passed series of Orders, aimed at promoting and regulating the biogas production in the country and execution of the Law N 601-VI. Among these Orders there is a concept of the state program for development of production and use of biofuels in 2010-2014²⁴, directed at the solution of the problem of energy dependence via development of bioenergy. The concept states that biogas production allows benefiting both from energy production and use of biological fertilizers as by-product. Furthermore, payback period of the biogas plant based on the use of waste is estimated at three-four years. The execution of the program should lead to the increased biogas production from sludge to the level of 130 mln m³, that can substitute approximately 78 mln m³ of natural gas²⁵. According to the Cabinet of Ministers Order N 256²⁶ the consumption of the natural gas in 2010 should be cut by 8127.6 mln m³ compared to the year 2008 mostly by thermal power plants for energy and heat production.

24 Order of the Cabinet of Ministers from February 12, 2009 No. 276-p

25 Accounting that 1 m³ of biogas equals approximately to 0.6 m³ of natural gas.

26 Order of the Cabinet of Ministers from February 19, 2009 No. 256-p

Order No 223-p «On the creation of the register of resources suitable for biogas production»²⁷ obliges Ministries and other central executive authorities as well as local administrations annually to collect and report until March 25 to the NCER the information on the availability on the agricultural enterprises resources for biogas production. The reporting form, attached to the Order, includes information on the enterprise, amount and costs of the energy consumed as well as the list of the resources (animal waste, poultry manure, products of animal utilization, green mass, food wastes, hard domestic wastes and communal sewage). The NCER in its turn should accumulate the information and supply it to the National academy of sciences for recommendations on the volumes of biogas production in Ukraine. The register of resources for biogas production should be created until May 1 each year and the summarized information is to be made public. Production, storing and sale of biogas and liquid fuel from biomass is the subject of licensing by the Ministry of fuel and energy.²⁸

On January 15, 2009 the NCER set the green tariff for the year 2009 on the level of 0.6624 UAH/kW*hour (without VAT), that is 0.7949 UAH/kW*hour (with VAT)²⁹ and a week later defined the procedure for setting, revision and cancellation of the green tariff for subjects of economic activity, which are licensed to produce electricity from alternative sources of energy. This procedure does not refer to those producers, combining alternative resources with traditional fuels.³⁰ The procedure gives the list of documents, which are necessary for the application procedure and has three reporting forms attached. Among those are the cost structure of production of electricity from alternative sources of energy as well as expected output. The applicant should also report on the cost of each kWh of the produced electricity.

In April 2009 the Ukrainian Parliament passed another Law «On amending some laws of Ukraine (with regard to promoting the use of alternative sources of energy)», which proposes several amendments to the Law «On electricity» regarding the green tariff and its establishment³¹.

The law makes clear that state policy aims at supporting not only the development of wind energy but also all other renewable energy sources (except blast-furnace and coke gases; with regard to hydropower – at small plants only, i.e. with capacity up to 10 MWel). It obliges the National Commission for Electricity Regulation to establish and maintain a register of facilities of the energy system that use alternative sources of energy.

27 *Order of the Cabinet of Ministers from February 12, 2009 No. 223-p*

28 *Decree of the Cabinet of Ministers N 829 from July 29, 2009*

29 *NCER Regulation from January 15, 2009 No. 25*

30 *NCER Regulation from January 22, 2009 No. 32*

31 *Law of Ukraine «On amending some laws of Ukraine (with regard to promoting the use of alternative sources of energy)» N 1220-VI from April 1, 2009*

Further, the law underlines that the main instrument for supporting the development of alternative energy sources is a feed-in «green tariff». The law supplements the Law «On electricity» with a new article – Article 17-1 that stipulates the procedure for fixing the green tariff and changes the procedure of its calculation.

The green tariff shall be approved by the National Commission for Electricity Regulation for 1) each company that produces electricity from alternative sources of energy, 2) for each type of alternative energy and 3) for each facility.

The rate of green tariffs for producers that produce electric energy from wind energy, biomass, solar energy and hydro-power shall be based on the level of the January 2009 retail tariff for electricity for second-class consumers multiplied by the relevant coefficient for a specific energy source.

The coefficient shall vary according to energy source as well as the capacity of the power plant (in case of wind and solar energy) and the place where facilities are installed (solar energy).

The coefficient has been set:

- at 1.2 – for electric energy produced from wind (with the plant capacity that does not exceed 600 kWel);
- at 1.4 – for electric energy from wind (600 kWel – 2000 kWel);
- at 2.1 – for electric energy from wind (the capacity exceeds 2000 kWel);
- at 2.3 – for electric energy from biomass³²;
- at 4.8 – for electric energy from solar energy (for onland facilities);

32 *To Biomass in this law refer products, that fully or partly consist of phylogenous matters (plant origin), which can be used as fuel in order to converse energy, that is contained in them. Word «partly» actually gives flexibility in classification of phylogenous matters, requires however there presence in the feedstock. However, according to the law of Ukraine «On the alternative types of fuels» from January 14. 2000 with amendments from 21.05.2009 Biomass is defined as biologically renewable substance of organic origin, that is biologically digestive (agricultural wastes (from plant growing and animal breeding), forestry and technologically connected to it industrial sectors, as well as organic part of industrial and domestic wastes. This inconsistency in legislation actually narrows the possibilities of investors for biogas plants, as currently regulator qualifies for the «green» tariff only those plants, which produce electricity from bioogas generated from fully phylogenous feedstock. Further interpretations from the legislator concerning content of feedstock should follow to eliminate the collision*

- at 4.6 – for electric energy from solar energy (for facilities installed on roofs, with the capacity over 100 kWel);
- at 4.4 – for electric energy from solar energy (for facilities installed on roofs, with the capacity that does not exceed 100 kWel);
- at 0.8 – for small hydropower stations.

According to the retail tariff for electricity for second-class consumers in 2009, the green tariff for electric energy from biomass is 1.3446 UAH/kWh excluding VAT and 1.6135 UAH/kWh including VAT.

The law also stipulates reduction of the coefficient for facilities commissioned (or substantially modernized) after 2014, 2019 and 2024 by 10%, 20% and 30% respectively.

Thus, for the facilities, producing electric energy from biomass, which would be commissioned (or substantially modernized) after 2014, the level coefficient would be 2.07, after 2019 – 1.84 and after 2024 – 1.61.

Substantial modernization means that modernization costs exceed 50% of the initial value of the equipment. Other alternative sources of energy such as geothermal sources, waves, etc. has not been considered by the law.

This procedure applies under the condition that from 1 January 2012 the share of materials, works, services and equipment of Ukrainian origin used for construction of a facility producing electric energy from alternative energy sources is not less than 30% of its total value and from 1 January 2014 – not less than 50%. Some additional requirements have been introduced for producers of solar energy.

The green tariff shall be applied until 1 January 2030. In case of changes to the procedure on the green tariff, producers may stick to the tariff established under the previous procedure but will have also the possibility to follow the new rules.

The law also sets the fixed «minimal» value of the green tariff, bound to Euro at the exchange rate of the National Bank of Ukraine on January 1, 2009 (i.e. 1 euro = UAH 1085,5460). All further values of green tariff should exceed the «minimal» value of the green tariff in its hryvnia equivalent for the certain date at the current official exchange rate of the National bank.³³ This mechanism is designed to protect investors from devaluation of hryvnia.

33 *Review of laws and draft laws initiated and considered by the Verkhovna Rada (Parliament) of Ukraine in March 2009 by Justyna Jaroszevska and the Law Firm Sofiya.*

On 23 July 2009 the National Commission for Electricity Regulation approved³⁴ the fixed minimal green tariff. Table 3 shows the green tariff scheme with tariff coefficients, fixed minimal tariff and its bound rate in Euro.

Table 3: GREEN TARIFF SCHEME

Origin of electric energy	Tariff coefficient 2009	Tariff level 2009 without VAT(UAH Kop/kWh)	Euro binded minimal tariff level 2009 without VAT (EUR cent/kWh)	Tariff coefficient 2015 (-10%)	Tariff coefficient 2020 (-20%)	Tariff coefficient 2025 (-30%)
Wind (plant capacity under 600 kWel)	1.2	70.15	6.46	1.08	0.96	0.84
Wind (600 kWel – 2000 kWel)	1.4	81.84	7.54	1.26	1.12	0.98
Wind (over 2000 kW)	2.1	122.77	11.31	1.89	1.68	1.47
Biomass	2.3	134.46	12.39	2.07	1.84	1.61
Solar energy (onland facilities)	4.8	505.09	46.53	4.32	3.84	3.36
Solar energy (facilities installed on roofs, capacity over 100 kWel)	4.6	484.05	44.59	4.14	3.68	3.22
Solar energy (facilities installed on roofs, capacity under 100 kWel)	4.4	463.00	42.65	3.96	3.52	3.08
Small hydro-power stations	0.8	84.18	7.75	0.72	0.64	0.56

Source: NCER Regulation from July 23, 2009 No 857, Law of Ukraine N 1220-VI from April 1, 2009

34 NCER Regulation from July 23, 2009 No 857

The National Commission adopted amendments to the «Procedure of setting, revising and abolition of the «Green» tariff for subjects of economic activity»³⁵ in July 2009. The procedure sets, that stimulation mechanism for electricity production from alternative sources of energy refers to licensed producers of electricity only or producers of combined electricity and heat. Each interested company shall apply to the Commission for approval of a concrete green tariff, effective for this concrete company. The application package was widened comparing to the previous list and above the detailed cost structure the applicant should also provide the commission reasoning and proved of each line of costs (copies of purchase contracts, invoices, cost calculations etc.). NCER has 30 days to examine the application and additional 15 days for approval the «green» tariff. The licensees should quarterly report the commission on their activity.

As of September 2009 the NCER has no application from electricity producers from biomass under the «green» tariff. It has only set the value of the «green» tariff on the level of UAH 123.22 kop./kWh without VAT for four electricity producers from wind energy and on the level of UAH 84.49 kop./kWh for 28 small hydropower stations, whereby there two juridical persons, which own 11 and 15 of hydropower stations respectively, one physical person – entrepreneur and one closed joint stock company.

In May the Parliament adopted Law amending legislation in order to promote production and use of biological fuels.³⁶ The Law comes into force on January 1, 2010 and provides for 9 year waiving from profit tax on profit from own produced biofuels sale and from import duty and VAT tax on equipment for biofuel production and on vehicles, which consume biofuels and are not produced in Ukraine. The act also abolishes state monopoly on spiritus plants for bioethanol production.

Feeding the electricity produced from the alternative sources into the electricity network

The National Commission for Electricity Regulation has to approve the sample agreement on feeding in to the electricity network of the producers of electricity from alternative sources and the agreement of purchase-sale of electricity from alternative sources of energy³⁷.

35 *NCER Regulations from July 16, 2009 No. 828*

36 *Law of Ukraine 1391-VI from 21.05.2009*

37 *The Order of the Cabinet of Ministers «On ways of feeding in to the electric networks the object of electricity, which produces electricity using alternative sources» from February 19, 2009 N 126*

The point of feeding-in of electricity is the border of the land lot, on which the plant is situated, or upon the agreement of the owner, on the territory of the plant.

NERC has approved samples of contract forms and technical norms for feeding in to the electric network the power plant, which produces electricity from alternative resources, and sample contract forms between state enterprise «Energorynok» and electricity producer from alternative resources. The commission has also developed sample contracts between the consumer, supplier and producer of electricity from alternative sources. According to the contract forms the point of electricity sale is the border point of accounting attribution and is stated in the Differentiation act of the accounting attribution.³⁸

The Law «On amending some laws of Ukraine (with regard to promoting the use of alternative sources of energy)» also states that suppliers of energy have no right to refuse producers of energy from alternative energy sources the access to their distribution grids. Moreover, suppliers of energy shall provide for expenses for feeding-in the facilities that produce energy from alternative energy sources in their investment plans.

38 *Nerc Regulation from July 16, 2009 No. 838*

3. ESTIMATION OF PROFITABILITY OF BIOGAS PRODUCTION IN UKRAINE

To estimate the profitability of biogas production in Ukraine under the green tariff³⁹ we compare costs and benefits of operation of biogas plants of three different installed electrical capacities (0.5 MWel, 1 MWel and 3 MWel), which process three different types of feedstocks for biogas production (cattle and pig manure, chicken dung and silage corn). Thus, we analyze nine different cases of profitability of biogas production. In our model we use plain feedstock to keep the calculation simple, although substrates can be differently combined by biogas production, giving different yields and requiring different types of equipment (mainly different fermenter volume). In practice producers more often combine the feedstocks, however interested investors can use our tables to compare various opportunities and combinations of feedstocks.

The major groups of costs in the calculations are production, and operational and maintenance costs. Production costs are costs for purchase of equipment for biogas production and electricity generation (plant itself) as well as of land needed to place the plant, costs for personnel, electricity, heat and water consumption. Operational and maintenance costs include costs to regularly provide the biogas plant with raw materials and annual maintenance and repair costs of the equipment. Transport costs are included in the feedstock costs. Other costs are case specific (administrative costs range from 2% to 10% of total benefit, some other additional transaction costs, etc.). Those are excluded from the calculations.

Benefits that can be obtained from biogas production are generated from the sale of electricity (produced from biogas and sold by green tariff). Bio-fertilizer is a by-product of biogas production and we can also consider benefits from its sales or own use. The detailed description of each category of costs and benefits of biogas production is given in Annex A and results of detailed calculations of the profitability of different scaled biogas plants, using different types of feedstocks can be seen in Annexes B, C and D. Here we will only focus on the main obtained results.

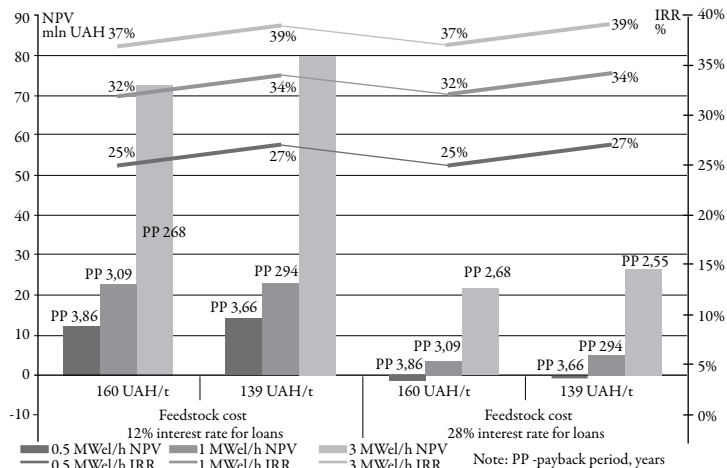
³⁹ *Multiplying the coefficient by the tariff for electric power for consumers of the 2nd class of voltage (as noted as a base for the green tariff calculation in the Law) and adding the VAT tax we get 1.61 UAH/kWh as the green tariff that we use in our calculations.*

3.1 Cost-benefit analysis of biogas production from corn silage

we consider three types of biogas plants according to the installed electrical capacity of 0.5 MWel, 1 MWel and 3 MWel with the working period of the next 15 years. The investment period for construction and preparatory works for production is «year 0» (12 months). Specific figures of costs and benefits of the three scales of plants which produce biogas from corn silage are given in the Annex B. Figure 2 shows the main indicators to judge the profitability of the project.

With the increase of capacity of the plant, the difference between costs and benefits increases in the positive direction, making NPV and IRR higher, and payback period lower. Depending on the feedstock price and biogas plant electrical capacity, NPV varies from 12.2 to 79.8 mln UAH when the interest rate is on the level of 12%⁴⁰. When the interest rate is on average market level and equals 28%, NPV is negative for the small-scale biogas plant of the capacity of 0.5 MWel. With scale increase to 1 and 3 MWel, NPV grows to 3.5 and 26.4 mln UAH respectively. IRR is varying from 25% to 39% depending on the considered option. The payback period lies in the interval of 2.6-3.9 years.

Figure 2. PROFITABILITY INDICATORS OF THE BIOGAS PLANTS OF 0.5 MWEL, 1 MWEL AND 3 MWEL INSTALLED ELECTRIC CAPACITY USING CORN SILAGE AS A FEEDSTOCK



Source: Own representation.

⁴⁰ This level might be granted by trade finance schemes of equipment suppliers and banks.

The results show that investments in biogas plant of 0.5 MWel installed electrical capacity pay back in about 3.9 years, and for 15 years of operation the excess of cash flows can reach 12-14 million UAH in present value terms, under the condition that the loan may be taken at a special interest rate of 12%.⁴¹ If the investor goes for the average market interest rate for loan of 28%⁴², the biogas plant with the installed electrical capacity of 0.5 MWel is not worth investing since its NPV is below zero. Moreover, the obtained internal rate of return of 25-27% is lower than the market interest rate of 28%.

Investing in biogas plants with the electrical capacities of 1 MWel and 3 MWel is more profitable. Due to economies of scale biogas plant of 3 MWel brings higher than 0.5 MWel biogas plant. Its internal rate of return is almost reaching 40% that means a profitable investment even under current capital market conditions.

By-profit from bio-fertilizers

Additional profit can be obtained from sale or own use of bio-fertilizers that are a by-product of biogas production. This profit however is very conditional as depends upon the big number of factors, including existence of market, which is currently absent, and comparative advantages of bio-fertilizers toward conventional ones. If we consider the profit of bio-fertilizers sale we get following figures:

- for 0.5 MWel plant NPV is between 18.8 and 52.8 mln UAH. IRR is 61%-63%. Payback period is up to 1.64 years;
- for 1 MWel plant NPV is between 44.3 and 85.7 mln UAH. IRR is 76%-78%. Payback period is 1.30-1.32 years;
- for 3 MWel plant NPV is between 145.6 and 271.4 mln UAH. IRR is 88%-90%. Payback period is 1.12-1.15 years.

The profit obtained from possible bio-fertilizers sale is rather big (above 7 mln (solid biofertilizers) and 700 thd (liquid biofertilizers) for 0.5 MWel capacity plant. It is above 14 mln and 1.4 mln respectively for 1 MWel plant and above 43 mln and 4 mln respectively for a 3 MWel capacity plant. Such profit for solid bio-fertilizer sale is achieved because they are dried to the solid stand suitable for sale with the heat, cogenerated by the electricity production.⁴³ However, the market of bio-fertilizers obtained during biogas production is not yet developed in Ukraine. That is why we do not account those profits into our base case scenario and leave them for investor considerations.

41 *Such credit rate is possibility under special trade finance credit programs or by equipment sellers.*

42 *Average interest rate on the capital market as of August 2009.*

43 *See Annex A «Cost of heat consumption».*

3.2 Gross margin analysis of production of grain and silage corn

an important practical question to be answered is whether grain corn production for sale on the market is more competitive towards silage corn for biogas production. To answer this question we calculate and compare gross margins for silage corn and grain corn (see Tables 3, 4).

In our calculations we differentiate between agriholdings with higher scale, efficiency and yields (30 t/ha for silage corn and 7.2 t/ha for grain corn) and comparatively less efficient average farmers (17.9 t/ha for silage corn and 4.7 t/ha for grain corn). Receiving higher yields, agriholdings invest however twice as much into the planted area as smaller farmers.

Table 3: GROSS MARGIN CALCULATIONS FOR SILAGE CORN

Biogas plant electrical capacity, MWel	Amount of silage corn needed for biogas prod-n per year, t ⁴⁴	Net profit of a biogas plant not accounting for feed-stock cost, UAH	Profitability of biogas plant per ton of silage corn, UAH/t	Revenue of silage corn in biogas plant, UAH/ha		Total costs for silage corn per ha of seeded area, UAH/ha		Gross margin of silage corn, UAH/ha	
				Agriholding	Farmer	Agriholding	Farmer	Agriholding	Farmer
0.5	10950	6114572	558	16752	9996	3006	1417	13746	8579
1	21900	12571521	574	17221	10275	3006	1417	14215	8859
3	65700	37934970	577	17322	10335	3006	1417	14316	8919

Source: Own calculations.

Table 4: GROSS MARGIN CALCULATIONS FOR GRAIN CORN

FOB price of grain corn, Ukraine, USD/t	NBU's exchange rate, UAH/USD by 09.09.09	FOB price of grain corn, Ukraine, UAH/t	Revenue of grain corn, UAH/ha		Total costs for grain corn per ha of planted area, UAH/ha		Gross margin of grain corn, UAH/ha	
			Agriholding	Farmer	Agriholding	Farmer	Agriholding	Farmer
150	7.997	1199.55	8636.76	5637.89	5414.85	2713.00	3221.91	2924.89

Source: Own calculations.

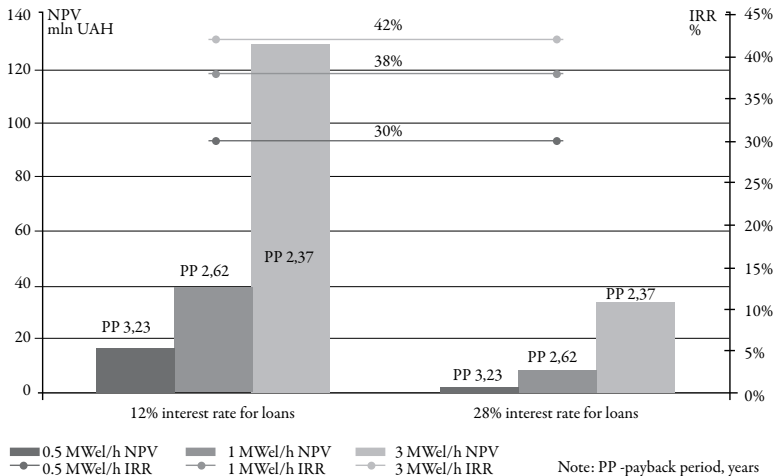
44 By the ratio:1t of silage corn equals 200 m3 of biogas and 1 m3 of biogas equals 2 kWh electricity.

The difference between the gross margins of silage corn for biogas production and grain corn is significant, proving that growing silage corn with its further use for biogas production have higher gross margins than growing grain corn for sales. This calculation is made under the assumption that FOB price for grain corn is 150 USD/t and the exchange rate is 8 UAH/USD. Assuming that the exchange rate would remain at the current level (8 UAH/USD), if FOB price for grain corn grows above 330-340 USD/t, export of grain corn will become more advantageous than growing silage corn for biogas production. Following a pessimistic scenario, if the exchange rate reaches 12 UAH/USD, the advantageous export price for grain corn would be at the level of 220-225 USD/t and producers should prefer to produce grain corn for export.

3.3 Cost-benefit analysis of biogas production from pig and cattle manure

benefits of the plants producing biogas using pig and cattle manure as a feedstock are depicted on the figure below.

Figure 3. PROFITABILITY INDICATORS OF THE BIOGAS PLANTS OF 0.5 MWEL, 1 MWEL AND 3 MWEL INSTALLED ELECTRIC CAPACITY USING MANURE AS A FEEDSTOCK



Source: Own representation.

Production of biogas from cattle and pig manure appears to be more profitable than from corn silage. The payback period is shorter, NPV and IRR values are higher. In this case the payback period is 2.4-3.2 years; NPV values reach 16.5, 40 and 129 million UAH for the plants of installed electrical capacities of 0.5 MWel, 1 MWel and 3 MWel respectively (under the interest rate of 12%). If the interest rate is 28%, NPVs are above 1, 8 and 33.5 mln UAH. IRR also prevail over the current deposit rates in Ukraine. All together it makes the option of investments into the biogas plants on manure attractive at current capital market rates.

By-profit from bio-fertilizers

It should be noted that benefit from the electricity sale by green tariff is approximately equal for cases of biogas production from corn silage and cattle and pig manure. At the same time benefit from sale of solid bio-fertilizers or opportunity costs are higher by more than 2.5 times for the case of cattle and pig manure as a substrate for production. Thus, if we find a market for manure bio-fertilizers we can additionally earn above 29, 55 and 167 mln UAH by plants of 0.5 MWel, 1 MWel and 3 MWel respectively. Moreover, here we can notice that the benefit from sale of bio-fertilizers is 3.7 times higher than the one obtained from the electricity sale by green tariff. In particular:

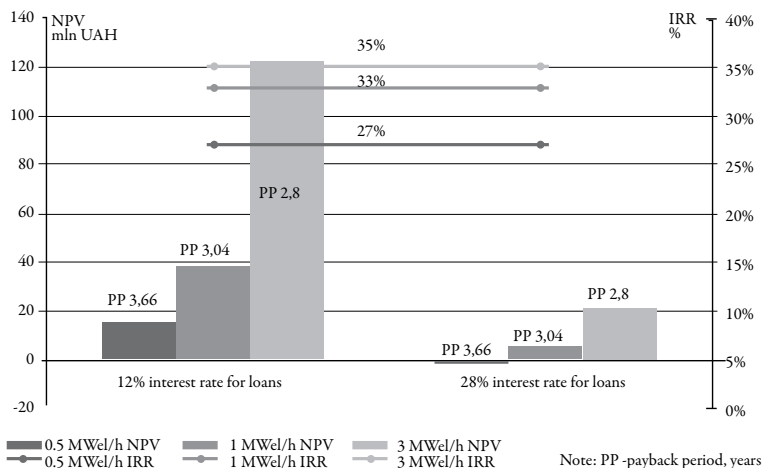
- for 0.5 MWel plant NPV is between 77.5 and 162.7 mln UAH. IRR is 173%. Payback period is 0.58 years;
- for 1 MWel plant NPV is between 153 and 316.7 mln UAH. IRR is 201%. Payback period is half a year;
- for 3 MWel plant NPV is between 467 and 760 mln UAH. IRR is 218%. Payback period is 0.46 years.

Detailed table of figures for biogas plants of the three given capacities using cattle and pig manure as a feedstock is given in the Annex C.

3.4 Cost-benefit analysis of biogas production from chicken dung

profitability of the plants producing biogas from chicken dung is shown in the Figure 4.

Figure 4. PROFITABILITY INDICATORS OF THE BIOGAS PLANTS OF 0.5 MWEL, 1 MWEL AND 3 MWEL INSTALLED ELECTRIC CAPACITY USING CHICKEN DUNG AS A FEEDSTOCK



Source: Own representation.

Comparing the option of biogas production from chicken dung with cattle and pig manure and corn silage, we can see that it is less profitable than biogas production from cattle and pig manure but more profitable than production from corn silage.

The benefit from the sale of the electricity produced by the set green tariff is equal for all considered raw materials and remains at the level of about 7 mln UAH/year for the biogas plant of 0.5 MWel installed electrical capacity, 14 mln UAH/year for the biogas plant of 1 MWel installed electrical capacity, and 42 mln UAH/year for the biogas plant of 3 MWel installed electrical capacity.

If chicken dung is used as a raw material for biogas production, the payback period varies from 86 to 111 months. IRR will grow by 6% and 2% upon capacities, and will be from 27% (for a 0.5 MWel plant) to 35% (for a 3 MWel plant) that in average prevails over the current capital market rates. It also prevails over the applied interest rate of 28% for 1 MWel and 3 MWel plants. As

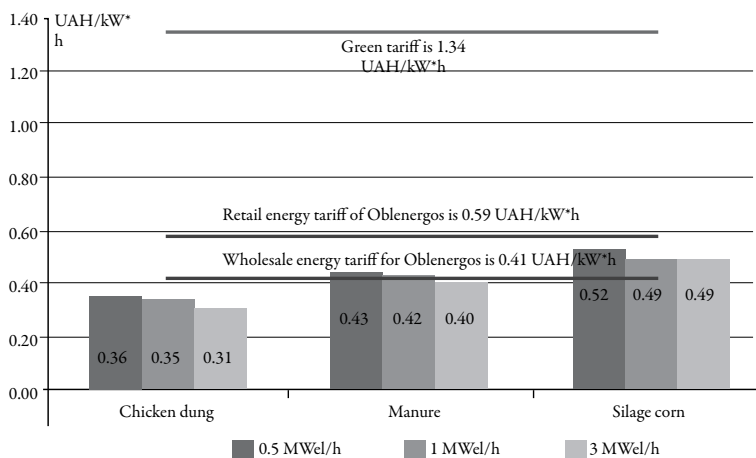
expected, NPV is growing from above 15 mln UAH to 122 mln UAH (and from -1 to above 21 mln UAH when the interest rate is 28%) with the increase of the plant capacity. Detailed model calculations can be found in Annex D.

By-profit from bio-fertilizers

When we consider earning from bio-fertilizers sale or own use, NPV values achieve 36-66 mln UAH (as compared to -1-15 mln UAH without bio-fertilizers) for 0.5 MWel biogas plants, 78-138 mln UAH (as compared to 4-38 mln UAH without bio-fertilizers) for 1 MWel biogas plants, and 241-421 mln UAH (as compared to 21-122 mln UAH without bio-fertilizers) for 3 MWel biogas plants. IRR values fluctuate from 84% to 107% and payback period drops to a year or even lower.

Figure 5 shows cost of production of 1 kWh of energy for three different sizes of plants and three different types of feedstocks. The gap between the cost of energy produced by biogas plants and the green tariff is rather big, being the evidence of high profitability that could be drawn by biogas producers in Ukraine. It also shows the huge price difference Energorynok should cover to fulfill its obligations to actually pay the «green tariffs» to producers.

Figure 5: ENERGY UNIT COST DEPENDING ON THE BIOGAS PLANT ELECTRICITY CAPACITY AND THE FEEDSTOCK USED



Source: Own calculations and the data from National Electricity Regulatory Commission of Ukraine and the Green Tariff Law.

Manure appears to be in the middle because of its lowest price per unit as an input as compared to chicken dung and corn silage. At the same time pig and cattle manure gives the lowest biogas output compared to other feedstocks analyzed.⁴⁵ Thus, chicken dung and pig and cattle manure are the most profitable feedstocks for biogas production.

We would like to conclude, that under the level of green tariffs set by the Ukrainian Government and under the assumption that biogas producers actually receive this money in full and considering given market conditions, biogas production using any kind of analyzed feedstock and by plants from 1 MWel and higher electrical capacities can be considered profitable in Ukraine. Biogas plants of 0.5 MWel capacities that work on corn silage and chicken dung under the current market interest rate of 28% are not profitable.

Table 5: PROFITABILITY COMPARISON OF BIOGAS PLANTS

Feedstock used	Feedstock price, UAH/t	Biogas plants electrical capacity					
		0.5 MWel		1 MWel		3 MWel	
		12% interest rate	28% interest rate	12% interest rate	28% interest rate	12% interest rate	28% interest rate
Silage corn	160	marginally profitable	not profitable	profitable	profitable	very profitable	profitable
	139	marginally profitable	not profitable	profitable	profitable	very profitable	profitable
Manure	35	profitable	profitable	profitable	profitable	very profitable	profitable
Chicken dung	50	marginally profitable	not profitable	profitable	profitable	very profitable	profitable

Source: Own calculations

3.5 How many biogas plants could be built in Ukraine?

looking at our calculations of the biogas potential, there are 8778.4 thd t of dry manure and 3686 thd t of dry chicken dung available in Ukraine each 24 hours for biogas production. However, in

⁴⁵ *Cattle manure gives biogas yield of 60 m³/t, pigs manure – 65 m³/t, chicken dung – 70-130 m³/t and corn silage – 200-300 m³/t. See <http://zorgbiogas.ru/biogazovyye-ustanovki/biogazovyye-ustanovki>*

the biogas production process they are watered. Thus, using dry matter for the calculation of potential number of biogas plants is a very conservative approach and gives very conservative picture of possible biogas production in Ukraine. Therefore, to assess the number of biogas plants we use crude manure output data, calculated in Annex E. There are 74.55 thd t of pig and cattle crude manure and 10.29 thd t of chicken dung available in Ukraine each 24 hours for biogas production. Additionally, Ukraine could have 17148.2 thd t of silage corn for biogas production (see calculations of potential).

Taking into account that biogas plants of 0.5 MWel, 1 MWel and 3 MWel capacities need 100, 200 and 600 t of manure, or 50, 100 and 300 t of chicken dung per 24 hours, or about 11, 22 and 66 thd t of silage corn per year⁴⁶ (see table 6), we can calculate that in Ukraine could be built:

- about 205 plants on chicken dung of 0.5 MWel electricity capacity, or 102 of 1 MWel electricity capacity, or 34 of 3 MWel electricity capacity;
- about 745 plants on cattle and pig manure of 0.5 MWel electricity capacity, or 372 of 1 MWel electricity capacity, or 124 of 3 MWel electricity capacity.
- and about 1566 plants on corn silage of 0.5 MWel electricity capacity, or 783 of 1 MWel electricity capacity, or 261 of 3 MWel electricity capacity.⁴⁷

Table 6: AMOUNT OF SUBSTRATES NEEDED FOR OPERATION OF BIOGAS PLANTS

Biogas plant electrical capacity, MWel	The amount of needed silage corn, t/year	The amount of needed pig and cattle manure, t/year	The amount of needed chicken dung, t/year
0.5	10950	36500	18250
1	21900	73000	36500
3	65700	219000	109500

Source: Own calculations.

46 We assume biogas plants work on imported equipment, according to specification of which cattle and pig manure have 60 m³/t biogas yield, chicken dung (layers) – 130 m³/t and corn silage – 200 m³/t.

47 It is possible to apply another approach here. According to State Statistics Committee of Ukraine information 3741.4 thd ha of land was not sown in 2008. Taking into account average yield of silage corn in Ukraine of 17.9 t/ha (that we applied for farmer when calculating the price of silage corn), from the above mentioned unseeded land we could get 67 mln t of silage corn in 2008. 6116 of biogas plants of 0.5 MW/h electricity capacity, or 3058 of 1 MW/h electricity capacity, or 1019 of 3 MW/h electricity capacity can operate on 67 mln t of silage corn per year. It means daily 3058 thd kW/h or yearly 26.8 bn kW/h of additional electricity for Ukraine. If we apply agriboldding silage corn yield of 30 t/ha we could get much more electricity for Ukraine. However, it remains questionable whether this unsown land of 3741.4 thd ha is really possible to use to grow silage corn.

Such number of plants could potentially annually generate about 11 bn kWh of electricity. In particular, biogas plants operating on pig and cattle manure – 3.26 bln kWh, on silage corn – 6.86 bn kWh, and on chicken dung – 897.9 mln kWh. This is 5.8% of annual Ukrainian electricity production.

Table7: «GREEN» ENERGY PRODUCTION IN UKRAINE

		Theoretical potential		Practical potential
		Calculations based on dry manure (dry volatile substance methodology)	Calculations based on fresh manure (standard biogas output)	Calculations based on biogas equipment provider characteristics
Pig and cattle manure	biogas yield, m ³ /24h	1,286,312.0	3,573,039.6	4,464,000.0
	electricity generation, kWh a day	1,929,468.0 – 3,858,936.0	5,359,559.4 – 10,719,118.8	6,696,000.0 – 13,392,000.0
	biogas plants of 1 MW/h capacity, units	—	—	372
Chicken dung	biogas yield, m ³ /24h	1,249,800.0	822,912.0	1,326,000.0
	electricity generation, kWh a day	1,874,700.0 – 3,749,400.0	1,234,368.0 – 2,468,736.0	1,989,000.0 – 3,978,000.0
	biogas plants of 1 MWel capacity, units	—	—	102
		Calculations based on export substitution assumption		
Corn silage	biogas yield, m ³ /24h	11,475,616.4		9,396,000.0
	electricity generation, kWh a day	17,213,424.6 – 34,426,849.2		14,094,000.0 – 28,188,000.0
	biogas plants of 1 MWel capacity, units	—		783

Source: Own calculations.

4. WHO PAYS THE BILL?

Today the state guarantees electricity producers from biomass a certain level of state guaranteed income for buying electricity at higher prices. Comparing the cost of production of 1 kWh of electricity by three sizes of biogas plants from three different feedstocks with the value of «green tariffs» set for electricity generated from biomass, we estimated the annual level of «support», guaranteed by the state to electricity providers and paid either by final consumers, when the regulated tariffs for electricity are raised or by Oblenergoes, when the wholesale tariffs are raised and regulated ones remain constant (Table 8).

Table 8: GUARANTEED LEVEL OF INCOME UNDER THE GREEN TARIFF

Feedstock	Plant capacity, kWel	Cost of 1 kWel/h generated by the plant, UAH/kWh	Difference between Green tariff and production cost, UAH/kWh	Annual level of income, UAH/year
Silage corn	500	0.52	0.82	3,588,686
	1000	0.49	0.85	7,449,078
	3000	0.49	0.85	22,355,629
Pig and cattle manure	500	0.43	0.91	3,998,984
	1000	0.42	0.92	8,098,469
	3000	0.40	0.94	24,753,214
Chicken dung	500	0.36	0.98	4,291,222
	1000	0.35	0.99	8,667,946
	3000	0.31	1.03	26,992,418

Source: Own calculations.

Comparing the level of the green tariff with the average wholesale price for electricity in October 2009 we can assess the sums to be covered by consumers or electricity distributing companies for each biogas plant (See Table 9).

**Table 9: ANNUAL STATE SUPPORT FOR THE BIOGAS PLANT
IN COMPARISON TO THE AVERAGE WHOLESALE PRICE
IN OCTOBER 2009**

	UAH/year
0.5 MWel	4,059,559.20
1 MWel	8,119,118.40
3 MWel	24,357,355.20

Source: Own calculations.

The wholesale tariff shows the average energy tariff for generated electricity in Ukraine, which is sold to the state company «Energoynok» by different electricity generators and then provided at the averaged prices to Oblenergos. Today the difference of values of «green» tariff and cost of energy from other sources can be «invisible» for consumers, as there is only few plants, operating under the «green» tariff. With the increased number of «green» plants the wholesale energy tariff for Oblenergos will increase and retail tariffs as a consequence too.

5. CONCLUSIONS

With the feedstock available in Ukraine such as pig and cattle manure, chicken dung and corn silage, Ukraine could annually produce up to 5.543 bn m³ of biogas. Transferring it to electrical energy it means about two times more electricity, namely 11.086 bn kWh, which is about 4-7% of Ukrainian annual electrical energy production.

The newly introduced «green tariffs» can become a stimulus for renewable energy producers. Although according to the law the tariff would be gradually decreased, the next two years is the most appropriate time to invest.

The difference between the current levels of «green tariffs» and retail energy tariffs give investors the opportunity to earn about 1 UAH for each kWh of produced energy. According to our estimation total annual benefits from electricity sale are about 7 bn, 14 bn and 42 bn for plants with the capacities of 0.5, 1 and 3 MWel.

Biogas plants that use corn silage as a feedstock show the highest cost of produced energy. Economies of scale help to reduce costs, making plants from 1 MWel capacities and higher attractive for investors under the assumed conditions.

Biogas production (and electricity generation) of biogas plants of 1 and 3 MWel installed electrical capacities that operate on corn silage under the assumptions of feasible green tariff, constant price level and tariffs and international production technology are profitable.

Biogas production from pig and cattle manure is profitable even at small scale plants of 0.5 MWel. With the capacity increase profitability characteristics become better. Cheaper feedstock is the key factor that distinguishes biogas plants on manure from plants on corn silage and chicken dung in terms of profitability. Biogas plants operating on chicken dung are attractive for investments only starting from 1 MWel installed electrical capacity scale.

Therefore, if cattle and pig manure is used as a feedstock to produce biogas in Ukraine, such production is profitable at all the three levels of electrical capacity analyzed. In case of corn silage or chicken dung as a feedstock biogas plants equal and above 1 MWel electrical capacity bring profits.

With the current feedstock potential Ukraine could substitute about 4-7% of electricity production with the electrical energy from biogas. However this would only be feasible if the Government enforced previously adopted legislative acts regarding the «green» tariff.

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<http://zorg-biogas.com/>

METHODOLOGY AND ANALYSIS

INDICATORS

Payback period refers to the period of time required for the return on an investment to «repay» the sum of the original investment. Payback period as a tool of analysis is often used because it is easy to apply and easy to understand for most investors. However, it is considered a method of analysis with serious limitations for its use, because it does not properly account for the time value of money, risk, financing or other important considerations such as the opportunity costs. There is no formula to calculate the payback period, excepting the simple case of the initial cash outlay and further constant cash inflows or constant growing cash inflows. Thus, alternative measures of «return» preferred by economists are Net Present Value (NPV) and Internal Rate of Return (IRR).

NPV is defined as the total present value (PV) of a time series of cash flows. It is a standard method for using the time value of money to appraise long-term projects (we consider 15 years for our project). It measures the excess or shortfall of cash flows, in present value terms, once financing charges are met. In general, if NPV value exceeds zero we conclude that our project will generate profit in the future taking into account cash flows discounting by the current discount rate for credits in UAH that we take at the levels of 12% and 28%.

The internal rate of return (IRR) is a rate of return used to measure and compare the profitability of investments. In the context of savings and loans the IRR is also called the effective interest rate or the annualized effective compounded return rate that can be earned on the invested capital. In more familiar terms, the IRR of an investment is the interest rate at which the costs of the investment lead to the benefits of the investment. This means that all gains from the investment are inherent to the time value of money and that the investment has a zero NPV at this interest rate. Therefore, we should compare the received IRR value to the current market interest rate (which is considered as a cost of capital rate) that is currently about 28% in Ukraine. This ensures that investment which IRR exceeds its cost of capital adds value for the company.⁴⁸

48 *Description of the terms Net Present Value (NPV), Payback Period (PP) and Internal Rate of Return (IRR) are taken from the Online Free Encyclopedia «Wikipedia». For details see:*
http://en.wikipedia.org/wiki/Internal_rate_of_return
http://en.wikipedia.org/wiki/Payback_period
http://en.wikipedia.org/wiki/Net_present_value

DESCRIPTION OF COSTS OF THE BIOGAS PRODUCTION FROM CORN SILAGE, MANURE AND CHICKEN DUNG IN UKRAINE.

Cost of land purchase:

Purchasing land to build a biogas plant is not difficult in Ukraine. According to market information there is a lot of free land that is for sale in Ukraine. Average prices for one hundred square meters (standard measure of land plots in Ukraine is «sotka») that are about 100 km far from oblast centers have been varying in June, 2009 between 50-300 USD.⁴⁹ In our calculation we take the price inside given interval of 200 USD, assuming that all accompanying land sale costs are included in this price (legalization costs and payment to realtor). It means that per hectare price is 2000 USD or 15220 UAH (since median exchange rate UAH/USD has been 7.61 in June). Thus, the total cost of land purchase we get by multiplying this price on the land area that is needed to set the equipment for biogas and electricity production.

Cost of electricity consumption:

Tariffs for electricity consumed by enterprises are officially published by National Electricity Regulatory Commission of Ukraine (NERC). Taking an average tariff (without VAT tax) for consumers of 2nd voltage class from the list of energy supplying companies in Ukraine we get 0.5846 UAH/kW*hour.⁵⁰ Adding VAT tax to this tariff one can get a tariff for electricity that his enterprise or plant must pay for electricity consumed. This tariff equals 0.70152 UAH/kW*hour. Finally, to get the total cost of electricity consumption, we will multiply this tariff on the amount of electricity that a biogas equipment of certain capacity consumes. However, this cost is relevant only for the first year of operation of a biogas plant. In the latter years we will just deduct the amount of electricity consumed by the equipment from the amount of electricity produced. It leads to positive cost-benefit difference.

Cost of heat consumption:

Tariffs for heat energy are calculated from the information given by the Ministry of Housing and Communal services of Ukraine. We take average of all Ukrainian oblasts heat energy tariff for

49 See, for example, on-line realty sale web-site:

http://realt.ua/Db2/0_Bazad.php?cnt_all=2913&Opr=1&Obj=4&valt=2&srty=5&pos=0

Please, note that on-line service in land sale in Ukraine gives a lot of propositions only for Kyiv and neighboring regions. However, there are a lot of real-estate agencies which can easily find land everywhere in Ukraine.

50 This number has not changed in 2009, and is given by the state of September, 2009. See http://www.nerc.gov.ua/control/uk/publish/article/main?art_id=82493&cat_id=34446

commercial consumers (with VAT tax included).⁵¹ It equals 568.21 UAH/Gcal or, after transformation to a more convenient system of units, 0.4886 UAH/kW*hour. After that we multiply this tariff for the amount of energy needed to heat the premise of a plant, thus receiving the total cost of the plant heat consumption. The cost of heat consumption is effective for the first year of operation only. Next years the plant consumes the heat, that is formed by electricity generation – cogeneration of electricity and heat. This heat is fully consumed by drying process of liquid fertilizers into solid form.

Cost of water consumption:

Similarly to heat consumption cost estimation using the tariffs for water-supply services by basic enterprises in all Ukrainian oblasts given by the Ministry of Housing and Communal services of Ukraine, we get average tariff for water consumption in Ukraine equal to 5.22 UAH/cubic m or UAH/t. Multiplying this tariff by the amount of water consumption by the plant, we can estimate total cost of water consumption. We should also take into account here that after the first year of plant operation, water will appear as a by-product of processing of raw materials (especially, it concerns manure when an excess of water can appear). That is why there is no need to buy additional water for biogas plant operation in the following years that makes cost of water consumption being a one-time (of the first year) only.

Cost of personnel:

To estimate the cost of personnel, firstly, we take the average wage of Ukrainian employees working in agricultural and hunting spheres. It was 1055 UAH/month cumulative for January-April or 1186 UAH/month in April, 2009.⁵² This wage is just statistical average in Ukrainian agriculture. Taking into account market reality and companies practice in Ukraine, we will use the wage of 3000 UAH/month in our calculations. Starting from the 2nd year of a biogas plant operation we consider the growth of wage by 10% and put 3300 UAH/ month in the following years. To get the total cost of personnel, one should multiply the number of needed for biogas plant operation employees by given above wage. What is more important is that in our calculations we double the number of employees who are needed to manage the plant (by equipment provider data) since we account for their vacations, sick leave, overtime work, etc.

Cost of a biogas equipment:

We consider German biogas equipment. Costs of biogas equipment include project documentation, construction, supervision and equipment costs. Project documentation cost includes the whole plant design

51 See <http://www.minjkg.gov.ua/index.php?id=1724>. Tariffs are given by the state of May 1, 2009.

52 State Statistics Committee of Ukraine:
http://ukrstat.gov.ua/control/uk/localfiles/display/operativ/operativ2009/gdn/Zarp_ek_p/zpp2009_u.htm
http://ukrstat.gov.ua/control/uk/localfiles/display/operativ/operativ2009/gdn/Zarp_ek_m/zpm2009_u.htm

on paper (sketch) for a concrete biogas plant project. Construction cost includes the whole construction work of a biogas plant, including all necessary materials and equipment that are needed for that. After that one engineer from the company that supply the biogas equipment comes to the place of constructed plant and supervise the assembling and start-up of the equipment, its adjustment. Also supervision costs include costs of any number of personnel training that will work on this biogas plant. Finally, we, of course, include costs of equipment to produce biogas and to generate electricity from obtained biogas then. After that we sum all this costs to receive the total cost of a biogas equipment that, afterwards, we transfer from euros to hryvnas using the median UAH/EUR exchange rate for June, 2009 in Ukraine, which is 10.65.

Cost of the biogas equipment maintenance and repair:

The maintenance cost of equipment equal 0.01 Euro/kWh of the produced electricity. For the plant of 0.5 MWe installed electrical capacity annual maintenance cost will make up 43800 Euro, for 1 MWe – 87600 Euro and for 3 MWe – 262800 Euro.

Cost of raw materials:

Manure and chicken dung cost:

It is a well-known fact that formal market for manure does not exist. But manure should have a value at least because it can affect crop production.⁵³ Thus, to estimate the value of manure we will look at it as a fertilizer. Manure can be regarded as an excellent fertilizer containing many nutrients including: nitrogen, phosphorus, potassium and many others. However, nitrogen is often the main nutrient of concern for most crops.⁵⁴ Therefore, to calculate the value of manure we will equate its nitrogen content with a nitrogen content of an effective fertilizer.⁵⁵ The best choice for the fertilizer here is nitroamophoska⁵⁶ that is of a balanced composition of three important chemical elements: nitrogen, phosphorus, and potassium – N : P : K = 1:1:1. Value calculations are given in the Table below.

53 Massey R. and J. Lory (2003). *The Value of Manure as a Fertilizer. LPES Updates, University of Missouri.*

54 Ecochem. *Manure is an Excellent Fertilizer. Accessed on June 9, 2009 from http://www.ecochem.com/t_manure_fert.html*

55 *The same method was applied by Elke Lakemeyer. She states that «one cubic metre liquid manure transform into an average of 4 kg N, that is 2,4 US\$ based on the nitrogen content». For details see Lakemeyer E. (2007). Bioenergy production in Ukraine: the competitiveness of crops and other raw materials from agriculture and forestry. Policy paper # AgPP11, IER and German-Ukrainian Policy Dialogue in Agriculture.*

56 *Nitroamophoska is considered to be one of the best physiologically neutral fertilizers. It contains main elements of mineral crop fertilization in the kind of water-dissoluble and easily accessible compounds. It can be used in all soils and climatic zones for different crops. We will consider nitroamophoska of the brand 16:16:16 that is one of the most widely spread.*

CALCULATION OF POTENTIAL PRICES FOR DRY MANURE IN UKRAINE

	Nitrogen content, %	Market Price, UAH/t	Price based on nitrogen content, UAH/t
Nitroamophoska	16	3200**	512
Dry Cattle Manure	3.2*	—	102.4
Dry Pig Manure	6*	—	192
Dry Chicken Dung	6.4*	—	204.8

Source: Own calculation based on:

* National Agrarian University;

** EXW price of nitroamophoska, <http://www.agron.com.ua>.

Finally, to determine total cost of pig or cattle manure, or chicken dung we can apply pragmatic approach of multiplication of a defined quantity of certain raw material to produce set electricity amount by its price that is calculated above. But following market reality and business operators information we put the prices of 35 UAH/t for cattle and pig manure and of 50 UAH/t for chicken dung. We assume that this calculated price consists of the prime (production) cost plus all needed extra charges (like transport costs, for example).

Corn for silage cost:

We focused our assumptions on calculations of production costs of silage corn based on current market prices. In these calculations we consider the total period of silage corn growing to be 12 month, including autumn filed works (tillage, cultivation), early spring fertilizing and the corn transportation to the storages. To estimate the price of silage corn we sum up the costs associated with the workers wages, seeds, fertilizers and fuel purchase, harvest insurance, land rent and machinery depreciation. Thus, we get production cost. Marking up this cost for producer and seller gains, we get the price of 160 UAH/t for agriholding and 139 UAH/t for the farmer.

DESCRIPTION OF BENEFITS FROM BIOGAS PRODUCTION FROM CORN SILAGE, MANURE AND CHICKEN DUNG IN UKRAINE.

Producing biogas in Ukraine we can benefit from selling the electricity by green tariff and also from selling liquid and solid bio-fertilizers that are got as by-products during biogas production.

Benefit from the electricity sale

Adding an electricity generator to other biogas producing equipment in the plant, one can benefit from the Ukrainian policy on stimulation of alternative sources of energy production. Despite the fact that such generator is very costly, selling produced with it electricity by green tariff can bring significant profit. In this paper we overview three scenarios of 0.5 MW_{el}, 1 MW_{el} and 3 MW_{el} of electricity production. To estimate these benefits we just multiply the green tariff of 1.61 UAH/kW*h (with VAT tax included) by the amount (kWh) of received electricity (deducting before this the amount of electricity needed for own consumption).

Benefit from fertilizers sale

As was mentioned above, by-products in the form of liquid and solid bio-fertilizers can be obtained during the process of biogas production. These by products can bring significant profit to the plant. To calculate this profit we multiply the quantity of received fertilizers for a given capacity of a biogas plant by their price. Taking into account undeveloped markets of bio-fertilizers and difficulties with their sale, in our benefits assessments we imply the data of market players – price on the level of 20 Euro/m³ that equals 213 UAH/m³. In the end we subtract profit tax from the revenue obtained from bio-fertilizers sale.

Benefit from heat sale

On average heat production by the cogeneration (combined production of electricity and heat) by 20% surpasses electricity production. However, we don't consider any benefits from the heat sale. First reason is that this heat is fully consumed to dry the bio-fertilizer to a solid substance. Furthermore, Ukraine doesn't have a proper legislative environment yet to put into practice efficient heat sale by biogas plants. The current practice shows, that some plants rather deny the income opportunity from the sale of heat. Although in future, heat sale can become a sufficient income source for biogas producers.

Annex B

MODEL CALCULATIONS ON ESTIMATION OF PROFITABILITY OF BIOGAS PRODUCTION FROM CORN SILAGE (a)

		year 0	year 1	year 2-14
0.5 MWel				
a	Biogas equipment costs, UAH/year	16,747,125	0	0
b	Other production and maintenance costs, UAH/year	4,566	2,541,567 (b)	2,297,670
			2,311,617	2,067,720
c	Electricity sale benefit by green tariff, UAH/year	0	7,067,112.48	6,643,085.73
d	Profit, UAH/year	-16,751,691	4,525,546	4,345,416
		-16,751,691	4,755,496	4,575,366
e	Payback period (PP), years	3.86		
		3.66		
f	Net Present Value (NPV) when i=12%, UAH	12,211,286		
		13,735,433		
g	Net Present Value (NPV) when i=28%, UAH	-1,581,327		
		-785,991		
h	Internal Rate of Return (IRR), %	25		
		27		
1 MWel				
a	Biogas equipment costs, UAH/year	27,295,950	0	0
b	Other production, operation and maintenance costs, UAH/year	6,849	4,980,407	4,516,140
			4,520,507	4,056,240
c	Electricity sale benefit by green tariff, UAH/year	0	14,134,225	13,356,843
d	Profit, UAH/year	-27,302,799	9,153,818	8,840,703
		-27,302,799	9,613,718	9,300,603
e	Payback period (PP), years	3.09		
		2.94		
f	Net Present Value (NPV) when i=12%, UAH	20,230,018		
		22,688,729		
g	Net Present Value (NPV) when i=28%, UAH	3,519,462		
		5,110,134		
h	Internal Rate of Return (IRR), %	32		
		34		

3 MWel				
a	Biogas equipment costs, UAH/year	71,988,675	0	0
b	Other production, operation and maintenance costs, UAH/year	18,264	14,705,043	13,390,020
			13,325,343	12,010,320
c	Electricity sale benefit by green tariff, UAH/year	0	42,402,675	40,282,541
d	Profit, UAH/year	-72,006,939	27,697,632	26,892,521
		-72,006,939	29,077,332	28,272,221
e	Payback period (PP), years	2.68		
		2.55		
f	Net Present Value (NPV) when i=12%, UAH	72,456,588		
		79,832,722		
g	Net Present Value (NPV) when i=28%, UAH	21,636,136		
		26,408,151		
h	Internal Rate of Return (IRR), %	37		
		39		

Source: Own calculations.

Note:

(a) In these calculations we assume the biogas yield of corn silage on the level 200 m³/t (since this level is also assumed by equipment provider characteristics that we applied).

(b) Split rows show results for different feedstock prices. The upper one (grey) is for agroholding price of silage corn of 160 UAH/t with transportation cost included; the lower one is for farmer price of 139 UAH/t with transportation cost included.

Annex C

MODEL CALCULATIONS ON ESTIMATION OF PROFITABILITY OF BIOGAS PRODUCTION FROM PIG AND CATTLE MANURE.

		year 0	year 1	year 2-14
0.5 MWel				
a	Biogas equipment costs, UAH/year	15,570,300	0	0
b	Other production and maintenance costs, UAH/year	7,610	2,067,067	1,823,170
c	Electricity sale benefit by green tariff, UAH/year	0	7,067,113	6,643,086
d	Profit, UAH/year	-15,577,910	5,000,046	4,819,916
e	Payback period (PP), years	3.23		
f	Net Present Value (NPV) when i=12%, UAH	16,530,132		
g	Net Present Value (NPV) when i=28%, UAH	1,233,624		
h	Internal Rate of Return (IRR), %	30%		
1 MWel				
a	Biogas equipment costs, UAH/year	25,794,300	0	0
b	Other production, operation and maintenance costs, UAH/year	9,893	4,000,681	3,567,140
c	Electricity sale benefit by green tariff, UAH/year	0	14,134,225	13,427,514
d	Profit, UAH/year	-25,804,194	10,133,544	9,860,374
e	Payback period (PP), years	2.62		
f	Net Present Value (NPV) when i=12%, UAH	39,795,925		
g	Net Present Value (NPV) when i=28%, UAH	8,513,633		
h	Internal Rate of Return (IRR), %	38%		

3 MWel				
a	Biogas equipment costs, UAH/year	71,509,425	0	0
b	Other production, operation and maintenance costs, UAH/year	18,264	11,673,683	10,543,020
c	Electricity sale benefit by green tariff, UAH/year	0	42,402,675	40,706,568
d	Profit, UAH/year	-71,527,689	30,728,992	30,163,548
e	Payback period (PP), years	2.37		
f	Net Present Value (NPV) when i=12%, UAH	128,906,241		
g	Net Present Value (NPV) when i=28%, UAH	33,241,757		
h	Internal Rate of Return (IRR), %	42%		

Source: Own calculations.

Note:

In these calculations we assume the biogas yield from pig and cattle manure on the level 60 m³/t (since this level is also assumed in equipment provider characteristics that we applied).

Annex D

RESULTS OF MODEL CALCULATIONS ON ESTIMATION OF PROFITABILITY OF BIOGAS PRODUCTION FROM CHICKEN DUNG.

		year 0	year 1	year 2-14
0.5 MWel				
a	Biogas equipment costs, UAH/year	18,775,950	0	0
b	Other production and maintenance costs, UAH/year	4,566	1,726,648	1,458,170
c	Electricity sale benefit by green tariff, UAH/year	0	7,067,113	6,586,549
d	Profit, UAH/year	-18,780,516	5,340,464	5,128,379
e	Payback period (PP), years	3.66		
f	Net Present Value (NPV) when i=12%, UAH	15,400,604		
g	Net Present Value (NPV) when i=28%, UAH	-877,125		
h	Internal Rate of Return (IRR), %	27%		
1 MWel				
a	Biogas equipment costs, UAH/year	31,470,750	0	0
b	Other production, operation and maintenance costs, UAH/year	7,610	3,404,134	2,916,340
c	Electricity sale benefit by green tariff, UAH/year	0	14,134,225	13,286,172
d	Profit, UAH/year	-31,478,360	10,730,091	10,369,831
e	Payback period (PP), years	3.04		
f	Net Present Value (NPV) when i=12%, UAH	37,576,288		
g	Net Present Value (NPV) when i=28%, UAH	4,669,583		
h	Internal Rate of Return (IRR), %	33%		

3 MWe1				
a	Biogas equipment costs, UAH/year	89,758,200	0	0
b	Other production, operation and maintenance costs, UAH/year	10,958	9,740,043	8,432,220
c	Electricity sale benefit by green tariff, UAH/year	0	42,402,675	40,282,541
d	Profit, UAH/year	-89,769,158	32,662,632	31,850,321
e	Payback period (PP), years	2.82		
f	Net Present Value (NPV) when i=12%, UAH	122,065,406		
g	Net Present Value (NPV) when i=28%, UAH	21,027,253		
h	Internal Rate of Return (IRR), %	35%		

Source: Own calculations.

Note:

In these calculations we assume the biogas yield of chicken dung from layers on the level 130 m³/t (since this level is also built in in equipment provider characteristics that we applied).

Annex E

ALTERNATIVE METHOD OF BIOGAS POTENTIAL ESTIMATION (BASED ON MANURE OUTPUT FROM CATTLE AND PIG MANURE AND CHICKEN DUNG).

	Number of animals in agricultural enterprises, thd heads	Dry manure output per head, kg/24h	Crude manure output per head, kg/24h	Total dry manure potential in Ukraine, tons/24h	Total crude manure potential in Ukraine, tons/24h	Biogas output, m ³ /ton	Total biogas output, m ³ /24h
Total livestock	1,720.10			7,083.35	59,989.80	45.00	2,699,541.00
cows	624.30	6.30	55.00	3,933.09	34,336.50		
calves under 1 year	425.20		12.00		5,102.40		
cows of 1-2 years	85.20	3.59	27.00	305.87	2,300.40		
cows from 2 years and older (sired)	85.80	6.30	35.00	540.54	3,003.00		
cows from 2 years and older (unsired)	46.90	6.30	35.00	295.47	1,641.50		
bulls-producers	2.50	5.60	40.00	14.00	100.00		
other cows and bulls	450.20	4.43	30.00	1,994.39	13,506.00		
Total Pigs	2,730.90			1,702.79	14,558.31	60.00	873,498.60
Main sows	226.70	1.10	15.30	249.37	3,468.51		
Sows that are being checked	92.70	0.88	8.80	81.58	815.76		
Remount piglets over 4 months	135.60	0.80	1.80	108.48	244.08		
Piglets under 2 months	647.40	0.05	0.40	31.08	258.96		
Other pigs	1,628.50	0.76	6.00	1,232.29	9,771.00		
Hens and cocks	85,720.00	0.04	0.12	3,685.96	10,286.40	80.00	822,912.00
Total				12,472.10	84,834.51		4,395,951.60

Source: Own calculations based on National Agrarian University, BHII-AIIK-09.06, Ministry of Agrarian Policy of Ukraine, equipment provider and State Statistics Committee of Ukraine data.

As can be seen from the Table, total manure potential that could be obtained from all livestock of cattle, pigs and hens in Ukraine is about 85 thd tons per 24 hours if to judge by crude matter. From this manure we could produce 4.4 mln m³ of biogas per 24 hours if to do rough calculations following average biogas normative output per ton of manure.



STRAW USE IN UKRAINE – opportunities and options

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EXECUTIVE SUMMARY

1. In 2008-2009 Ukraine on average produced about 50 mln t of grains and about the same amount of straw. Straw is used for animal feeding and bedding, and for soil fertilization, applying excess of 20-40% of the total straw harvest. This excess straw can be used for producing energy or building materials.
2. In this paper three options of alternative straw use are considered. These are straw uses for (1) heating (small-scale and district heating), (2) building, and (3) compression to pellets.
3. EU countries do have experience in using straw for heating for many years. For decades some EU countries (the leader is Denmark) have been improving their knowledge in using straw for heating purposes. This knowledge has led to large-scale district heating. In Ukraine this development is currently at the beginning. Ukrainian producers mainly use small-scale straw heating systems.
4. Applying cost-benefit analysis, we assessed the profitability of two straw-heating plants of 600 kW and 1500 kW capacities based on Danish technology. These example plants are installed for district heating and therefore have a wide piping network. It implies investment costs for pipes even higher than for the heating system itself. Judging by financial profitability indicators, such as internal rate of return, net present value and payback period, both plants are profitable. The pay back period is about 3 years. For 15 years of operation the internal rates of return are higher than 30%.
5. Building with straw-bales has been spreading from America to European countries in the last years. It could provide long-term standing construction with a good structural capability, thermal and sound insulation, fire, moisture, earthquake and vermin resistance, breathability and good health impact for comparable lower costs than conventional brick structures have. The main bottleneck for straw-bale building in Ukraine is lack of expertise and experience.
6. Using compressed straw is possible for outside building and internal furnishing. Stramit-like technologies have been already applied for more than 70 years since they were invented in Sweden. Similar technology modernized and altered by one German producer proposes to compress straw without using high temperatures and dangerous chemical elements. Final products are cheap and can be of any dimension and shape to be used as building panels, furniture elements and even for piping systems. Production rests can be compressed to pellets. However, production costs of this technology are very high.

7. Cheaper straw compression methods are used in direct pellets and bricks production. It is a profitable and competitive business in the EU. In Ukraine pellet making technologies of up to 2 t/h capacities are used. They are often of soviet design. In future it is expected that new opportunities for Ukrainian pellet producers arise. Ukrainian producers will use high-quality reliable European equipment and feedstock suppliers will propose better quality straw bales for processing, which together will lead to better quality of Ukrainian straw pellets. This development may offer interesting opportunities on export markets.
8. This paper does not present and discuss the production of biofuels from straw. A comprehensive second paper is under preparation to assess the perspectives of so-called second-generation biofuels using cellulosic feedstock including straw.

INTRODUCTION

Ukraine annually produces about 50 mln t of grains and pulses. It means about the same quantity of straw as a by-product. It is primarily used for soil fertilization and for animal breeding. According to different agrarian practices different amounts of straw are used to fertilize soils.¹ Modern animal husbandry use water-wash systems in cattle-sheds and mixed fodders to feed animals. It implies that lower straw amounts are applied for animal bedding and feeding as animal breeding practices improve. About 20 to 40% of straw can be annually used for further processing. We assess three options of alternative straw use. They are (1) heating (small-scale and district heating), (2) building, and (3) pellets production.

One of the ways to use straw is to burn it to obtain heat. It provides autonomous independent heating systems. Such systems can be of small or large scales, and can be used either for private houses or for large districts. In Ukraine small scale boilers are more spread than large scale ones. Due to economies of scale, costs per unit of energy decrease with capacity increase. Using German experience, economies of scale will be analyzed based on two sample straw-bale burning systems of 600 and 1500 kW capacities. The methodology applied is cost-benefit analysis. It comprises production and operation costs and compares them with benefits from sale or own use of heat. The calculation is made in sub-chapter 3.1. The conclusions on profitability are based on internal rate of return, net present value and payback period indicators.

1 *Bogdanovich R. and Predolyak M. «Biological activity of typical chernozem in view of different options of soil fertilization and cultivation». National University of life and environmental sciences of Ukraine, Kiev 2009. Published in KHNAU Bulletin # 3, 2009, Pedology.*

Straw can also be used for construction. For this purpose straw bales of smaller sizes (up to 20 kg weight) should be used. There are two most spread technologies to build with straw: a functional straw bale structure and load-bearing beams. Straw-bale building is widespread in the USA and in many European countries. This experience in straw-building can be used in Ukraine. Based on German expertise, the technology of building with straw, approximate costs and several issues related to it are described in sub-chapter 3.2. The methodology used here is comparison of costs with performance characteristics that define a benefit for straw-bale construction.

Pellet production is a proven technology in Europe. Straw prices are higher in the EU than in Ukraine, giving the latter an incentive to export. A straw pelletizing market is developing in Ukraine, using soviet compression technologies of small capacities. Giving sometimes lower Ukrainian feedstock (straw bales) quality, outdated equipment adds to lower quality of produced pellets. To be competitive on international markets, modern automatic equipment should be used. In sub-chapter 3.3 we provide costs and benefits for producers. After describing pellet and pelletizing equipment markets in Germany and in Ukraine, we conclude about further development of pellet markets in Ukraine.

One of the options of straw pellet market development in Ukraine is to increase its export share in EU markets, foreseeing future benefits from increased European demand for straw as a feedstock for second-generation biofuels development. The technologies of second generation biofuels are innovative and still under development, thus, are very costly. The description of different second-generation biofuels technologies, tendencies, international attitude and company involvement on this market will be presented in a separate upcoming paper.

1. ESTIMATION OF STRAW POTENTIAL IN UKRAINE

There are different views on straw potential estimation in Ukraine. This estimation became relevant only with the appearance of demand for straw. Until recently, no one cared about the excess of straw that was burnt at fields. Some researchers argue that huge amounts of straw are necessary to feed animals. However, in modern animal husbandry not much straw is used for feeding. Use of straw for animal bedding has also decreased for the last years with the increase of water-wash systems application.

A lot of applied foreign and domestic research was undertaken to define the best amount of straw needed to fertilize soils. They proved that it is not necessary to use large straw quantities to maintain soil quality. Some researchers propose to apply the amount of straw equal to grain yield in a certain district² or to mix straw with manure and other stubbles³. Good soil performance was achieved mixing 4-8 t/ha of straw with natrium, potassium and phosphorus.⁴

Taking into account different views on amounts of straw actually used for animal feed and bedding, and to maintain soil fertility, the ratio of taking straw harvest 1:1 equal to the grain harvest is widely spread. This simple estimation is accepted because it is difficult to estimate how much straw was used in each region differentiating between different agrarian practices applied, different sorts of grain grown and different yields received. Taking the 1:1 ratio, 80% of this straw amount is assumed to be used and 20% is assumed to be in excess and, therefore, available for alternative use. Based on 2009 total grain harvest in Ukraine, straw potential by this 1:1 methodology is estimated in column 2 of Table 2-1.

The 1:1 methodology is used by many market actors who are planning to use straw. However, as was noticed above, some actors are rather pessimistic, and some are rather optimistic. Pessimism was discussed above and is mainly applied by conservative agrarians. Optimistic views are typical for companies aimed at investor attraction and are used in correspondent business plans. For

2 *Likhochvor V. Fertilization with straw. Lviv State Agrarian University.*

3 *Gamayunova V.V. and Sydyakina O.V. Current status of Ukrainian step soil fertility and ways of its improvement. Scientific research, vol. 107, nr. 94, April 2009.*

4 *Bogdanovich R. and Predolyak M. «Biological activity of typical chernozem in view of different options of soil fertilization and cultivation». National University of life and environmental sciences of Ukraine, Kiev 2009. Published in KHNAU Bulletin # 3, 2009, Pedology.*

instance, a company in Ivano-Frankivsk region that operates a pellet plant and wants to attract additional investment for plant capacity enlargement claims that there is about 1.5-2 tons of straw available per each ton of grain.⁵ It refers to Ukrainian experts» point of views.

We consider this optimistic estimate as realistic. There are a lot of other interesting methodologies. For example, evaluation of straw potential based on energy efficiency of agricultural technologies was proposed by an agrarian researcher.⁶ Using his methodology to estimate the total grain straw value for Ukraine, we sum up the amount of straw, calculated by given regression equations for each crop type in 2009. Finally, based on above mentioned reasoning, 20% of total grain straw potential is calculated to deduct the straw potential available for alternative use (see Table 2-1 column 1).

5 S.I.V. Holdings Ltd. Management Presentation. *The future of energy*. January 2010.

6 *The methodology of Yu. Tarariko accounts for energy equivalents of agrochemicals, irrigation, solar radiation, anthropological factors (accounting for crop rotation), labor, fuel, machinery, soil fertility, etc. After forming a ratio between all these energy equivalents, regression equations for each crop depending on yield range are made. These are simple linear equations made for winter rye, winter and summer wheat, barley, oats, millet, corn and buckwheat. For example, equations defining straw amount of winter rye are $x = 1.8y + 3.8$ (when yields are 1-2.5 t/ha) and $x = y + 25$ (when yields are 26-40), where x is straw amount and y is rye amount in tons. For other crops equations and methodological details see Tarariko Yu. *Sustainable agricultural ecosystems formation*. Monograph. Kiev, 2007.*

Table 2-1. STRAW POTENTIAL IN UKRAINE

	Available straw* for heating, building and other purposes in 2009	
	calculations by energy equivalents **	calculations by 1 to 1 ratio
Ukraine	13596.82	9205.66
Crimea	492.60	332.49
Vinnytza	853.55	618.45
Volyn	207.07	127.94
Dnipropetrovsk	873.22	563.45
Donetsk	556.05	344.86
Zhytomyr	364.53	247.52
Zakarpattia	93.54	60.34
Zaporizhzhia	665.63	426.14
Iv.-Frankivsk	117.76	80.40
Kyiv	688.24	496.52
Kirovohrad	732.85	506.84
Luhansk	372.00	211.09
Lviv	247.69	164.50
Mykolaiv	700.27	493.02
Odessa	823.94	567.74
Poltava	1099.22	765.97
Rivne	210.86	139.26
Sumy	592.17	401.00
Ternopil	438.06	314.78
Kharkiv	770.27	505.48
Kherson	557.56	353.78
Khmelnysky	482.45	340.32
Cherkasy	851.93	638.99
Chernivtsi	142.86	94.97
Chernihiv	618.41	409.79

Note:

* 20% of total straw harvest after its use for soil fertilization, bedding and feeding is left for alternative use.

** only winter rye, winter and summer wheat, barley, oats, millet, corn, buckwheat.

Source: Own calculations.

According to the 1:1 methodology Ukraine had about 9.2 mln t of straw available for alternative use in 2009. Based on energy equivalents methodology this amount was 13.6 mln t. Following both methodologies, Poltava, Cherkasy, Vinnytsa, Odessa and Dnipropetrovsk regions were leaders in straw production that together provide more than 1/3 of total straw production in Ukraine.

2. USE OF STRAW

2.1 Heating

Ukrainian practice of straw use for heating started with the installation of a straw-fired boiler of 980 kW/h capacity in Kiev region to heat the farm in 2000. The technology was based on Danish experience. Soon after this pilot operation the Ukrainian company UTEM started to produce similar boilers under a licensing agreement with the Danish Passat Energy. Initially, UTEM exported produced boilers to the European markets. In 2006 the first straw boiler of Ukrainian production origin of 250 kW/h capacity was installed in Vinnytsa region to heat the mill. It was the beginning to start straw use to heat not only farms but also schools, kindergartens and small districts. The majority of boilers that are currently installed in 9 oblasts of Ukraine are produced by UTEM. They have capacities from 150 to 860 kW and are mainly used to heat public buildings and agricultural enterprises. In total UTEM has set up 27 boilers in Ukraine.⁷

European countries (the leader is Denmark) can provide district heating for large territories. Denmark has above 60 operating district heating plants. They have an obligation to supply with the heat anyone in that area and because of this are not liable to pay tax. However, some plants are switching their activity to other feedstocks (wood residues) or to waste-fired combined heat and power plants.

Combined heat and power plants (CHP) are also known as co-generation plants since they use energy conversion process, where electricity and useful heat are produced simultaneously in one process. CHP heat can be used either for district heating or for industrial processes. CHP plants do not require sea water for cooling, therefore, they can be located decentralized near large cities that have a distribution net and require district heating. However, being involved in district heating, CHP plant can not achieve as high electrical power efficiency as coal-fired power plant. Straw-fired CHP plant has an electrical power efficiency of 20-30%. There are ways to improve CHP efficiency that started to be successfully applied in Denmark.⁸

7 *Information from UTEM company: <http://www.udem.com.ua/>*

8 *The Centre for Biomass Technology. Straw for Energy Production: Technology – Environment – Economy. 1998.*

Ukraine already has an experience of using straw for small-scale heating up to 1 MW/h. Following the example of European countries to install large-scale straw-fired plants, the introduction of district heating in Ukraine may be intensified. Provision of district heating can be efficient in rural areas with non-utilized straw and high demand for heat.

According to market evidence, heating with straw is less expensive than heating with gas. The saved difference between using gas and using straw for heating allows to pay the straw boiler back in about three years.⁹ However, heating with straw is more troublesome. Thus, when large-scale heating systems are installed, owners prefer to have a gas boiler too for the case of emergency or when additional supply of heat is needed. Some market operators install smaller than required straw boilers and a complementing gas boiler.

The main difficulty in using straw to obtain heat is to deliver and store the feedstock. Straw bales, used to heat, are of about 300-500 kg weight and up to 2 m³ of volume. During storage they should be well protected from absorbing excess moisture and from long lasting direct sun rays to keep the quality at more or less stable level and to avoid fire.

There are various producers supplying good straw bales burning equipment. According to German market operators, they prefer to use Danish LIN-KA systems.¹⁰ LIN-KA supplies standard systems of 60 to 1500 kW and can make individual projects for higher sizes. The most demanded systems are of 200, 400, 600, 800, 1000 and 1500 kW. LIN-KA plants are fully automated, have rubbish filtering and automatic ash removal that ease the use of this system. General description of the system is given in Annex A.

In Germany a system of 600 kW can, for instance, supply heat to a large farm with 25 thd chicken. A system of 400 kW is installed at the farm that specializes at selling small piglets (under 3 month). New-born piglets are kept with a mother pig in hot water that is supplied by straw hot-water boiler. This farm keeps 1200 mother pigs. In winter time they need more than 400 kW/h of heat. Thus, they use 200 kW gas boiler additionally. A smaller system of 200 kW is enough to supply heat for the farm that holds 3000 pigs and in total consists of 5 buildings (2 of which are 2-floor large houses). A system of 48 kW is enough to supply with heat two 2-floor large houses. However, these are individual German cases. So, how much heat is needed for an individual project in Ukraine and the needed capacity of a boiler depends on a lot of factors. Among these factors are the quality of isolation of a building with a plant and pipes distributing hot water to the objects. All this influences costs of producing heat.

9 *Simple calculations for small-scale boilers are done here: <http://www.vicbe.info/journal/1405/>*

10 *<http://linka.dk>*

It is relevant to compare two different capacities of straw burning hot-water plants and observe economies of scale. We will compare LIN-KA plants of 600 kW and 1500 kW. To make the cases realistic we assume two different models based on pig complexes that installed straw-burning LIN-KA equipment in Germany (as described above). They need boilers for 200 kW and 600 kW of heat. However, we assume that they installed larger plants of 600 kW and 1500 kW and supply the excess of heat to the nearby village.

The first model assumes installation of 600 kW straw-burning equipment (plant). It is set up in a pig complex with 3000 heads which are placed in two buildings. The pig complex territory consists of 5 buildings, 3 of which are administrative. The complex needs 200 kW of heat; the excess of heat will be supplied to the school that is 3 km far from the pig complex. Total length of the piping network is 4450 m.

The second model assumes 1500 kW straw-burning plant and provides heat to a larger pig complex. It consists of 5 buildings, 4 of which are buildings where pigs are kept. The complex needs 600 kW of heat mainly for 1200 mother pigs with piglets. The excess of heat will be supplied to the village that has a school of 2500 sq. m, two kindergartens of 500 and 1000 sq. m, hospital of 750 sq. m, library of 250 sq. m and village council of 1000 sq. m. The total length of piping network is 7150 m.

Estimation of profitability for these two models is made based on cost-benefit analysis. Conclusions are derived from the values of Net Present Value, Payback Period and Internal Rate of Return.¹¹

According to the Law of Ukraine # 1391-XIV «On amendments to some Laws of Ukraine as for stimulation of production and consumption of alternative fuels» from May 21, 2009 equipment that is used to build plants to produce biofuels, including code 8403 «Boilers for central heating» is exempted from import duty from January 1, 2010 to January 1, 2019. Also this Law introduces changes to the Law of Ukraine # 334/94-VR «On enterprise profit tax» from December 28, 1994 that exempt enterprise profit, received from heat production using alternative fuels, from profit tax for 10 years starting from January 1, 2010.

Total equipment cost consists of the cost of equipment itself, shredder, transportation, montage, start up and personnel training. Standard price is given for the shredder of 15 m length. If additional meters are needed (as in the case for 1500 kW plant), extra cost should be added for each

11 *Payback period refers to the period of time required for the return on an investment to «repay» the sum of the original investment. Payback period as a tool of analysis is often used because it is easy to apply and easy to understand for most investors. However, it is considered as a method of analysis with serious limitations for its use, because it does not properly account for the time value of money, risk, financing or other important considerations such as the opportunity costs. There is no formula to calculate the payback period, excepting the simple case of the initial cash outlay and further constant cash inflows or constant growing cash inflows. Thus, alternative measures of «return» preferred by economists are Net Present Value (NPV) and Internal Rate of Return (IRR).*

3 meters length. Shredder can be built in 2-floors construction to economize the space. Here we use the costs given by German supplier of LIN-KA systems to Ukraine.¹² They provide us with costs for the equipment itself, shredder, start-up, montage and transportation (delivery) of the equipment.

After a preliminary project is known, a project engineering office can work out a detailed project to supply a district with heat.¹³

After the project outline is ready, building itself comes. Heating equipment needs 114 sq. m and 273 sq. m building respectively to put straw burning equipment of 600 kW and 1500 kW there (with a trailer for straw and having free space to store a certain amount of straw). There are no strict requirements for building. It can be of any not highly inflammable material of about 4-6 m height with a good insulation to avoid loss of heat. Ukrainian builders¹⁴ propose to make metal construction of sandwich panels using mineral wool or to make standard brick building. Since large doors (to allow tractor coming in) are needed, extra cost of 4-10 thd. UAH must be added. Large outside doors are proposed to be built from profiled sheet with mineral wool insulation. According to market information prices to construct such a building varies among 2000-6000 UAH per square meter. We take 3200 UAH/sq.m assuming that all building materials (including doors) are included in this price. We also assume buying additional land to construct a building

NPV is defined as the total present value (PV) of a time series of cash flows. It is a standard method for using the time value of money to appraise long-term projects (we consider 15 years for our project). It measures the excess or shortfall of cash flows, in present value terms, once financing charges are met. In general, if NPV value exceeds zero we conclude that our project will generate profit in the future taking into account cash flows discounting by the current discount rate for credits in UAH that we take at the level of 23%.

The internal rate of return (IRR) is a rate of return used to measure and compare the profitability of investments. In the context of savings and loans the IRR is also called the effective interest rate or the annualized effective compounded return rate that can be earned on the invested capital. In more familiar terms, the IRR of an investment is the interest rate at which the costs of the investment lead to the benefits of the investment. This means that all gains from the investment are inherent to the time value of money and that the investment has a zero NPV at this interest rate. Therefore, we should compare the received IRR value to the current market interest rate (which is considered as a cost of capital rate) that is currently about 23% in Ukraine. This ensures that investment which IRR exceeds its cost of capital adds value for the company.

Source: Description of the terms Net Present Value (NPV), Payback Period (PP) and Internal Rate of Return (IRR) are taken from the Online Free Encyclopedia «Wikipedia». For details see:

http://en.wikipedia.org/wiki/Internal_rate_of_return

http://en.wikipedia.org/wiki/Payback_period

http://en.wikipedia.org/wiki/Net_present_value

12 Hans-Jürgen Helbig GmbH (Germany): <http://www.helbig-gmbh.de/>

13 We use the data for project work costs provided by Ukrainian building company «Ukrbud» that has six project institutions throughout Ukraine: <http://www.ub.com.ua>

14 <http://averbud.com.ua> and <http://adivision.ucoz.com/>

near the pig complex where the straw heating plant will be placed. The land area should be larger than the building itself. Thus, we take 200 and 350 square meters for 600 kW and 1500 kW plants respectively. In our calculation we take current market price for land about 100 km far from oblast centers that equals about 200 USD per 100 square meters («sotka»), assuming that all accompanying land sale costs are included in this price (legalization costs and payment to realtor).

One of the most expensive positions of the production costs are the hot water pipes. Their total cost consists of the cost of a pipe itself, insulation of pipes, chutes for pipes, heat-chambers and montage of the whole piping system. Modern pipes can be supplied already insulated.¹⁵

As for personnel to service the plant, one well-qualified person (engineer) spends 1 hour a day to supervise the equipment (plant) work and to put straw bales to the shredder.

Regular costs include feedstock and equipment maintenance costs. Straw as a feedstock is not very expensive (about 200 UAH/t in square bales). However, it should be available at most in 50 km area. The bales are large enough, so no more than 40 bales are possible to deliver by large truck. That is why straw delivery becomes a rather expensive item in plant operation. Besides, here we should account for 10% of heat loss, by adding extra 10% of straw needed for a plant operation.

Also, maintenance costs must be accounted for. They are about 3% of total installation and piping work. Moreover, a plant consumes electricity that amounts to about 1.5% of total cost.

Profits from plant operation can be obtained from heat sale. Heat is sold by standard tariff calculated as Ukrainian average by regional level information given by the Ministry of Housing and Communal services of Ukraine. This tariff for commercial consumers (with VAT tax included)¹⁶ is 610.13 UAH/Gkal or 0.5246 UAH/kW*hour. We assume that heat is produced 24 hours during the heating season (in Ukraine from October 15 to April 15) and the rest of the year the heat is needed only for pigs. We assume 8 hours of producing heat during the rest half of the year.

Ash is obtained as a by-product during the straw burning process. It can provide additional benefits from its use as a plant fertilizer at fields. It can have a certain monetary value. However, in most cases it creates more problems than benefits. If the straw heat producer does not have his own fields, no one is eager to buy ash as a fertilizer. Absorbing water, ash turns into stones. Therefore, straw consumers often try to make an agreement with straw suppliers so that the latter take ash from their straw back free of charge.

The results of the cost-benefit analysis are given in the table below.

15 *Ukrainian companies that make set up and montage of heating systems, Teplomaster and Rosmar (<http://www.teplo-montag.com.ua/> and <http://rosmar.com.ua/>) provide us with the costs for the piping system as described in the text.*

16 *See <http://www.minjkg.gov.ua/activity/tp/tp-stats/>. Tariffs are taken by the state of June 1, 2010.*

Table 3.1-1. PROFITABILITY INDICATORS FOR STRAW HEATING PLANTS OF 600 KW AND 1500 KW CAPACITIES.

	Costs:	Heat production capacity, kW/h	
		600	1500
1	Total equipment cost* (equipment, shredder, transportation, montage and start up)	1,423,014	2,380,635
2	Total piping work* (pipes, chutes, heat-chambers and their montage)	1,810,400	5,548,200
3	Total annual personnel cost*** (1 person, assuming 10% wage increase in years 2-14)	39,600	39,600
4	Design and construction cost* (projection and design work, land purchase and construction of the main building where the equipment is placed)	909,864	1,692,064
5	Feedstock cost**** (feedstock, transportation and 10% efficiency losses)	292,874	732,185
6	Other costs** (electricity consumption is up to 1.5% of total cost; plant maintenance cost is 3% of total equipment and piping cost)	159,692	310,292
	Benefits:		
7	Total profit from heat sale (Given as the value for 2-14 years, Profit tax is 0%)	1,825,608	4,564,020
	Profitability characteristics:		
8	Payback period, years	3.13	2.77
9	Net present value, UAH	1,301,647	4,650,418
10	Internal rate of return, %	31%	36%

Note: All costs and benefits are given in Ukrainian hryvnas.

* *Fixed costs, effective for installation year (year 0, when all preparatory works are made and a plant does not operate).*

** *Fixed costs, effective for all 15 years.*

*** *Variable cost, changes starting from 2nd year. Given as a value for 2-14 years of operation.*

**** *Assumed to be fixed and effective for all years except installation year.*

Source: Own calculations.

With the increase of capacity of a straw boiler, the profitability of investments into the plant grows indicated by the rise of NPV and IRR, and shortening of payback period. Due to the economies of scale effect, payback period for 600 kW plant is 3 years and 3 month, and for 1500 kW plant is 2 years and 9.5 month. Profit from providing heat to the pig complex and a village that can be obtained for 15 years (assuming current discount rate for credits at 23% and expressed as net present value) is 3.6 times higher for 1500 kW plant and equals 4.6 mln UAH. The internal rate of return is 5% higher for the plant with 1500 kW capacity and equal to 36%.

Conclusions:

Both projects, installing 600 kW or 1500 kW straw burning plants are profitable. The pay back period is about 3 years. Their internal rates of return prevail by 8% and 13% respectively over the current Ukrainian discount rate of 23%. Their NPVs are positive, amounting to 1.3 mln UAH and 4.7 mln UAH respectively.

2.2 Building

Straw can effectively be used for building either directly applying straw bales or compressed straw. Buildings are mostly made from straw bales. Compressed straw in building is used for interior furnishing (to warm or to make partitions inside).

First houses made from straw bales are dated by the 18th century. From that time the principle of building remained the same, however, the technology is constantly improving. In modern times building with straw bales is widespread in USA, Canada and Europe.

There are two major kinds of straw bale buildings: load-bearing and a post and beam framework (another name is in-fill or timber-framed).¹⁷

Load bearing construction (taken mostly from Nebraska houses) means that the bales are used as the structure for the building and they bear the load of the roof. Thus, little wood is required. Wood is needed to add windows and doors to the building, to frame the roof and the actual box it attaches to on top of the bales. Care must be taken to consider the possible settling (compression) of the straw bales as the weight of the roof. The most obvious reason to choose a load bearing structure is the simplicity of the construction. Load bearing structures have simple designs. Simple

¹⁷ <http://www.greenhomebuilding.com/strawbale.htm>

design could mean saving money, time, headaches, and can be self-built instead of using hired help. In the Western World people like to build load bearing houses not even thinking of economic reasons. There are a lot of books and organized seminars that provide interested people with details of such building. For example in Germany there is an ecovillage Sieben Linden¹⁸ where people try to use renewable resources in building, heating, etc. They also organize different workshops on ecolving including building of straw bale houses where not only theoretical details can be taught but also practice of building is included. There are various organizations in Europe who can give theoretical as well as practical knowledge for straw building.¹⁹ Often they gather people to build small simple load-bearing structures that can be constructed by a group of people in a few hours.

Post and beam framework is used by those who prefer designer long-term standing houses. Here another structural system supports and attaches the roof and the bales are either inserted as in-fill material between the columns of a structural framework, or the bale walls wrap a structural framework. Any design as for wood or brick houses can be chosen. The width of the straw bales allows other design brushstrokes such as broad window seats, corners or long wall benches. This is also the only straw bale construction that many building authorities allow in many countries.

Building with straw has many benefits. Among them are savings on heating and cooling costs due to great insulation value and internal thermal mass evenly distributed through the building, strength and durability, carbon locking for possibly centuries, fire resistance, as well as the ability to be finished in an almost unlimited range of textures and styles (see Table 3.2 – 1).

There are a lot of details needed to make a straw bale construction. Straw bales are natural materials that can easily absorb water or become inflammable. To prevent this, straw bale walls must be covered with a surface material. It will allow any water vapor getting into the wall to migrate out again readily, i.e. the wall must «breathe» but not leak. To use any sort of building paper or membrane between straw bales and plaster is not recommended since it can trap moisture or limit its movement. For instance, stucco plaster is regarded as secondary weather protection since it is very difficult to guarantee leak free and 100% water exclusion. Dense stucco plaster is also not a particularly good «breathing» coating (especially if painted). Softer plasters such as lime, gypsum or earth are better.²⁰ According to market information, covering coat of a straw bale house must be applied in two layers. After making this, the straw bale house becomes protected from water and from fire. There have been made a lot of tests to prove fire and water resistance of straw bale constructions (see EU examples below). According to German straw bale building company being under fire straw bale house can stand about 5 hours.²¹

18 <http://www.siebenlinden.de/english2035.html>

19 For example, <http://glassford.com.au/main/>

20 More details on protection from moisture can be found in <http://www.earthbuilding.org.nz/articles/strawmoisture.pdf>

21 *Baubiologie-Altmark*: <http://baubiologie-altmark.de/>

To summarize, here are strawbale houses properties that make them competitive in comparison with other constructions.

Table 3.2 – 1: PERFORMANCE SUMMARY OF A STRAWBALE BUILDINGS

Property	Description
Appearance	Rendered straw bale walls are not visible. They are smooth and not distinguishable from rendered blockwork. Sometimes European consumers prefer to live small part of the house not rendered to show their attitude to ecobuilding to surrenders.
Structural capability	There are examples of up to three floors in load-bearing structure and timber-framed multi-storeys.
Thermal mass	Pure straw bales have very low thermal mass. When they are earth rendered (with a coat of up to 75 mm), a significant thermal mass can be achieved.
Thermal insulation	Straw bales are among the most cost effective thermal insulation available.
Sound insulation	The overall insulation value for straw bale construction exceeds the values of any conventional walls in the most cost-effective way.
Fire resistance	Straw bale constructions survived during Californian bush fires while conventional structures were destroyed. Cement covered high-dense straw bale walls are nearly airless, and fire cannot burn without oxygen.
Vermin resistance	Even if vermin manage to get inside the straw bale wall, densely packed straw makes it hard for them to navigate through the space.
Durability and moisture resistance	With a water content not exceeding 15%, straw bale constructions can have a lifetime of 100 years or more. Nebraska and Alabama historical experience show that the best way to prevent rot in a finished structure is to create breathable walls.
Toxicity and breathability	There is no toxic end to straw bale constructions cycle. Covered with earth or earth-lime, straw bale walls breathe better in contrast to the walls with high cement to sand ratio.
Environmental impacts	Straw bales are biodegradable. Using them for building reduces air pollution, stores carbon and produces minimal waste from this material use.
Buildability, availability and cost	There is a very active and informative international network as for straw bale building that constantly explores ways to improve and quantify bale construction technologies. Straw bales are low-cost material that is available in Ukraine in large quantities (see chapter 2).
Ease of construction	Straw bale walls can be built easily and quickly. It is better to use professional organizations, experienced in straw bale building, to avoid any pitfalls.
Earthquake resistance	Well-braced timber-frame straw bale construction generally has sufficient stability to withstand lateral wind and earthquakes.

Source: Own presentation based on Your Home (<http://www.yourhome.gov.au/>) and Smarter Homes (<http://www.smarterhomes.org.nz/>) publications.

The EU has strict standards to approve any material for building. Straw bales got a permission at the EU level to be used in construction. All construction products are classified into one of seven Euroclasses (A-F) according to their reaction to fire performance in fire tests. According to ISO standards, straw bale specimens are checked for non-combustibility (EN ISO 1182 based on ISO 1182). Products with appreciable combustibility can be assessed using a simple ignitability test by EN ISO 11925-2.²² Straw bales used in construction in general satisfy E class for ignitability.²³ It means normal ignitability. To prove this essentially flat specimens are used with dimensions of 250 mm x 90 mm and maximum thickness of 40 mm. These specimens are required to be 15 s under exposure, and the flame height should not exceed 150 mm within 20 seconds after the start of the test.²⁴ Check of straw bales for fire resistance according to EN 1365-01 and EN 1363-1 showed their resistance during 90 minutes. As for the resistance against biological influence according to ON 6010 / DIN EN ISO 846 EOTA CUAP, quantifying of fungus growth, straw bale specimens received 25%-50% of probability for that (class 2-3). For example, according to the tests made upon German and Austrian projects, they got a permission to be implemented in building. The first one «Strohballenbau in der Altmark» was aimed at regional development of straw bale building using the bale sizes of length 50-100 sm, width – 46-50 sm and height – 36-40 sm with gross density of 90-130 kg per cub. m and straw moisture content of less than 15%. The material used showed thermal conductivity (λ) of 0.04 W/mk in fibre-direction²⁵ and 0.065 W/mk against fibre-direction ; for fire behavior straw bales were referred to class B2²⁶; for resistance against the impact of biological agents – classes 2 and 3 and for resistance against fire – F-30 – F-90 (that means 30-90 minutes). The second project, Austrian «Stroh kompakt», used bale sizes of 60-90 sm length, 46-50 sm width, 36-40 sm height with gross density of 80-90 kg per cub. m²⁷ and moisture content of less than 15%. Tests show straw bales thermal conductivity of 0.046 W/mk and fire behavior according to B2 class.

-
- 22 http://www.wpif.org.uk/uploads/PanelGuide/05_%20Section%202_2%20BRE%20V3%2021_04.pdf
- 23 Presentation «European technical approval (ETA) for straw bales» accessed at German national organization of straw bale building: <http://fasba.de>
- 24 Efectis Nederland. «EN ISO 11925-2:2002 – The Ignitability test», January 2007.
- 25 http://www.efectis.com/nl_en/Downloads/techn_productfolder_ignitability_test.pdf
- 26 Basically it is the test for insulation material that in general for straw equals 0.05 W/mk. It observes how the steam (in Watts) comes through the wall (linearly) per 1 m. It is the measure of heat flow rate by conduction through a unit of distance in the material per unit of area per degree of temperature difference (see http://www.proz.com/kudoz/german_to_english/tech_engineering/2330-u_wert.html). For wood $\lambda=0.17$. The less λ value – the better. A better option is to check the whole wall (not only insulation material as λ does). U-Wert or U-value does it. It measures thermal transmittance that for straw bales plastered at both sides equals 0.12 W/m²K. For wood U-value is higher. The lower U-value – the better.
- 27 category B there are B1, B2 and B3 classes. B1 is not easily flammable, B2 is just flammable and B3 is easily flammable. See «Fire testing to building material – Germany Standard DIN 4102-1» at <http://firetc.com>

According to European experience of applying straw bales in building these houses appear to be not much less costly than conventional ones. The main material used (straw bales) is of low cost. However, straw bale buildings require labor-intensive construction techniques. Thus, the essential part of the cost is labor that is costly in EU. In Ukraine labor is cheaper. However, international expertise, needed for first straw bale projects Ukraine, will add to the cost. Moreover, straw bales of special small sizes are required for building. Since Ukraine does not use straw for building, there are no such sizes of straw bales proposed to the market. Thus, it is additional cost «to produce or find» such bales. Straw bale construction appears to be low-cost only for owner builders (as Australian experience justifies). In this case, the cost per square meter is from 100 USD²⁸, while it can achieve 1000 USD for architect designed houses.²⁹ Different internet resources, aimed at attracting people to build with straw bales, claim prices in the range of 10-50 thd. USD for the whole house³⁰. It is possible to achieve during own making of load-bearing simplest structure. According to German market information on average a price for a straw bale house for 2-3 people can be 100 thd. USD. Therefore, to choose between straw bale or conventional structure to build, one should focus on properties of a «home» he or she wants to get instead of costs that are possible to minimize using simple load-bearing structures and own participation in building process.

There are available technologies on the market on how to use compressed straw for building. Using straw property to be compressed under high temperature, Stramit technology was invented in Sweden in 1935. High-compressed straw panels can be produced by this technology. After the original compressed agricultural fibers (stramit) patents have expired, numerous companies using this process have sprung up worldwide. This technology is known in Australia, UK and several European countries. A lot of buildings have been built using stramit-like technologies.³¹

Using Stramit process, Australian company «Ortech» under the brand «Durra Panel» produces standard straw panels of width 1187 mm, length – 1800-3600 mm, nominal thickness 50 and 58 mm, and nominal weight – 18-22 g/m² from rice straw fibers. Durra manufacturing process combines extreme heat and compression in a dry extrusion process to form the solid panel core. A natural polymer in the straw fiber is released during the procedure, and a water based PVA glue is used to encapsulate the finished core with a high strength recycled Kraft paper liner (having no toxic waste). These panels have distinguishing acoustic and thermal insulating properties, proven durability, and high impact fire resistance. They contain no formaldehyde or additional chemical binders. They have commercial, industrial and residential applications in walls and ceilings, and can be used in low cost housing/buildings.³²

28 http://www.strawbale.com/cost_of_straw_bale_construction

29 *Environment Society of Australia*: <http://enviro.org.au/StrawBale.asp>

30 *See Solar Heaven*: <http://www.solarhaven.org/StarterStrawBale.htm> and *A House from Straw*: <http://www.abouseofstraw.com/expenses.htm>

31 <http://www.buildinggreen.com/auth/article.cfm/1995/5/1/Straw-The-Next-Great-Building-Material/>

32 <http://ortech.com.au/durra/durrapanel.html>

There are various international companies that offer compressed straw products.³³ However, there is no stable demand for straw compressed products. Thus, many companies exited this market. At the same time the research in straw compression has not stopped. A company in Germany produces not only panels, but also square and round forms from the compressed straw. These products can be used for different buildings construction, to make furniture, decorative elements and even pipes for water (since these materials are water and high-temperature resistant).³⁴ It has a patent for a special technology to compress straw without using high temperatures and any unhealthy chemical elements applying special feedstock mixture. Compressed by this technology straw products (according to DIN 55666) have formaldehyde content (cohesive element) of 0.06 ml/m³ (while compressed wood-based products 0.1 ml/m³).³⁵ The rests of the material can be compressed to pellets at the same plant. All final products produced by this technology are cheap to buy and reliable in use. However, initial investments are high. A full set of such equipment costs 18-20 mln Euros for 30-50 thd m³ annual production.

Conclusion:

In construction straw can be used in the form of straw-bales or compressed products. If straw bales are used, then we can consider either load-bearing or timber-frame structure. Both of these structures can provide long-term standing constructions with a good structural capability, thermal and sound insulation, fire, moisture, earthquake and vermin resistance, breathability and good health impact. However, the costs associated with using straw bales for building are not always lower than for conventional structures, especially if designer timber-frame projects are considered. According to market information, people choose straw-bale building mostly because of house quality characteristics and not costs. It is possible also to use compressed straw products in construction or internal furnishing. There are several companies in the World that produce such products. In most cases these products are innovative, rare and still not-commonly used that implies higher production costs for them than for their analogues. It is a technology for the future that can be considered by Ukrainian producers of offering domestic or international market opportunities.

33 Lists can be found at footnote 31 table 4 or at <http://www.austinenergy.com/energy%20efficiency/Programs/Green%20Building/Sourcebook/engineeredSheetMaterials.htm> For example, Agriboard Industries, a division of American Ryan Development Company LLC, compress wheat straw to produce special panels that can be used in industrial building (for details see: http://www.agriboard.com/panels_from_agriboard.htm). Meadowood Industries Inc since 1977 develops and manufactures primarily from ryegrass decorative and structural boards, panels, and molded products for building. They are used for interior design as well as architectural elements (for details see: <http://www.meadowoodindustries.com/>).

34 Stroblos Produktentwicklung KG: <http://stroblos.com/>

35 Tests results as for other properties of materials produced can be found under: <http://stroblos.com/stroblosentwicklungdetails/index.php>

2.3 Pellets production

for heating a satisfactory level of quality is easier to maintain in compressed straw in the form of pellets or briquettes. Pellets are small particles typically created by compressing straw. Briquettes have larger size and lower density in comparison with pellets.

Pelletizing is closely related to briquetting except that it uses smaller dies (approximately 30 mm) so that the smaller products obtained are called pellets. Standard straw pelletizing process consists of seven stages. First, straw bales are freed from heavy contaminant and then grinded. Second, the particle size is adjusted to a uniform maximum dimension to be produced (about 85% of the minimum thickness of the pellet). Sometimes drying is necessary. Third, feedstock is conditioned (more often steam is used). Forth, the particles are moved to a pellet mill. Fifth, hot pellets are immediately air quenched down to 25°C. It sets up the lignin and hardens the product. Sixth, pellets are screened, residual fines are separated and then re-used in the process. Finally, dust free pellets are directed for storage (if in bulk) or go to automatic packing (in small or big bags).

There are two main types of pellet presses: flat die and ring die types. The flat die type have a circular perforated disk that contains two or more rotating rollers and force the material through the holes. The ring die press features a rotating perforated ring on which rollers (normally two or three) press on the material to the inner perimeter.³⁶ Disk diameters and track surfaces of rollers are larger for flat die types in comparison with the ring one. Pellet press capacity is not restricted by the density of the raw material as in the case of piston or screw presses used for briquetting.³⁷ The flat die pellet machines were the first design to be used that originally applied to produce animal feed, and later was adapted to process other raw materials including biomass pellets. Flat die pellet machines are of a much simpler design than ring die pellet ones. The ring die pellet machines are second generation designs that have been widely adopted in large scale animal feed and wood pellet production. There are quite a lot of pros and cons of both types of pelletizing machines.³⁸ The choice should be made based not on the type but on characteristics of the equipment, which are better suitable for a certain quantity and quality of pellets aimed to produce.

The full set of the equipment can be supplied, installed, set up and supervised by one company. This company gives a guarantee to produce pellets of a certain quality to adjust to recommended conditions. The complexity of the needed equipment / plant depends on the properties of the ex-

36 EUBIA. «*Analysis of the technical obstacles related to the production and utilisation of fuel pellets made from agricultural residues*», 2002.

37 http://www.eco-ventures.org/files/Briquetting%20docs/briquetting_technologies.doc

38 <http://mydiyhometips.com/2009/12/01/pellet-mill-die-details-and-greenhouse-gases-and-carbon/>

isting raw material. German large pellet equipment producer Amandus Kahl³⁹ recommends to use wheat straw. However, first, it states that other straw types (such as rye, oats, barley, triticale and rape straw) can be processed too but with some capacity deviation from the nominal one. Second, the bales used should be of rectangular shape (with possible dimension of 0.7 x 1.2 x 2.0 m). Other bale shapes and bulk straw can be processed too but in this case the capacity will be lower than the nominal one. Third, average moisture content in straw bales should be lower than 12-14% by weight. Moisture of up to 20% in the bale edges must not be exceeded. Also the straw bales must not be rotten and enrooted. Binding ribbons (wires, foils, etc.) on straw bales have to be removed manually on the feeding belt. Impurities of more than 0.5% can cause higher wear and reduce the capacity. Finally, the input feedstock must be free from foreign matters (such as oversizes, stones, glass, nails, ferrous and non-ferrous metals, etc.). Sticking to listed necessary conditions for pellet production, the bulk density of a final product (pellets of diameter 10 mm or 6 mm) is 450-550 kg/m³.

In most cases big international pelletizing equipment suppliers specialize on large plants. For example, Amandus Kahl prefers to supply to Ukraine pelletizing plants from 3t/h capacity.⁴⁰ A straw pellet producer in Germany⁴¹ has a plant of 1.5 t/h capacity. He reported to previously use Amandus Kahl equipment. After renovation he switched to Buhler⁴². Good quality of equipment used contributes to better quality of pellets produced that are sold for horse-bedding⁴³ for higher price. It gives the possibility to provide good profitability of straw pellet production.

Pellets have been actively used from 1980th in USA and Canada, from 1990th – in Austria and Scandinavian countries, from 1999 – in Germany. For Ukraine it is the new market.

In 2009 in Ukraine work 13 pellet producers with straw and 51 with wood.⁴⁴ According to market information⁴⁵ there are about 30 pellet and briquette producers from straw, wood and sunflower husk who work on a permanent basis, and only about half of them propose pellets to the market;

39 http://www.akahl.de/akahl/en/products/biomass_pelleting/straw_pelleting/

40 *A preliminary cost of German Amandus Kahl equipment (EXW, Reinbek) for Ukraine is about 1.2 mln Euro for 3 t/h capacity to 4.4 mln Euro for 18-20 t/h capacity. Service costs about 12-13% of the equipment price.*

41 *Lange&Meyer: <http://strohpellets.de/>*

42 *Buhler is known as a company that installed Europe's first wood pelleting plant (1982 in Sweden), the world's largest straw pelleting facility (2003 in Denmark) and the biggest wood pelleting plant in the world (2008 in the USA): <http://www.buhlergroup.com>*

43 *Pellets used for animal bedding must be of higher quality (do not contain dangerous for animal health elements) and, therefore, have higher price. Burning of such clean straw pellets is also allowed in Germany. But the price for such pellets is too high to use them for heating. Thus, German consumers prefer wood pellets that for the same price give higher energy output.*

44 <http://pellets-wood.com/>

45 *Interviews with pellet traders and Ukrainian producer association on solid biofuels (<http://uavap.org>).*

others work by contact and produce directly for a particular consumer. Total pellet and briquette production in Ukraine is estimated at about 250 t per year. 50% of this amount are pellets and briquettes from straw and sunflower husk. The majority of producers are export oriented, mostly to the European market. 85% of Ukrainian pellets are exported and constitute about 2.5% of the European pellet market. Annual growth of this market in Ukraine is 15-20%.⁴⁶

The major problem of Ukrainian pellets is its high ash content. Some producers achieve ash content up to 1% in wood pellets and up to 5% in straw pellets; others finish with up to 3% and 8% respectively.

Straw pellet prices in Ukraine currently vary between 60-125 Euro/t, wood pellets – from 80 to 160 Euro/t.⁴⁷ The price depends on pellets sort and quality (mostly ash content), and on terms of delivery. Wood pellets in Ukraine are produced from pine, oak, poplar and different sawdust. Straw pellets are produced from grain straw. Standard supplied size is in majority of cases 8 mm, sometimes 6 mm is also proposed. Moisture content is up to 10%. Content of other elements satisfy European standards. Majority of produced in Ukraine pellets are able to satisfy German DIN standard, and they are on the way to satisfy European EN Standard.⁴⁸

There are a lot of companies in Ukraine supplying pelletizing equipment. Much of the equipment is produced or assembled in Ukraine.⁴⁹ Many producers use modernized soviet technologies that are proved over time and preferred over recently developed Ukrainian designs. Some Ukrainian companies use imported details or technologies, and make pelletizing line assembling in Ukraine. For example, Ukrainian company «Grantech»⁵⁰ uses Italian technology while Ukrainian company «Zenako»⁵¹ uses soviet technology. The price difference is considerable.

46 http://ecotech.zenako.ua/products_mar.htm

47 Interviews were made among Ukrainian pellet producers and traders listed at Global Trade Database: <http://www.alibaba.com> Also some prices are listed here: <http://price-list.kiev.ua/word/43/6743/index.html>

48 About quality standards DIN and ONORM: http://uavatp.org/index.php?option=com_content&view=article&id=57&Itemid=61 About EN quality standards see EUBIONET publication on New European Pellet Standard EN 14961-1: http://www.foex.fi/bioenergy/images/temp2/Alakangas_Pellet_standard_EN14961-1.pdf

49 Information is given by Ukrainian Association of alternative solid fuel producers: <http://www.uavatp.org/>

50 Grantech's pelletizing equipment with the capacity of up to 2.2 t/h will roughly cost about 350 tbd Euro (granulating press price is about 1 mln UAH, drying complex – 1.6 mln UAH, cooler – 68 tbd UAH, other costs – up to 80 tbd UAH. All prices are VAT included): <http://crystal.kiev.ua/en/grantech/site/content/devices/linesICKGroup>

51 One of Ukrainian leaders in solid biofuel market is Zenako. Its pelletizing equipment of the capacity 2 t/h costs about 200 tbd Euro (including all associated with its setting up and start up costs): <http://ecotech.zenako.ua/>

According to market information Ukrainian producers of pellets prefer using small capacities equipment installed in several places instead of setting up a large pelletizing plant. Having not enough finance and facing high interest rates for loans, they often choose the cheapest option of equipment. Knowing these market tendencies and Ukrainian consumer preferences as for pelletizing equipment, companies that supply high-quality foreign equipment to Ukrainian market propose capacities of up to 2 t/h.⁵²

The quality of pellets produced in Ukraine does not completely meet EU requirements yet. In any case, homogeneity of pellets regarding size, water content and particle density (all that is relevant for automatic combustion) seems quite a well controlled factor in the pelleting process. Content of ash and other unnecessary chemical elements in pellets can be overcome by not only controlling of feedstock used but also partly by a range of combustion processes and flue gas cleaning techniques used. Despite the lower quality of currently produced Ukrainian straw pellets due to lower straw bales quality and the quality of the equipment used, some are exported quite successfully. According to market information, the export prices are about 50% higher than the prices on domestic Ukrainian markets.

A straw pelletizing market is slowly developing in Ukraine. However, the amount of pellets produced is increasing each year. In future, Ukrainian pellet producers will most likely switch to modern equipment and higher capacities, benefiting from economies of scale.

Conclusions:

Costs of pellets production mainly depend on the cost of feedstock and technology used. The use of different equipment (technologies) and improvement in straw market organization allow satisfying market standards as for the quality of straw pellets. To meet market requirements concerning the quality of pellets is important for being competitive and get higher profits. Larger difference between costs and benefits can be achieved in two ways: (i) by reducing the production costs applying better technology, and (ii) by increasing benefits by offering the produce to international consumers. In European market straw as a feedstock is more expensive than in the Ukrainian market. Therefore, final straw products including pellets are more expensive too. So, exporting straw pellets and briquettes to the European market offers interesting opportunities for Ukrainian producers if quality standards are met.

52 *For example, Ukrainian company «Atagos (Ploeger)» trades English-making palletizing equipment. They can supply high capacities. Taking into account Ukrainian preferences of small pelletizing plants they propose 1 t/h equipment to the market for the price of roughly 215 thd English pounds. <http://www.atagos.com.ua>*

Annex A:

SHORT DESCRIPTION OF LIN-KA STRAW BURNING PLANT OPERATION

A straw plant (system) consists of the LIN-KA straw shredder with shredder drums which pull the straw upwards, preventing stones and other foreign objects are passed back into the shredder drums⁵³, from where they can be removed. The straw shredder is available in a range of sizes depending on boiler size and is controlled by the load placed on the shredder drums. This means gear and motor overloading is avoided, ensuring that the straw volume set for the boiler plant is always correct. Shredded straw is transported from the shredder in a closed pipe system directly to the combustion chamber, where it passes through a cell sluice before being fed into the combustion hearth by a worm drive.

A straw conveyor with height-adjustable legs is supplied, the length of which can be determined by boiler size and customer requirements.

Feed procedure

The «on-demand» function of the boiler will activate the feed procedure, i.e. the straw shredder and worm drive will start producing and feeding the appropriate amount of straw into the boiler for the desired effect. Straw volume is controlled by an oxygen gauge which constantly monitors oxygen percentage in the flue gas.

LIN-KA H boiler

The hot water boiler is a cylindrical, efficient, 3-phase pipe boiler designed for burning straw. It features a smooth flame channel, water-cooled rotation chambers and is dimensioned to achieve full combustion and efficient utilisation of radiated heat in the flame channel, whilst convection heat is utilised to the maximum in the two subsequent flue gas sections.

At the end of the boiler combustion chamber is a cylindrical water- and air-cooled combustion hearth, which helps avoid slag formation. Preheated air is added from the sides and top to create the correct amount of turbulence in the combustion area, and completely burning off the gases developed.

Thorough insulation of the boiler with 100mm mineral wool means that heat loss is minimal. The boiler is a fully welded, gastight and sealed unit, supplied with nozzles, flanges and counter-flanges for feed and return, plus safety nozzles. A cleaning hatch at the end of the combustion chamber makes inspection and cleaning simple.

53 *Market operators claim that different rubbish is often found in straw bales during its processing. Thus, LIN-KA systems advantage is that this rubbish is «filtered» before straw comes into firing module. In the systems with manual straw bales feeding directly to the firing module, rubbish burns together with straw reducing operation life cycle of a plant.*

The boiler exterior is of blue plastic-covered steel modern design panels. It is available in sizes ranging from 60-1500kW for straw, with the standard version designed for a maximum operating pressure of 4 bar, and maximum operating temperature of 110° C.

Automatic ash extraction

A stainless steel, laterally-mounted worm drive is fitted in the base of the boiler to transport ash out to the inclined worm drive, which takes it onwards, including outside the building, to an ash container.

Automatic flue cleaning

A number of pressure tanks are mounted on the boiler with air injection valves fitted to inject air into the boiler flue to keep it clean. This means that manual cleaning of the flue is rarely necessary.

Electronic control and monitoring system

Control and monitoring of the straw plant is based on a Programmable Logic Controller (PLC) system. This ensures controlled regulation of fuel feed to maintain maximum heat production. All set points can be read off and reprogrammed via a display and the oxygen percentage is continuously shown on the display. There is also an alarm outlet on the control system.

The control panel can be connected to the internet if the boiler room has a fixed IP address to facilitate remote support from LIN-KA when commissioning, trimming and in the event of disruption to production.

A straw heating plant of sizes from 1,500 to 3,000kW can be built in many ways, depending on customer and operating requirements. LIN-KA has three basic construction methods depending on boiler size. They are basically built as small outdoor plants, with a straw shredder. When large quantities of straw are to be burned, a feeder system with belts at 2 or 3 different levels can be installed with an elevator to lift the bales down to the shredder. Alternatively, a straw crane can be installed which brings the bales to the shredder.

When a heating plant of higher capacity, from 3,000 to 8,000 kW, is required, plants are constructed with a straw cutter as feeder unit and where a crane is usually used. A traverse crane picks up the bales and takes them to a safety box which is also located in the barn. The bale will then be hydraulically fed into the cutter which turns the bale onto its edge before a slice is cut off hydraulically and fed into the boiler for incineration.

A system is also available that works on the cigar principal, which works best for plant sizes from 8,000 to 10,000 kW. A crane and safety box are used to move the bale into a drawer which is offset in the bale's width in relation to the boiler. When the drawer closes, the bale is directly aligned with the boiler inlet, and is slowly fed into the boiler as it burns.



THE EU DAIRY MARKET – Real Opportunities for Ukraine?

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EXECUTIVE SUMMARY

1. The dairy sector in the European Union (EU) is characterized by its high productivity and the longstanding application of tools of government intervention in agriculture. In recent years, however, regulation of the dairy sector under the regime of the Common Agricultural Policy (CAP) has undergone various structural reforms. These reforms are gradually exposing dairy farms to global market conditions and will continue to do so in future.
2. The output quota is a prominent measure of the CAP with regard to dairy policy, but the quota is not its core element. Instead, EU dairy policy is based on an economically inefficient system of intervention prices and import tariffs. The quota is set above EU consumption and excess production can only be sold on the world markets by making use of publicly funded export subsidies.
3. The EU exports its dairy products to almost the entire world. On the contrary, only a comparatively small amount of cheese, butter and whole milk powder (WMP) from selected destinations is being imported into the European Union and a large share of these imports qualifies as intra-industry trade, e.g. with Switzerland. Although the EU has granted wide ranging tariff preferences to a reasonable number of countries, currently only very few match EU standards with regard to dairy product quality. Therefore, the EU Commission encourages countries to work towards those standards and offers assistance.
4. European consumers and policy makers are very much concerned about food safety and food quality. In Western Europe, there is an increasing demand for highly processed products based on milk, such as special cheese varieties or yogurts. At the same time, rising income and changing consumption preferences in the new member states absorb more and more of the excess milk production.
5. World market conditions in general are currently shaped by high volatility. In the medium term, the most important international agencies with regard to dairy market forecasts expect global supply to grow slower than global demand. Especially the demand for dairy products in Russia and in the newly industrializing countries (NICs), such as China, India, Thailand, Indonesia and Malaysia is projected to increase.
6. Dairy exports from developed countries, however, are expected to remain constant around current levels, while Ukraine and countries in South America are expected to become major exporters. Therefore, the EU market clearly constitutes an interesting destination for Ukrainian dairy products if they match the rigid EU quality standards. The EU provides clear guidelines in this regard but is not going to make any exemptions from current rules.

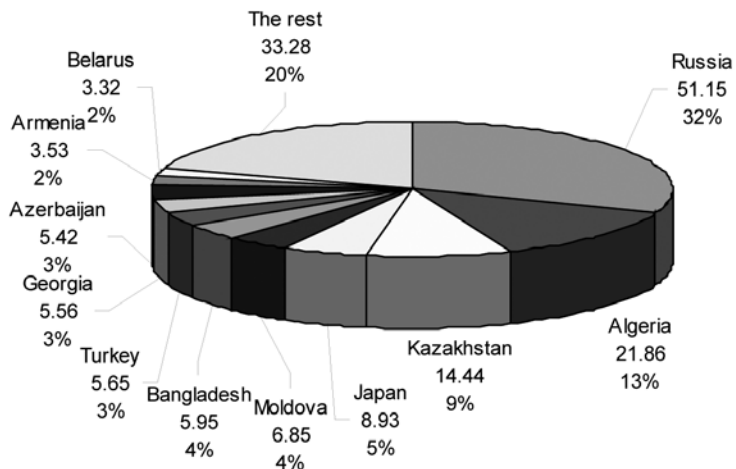
7. For these reasons, Ukraine should work towards the implementation of EU standards for its dairy products in order to gain access to the European market. But at the same time, Ukrainian producers should not miss to explore other emerging export destinations especially in South-East Asia. Most likely, these are fast-growing markets for dairy products in the near future.

1. MAJOR BOTTLENECKS OF THE DAIRY SECTOR IN UKRAINE

EXPORT STRUCTURE

Ukraine has a good potential to become a player on dairy export markets. However, today there are various bottlenecks in the dairy value chain to increase efficiency and sector performance. Russia and the CIS countries remain the main importers of Ukrainian dairy products. In 2005 66% of Ukrainian dairy products were exported to Russia¹. The Russian import ban on dairy products caused decreasing of this share to 32% in 2006 to 51,150 t. The amount of dairy products export to Russia increased in 2007 again to 57,330 t. The share remained 32% in 2007. In 2008 the export share to Russia grew to 37% (73,240 t) and in 2009 this figure was 39% although in physical volumes export decreased to 62,510 t. Kazakhstan is the second largest destination of Ukrainian dairy products with 17% and 19% in 2008 and 2009 respectively. (See Figure 1-4).

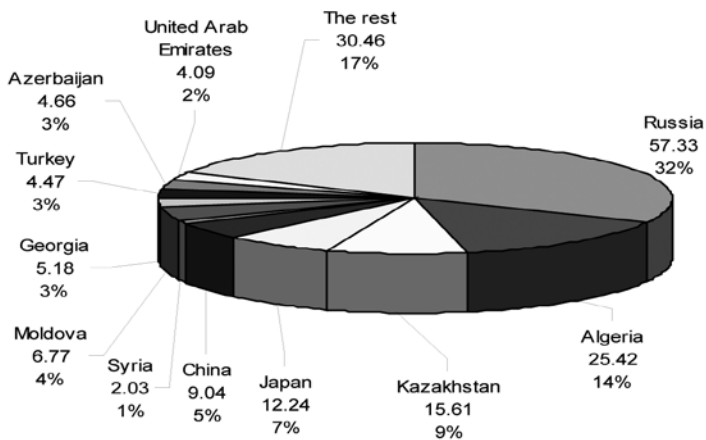
Figure 1. EXPORT OF DAIRY PRODUCTS FROM UKRAINE IN 2006; 166,000 t



Source: State Statistics Committee of Ukraine, 2007

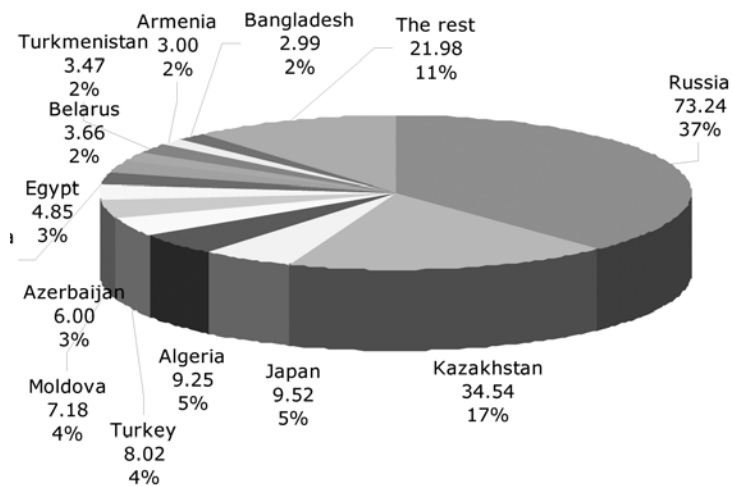
1 Dairy and dairy processing industry: Ukraine – 2007. Ukrainian Club of Agrarian Business Association. Kyiv, 2008.

Figure 2. EXPORT OF DAIRY PRODUCTS FROM UKRAINE IN 2007; 178,000 t



Source: State Statistics Committee of Ukraine, 2008

Figure 3. EXPORT OF DAIRY PRODUCTS FROM UKRAINE IN 2008; 192,761 t



Source: State Statistics Committee of Ukraine, 2010

Note: codes 401-406

In particular, the restriction of exports to Russia had an extremely negative impact on cheese and butter production in Ukraine in 2006/2007. Before the ban introduction Russia accounted for 98% of the Ukrainian hard cheese export volume. In 2006 the share of hard-cheese exports reduced to 82%. In the first half of 2008 hard cheese exports to Russia was 83.3% of the exports. Therefore, it seems to be obvious that Ukraine has to develop other market opportunities including the EU to broaden the export structure and to lower export risks. This implies changes on the company level as well as on the level of the Government.

By now Ukrainian dairy products are not allowed to be exported into the EU because of unsatisfactory veterinary standards and product quality standards. To promote dairy exports to the EU the Government is increasing its efforts to adapt new veterinary standards. In 2008 the residue monitoring plan for milk submitted by Ukraine was officially approved by the EU Commission² – an approved residue plan is one of the prerequisites for dairy exports to the EU³. Various EU Delegations of sanitary inspectors from the Food and Veterinary Office have been visiting selected Ukrainian dairy farms and milk processing enterprises, whose aim is to receive the EU approval for export of dairy products in the EU. Their positive outcome would allow Ukrainian dairy companies to apply for dairy exports to the EU in the nearest future. However, none of those enterprises was approved for exports to the EU so far.

PRODUCTION STRUCTURE

In total Ukraine has been officially producing about 13-14 m tons of raw milk annually from 2001 to 2006. In 2007-2009 production volumes decreased to 12-11 m tons (see Table 1)⁴. The share of households in the total raw milk volume increased from 24% in 1990 to 81% in 2006. Such a rapid contraction of the farms» share was a result of transformation from the Soviet planned to the market economy (Zorya and von Cramon-Taubadel, 1999). This led to the relatively rapid increase of the households» share in total raw milk production. The generally underemployed members of rural areas used subsistence production of milk as a «social buffer» during difficult times of transformation.

-
- 2 *Commission Decision of 2 June 2008 amending Decision 2004/432/EC on the approval of residue monitoring plans submitted by third countries in accordance with Council Directive 96/23/EC* <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:143:0049:0054:EN:PDF>
 - 3 *Meeting the relevant animal and public health conditions is another prerequisite. If a country meets these criteria it can obtain a third country status that allows it to export dairy products to the EU. You can find the list of such countries on https://sanco.ec.europa.eu/traces/output/listsPerActivity_en.htm. See also point 3.1 of this paper.*
 - 4 *Dairy processing companies are questioning official figures because of the high share of household production.*

Table 1. RAW MILK PRODUCTION

	1990	1995	2001	2002	2003	2004	2005	2006	2007	2008	2009
Cows in milk, m head:											
Dairy farms	6.2	4.6	1.7	1.4	1.1	0.9	0.9	0.8	0.7	0.6	0.6
Households	2.2	2.9	3.2	3.3	3.2	3.0	2.8	2.7	2.4	2.2	2.1
Total	8.4	7.5	4.9	4.7	4.3	3.9	3.6	3.4	3.1	2.9	2.7
Fluid Milk, m t:											
Dairy farms	18.6	9.4	3.6	3.5	2.7	2.5	2.6	2.5	2.2	2.1	2.2
Households	5.9	7.8	9.8	10.7	11.0	11.2	11.1	10.8	10.1	9.7	9.4
Total	24.5	17.3	13.4	14.1	13.7	13.7	13.7	13.3	12.3	11.8	11.6
Yield, t/cow:											
Dairy farms	3.0	1.9	2.1	2.2	2.1	2.5	2.9	3.2	3.1	3.4	3.9
Households	2.7	2.7	3.1	3.2	3.2	3.4	3.6	3.9	3.8	3.9	4.1
Total	2.9	2.2	2.7	2.9	2.9	3.2	3.5	3.6	3.7	3.8	4.1

Source: State Statistics Committee of Ukraine, 2008-2010

The dominance of households» in the total raw milk supply poses a significant challenge for the future development of the dairy sector. Households cannot capture economies of scale in production. This adds costs to the dairy sector, making it less competitive. For example, individual households cannot guarantee large volumes to input suppliers. Thus, either they cannot receive a discount on volumes and have higher production costs, or purchase cheaper, often of worse quality inputs.

The production of raw milk follows a seasonal pattern. Prices also follow the pattern of supply and demand forces on the market. This has a big impact on dairy processors» strategies and costs. In summer time there seems to be enough supply and quality of this milk could be reasonably controlled. However in winter-time the supply falls dramatically, so processors are ready to pay more even for milk of worse quality, just to ensure enough raw material supply. This certainly adds to processors» costs.

Moreover, households in great extent contribute to supply fluctuations compared to dairy farms. The reason is that households cannot guarantee a stable supply all the year round as they do not

have enough herd size to plan with. Another reason is the lack of managerial skills on farms. That means that farmers do not have enough proficiency to organize unwavering supply of milk during the year⁵.

INVESTMENTS

Investments into dairy farming are characterized by long pay back periods. It is about 10 years under current price ratios and capital markets in Ukraine⁶, far too long to stimulate significant flows of investment.

The Government puts a lot of emphasis on the promotion of the livestock sector, e.g. in its National Rural Development Support Program up to 2015 the sectoral dairy livestock development objectives have been defined. The main tasks of the program are: dairy livestock increase up to 4,400,000 heads, in particular, in dairy farms from 700,000 to 1,800,000 heads; cows» productivity raise up to 4,300 to 4,500 kg of milk per cow; milk production increase up to 20 million t per year; production quality improvement.

Among the instruments of the implementation of the government livestock promotion, the program mentions investment mechanisms improvement as well as development and creation of modern dairy farms. For this purpose, the government intends to provide some budget funds for dairy farms for reconstruction, technical re-equipment and introduction of modern processing technologies in dairy enterprises.

SUBSIDIES TO DAIRY FARMS: VAT REGIME

In 2009 was adopted a new subsidy mechanism for dairy and meat producers and zero VAT rate was cancelled. The amount of VAT to be paid to processing enterprises would be transferred to a Special Fund of the State Budget of Ukraine and subsidies to dairy and meat suppliers would be paid according to herd size. According to the new mechanism, subsidies of about UAH 600-1300 would be paid per animal head instead of the accumulated VAT of 20% from the sum of delivered milk and meat on special accounts. The old subsidy mechanism, according to which VAT received by food processing enterprises from selling dairy and meat products is saved on a special account and paid to agricultural producers selling their unprocessed milk to processing enterprises, will be in force until January 1, 2011.

Assuming that the Ukrainian dairy sector overcomes current bottlenecks and increases productivity by rising investments, it has the potential to become an important player on export markets. It is therefore interesting to look at the specific opportunities of the EU and beyond to broaden the actual export structure.

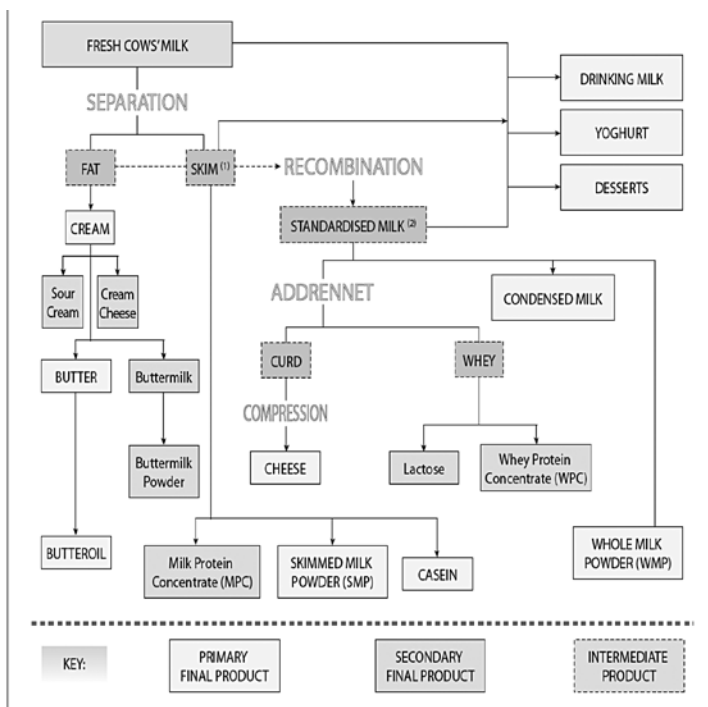
5 Nivjevskij, O. and von Cramon Taubadel, S., (2008): *The Determinants of the Dairy Farming Competitiveness in Ukraine. Presented at the XIIth Congress of the European Association of Agricultural Economics 26-29 August 2008, Ghent – Belgium.*

6 *Insider information from dairy business operators.*

2. THE DAIRY SECTOR IN THE EU

With 20-25 % of total world supply, the European Union (EU) is the largest milk producer worldwide. Cows are milked in every single member state of the EU, and dairying is one of the most profitable branches of EU agriculture. More specifically, the dairy sector is the EU's number one single product sector in terms of value at approximately 14% of agricultural output. At farm level, EU milk production was worth about EUR 43 billion in 2004 whereas the EU's dairy processing sector has an annual turnover of ca. EUR 117 billion (EUROPEAN COMMUNITIES, 2006). Thus, dairying plays a key role in the EU's agricultural sector with enormous impact on both farm households and the food industry.

Figure 5: PRODUCTS MADE FROM DAIRY COWS» MILK



⁽¹⁾ SKIM = protein + other solids (lactose + minerals) + water

⁽²⁾ STANDARDISED MILK = of a fat content adjusted by the addition of skim or cream

Source: Trevor Smith - dairy industry consultant

Source: *European Communities, 2006: 7.*

Besides fresh cows» milk as key input, the dairy sector deals with three different product categories, namely primary final products, secondary final products and intermediate products. These are depicted in Figure 5, which schematically illustrates the general production processes and workflows. In this respect it is worth mentioning that nearly 40 % of EU milk is consumed as cheese and that more than 75 % of EU cheese is produced in Germany, France, Italy and the Netherlands.

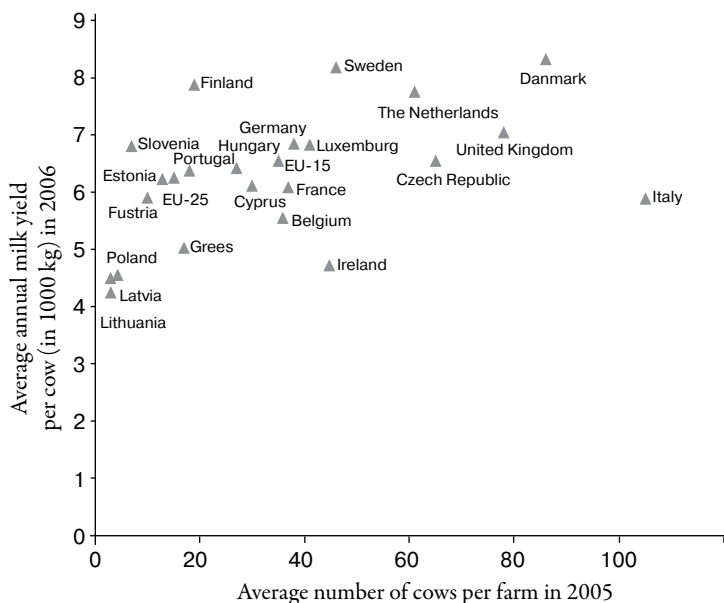
An important feature of the EU dairy sector is the relevant regime of the Common Agricultural Policy (CAP). It stands for large-scale market intervention. Since 1984, e.g., the EU operates a milk quota scheme as a supply control measure to limit the volume of milk produced. Allocations are fixed at individual producer level and there is a difference in quotas for deliveries to processors and direct sales from the farm. The quantities of milk up to the individual farmer's specific quota benefit from full market price support whereas over-quota volumes will be penalized by a so called «super levy». Generally speaking, the overall amount of quota for 2007 for the EU-27 (142 million tons) exceeds total EU-27 deliveries (~133 million tons) to dairy processors. But even when factoring the quotas for direct sales from the farm into the equation, there is a huge difference. The 2006/07 quota year saw an undershoot of almost 2 million tons. By 31 March 2009, total milk production is estimated at 4.2% below the overall quota. (EUROPEAN COMMISSION, 2008a: 27). Nonetheless, even if the quota margins allow for no direct limitation effect on cumulated output quantities throughout the EU, this policy instrument can be rather harmful to individual farmers in particular member states. After all, it puts additional costs (to purchase additional quota) on those who intent to increase their output. From a macro-economic perspective, this implies that the quota system impedes structural change. Moreover, it encourages rent-seeking behavior and weakens competitiveness. This means that despite positive market price incentives, individual farmers might not be able to increase their production. Consequently, this circumstance can impact milk supply and dairy commodity markets. It also explains why individual member states might not fulfill their respective quotas.

But besides agricultural policy measures, however, herd size, management decisions as well as geographic or climatic factors also impact final production figures on the farm level. Milk yields per cow increase steadily in every member state and overall EU dairy production continues to follow a trend towards greater intensification. Since the introduction of the milk quota, the number of dairy farms has declined by 72 % but individual production units have become larger and more specialized. Today, the EU-25's 1.6 million full-time dairy farmers face a growing urge to invest into new technologies in order to increase their scales. This is accompanied by the need for cost-cutting larger sized units, both in the plant and livestock area (VAN DEN HAM and DE HOOP, 2006).

The EU's milk producers form a rather heterogeneous group with regard to size and output. Figure 6 offers a snapshot perspective with regard to farm structures in the dairy sector throughout the EU.

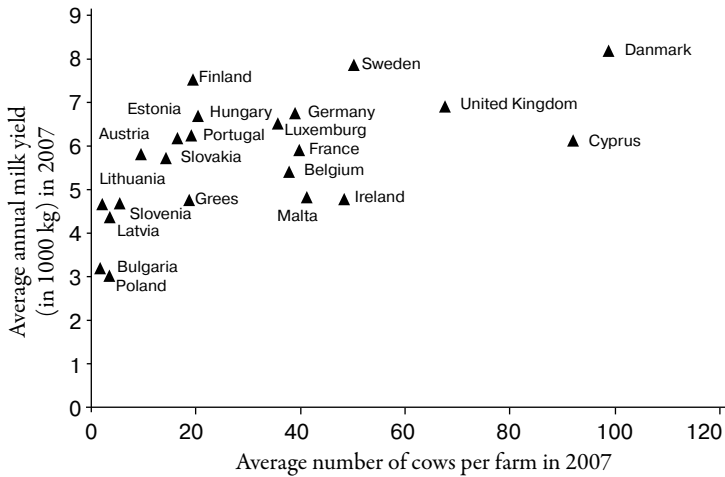
Given that year-to-year changes are more or less gradual, the illustration underlines that there are significant differences between the individual member states. In the upper right corner of the scatter plot we find those countries whose dairy farms are on average the most productive ones. They show a high number of animals per farm as well as a high output level per cow. It also becomes clear, however, that the two EU member states with the highest production volume of cows» milk, namely Germany and France (cf. Figure 8), obviously do not have the most productive dairy farms on average.

Figure 6-1: AVERAGE MILK YIELD AND COW STOCKING IN EU MEMBER STATES (2005)



Source: Own presentation. Data: ZMP, 2007.

**Figure 6-2: AVERAGE MILK YIELD AND COW STOCKING
IN EU MEMBER STATES (2007)**



Source: Own presentation based on Eurostat data, 2010. Data: Production and utilization of milk on the farm (annual data) and Livestock: Number of farms and heads by size of farm (UAA) and LFA status.

A general survey regarding the development of the dairy sector in the EU is given in Table 2.

«Relatively high delivery ratios (89.6 % in 2006, 91.3 % in 2015) for milk point out that the main income on EU dairy farms is generated from supplying milk to a dairy processor (farmer-owned cooperatives as well as private companies). Of course, there also are dairy farmers, who sell their milk and farm-made dairy products directly to consumers (ca. 1.8 million tons of raw milk). In addition, on-farm milk consumption accounts for ca. 22% of total production in the member states of the EU from May 1st, 2004 (EU-10) and more than 73 % of total production in Romania and Bulgaria (EU-2), whose agri-food sectors still cope with subsistence farming to a certain extent» (EUROPEAN COMMISSION, 2008a: 27).

**Table 2: MILK PRODUCTION, DELIVERIES AND DAIRY HERD
IN THE EU-27, 2005-2014**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total production (mio t)	148.1	148.0	148.7	147.4	147.5	148.2	148.7	149.6	149.8	151.4
of which EU15	119.6	119.7	120.2	119.4	119.6	120.4	121.3	122.2	122.5	124.3
of which EU12	28.5	28.3	28.5	28.1	27.9	27.8	27.4	27.5	27.3	27.1
Deliveries (mio t)	132.6	132.9	133.6	132.7	133.1	134.0	134.8	135.9	136.4	138.2
of which EU15	113.9	114.1	114.6	113.8	114.1	114.9	115.9	116.8	117.1	119.0
of which EU12	18.8	18.8	19.0	18.8	18.9	19.1	18.9	19.1	19.2	19.2
Delivery ratio (in %)	89.6	89.8	89.9	90.0	90.2	90.4	90.6	90.8	91.0	91.3
of which EU15	95.2	95.3	95.3	95.4	95.4	95.5	95.5	95.6	95.8	95.7
of which EU12	65.0	66.3	66.8	67.1	67.9	68.6	68.9	69.7	70.3	70.8
Fat content (in %)	4.04	4.04	4.04	4.04	4.05	4.05	4.05	4.05	4.05	4.05
Protein content (in %)	3.34	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36
Milk yield (kg/dairy cow)	6093	6124	6200	6277	6346	6426	6520	6629	6693	6753
of which EU15	6654	6690	6745	6817	6880	6941	7033	7121	7154	7173
of which EU12	1501	1509	1623	1693	1763	1861	1928	5069	5196	5325
Dairy cows (mio heads)	24.3	24.2	24.0	23.6	23.2	23.1	22.8	22.6	22.4	22.4
of which EU15	18.0	17.9	17.8	17.5	17.1	17.3	17.2	17.2	17.1	17.3
of which EU12	6.3	6.3	6.2	6.0	5.9	5.7	5.6	5.1	5.3	5.1

Source: European Commission, 2009a: 36.

Milk production is projected to exceed the 2007 level by 2.3% in 2015 at 151 mio t, but EU-12 supply is foreseen to decline to 27 mio t (-4.2%) driven by a steady decrease in subsistence production. On the other hand, the proportion of milk delivered to dairies is foreseen to expand over the medium term, particularly in the EU-12 (+6.7%), leading to a 4% increase in milk available for processing by 2015 to the level of 138 mio t (EUROPEAN COMMISSION, 2009a: 36).

Furthermore, Table 2 shows that the number of dairy cows is being reduced throughout the EU. The EU-27 dairy herd is projected to decline from ca. 24 million heads in 2007 to roughly 22

million animals by 2015. This is mainly driven by cutbacks in the EU-12 as a result of continued restructuring of the local dairy sectors. However, milk yield per cow increases steadily with the Friesian-Holstein being the most prevalent breed in the EU. Figure 7 offers further exemplification. In general, the developments indicate that farmers» practices change towards specialization and intensification of dairy production rather than towards an increase in herd size.

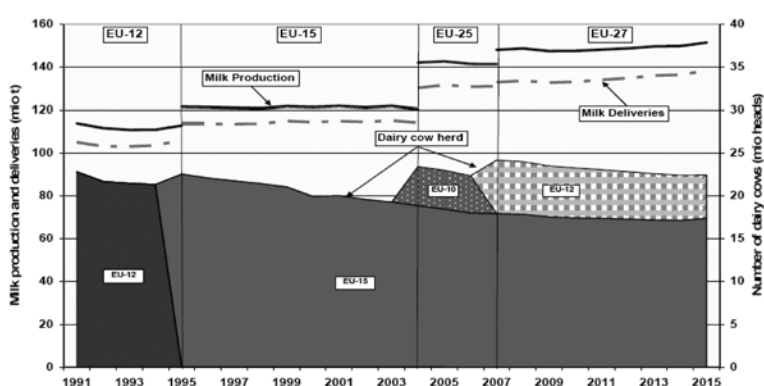
Taking advantages of larger units is not only unavoidable on the farm level. As processors observe a certain polarization on the dairy markets, further concentration as well as mergers and acquisitions all are key issues for EU dairies as well.

They represent ca. 15 % of the turnover of the food and drinks industry in Europe and employ about 13 % of the total workforce. In 2007, the European dairy industry has processed approximately 133 million tons of raw milk. Its output is used for human consumption and for the production of a broad range of food, feed and even pharmaceutical products.

The EU dairy industry is well-known for the quality of its products. Besides an ample variety of cheeses there is also a wide range of creams, yoghurts and other specialties. However, most internationally traded milk products are standardized mass goods, whose prices depend to a large extent on raw material input costs. For this part of the market, a good number of dairies follow a strategy which is to offer homogeneous products with a quality far above average, while achieving cost leadership by minimizing collection, production and marketing expenses.

On the other side, market shares for specialty products have been successfully obtained by EU processors which follow a clear differentiation strategy. This involves meeting the highly assorted demand of rather affluent buyers. It can be achieved through market segmentation and by making use of a responsive marketing concept. This aims at the gain of supplier competence through special product characteristics and production processes.

Figure 7: OUTLOOK FOR THE EU MILK PRODUCTION, DELIVERIES AND DAIRY HERD, 1991-2015



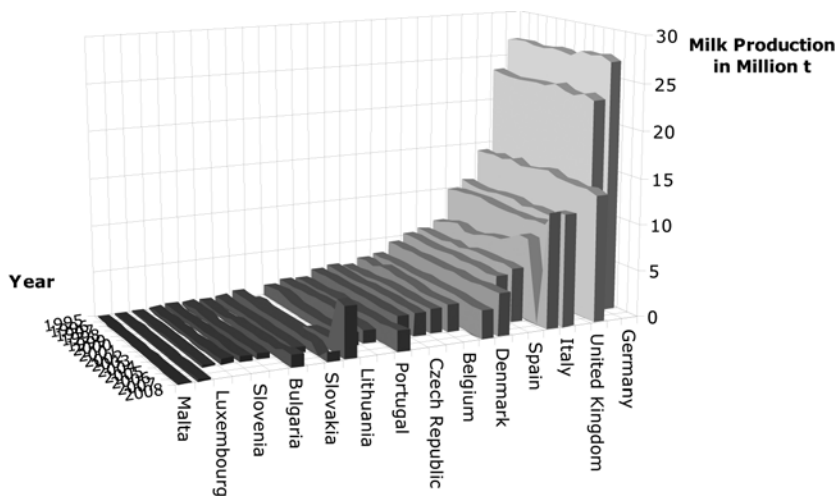
Source: European Commission, 2009a: 24.

Consequently, the majority of cow milk in the EU is produced on an industrial scale by commercial dairy farms using automated milking equipment and following a strict total quality management. This is required not only by legally binding regulations on the EU and national levels (see chapter 2) but also as a consequence of specific supply contracts offered by most dairies and other processors that act increasingly multinational.

Figure 8 depicts the regional distribution of milk production in the EU from 1995 to 2008.

The diagram indicates that the quantity of produced milk remains more or less stable in any of the individual member states – with Poland being the only exception. The overall effect is due to the milk quota system, which has effectively limited the amount of milk EU dairy farmers produce each year. Among the largest producers, only Poland has managed to receive significant expansions of its national quota volume compared to pre-EU accession production levels. Most new member states from Central and Eastern Europe have received quotas according to their production volumes in the years before accession (in case of Romania the increase is due to missing data before EU accession 2004).

Figure 8: MILK PRODUCTION IN EUROPEAN COUNTRIES SINCE 1995



Source: Own presentation. Data: EUROSTAT 2010.

Table 3. MILK PRODUCTION IN EUROPEAN COUNTRIES IN 2007-2008, THS TONS

	2007	2008
United Kingdom	14073.00	13722.11
Poland	-	12445.00
Italy	11924.84	12115.76
Romania	5667.00	5494.00
Denmark	4618.60	4656.00
Sweden	2985.86	2986.62
Portugal	2092.43	2141.88
Bulgaria	1327.46	1316.04
Slovakia	-	1066.31
Cyprus	183.48	194.98
Malta	43.42	42.80

Source: Eurostat 2010.

Note: The only available information for EU-27 countries since 2006. Category: Production and utilization of milk on the farm (annual data). Last Eurostat update was made on June 6, 2010.

Compared to its geographical size, the Netherlands are especially powerful milk producers with a slightly larger production than Italy. According to the European Commission's Directorate-General for Agriculture and Rural Development «[t]he United Kingdom, Sweden, Finland and Hungary continue to show a production pattern which is structurally below quota. In France restrictions on quota reallocation have been relaxed in order to encourage a better use of production quotas.» (EUROPEAN COMMISSION, 2008a: 27)

On the processing side, along with the stabilization of raw milk supply there has been a constant shift towards products with a higher value added and away from bulk commodities over the last years. Due to the reduction of intervention prices of butter there is less incentive for the industry to get involved with this product. Despite a preceding reduction of intervention prices of SMP, 2007 has seen a notable increase in the production levels of SMP which were triggered by rather strong price movements. An increased demand for cheese has led to an expansion of capacities in this business area. As can be seen in Figure 8, this automatically has led to a reduction of WMP production. Lower casein production has also made alternative use of proteins possible.

Starting from this overview on European dairy production, the following chapter will closely examine the EU's dairy market policy with regard to prices, quantities, and quality regulations. In addition, quality measures introduced by the food industry are summarized. Chapter 3 then analyzes current market trends within the EU, especially with regard to the vertical integration from farm level production to the retail store. Chapter 4 presents short- and long term forecasts for world dairy markets; chapter 5 concludes with regard to potential market opportunities for Ukraine in the EU and elsewhere.

3. DAIRY MARKETS, POLICIES AND REGULATIONS IN THE EU

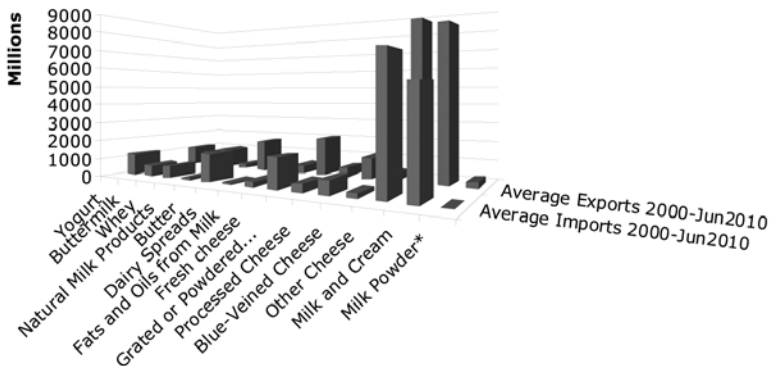
3.1 *European imports and exports of dairy products*

the EU is the largest single market in the world and at the same time qualifies as one of the largest agricultural exporters in the world. Due to the growing liberalization of world markets and the continuing European integration, agriculture in the EU is undergoing constant restructuring in order to meet the demands of global competition. The competitiveness of market participants is dependent on efficient production and marketing processes. Apart from that, it is also determined by process efficiency on the input supplying (farm), and output demanding (retail) level to a large extent.

The EU is a net exporter of all dairy product categories that are included in the so called Harmonized System (HS). But even at the HS6 level, intra-industry trade plays an important role, especially for the cheese, buttermilk, milk, and cream categories. Here, import volumes sum up to roughly EUR 1 billion. The values displayed in Figure 9 represent averages of the years 2000- June 2010 in order to control for yearly fluctuations in trade volumes.

Figure 9 shows imports and exports of various dairy products (HS6 categories) of the EU in million EUR value. According to this graphical presentation, cheese, milk and cream are by far the most important products of EU imports and exports.

Figure 9: EU IMPORTS AND EXPORTS IN MILLION EUR



Source: Own presentation. Data: Eurostat 2010.

Note: Data for Milk Powder trade finish with 2007.

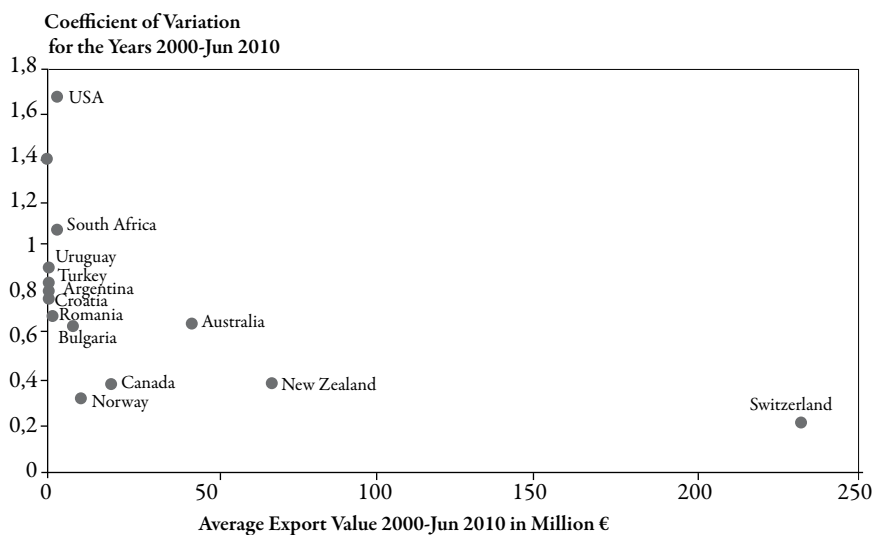
Figure 10 and Figure 11 break cheese exports and imports of the EU further down. To be able to compare the volatility of exports and imports without having to plot entire time series, we use the coefficient of variation as a simple measure. The coefficient of variation is defined as follows:

Coefficient of Variation = Standard Deviation / Arithmetic Average.

Figure 11 presents EU exports of cheese during the period 2000- June 2010. Surveyed in detail, Figure 11 underlines the fact that the EU truly is a global player on world dairy markets. As such, the EU heavily protects its own markets. The only exception would be a few specialized imports from a small number of destinations: Figure 10 shows that the EU buys cheese from a comparatively small source of import destinations – 14 countries account for 99% of all EU cheese imports during the time period from 2000 to June 2010. The remaining 1% of cheese imports origins from 55 other countries that occasionally export only small amounts of cheese to the EU.

The EU received stable streams of cheese imports from few destinations, namely Switzerland, New Zealand, Australia, Canada and Norway during the last ten years. In this regard, the larger coefficient of variation demonstrates that the annual quantities of other countries» imports have been subject to much stronger fluctuation.

Figure 10: CHEESE IMPORTS BY THE EU IN MILLION EUR

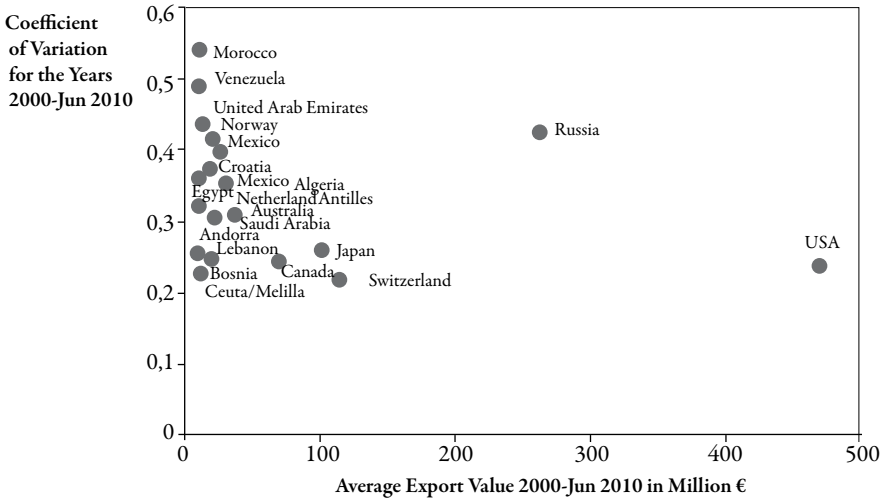


Source: Own presentation. Data: Eurostat 2010.

Note: In the period 2000-Jun 2010 in total 71 countries have exported to the EU, but the 14 countries displayed here account for 99.5% of total EU imports of cheese in this period.

On the other hand, considering cheese exports out of the EU, the Union's most important trading partners are depicted in Figure 11. The 20 countries displayed in Figure 11 only account for 88 % of EU exports. This implies that EU exports also satisfy the comparatively stable and constant domestic demand from a number of significant nations. At the same time the EU exports cheese to almost all other countries, in total 200 export destinations.

Figure 11: STRUCTURE OF EU CHEESE EXPORTS



Source: Own presentation. Data: Eurostat.

Note: In the period 2000-2007 more than 200 countries have imported from the EU, but the 20 countries displayed here accounted for 88% of total EU exports of cheese in that period. In 2008-Jun 2010 exports to displayed countries was 85% not accounting for intra EU-27 exports.

Trade with non-EU Countries is subject to the so called Most Favoured Nation (MFN) tariff unless other, bilateral agreements apply. These import tariff rates as well as all other tariff-related taxations at EU-27 borders are common for all member states and cannot be changed by them individually. In addition, individual member states have no right to add further tariffs on top of the existing ones. And of course, all these regulations have to be in line with the agriculture agreement of the World Trade Organization (WTO).

Various countries have received tariff rate quotas for the export of dairy products into the EU. Once these quotas have been negotiated, e.g. as part of FTA negotiations between two countries,

the EU issues these quotas (e.g. first come/first served principle) and practical implementation then happens through each country's border and trade administration: Individual member states issue import or export licenses that are administered through their respective customs agencies that function as point of contact for importing companies.

Despite a wide range of tariff preferences that have been granted to non-EU countries, the actual list of importers that are allowed to deliver dairy products to the EU is small (see Figure 12) and the Ukraine is currently not part of it.

Figure 12-1: LIST OF COUNTRIES CURRENTLY PERMITTED TO EXPORT DAIRY PRODUCTS INTO THE EU, 2008

Argentina	Australia	Canada
Chile	China	Croatia
Iceland	Israel	Kenya
Macedonia	Mexico	Netherlands Antilles
New Zealand	Russian Federation	Singapore
South Africa	United States	Uruguay

Source: Own presentation. Data: EUROPEAN COMMISSION, 2008b.

Figure 12-2: LIST OF COUNTRIES CURRENTLY PERMITTED TO EXPORT DAIRY PRODUCTS INTO THE EU, June 2010

Argentina	Australia	Canada
Chile	Croatia	Iceland
Israel	Macedonia	Netherlands Antilles
New Zealand	Russian Federation	Singapore
United States	Uruguay	

Source: Own presentation. Data: Third Country Establishment, List per Section.

Section IX : Raw milk and dairy products PDF Documents (last change date)

https://sanco.ec.europa.eu/traces/output/listsPerActivity_en.htm#

Compared to 2008 four countries fell out of the list: China, Kenya, Mexico, South Africa. When a country is suspected in lower quality, imports from it is temporarily banned until the situation

becomes more clear. After some „scandal« EU import check becomes stricter since reputation of the exporter is damaged. It can bet the case that a suspected country will not export to EU certain products for a long time.⁷

Figure 13 illustrates the procedure that is involved when a non-EU country is exporting products of animal origin to the EU: the competent national authority, e.g. the Ministry of Agriculture, establishes a formal contact to the European Commission and requests approval. In the next step, the EU Commission visits the country and inspects whether hygiene standards comply with EU standards. Given that the country's trade request is approved, the next crucial step is the inspection of products at the EU border through an official Veterinary Surgeon. This measure aims to determine whether the product can enter the EU market or has to be re-exported or destroyed.

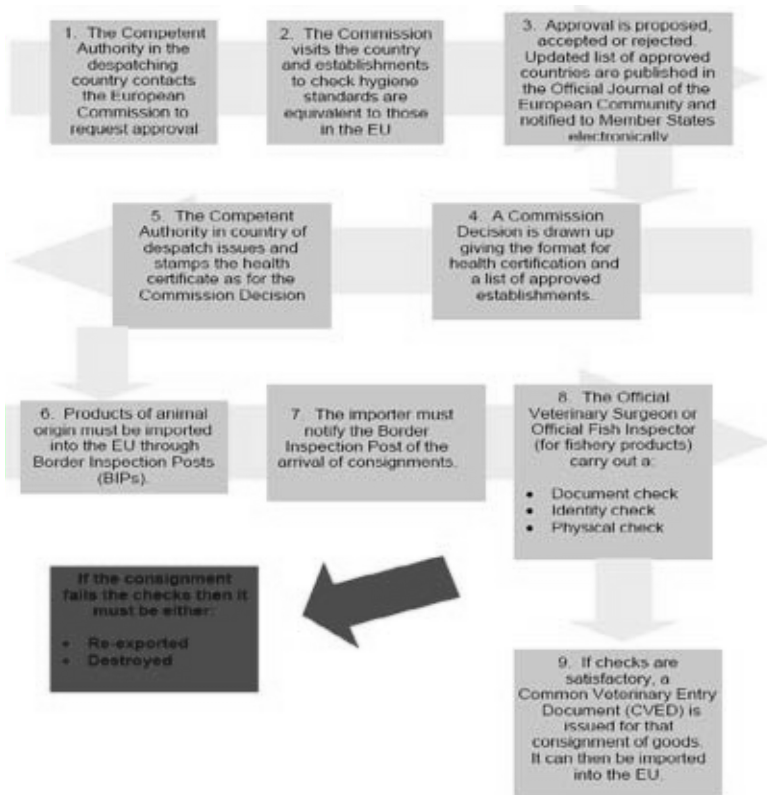
The EU Commission has published an easily accessible user guide for the import of live animals and animal products from non-EU countries. This document provides guidance to the national authorities in those countries that are interested in exporting say domestic dairy products to the EU. It is emphasized in this document that interested parties should contact the European Commission under the contact details provided in section 14 of the user guide. It can be downloaded at:

http://ec.europa.eu/food/international/trade/guide_thirdcountries2006_en.pdf

The preceding explanations underline that the EU is open for and interested in receiving imports from non-EU countries. Imports to the EU require that a consumer or a company within the EU is willing to buy the relevant goods and that the various quality criteria are matched. Especially in times of high international food prices, exports to the EU are likely to become easier than in times of low prices. On the other hand, exporters of dairy products from non-EU countries should anticipate that market conditions within the EU reflect the market situation outside the EU only partially. This is due to the system of the CAP. Understanding markets for agricultural products and especially for dairy products within the EU therefore requires understanding the goals, instruments, and future directions of the CAP.

7 *Fe in October 2008 high levels of melamine were found in infant milk and other milk products in China. Kenya put the ban on Chinese milk imports after melamine was discovered. However, EU checked Kenyan milk products for melamine. http://ec.europa.eu/food/animal/bips/docs/special_import_conditions.pdf (see last cell – Ukraine).*

Figure 13: PROCEDURE FOR THE EXPORT OF PRODUCTS OF ANIMAL ORIGIN TO THE EU



Source: UK Government 2008; Sitpro Ltd, 2007.

3.2 A guide to price and quantity restrictions of EU dairy products

3.2.1 Development and principles of EU agricultural policy

The initial goal of the CAP dairy market regulation has been to ensure «a fair standard of living» for farmers through stabilization of milk prices. This stabilization was meant to comprise fluctuations in terms of the absolute level of milk prices as well as in terms of variations over time that could potentially harm individual milk producers.

The EU milk and dairy policy is often associated with the quota system that controls output of raw milk at the farm level. Despite being important for farmers, however, this regulation is by far not the only important regulation of EU dairy markets. Furthermore, economic analysis suggests that output quotas are effective if consumption and production are limited in order to keep the market price up.

An analysis of the system of EU dairy markets shows, however, that the market price for milk at the farm level is not primarily induced by the output quota system because the quota level has been set well above domestic consumption. In fact, the main reason for the introduction of the quota system in the year 1984 has been the political goal to limit surplus production. Moreover, the quota system has not primarily been introduced in order to raise prices. The following paragraphs explain the complicated system of EU dairy and milk market regulations.

Due to the fact that milk itself is tradable only within limited ranges of distance, but products made out of milk are easily tradable and storable, EU regulations had to control trade with the latter in order to reach to their goal of protecting markets that are directly relevant for farmers. The EU milk and dairy policies therefore cover a wide range of products and apply individual measures to each. The legal framework is established in the Council Regulation (EC) on the common organization of the market (CMO) in milk and milk products. It covers:

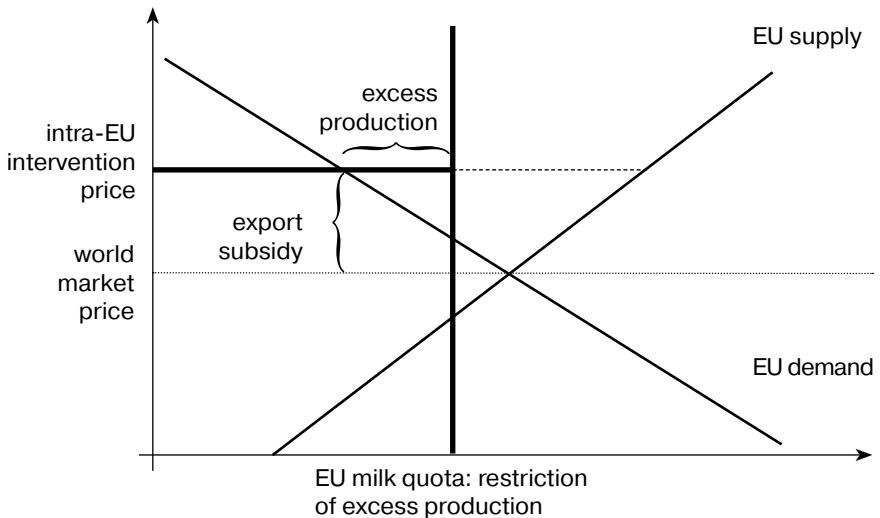
1. milk and creams;
2. buttermilk, yoghurt and kephir;
3. whey;
4. butter and other fats;
5. cheese and curd;
6. lactose and lactose syrups;
7. preparations used as animal feed.

3.2.2 The system of price interventions

The CMO provides a system of EU market interventions. Figure 14 illustrates this system for any given dairy product: The EU buys quantities of a certain product until a specific target price is reached. This ensures that the domestic EU price is artificially kept above the world market price. Thus, EU exports have to be supported by tax-funded export subsidies in order to be competitive on extra-EU markets. At the same time, imports are regulated through tariffs. However, if internal markets are tight, the EU Commission may reduce or even completely eliminate import tariffs. In the past, the Commission even has occasionally charged export taxes in order to stabilize intra-EU markets.

Out of the set of common policy measures typically applied to support an industry, there is proof that price interventions have seriously negative effects: Other things being equal, price interventions are welfare-distorting, potentially terms-of-trade affecting, and the most expensive agricultural policy measures of all typically applied by governments. However, farmers tend to favour price interventions because these measures create an illusion of being independently working in a market economy, yet without having to bear the downsides such as price fluctuations and import competition. But consumers are facing higher prices than under free trade. In the end, and because of the subsidies, it is the taxpayer who pays the bill for this.

Figure 14: THE SYSTEM OF PRICE INTERVENTIONS



Source: Own presentation.

All measures described refer to EU law that is executed by individual member states. In addition, EU law provides the common denominator for all regulations. But to certain extent, individual member states are free to add their own regulations. Following is a list of individual specifications for key dairy products.

- **Butter**

Agencies buy up butter at 90 % of the intervention price during the period 1 March to 31 August of any year. In addition, private storage is subsidized if salted or unsalted butter produced from cream or milk is bought. The amount of aid is not fixed but varies according to storage costs and price trends

- **Skimmed Milk Powder (SMP)**

Agencies buy in at the intervention price between 1 March and 31 August. The Commission may suspend intervention if the quantities offered exceed 109 000 tonnes.

- **Cheese**

The EU subsidizes private storage of special varieties of cheese, such as Grana Padano, Parmigiano Reggiano, Provolone, sheep's and goat's milk cheese, as well as long-keeping cheeses. The aid amount is determined in the light of storage costs and probable price trends. On the other hand, the Commission may decide to sell the stored cheeses if prices are reasonably high.

Due to the fact that the intervention system creates excess supply and the output quota has been set above EU consumption levels, the EU has introduced additional laws in order to increase the domestic use of milk or to facilitate sales of milk at EU market:

- **Special marketing aid**

There is a special marketing aid for producers of skimmed milk and SMP used for animals, casein, and purchase of cream, butter and concentrated butter by non-profit bodies, by manufacturers of certain food products and for direct consumption.

- **School milk**

In order to increase the amount of milk consumed by children in schools there is a financial aid package for the distribution of school milk. Recently, the commission has proposed to extend the system of subsidized school meals on fruit and vegetables in order to increase domestic consump-

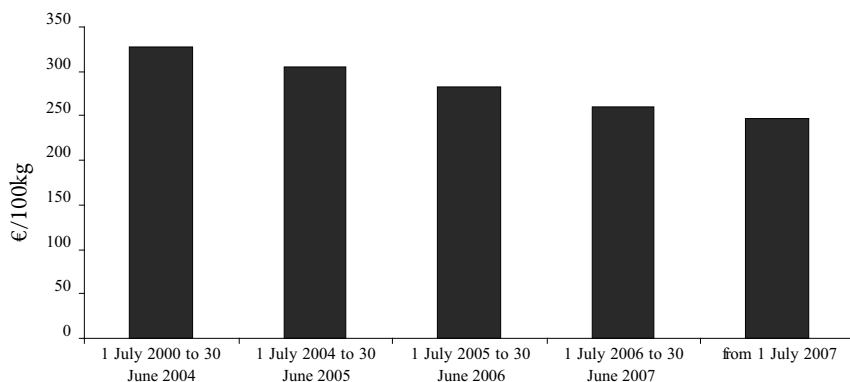
tion and in order to have children benefit from it.

In addition, **safeguard measures** may be taken if the EU market is threatened with serious disturbance by reason of imports or exports.

3.2.3 Ongoing and future reforms: «Mid-Term-Review» 2004 and «Health Check» 2008

Although it can be assumed that CAP measures in connection with the dairy sector will be subject to further reforms in the future, currently it does not seem that the EU will completely eliminate its milk market intervention policy. In addition, the various regulations with regard to veterinary standards, animal welfare and cross compliance are likely to persist and to be extended following consumer demand.

Figure 15: MARKET PRICE INTERVENTIONS FOR BUTTER SINCE THE AGENDA 2000



Source: Own presentation based on European Commission 2007b. Council Regulation (EC) No 1255/1999 of 17 May 1999 on the common organization of the market in milk and milk products is effective in 2010 meaning that intervention price for butter in 2010 is EUR 246.39 that was from 1 July 2007.

Coinciding with the start of the dairy reform in 2004, 10 new member states joined the EU. This increased the EU base quota by 18.5 million tons and added 80 million consumers. Furthermore,

in accordance with the accession agreements, a restructuring reserve of 0.67 million tons was established for eight of the new member states. This additional reserve was added to their national quotas on 1 April 2006. The next enlargement round in 2007 brought two new member states with a total quota of 4 million tons into the Union. This led to a total amount of quota for the EU-27 of 142 million tons. Thus, by 1 April 2008, further to 103 million consumers, 24.5 million tons of additional quota will have been added to the EU total since 2003.

The aim of the 2003 dairy reform was to increase competitiveness and market orientation. Reducing the guaranteed price for butter (see Figure 15) and SMP aimed at triggering a decrease of production in order to stimulate a switch of factor allocation into more value added products like cheese and fresh dairy products. By increasing the quota at the same time the Commission tried to foster additional production, which was meant to facilitate a restructuring of the sector and to encourage young farmers to enter the sector (EUROPEAN COMMISSION, 2007).

The ongoing and future political reforms of the CMO after 2003 («Health Check») currently look as follows:

after Mid Term review 2003:

- (1) Reduction in intervention prices:
 - 25 % for butter (from 328.20 to 246.39 €/100 kg), and
 - 15 % for SMP (from 205.52€/100 kg to 174.69 €/100 kg);
- (2) compensation for intervention price cuts:
dairy farmers receive a direct payment of ca. 35.5€/100 kg of quota up to the national quota in each member state in the years 1999/2000. But no later than 2007 payments had to be decoupled from production;
- (3) butter intervention not beyond 30,000 tons at fixed prices;
- (4) elimination of production quotas on 1 April 2015;
- (5) gradual quota increase of 1.5 % in three steps of 0.5 %
for 11 member states, corresponding to 1.4 million tons of milk;
- (6) reduction of the super levy for production exceeding quota levels:
four steps from 35.63€/100 kg in 2003/04 to 27.83€/100 kg
from 2007/08 onwards.

3.2.4 What is in the «Health Check»?

It seems that traditional CAP spending through price interventions and direct transfers («first pillar») has become unpopular among voters in Western Europe. So currently there even is no need for the WTO to pedal the EU to induce further CAP reforms. These reforms will not phase out spending on agriculture but shift payments towards the so called second pillar of the CAP – a budget largely flexible with regard to local initiatives and not tied to agricultural output.

The EU Commission is constantly increasing market orientation of farm policy and currently proposes the removal of most of the remaining production control mechanisms. In this line, it has been suggested to abolish dairy quotas in 2015. For instance, the Commission is currently proposing a 1 % increase in quotas for each of the next 5 years on top of a 2 % increase already agreed upon for 2008.

Besides other reforms that all target towards market orientation but are not explicitly related to the dairy sector, the Commission is also proposing to cut higher total sums of subsidies per farm («modulation») above EUR 100,000 in order to address taxpayer concerns. This will likely be done through a progressive rate starting from 3 % per EUR 100,000.

Impact of the Health Check decisions in the dairy sector

«The increase in milk production over the phasing-out period would remain well below potential, exceeding the «no health check» baseline level by 1.6% in 2014, with milk price falling 5.3% below the «no health check» scenario level. This will subsequently lead to a significant increase in intervention stocks for butter and SMP and a sharp fall in the milk producer price. Furthermore, evidence from the impact of the 2008/09 quota increase indicates that the response of milk production at the aggregate EU level remains fairly modest, despite a significantly higher average producer price for milk. The impact on milk deliveries to dairies would follow the path of milk production, exceeding the «no health check» scenario level by 1.6% in 2014. The EU producer milk price is projected to stand considerably below the high level attained during the second half of 2008 throughout the baseline period as the slow de-stocking of intervention stocks would maintain bulk commodity prices near the effective intervention price level. As a consequence, the impact of additional quotas on milk production would remain limited at the aggregate EU level.

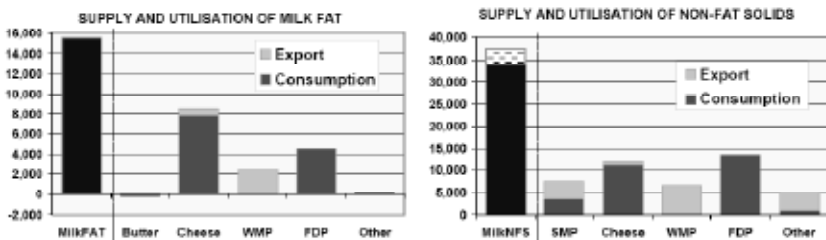
As such, under the current macroeconomic assumptions and resulting market environment, the abolition of milk quotas in 2015 would not have a significant impact with regard to milk production and milk price at the aggregate EU level. When compared to 2014, milk production is projected to increase by 1.1% in 2015 with a slightly higher increase in milk deliveries to dairies at 1.4%, while the average EU milk price would display a marginal decrease of 0.1%.

With respect to dairy commodities, the quota abolition would lead to an increase in the production of higher value-added products compared to the «no health check» scenario, responding to both domestic as well as external demand growth. Under the current projections (with quota abolition) cheese consumption and exports are projected to be higher by 3.5% and 4.8% respectively (with a 3.6% increase in cheese production) in 2015 compared to the «no health check» scenario. As regards bulk commodities, WMP and SMP production would increase by 12.8% and 5.8% respectively, while butter production would be hardly affected. Domestic consumption of SMP would exceed the «no health check» level by 5.3% in 2015, while consumption of butter and WMP would be less affected at -0.1% and +0.8% respectively. Exports would be higher by 68.4% for SMP and 26.2% for WMP by 2015, while butter exports would only grow modestly (+2.1%).

Figure 16 presents the impact of quota abolition on the supply and utilisation of milk fat and non-fat solids in 2015, in comparison to the «no health check» scenario. In terms of milk fat, the higher milk deliveries due to quota abolition would lead to an additional 15,495 tons of milk fat available for processing, of which 13,080 tons (84%) would be used for value-added commodities (cheese and fresh dairy products) and mainly for domestic consumption. WMP production would account for most of the remaining milk fat utilization with exports accounting for 15% of the additional milk fat supply.

Non-fat solids would exceed the «no health check» level by 37,482 tons of which 3,367 tons attributable to de-stocking from intervention stocks (dashed area). From the additional 34,115 tons coming from increased production, value-added output would account for 75% and almost entirely for domestic consumption. SMP and WMP production would account for 12% and 19% respectively, with a large proportion aimed at export markets» (European Commission, 2009).

Figure 16. PROJECTED IMPACT OF QUOTA ABOLITION ON THE SUPPLY AND UTILIZATION OF MILK FAT AND NON-FAT SOLIDS IN 2015



Source: European Commission: Prospects for agricultural markets and income in the European Union 2008 – 2015, march 2009

3.3 EU-regulations: Milk quality, hygiene and veterinary issues

3.3.1 Legally binding regulations: National and EU

In the previous chapters, CAP market regulations and political price interventions have been described as main elements shaping the protectionist face of the CAP. In addition to these regulations there are several quality regulations that apply to milk which is marketed or processed within the EU. These regulations can only partially be considered as protectionist with regard to imports. Instead, these regulations merely reflect the growing concern of EU policy makers to protect consumers from any harmful effect that may arise from the consumption of food produced internally or externally.

When these regulations became legally binding in the EU, a number of farms stopped production and left the sector as it would have been too costly for them to introduce sufficient technology to match the new standards. In other words: the current milk market in the EU has already been through a long period of quality adjustments and tightening of quality measures. Documentation of all actions and tasks during the production process nowadays constitutes an important and inevitable task for professional dairy operations in the EU.

Table 4: REGULATIONS WITH REGARD TO RAW MILK BEING PRODUCED ON GERMAN FARMS

Criterion	Analyzed times/month	Maximum/ml	Penalty Cent/kg
Bakteria	2	not more than 100,000 for milk class 1; above milk is downgraded to class 2	at least 2
No. of somatic cells	2	Up to 400.000	at least 1.5
Fat content	3		
Protein content	3		
Freezing point	1	-0.515 °C	according to dairy company
Residuals from Antibiotics, etc.	2	if found, company does not buy milk from this farm for one month, and until the farm can prove that the problem does not exist any more	5

Source: Landesvereinigung der Milchwirtschaft Niedersachsen e.V., 2006.

Regulations with regard to the quality of raw milk may vary slightly between member states. The following example presents the regulations for Germany as framed by the Milk Quality Act («Milch-Güteverordnung»). This directive regulates the veterinary and sanitary measures that apply to raw milk being produced on German farms. Table 4 presents the tests that dairy companies have to enforce on a regular basis if they receive milk deliveries from farms. If a farm fails to comply with any of the standards set by the Quality Act, the dairy company can refuse acceptance of further supplies.

3.3.2 Industry standards to control dairy product quality

In addition to governmental regulations within the EU, the quality of dairy products is also closely monitored by the food processing industry and the large retail chains that sell most EU dairy products directly to the consumer. Decades ago the food processing industry has started to control the supply chain of high value products through certification schemes. These schemes either document the production process or certify that specific standards and regulations are matched. Due to market pressured by retail chains and by the requirements of extra-EU markets for high quality food products, e.g. the USA, the Western European food industry has introduced such standards a long time ago.

In this regard, the enlargement of the EU towards Central and Eastern Europe enables useful comparisons for Ukraine because it shows how the food industry within the EU has introduced standards that comply with legal EU requirements and match the preferences of retail chains and consumers on the one hand, while dealing with the specific transitional situation of formerly planned economies on the other.

For instance, certification schemes are gaining more and more importance in Central and Eastern Europe. It has to be emphasized that these schemes are by no means legally binding requirements but often fully embrace the legal framework issued by the EU as well as the regulations added to that of the member states. Instead, certification schemes are voluntary schemes used by the food processing industry in order to give quality signals to retail chains and consumers.

The most prevalent schemes that have been introduced especially in Central- and Eastern European countries after their EU accession are described below.

ISO 9001:2000: ISO 9001 is a private standard developed by the International Organization for Standardization (ISO). It is a business-to-consumer (B2C) standard focusing on the manage-

ment system and covering all the steps in the agrifood chain except for agricultural production. ISO 9001 is a global standard with about 900,000 certificates conferred worldwide (ISO, 2006). As an industry-neutral standard also adopted in the agrifood sector, ISO 9001 does not include any sector specific aspects, such as hygiene rules (HACCP concept, for instance), sensory tests, etc.

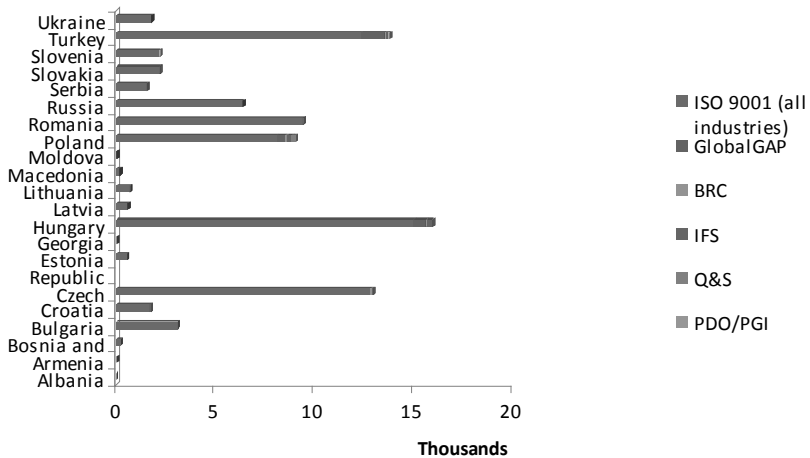
GlobalGAP: The GlobalGAP standard was developed in 1997 by retailers organized in the so-called Euro-Retailer Produce Working Group. It is a private business-to-business (B2B) standard whose main objective is the improvement of food safety by guaranteeing compliance with minimum standards. GlobalGAP focuses only on agricultural production. Just like ISO 9001, it is a quality management system audit. All in all, ISO 9001 has issued 71,125 certificates around the world (GLOBALGAP, 2008).

Q&S: In response to the BSE-crisis in the year 2000, in 2001 the private Q&S GmbH established their Q&S System to guarantee compliance with minimum standards and, in this way, signal food safety to processors, retailers (B2B) and the final consumer (B2C). Q&S focuses on the quality management system and covers the whole supply chain from agriculture to the final consumer. Most participants are still located in Germany but the number of certified farms and firms outside Germany is growing quickly; nevertheless, it can still be considered a national system (Q&S, 2008).

BRC Global Standard: Similar to some of the schemes mentioned above, the BRC Global Standard grew out of the initiative of British private label retailers. The British Retail Consortium (BRC) is the leading trading organization in the UK. The BRC Global Standard is a B2B standard guaranteeing minimum standards. It includes quality management system audits in food processing companies. It is an international scheme with about 6,000 certificates issued in Europe and about 7,300 in the rest of the world (BRC, 2008).

International Food Standard (IFS): In 2002, German retailers cooperating in the quality assurance board of the EHI Retail Institute developed the IFS. Like the BRC Global Standard, the IFS tends to cover minimum standards and addresses food processors and retailers. One main objective was the reduction of the number of audits and, therefore, certification costs. The focus is on food processors» quality management systems. As an international scheme, it has conferred about 8,500 certificates throughout Europe (TROMP et al., 2007; BUHLMANN et al., 2004; IFS, 2008).

Figure 17: CERTIFICATION SCHEMES CURRENTLY IN PLACE IN CENTRAL AND EASTERN EUROPE



Source: Own presentation based on Gawron and Theuvsen (2008).

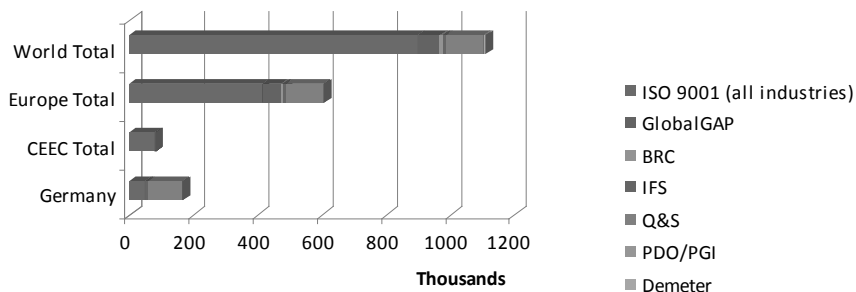
Figure 18 shows that the total number of certificates in the Central and Eastern European countries (CEEC) is still small compared to Germany, Europe and the world industry in total.

PDO/PGI/TSG: With the support of the EU, the introduction of three different systems, namely the Protected Designation of Origin (PDO) system, the Protected Geographical Indication (PGI) system, and the Traditional Speciality Guaranteed (TSG) system, started in 1992. The main objective was to differentiate food products by particular guarantees. Consumers are informed by product labels. Unlike the schemes mentioned above, the focus here is on product quality. All in all, there are 785 PDOs, PGIs and TSGs in the EU (EU, 2008C; BELLETTI et al., 2007).

Demeter: In 1994 Demeter became one of the first private ecological associations to adopt guidelines regarding the production of organic products. Similar to the PDO, PGI and TSG systems, product differentiation is its main objective. Demeter is a B2C standard and is communicated to the final consumer by a product label. Demeter mainly addresses the production process in agriculture. Certificates are conferred on producers and processors in many countries, including Hungary, Slovenia and Turkey (DEMETER 2008).

Figure 17 summarizes how certification schemes of the industry have gained importance in Central and Eastern Europe after EU enlargement.

Figure 18: TOTAL NUMBER INDUSTRY CERTIFICATION SCHEMES BY GEOGRAPHICAL REGION



Source: Own presentation based on Gawron and Theuvsen (2008).

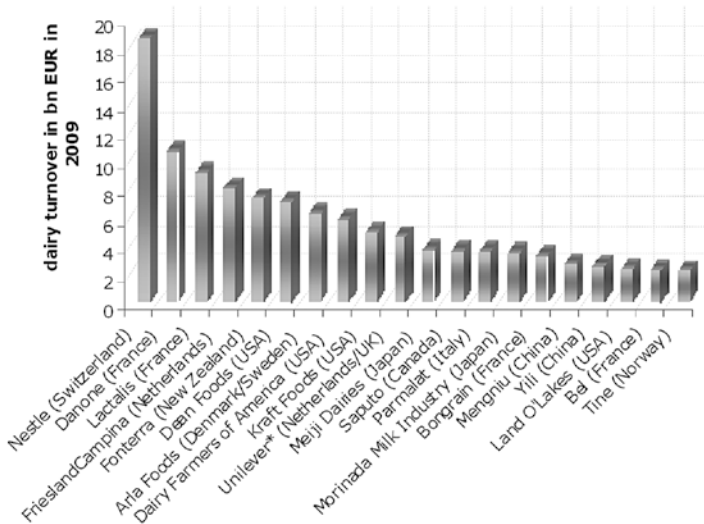
On the other hand, it can be seen in Figure 18 that slightly more than half of the world's industry certification schemes are issued in Europe, with Germany alone exhibiting more than twice as many certificates as CEEC in total.

4. CURRENT DAIRY MARKET TRENDS

Some of the world's leading dairy processors are located in the EU and carefully react towards consumer demand in order to defend or increase their market shares. These companies are confronted with fierce competition but also have a lot of know-how and many years of experience with the business.

Figure 19 gives an overview of the most important dairies in the world in 2009.

Figure 19: WORLD'S LARGEST DAIRY COMPANIES

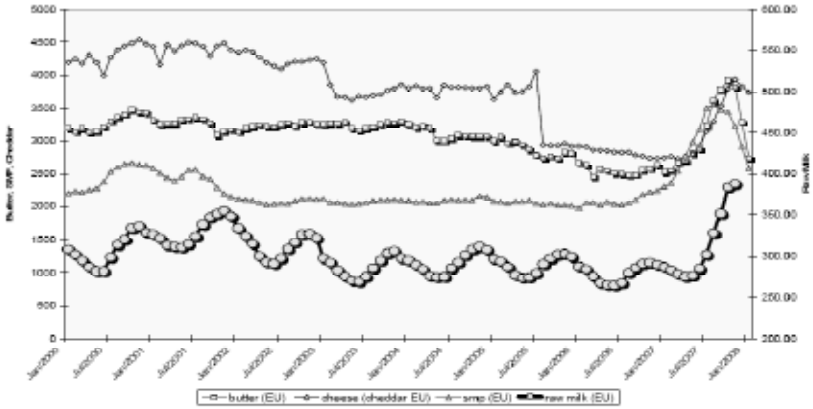


Source: Own presentation based on Rabobank: Global Dairy Top-20, June 15, 2010.

Note: Turnover data are daily sales only, based on 2009 financials and M&A transactions completed between 1 January and 15 June 2010.

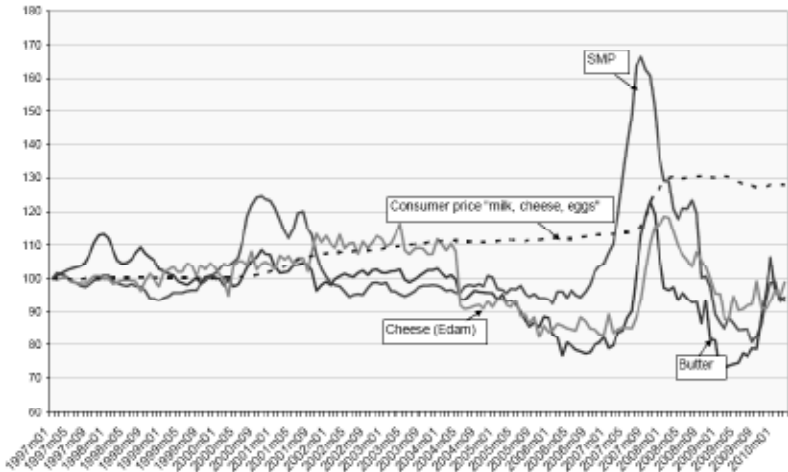
Since the start of the 2003 CAP reform, the internal market has seen a continuous reduction of raw milk prices in the EU. However, limited global supply along with strong demand for dairy products resulted in unanticipated price increases for all dairy products during 2007 till the beginning of world financial crisis in fall 2008 (see Figure 20). As a consequence there was strong competition for raw milk among the dairy producers within the EU.

Figure 20-1: RAW MILK AND DAIRY PRODUCT PRICES IN THE EU (2000-2008)



Source: European Commission, 2007b: 25.

Figure 20-2: EU AGRICULTURAL MARKET AND CONSUMER PRICE DEVELOPMENTS (JAN 1997-MAR 2010, JAN 1997 = 100)



Source: APRIL 2010 update on recent agricultural commodity and food price developments in the EU, Brussels, 20/04/2010, CMD(2010)

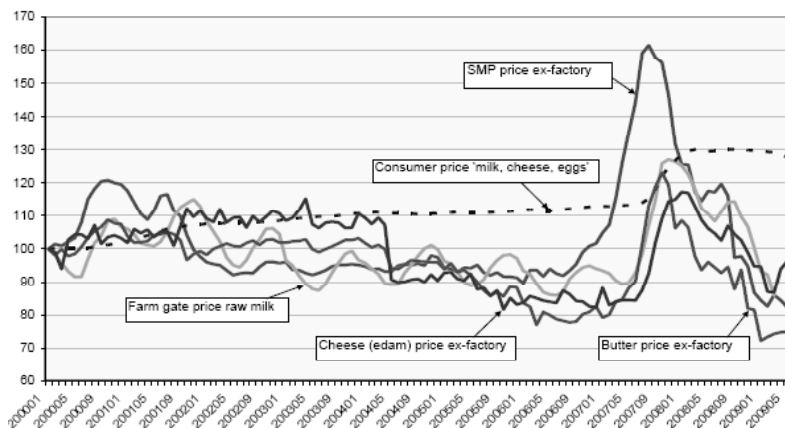
In 2009 dairy product prices declined sharply with a slight increase again in 2010.

Producer prices for EU dairy farmers are determined by a broad range of parameters, among them:

- supply and demand on the internal EU market,
- world market prices for dairy products,
- currency exchange rate fluctuations,
- quality requirements and industry standards, as well as
- policy interference and CAP measures.

Throughout 2007, domestic prices for butter, WMP and SMP remained well above the intervention buying-in price. Only cheese prices remained relatively stable during the first two quarters before starting to increase in the third quarter of 2007. The consumer prices for milk, cheese and eggs in March 2010 remained 12.1% higher than in March 2007, but were 1.8% lower than in March 2009. Agricultural market prices for skimmed milk powder decreased by 20% while butter and cheese (Edam) prices were 11% and 17% higher in March 2010 as compared to March 2007. Skimmed milk powder, butter and cheese (Edam) prices were 7%, 26% and 13% higher in March 2010 as compared to one year ago.

Figure 20-3: PRICE INDEX DEVELOPMENTS AT DIFFERENT STAGES OF THE EU DAIRY SUPPLY CHAIN (JAN 2000=100)



Source: COMMUNICATION FROM THE COMMISSION TO THE COUNCIL: Dairy market situation 2009, Brussels, 22.7.2009, COM(2009) 385 final.

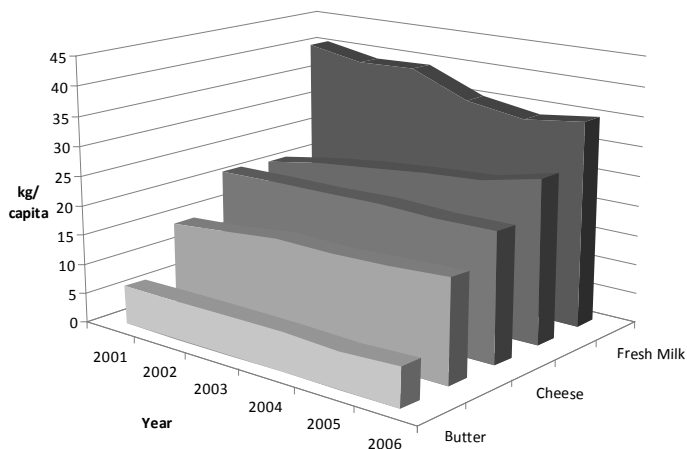
Note: The consumer prices for the «milk, cheese and eggs» category do not cover the consumer price of butter.

The short-term perspectives remain dominated by the economic crisis. Prospects for cheese and value-added fresh dairy products markets are determined by restrained EU and world demand and show a production decline in 2009 and marginal improvement in 2010 driven by a slight demand recovery. As a sufficient revival in the EU and world market prices is not expected in the short term, the accumulation of intervention stocks for butter and SMP is projected to continue in 2009 and 2010. Furthermore, export refunds can for the time being contribute to balance the EU market, although low world demand and strong competition from lower-priced exporters limit EU export potential.

Besides these current developments, some broad trends with regard to dairy products can be identified:

- Throughout the EU, consumption of drinking milk decreases.
- Consumption of butter in the EU has been continuously declining for many years.
- Milk powder consumption slowly decreases.
- Between 1995 and 2004 per capita consumption of cheese has been growing at an average rate of 1.5 % per year. Cheese consumption will continue to grow.
- Following increasing demand there is rapid growth on the markets for fresh fermented dairy products such as cream, specialized milk proteins for the food industry, and other dairy ingredients.

Figure 21: PER-CAPITA CONSUMPTION OF SELECTED DAIRY PRODUCTS IN GERMANY



Source: ZMP, 2007.

Table 5: GROSS HUMAN APPARENT CONSUMPTION PER CAPITA OF MAIN DAIRY PRODUCTS IN SELECTED EU COUNTRIES IN 2007-2008.

	2007	2008	2007	2008	2007	2008
	Drinking milk		Cheese		Butter	
Belgium	-	65.10	-	19.14	-	5.53
Bulgaria	0.87	7.98	1.09	7.08	0.05	0.28
Denmark	102.03	101.51	-	-	1.84	1.83
Germany	64.15	62.78	20.54	20.7	6.35	5.78
Estonia	116.42	120.64	18.4	16.7	3.5	4.25
Ireland	144.99	142.25	7.17	6.15	2.65	2.6
Greece	66.57	70.73	33.38	29.71	0.78	0.77
France	66.51	66.24	23.88	23.71	7.9	7.9
Cyprus	125.96	108.15	16.79	16.25	0.67	1.53
Latvia	94.00	85.64	12.84	13.03	2.32	2.55
Lithuania	144.03	-	13.63	14.43	2.56	1.56
Luxembourg	51.80	-	18.27	-	6.93	-
Hungary	81.85	70.84	8.95	9.07	0.69	0.74
Malta	79.22	75.65	21.49	22.01	0.74	0.92
Austria	71.46	72.07	17.72	18.32	5.03	4.92
Poland	70.88	103.71	18.87	18.03	5.41	4.9
Portugal	92.20	90.72	10.38	9.89	1.6	1.41
Romania	112.96	105.25	19.39	21.53	0.45	0.76
Slovakia	0.11	53.73	0	7.86	0	2.36
United Kingdom	115.65	-	10.1	-	2.64	-
Croatia	-	-	8.67	-	1.67	-

Source: Eurostat 2010.

Note: Data for 2009 are available only for Malta that consumed 76.07 kg/head of drinking milk, 22.41 of cheese and 0.81 of butter in 2009. Data for milk products consumption for the rest of EU-27 (that are not given in the table) are not available at Eurostat at all.

Interestingly, Figure 21 shows that Germany as the largest single market within the EU only follows these trends with some delay. So far, consumption levels for aggregated products remain relatively constant. But since 2000, there was a 3.1 % increase in per capita consumption of yoghurt and buttermilk products that also include processed fresh drinks. Today, aggregate consumption of these dairy foods is at 95.1 kg per capita and year (ZMP, 2007).

However, future market developments are also influenced by social factors. These lead to the following trends:

- In Western markets producers have to deal with a growing awareness of consumers with regard to health and wellness issues („light»).
- There is a growing market for less fat and low-calorie products.
- The retail store concept constantly gains importance for selling food products.
- Convenience products (e.g. cheese sticks, frozen deep-fried Camembert, Pizza etc.) are gaining market shares due to a growing number of single households and the vanishing of traditional family roles.
- Ecologically farmed and produced products are booming. E.g., the German bio-milk turnovers were 24 % higher in 2005 than in 2004.
- There is a growing demand for functional foods, such as probiotic dairy products or ACE drinks (e.g. Actimel, Yakult).

In summary, EU markets currently witness a polarization with two opposite lines of development:

1. Low-priced generics, that are **retailers» own branded products** (= private commercial labels PCL), emerge as a major market factor.
2. Expensive **premium products** emerge as a major market factor.

In this respect, Table 6 shows the market shares of own branded products (private commercial labels) in some EU member states.

Table 6-1: PRIVATE COMMERCIAL LABELS (PCL) IN LARGE EU COUNTRIES 2007

Country	Share of PCL (% of overall 2007 turnover)	Difference in prices PCL compared to manufacturer brands (in %, 2005)
Germany	35	-46
Spain	28	-44
France	27	-40
UK	26	-36
The Netherlands	24	-26
Italy	13	-26

Source: IRI, 2007.

Table 6-2: PRIVATE LABEL PRICING AND VALUE SHARE 2008

	Private Label Pricing Among Leading CPG Channels (Grocery Channel 2008)		Private Label Value Share by Country: "Staples" Categories (Grocery Channel 2008)	
	PL \$ Share	PL Discount vs Branded	Milk	Natural Cheese
Spain	32%	-38%	35%	37%
Germany	31%	-30%	54%	NA
France	28%	-40%	40%	35%
UK	27%	-51%	74%	59%
The Netherlands	27%	-25%	57%	42%
Italy	13%	-21%	13%	17%

Source: IRI Consumer Network Times & Trends Special Report: U.S. & Europe Private Label 2008 (52 weeks ending 8/24/2008 and same period prior year; IRI InfoScan).

Note: Price gap analysis based on price per volume among select key CPG (consumer product goods) categories.

In The Netherlands, the Natural Cheese category includes both Natural and Processed Cheese categories; Germany's category-level analysis excludes Aldi.

Across countries, private label offers substantial discounts versus nationally branded products. The United Kingdom demonstrates the largest price gap, at 51%, while the private label discount is smallest in Italy, at 21%. In Spain, for instance, private label prices are climbing at twice the rate of CPG products as a whole. The other force behind private label price gap fluctuation is the degree and rate of development among multi-tiered private label lines. Again, variations occur at the country level. In France and Germany, for example, private label growth is being driven by premium-level private label offerings. In contrast, value-and economy-level private label is driving overall private label growth in the United Kingdom.

Across key staple CPG products, private label is quite well-entrenched. Private label is above CPG average across nearly all categories in every country studied, except Germany. German data shown below are abnormally low because Aldi, the dominate player in the German market, is not included.

Throughout the EU, food retailing shows a high concentration (e.g. Carrefour, Tesco, Metro, Ahold, Rewe, Schwarz-Gruppe, Aldi). But this also is an issue on a global scale. Urbanization and a deepening distribution drive sales. Following is a chart (Table 3-2) of the largest global food retailers that have a third of their sales from food (sales figures are for the latest financial year and companies with their headquarters in the EU are printed in bold).

Table 7: TOP 25 WORLDWIDE FOOD RETAILERS FOR 2010

Rank	Company	Headquarters	Sales in Billions USD	No. of Stores	Countries of Operation
1	2	3	4	5	6
1	Wal-Mart Stores	United States	405.0	8,416	Argentina, Brazil, Canada, Chile, China, Costa Rica, El Salvador, Guatemala, Honduras, India, Japan, Mexico, Nicaragua, Puerto Rico, United Kingdom, United States
2	Carrefour	France	119.5	14,215	Argentina, Bahrain, Belgium, Brazil, Bulgaria, China, Colombia, Cyprus, Dominican Republic, Egypt, France, French Polynesia, Greece, Guadeloupe, Indonesia, Iran, Italy, Jordan, Kuwait, Malaysia, Martinique, Morocco, New Caledonia, Oman, Pakistan, Poland, Portugal, Qatar, Reunion, Romania, Saudi Arabia, Singapore, Spain, Taiwan, Thailand, Tunisia, Turkey, United Arab Emirates

3	Metro Group	Germany	91.1	2,127	Austria, Belgium, Bulgaria, China, Croatia, Czech Republic, Denmark, France, Germany, Greece, Hungary, India, Italy, Japan, Kazakhstan, Luxembourg, Moldova, Morocco, the Netherlands, Pakistan, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, Vietnam
4	Tesco	United Kingdom	88.8	4,835	China, Czech Republic, Hungary, India, Ireland, Japan, Malaysia, Poland, Slovakia, South Korea, Thailand, Turkey, United Kingdom, United States
5	Schwarz Group	Germany	80.6	9,902	Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom
6	Kroger Co.	United States	76.7	3,619	United States
7	Rewe Group	Germany	70.8	13,148	Austria, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Poland, Romania, Russia, Slovakia, Switzerland, Ukraine
8	Costco Wholesale Corp.	United States	69.9	560	Australia, Canada, Japan, Mexico, Puerto Rico, South Korea, Taiwan, United Kingdom, United States
9	Aldi	Germany	68.7	9,436	Australia, Austria, Belgium, Denmark, France, Germany, Greece, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Switzerland, United Kingdom, United States
10	Target	United States	63.5	1,740	United States
11	Edeka	Germany	58.5	15,072	Germany
12	Auchan	France	55.2	2,964	Angola, China, France, Hungary, Italy, Luxembourg, Poland, Portugal, Romania, Russia, Spain

13	Seven & i	Japan	54.6	26,371	Australia, Canada, China, Denmark, Hong Kong, Indonesia, Japan, Malaysia, Mexico, Norway, Singapore, South Korea, Sweden, Taiwan, Thailand, United States
14	Aeon	Japan	54.0	15,756	China, Hong Kong, Indonesia, Japan, Malaysia, the Philippines, South Korea, Taiwan, Thailand, Vietnam
15	Woolworths	Australia	41.8 est.	3,882	Australia, India, New Zealand, Germany
16	Safeway	United States	40.9	1,885	Canada, Mexico, United States
17	Supervalu	United States	40.6	2,484	United States
18	Ahold	The Netherlands	38.8	5,234	Czech Republic, Estonia, Latvia, Lithuania, the Netherlands, Norway, Portugal, Slovakia, Sweden, United States
19	Casino Group	France	37.2	10,783	Andorra, Argentina, Bahrain, Belgium, Benin, Brazil, Cameroon, Colombia, Comoros, Congo, France, French Guiana, Gabon, Germany, Guadeloupe, Kuwait, Madagascar, Mauritius, Morocco, New Caledonia, Reunion, Senegal, Switzerland, Thailand, Togo, Tunisia, United Arab Emirates, Uruguay, Venezuela, Vietnam
20	Coles Group	Australia	36.2	3,387	Australia, New Zealand
21	J Sainsbury	United Kingdom	30.1	872	United Kingdom
22	Leclerc	France	29.4	1,118	France, Italy, Poland, Portugal, Reunion, Slovenia, Spain
23	Delhaize Group	Belgium	27.7	2,732	Belgium, Cyprus, France, Greece, Indonesia, Luxembourg, Romania, United States
24	Loblaw Cos.	Canada	26.9	1,441	Canada
25	ITM (Intermarché)	France	25.0 est.	4,132	Belgium, Bosnia-Herzegovina, France, Poland, Portugal, Romania, Serbia

Source: PlanetRetail. Based on sales for calendar 2009 or fiscal year closest to calendar 2009. All sales include nonfood operations and are net sales in U.S. dollars based on full-year average exchange rates. Store counts include franchised or licensed locations and may include nonfood outlets; counts are based on PlanetRetail research, company reports and estimates. <http://supermarketnews.com/profiles/top25-2010/top-25/>

Global retailing companies are targeting consumers in developed and emerging markets of high purchasing power. Expansion strategies of these companies include considerations of demand, but also of supply within countries: If the local food processing industry is not able to meet standards and logistical requirements of these companies and transports are too costly, entering a specific country is not attractive for a large retailing corporation.

Obviously, an analysis of the EU dairy market cannot stop at the farm gate. Instead, the vertical linkages from dairy farms via dairy processing companies to the retailing stores have to be included into any analysis of the overall market situation because future trends with regard to consumption patterns and safety/quality preferences will require farmers and dairy companies to react to these trends. Retailing companies are likely to bundle consumers» preferences with regard to dairy products and can be expected to pass these preferences on to dairy companies and farmers. Given the large concentration of global retailing companies and their strategies for expansion, only large dairy companies, if any, will be left with bargaining power if prices and product quality is negotiated.

With regard to Ukraine, dairy companies that are willing to export dairy products to the EU should be aware of these trends of vertical integration within the dairy industry; these trends are typical for high income countries. For Ukraine, producing and selling raw products alone would mean to forgo opportunities with regard special dairy products of a high level of processing. In other words: exporting products that would go directly to the retail stores in Europe or elsewhere would enable Ukraine to catch a large share of the value that is added to these products during the processing stage.

At the same time, Ukrainian consumers, especially in the Kiev metropolitan area, can be expected to further develop their preferences for processed food products, organic food, animal welfare, and food safety in a similar way as consumers within the EU. The role of retailing companies can be expected to become increasingly important for the domestic market of Ukraine as well as with regard to export destinations in high income countries, and this is likely going to have similar effects with regard to price negotiations, introduction of quality certification schemes and milk quality standards as it is happening in the EU.

5. WORLD DAIRY MARKETS: OUTLOOK

5.1 Projections of world dairy markets: Caveat

The following chapter compares and discusses actual forecasts of the most well known independent institutions that frequently issue long term dairy market projections. These institutions are the Organisation for Economic Co-operation and Development (OECD), the Food and Agriculture Organization (FAO) of the United Nations, and the Food and Agricultural Policy Research Institute (FAPRI). In addition, the EU Commission and the United States Department of Agriculture (USDA) frequently issue forecasts, too. However, these institutions may not be completely independent and therefore their forecasts could be biased in order to support their own positions.

Predictions and projections should never be considered as measurements. Even market projections issued by the best economic institutes and international organizations have frequently been turned out to be wrong with regard to future events. But taking this into account, why should it be useful to look at these projections? The reason is clearly that long term market projections incorporate and condense a large amount of information about historic and ongoing market trends. Projections therefore provide a summary of what leading experts currently think about future developments. Projections therefore provide guidance on how to think systematically about likely future developments; projections should not be seen as 1:1 forecasts of reality: On the one hand, it is impossible to foresee global events, such as natural disasters, or political crisis, such as 9/11. On the other hand, it is extremely difficult to correctly forecast global gross domestic product (GDP) and population growth. However, since most long term market projections have to incorporate these forecasts as well, small deviations from reality may cause a projection to deviate significantly from what is actually going to happen in reality.

Serious predictions at best can ask «what can be expected to happen given the information we have and the assumptions we have to make». If these elements of a projection are presented in a transparent way, the projection can already be useful no matter how simple it looks because any predicted scenario should not only provide insights but also stipulate the way a reader thinks of future market trends.

The following questions should always be asked when looking at market projections:

- What is projected?
- On which assumptions is this projection based?

- Which information may not have been incorporated?
- Who executed the projection and authored the study?
- Could the initiators be motivated to influence public opinion in a certain way?

Projecting the future of world dairy markets cannot do more than assessing those factors that typically determine prices and quantities traded at national and international markets. These factors are supply and demand. It has to be clearly distinguished whether supply and demand are analyzed for dairy products in aggregate or for specific products because this determines to what extent substitution due to rising prices has to be taken into account. In general, there are few substitutes for fresh milk and processed dairy products as an aggregate, however, fat and protein derived from milk can relatively easily be generated from vegetables, e.g. soybeans. The crucial question for any forecast thus is the question to what extent quantities of demand and supply will react to price changes, and to what extent demand will be influenced by substitution effects of specific products.

With regard to the supply of dairy products, short run supply has always been limited due to the fact that a cow's daily and yearly milk yield is naturally limited. Changing the ratios and amount of feedstuff for cows is typically complicated and risky with regard to animal wellbeing. Pasture quality and feedgrain prices therefore tend to have a rather inelastic impact on European dairy production. At the same time, average herd yield gradually increases as a result of constant growth of productivity per cow due to breeding. Beyond these factors, supply increases in the EU only happen gradually through the number of heifers that are added to the herd.

Since it typically requires at least 1/3 of a year's heifers to replace herd dropouts, the maximum supply response from one year to the next would theoretically be about 66 %. This would certainly be a very fast expansion that may never be reached in reality. On the other hand, it shows that natural conditions prevent dairy supply from infinite elasticities in the short run. Of course this implies the assumption that current production is technically efficient. Otherwise, efficiency improvements can increase supply response at any time.

Farmers will base their decision on the number of heifers to be retained in the herd on expectations about future market development, opportunity cost for heifers, and farm level output restrictions due to land, labour and milk quota.

5.2 Starting projections: Situation in the years 2007/2008

With regard to the world market for dairy products, WMP plays by far the most important role and is exported mostly by the EU, New Zealand, Australia and Argentina. WMP is used to blend fresh drinking milk, but also constitutes an important input to processed food products. Butter and Cheese are mainly exported by the EU, Canada, Japan and the USA. World trade of these products remained fairly constant during recent years.

Other dairy products of a higher order of processing include much more value added than WMP, SMP, cheese and butter. These products, however, are largely traded within firms and between firms and retail stores. Comparatively small amounts of traded goods in this category can be of extremely high value. Their demand depends highly on income levels. Especially for Russia, India and China, future demand for highly processed dairy food products or products that contain a high share of milk is therefore difficult to forecast because it is not clear how the distribution of income will change along with GDP growth.

World market prices for dairy products and domestic prices in many countries have been at an all time high in mid and late 2007 and early 2008. However, trends during spring 2008 indicate that at least within the EU this development has not continued at the same pace but rather shows signs of having been reversed. In recent months, world market prices for grains and oilseeds have risen dramatically. Since grains and oilseeds represent a major cost component in livestock production, and input prices as a whole have also risen sharply, farmers' profit margins were eroded. This potentially slowed down investment into the dairy sector.

Several shocks around the globe are now seen to have created the recent shortage of milk. First, stocks had been low. These shocks have mainly been due to adverse weather conditions in major areas of production. In addition, production may have declined in some countries in favor of a shift towards arable land and crop production, partly stipulated by the demand for biofuels that are by many experts believed to have partly caused prices for feed grains to soar.

With a total output of about 670 million metric tons in 2007, global milk production is rising at moderate speed.

The leading exporting countries, Argentina, Australia, EU 27, USA, New Zealand and Ukraine currently produce about 40 percent of global milk and account for about 80 percent of global exports. Therefore, the current world market situation in the short run is dominated by supply response and exports of these countries.

However, extrapolating from currently emerging trends, the FAO identifies Asia as the dairy market that is currently growing most dynamically in terms of production expansion, but also in terms of import demand due to rising purchasing power of consumers in China, India, Indonesia, Malaysia and the Philippines.

While Ukraine currently a major exporter of dairy products has recently failed to expand its production along FAO expectations, the Chinese dairy industry continues to grow much faster than anticipated by FAO experts in the past.

In South America, dairy production has been expanding in recent years but has recently been severely affected by adverse weather conditions. The FAO and the EU Commission partly attribute the rise in world dairy prices to these adverse shocks in South America and it remains uncertain how fast Argentina's dairy industry is going to recover.

Africa is currently a subsistence producer of dairy products, neither exporting nor importing large amounts. South Africa and Kenya are exceptions in this regard and may increasingly produce for the emerging markets in urban areas on the African continent, while northern Africa, especially Algeria and Egypt, are expected to remain importers of dairy products now and in future and may, due to rising purchasing power, in the near future constitute an export destination for dairy products from Ukraine, but also from the EU.

On the other hand, especially for Africa the development of domestic policies has to be monitored closely because some countries have launched programs to increase domestic productivity of their dairy sectors, while others, especially least developed countries, may consider subsidization of their food imports in the near future and will thus create occasional export opportunities.

In the short run, world markets for dairy products will not only be determined by how much leading exporters may increase their quantities but also by the production levels in major importing countries. The FAO foresees a firm growth of Russian dairy production due to domestic programs that increase investment into dairy production. Exchange rates may play a crucial role in this regard because currencies effectively pegged or moving close to the US Dollar may continue to experience favorable export conditions. For these reasons, market and policy conditions are currently especially favorable for US dairy farmers, in absolute and in relative terms.

5.3 Projections of EU dairy markets

For dairy products, the EU commission, as well as the FAO and FAPRI, all project favourable conditions on world markets for the medium term. However, besides weather conditions that have recently decreased the quality of EU pasture, policy is perhaps the most important determinant of supply response: Output expansion due to favourable price incentives may be slowed in the short run due to output quotas. The EU has entered a gradual process of quota abolishment through quota expansion as a result of the CAP «Health Check» 2008. In the short run, intra-EU prices will therefore come down from high 2007 levels due to this quota expansion. However, according to forecasts of the Commission, this increase will, easily be absorbed by growing demand on intra-EU markets as well as rising extra-EU shipments. The Commission expects a boost especially in the production of cheese and SMP, while production of butter is expected to remain fairly constant.

Furthermore, the EU Commission expects European dairy farms to become more competitive through a gradual quota abolishment. It is likely that in fact many small farms will step out of production after the quota does not generate a rent any more. This may decrease the demand for agricultural land thus helping full-time dairy farms to cut their costs for land-lease and to become more competitive. Contrary to the Commission's view, however, there is evidence that the existence of the quota is not the only reason for slow structural change, e.g. in South West Germany or in France. Many dairy producers in these areas are already part time farmers and operate their farms based on sunk cost calculations. They do not plan to invest but at the same time do also not intent to step out of business before reaching the retirement age. According to estimates (e.g. see MORO, NARDELLA and SCKOKAI, 2005), about 25 % of German milk production comes from such farms. But it is hard to predict whether and to what extend their structural change really follows rational economic decision-making rather than being shaped by persistent personal views and path dependencies interconnected with parameters set by the family farm household.

On the other hand, competitive farmers have mobilized large sums for buying additional quota in recent years. So with regard to future investments, they are not too flexible any more since this has tied up their capital. These farmers typically operate large dairy farms with modern technology, but also have to deal with a much larger level of debt than family farms with diversified income portfolios. Recent strikes of dairy farmers can be an indication that in times of both high input and high output prices, liquidity is a concern especially for farms with a low share of equity. This leads to the conclusion that overall European dairy supply will likely grow slower than potentially rising prices may indicate.

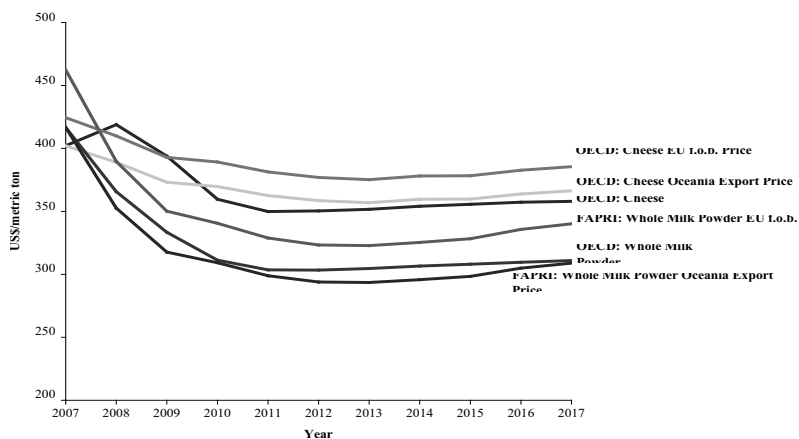
5.4 World dairy market outlook

figure 22 summarizes various long term price projections issued by FAPRI and the OECD. The graph shows that these long term forecasts are all within a similar range and indicate a stable expected path of growing world market prices in the future. Within the next 2-3 years however, world prices are expected to decline compared to relatively high 2007 levels.

The fundamental assumptions behind these projections can be summarized as follows: The ongoing global «food crisis» is expected to be solved soon after supply will have responded (e.g. weather in Argentina and Australia clears) and new 2008 harvests will take pressure from the market for feedstock. In addition, high prices for dairy products will trigger efforts of the food processing industry to substitute away from dairy products.

But in the long run, both institutions, the OECD as well as FAPRI, expect global demand for dairy products to grow slightly faster than global supply. Therefore, increasing price levels are projected. The FAO World Food Outlook is also in line with this reasoning, although this report does not present long term price projections itself. Instead, the FAO is rather concerned with changes of trade flows and quantities supplied and demanded in each region. The projected quantity changes, however, also correspond to the general conclusion that due to rising incomes and changing consumer preferences global demand is going to grow faster than global supply in the medium term.

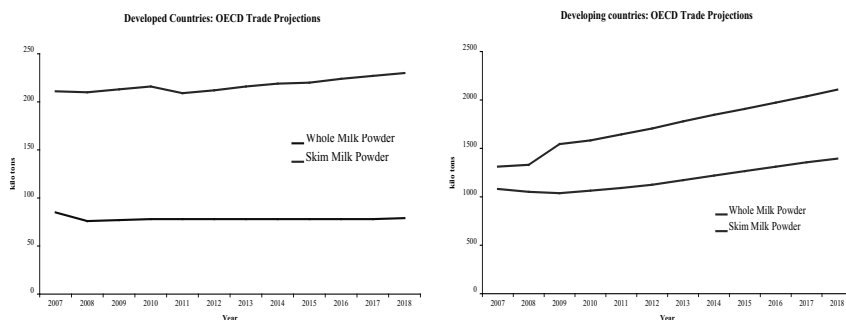
Figure 22: COMPARISON OF FAPRI AND OECD WORLD MARKET PRICE PROJECTIONS FOR CHEESE AND WMP



Source: Own presentation. Data: OECD, FAPRI.

The most important independent international organizations that monitor world dairy markets thus conclude today that in the medium term market conditions for dairy production will be favourable. But their projections differ on the projected length of the current peak price period. However, it is worthwhile to consider various trends in international dairy markets in more detail in order to understand where potential opportunities and potential competitors for Ukraine are likely to emerge.

Figure 23a and 23b: PROJECTED TRADE IN MILK POWDER

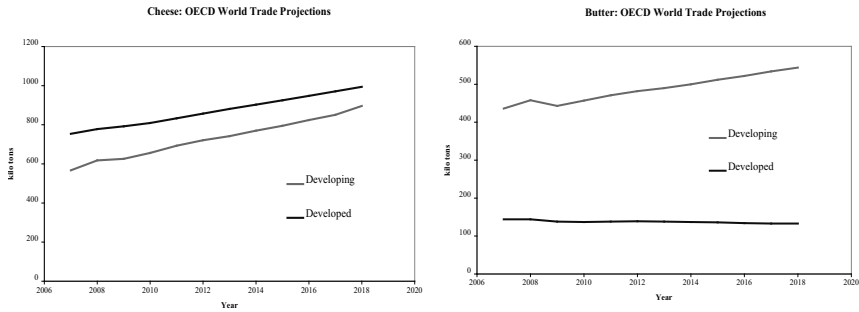


Source: Own presentation. Data: OECD-FAO Outlook.

Figures 23a and 23b shows that developed- and developing countries» markets are projected to develop in opposite directions: The vertical axis on the left side depicts trade quantities between developing countries. The scale of the vertical axis on the right side of the graph presents projected trade for developed countries. This scale is roughly 1/10 of the trade volume for developing countries, implying that in comparison to the southern hemisphere, developed countries trade much smaller amounts of milk powder on the northern hemisphere. At the same time, the graphs show that trade for milk powder between developing countries is expected to grow steadily, while developed countries» trade will stagnate. Developing countries are going to trade about 10 times more milk powder than developed countries in the future with ever rising volumes (note different scales at vertical axis), while developed countries show a projected declining trade with WMP and constant quantities for SMP.

Figures 24a and 24b plot similar projections for the trade of butter and cheese. These figures reveal that butter trade among OECD countries is projected to remain fairly constant while trade with cheese will constantly grow. Within the next ten years, trade of cheese between developing countries is estimated to reach about the same volume as cheese trade among developed (OCED) countries. For butter, developed trade is also expected to grow at about the same pace as cheese trade.

Figure 24a and 24b: PROJECTED TRADE IN CHEESE AND BUTTER



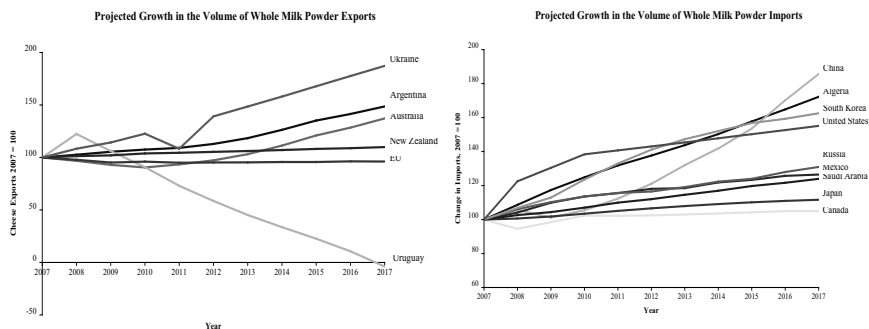
Source: Own presentation. Data: OECD-FAO Outlook.

Please note that these trade projections do not allow for a differentiation between individual product specifications. The projections cover quantities measured in metric tons, but do not take quality differences into account. With regard to butter and milk powder this does not play a role, but considering the cheese trade, distinctions should be made between high quality gourmet cheese brands and cheese used for pizza or other processed food products. This can alter the volume flow of cheese trade quite significantly and may have potential impact on the terms of trade between two countries with regard to import and export of products from the heterogeneous aggregate «cheese».

In summary, current projections for dairy products expect a decline of peak prices after 2007 and a slow but constant recovery in the years afterwards. These medium term trend rests on the assumptions of growing income in many developing countries and an increase of world milk supply that is not quite as dynamic as the growth in demand. This is mainly due to the fact that growth in developing countries is projected to be much more pronounced in relative as well as in absolute terms. On the other hand, if growth in China or India would slow down or a wide range of consumers would increasingly become disconnected from rising income, these forecasts would turn into the opposite: A steadily growing supply slightly above the growth of demand.

Furthermore, it is interesting to anticipate where major growth opportunities are expected to emerge. Looking only at the largest importers and exporters in absolute terms may distract the view from emerging markets that may provide very attractive export destinations especially for Ukraine. In this context, chapter 2 has revealed that the EU trades cheese with a comparatively small number of countries, but has managed to deliver exports to almost any country in the world. Therefore, even for dairy products of low processing level and/or low unit value the EU market must be considered a premium market with high entrance barriers due to policy, market competition and quality regulations.

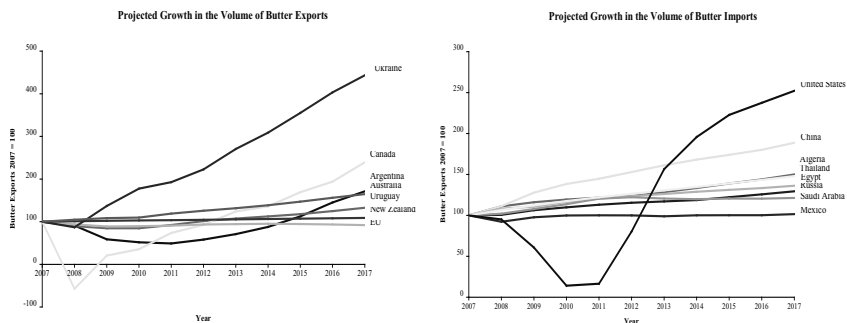
Figure 25a and 25b: PROJECTED CHANGES OF WMP TRADE VOLUMES RELATIVE TO THE YEAR 2007



Source: Own presentation. Data: FAPRI 2008.

On the other hand, especially emerging, fast growing markets are still open for new suppliers, even if the total quantity demanded by these markets might be small. In the following, the projections issued by FAPRI are utilized in order to gain understanding of the future development of world dairy markets in relative terms. The FAPRI projections have already been mentioned and it has been shown that FAPRI's overall assumptions are in line with those undertaken by the FAO, the OECD and the EU commission. In order to understand, which markets might offer interesting export prospects, these FAPRI projections are set in relation to quantities traded in the year 2007. Figures 25, 26 and 27 therefore provide insight into the potential dynamics of regional dairy markets. Contrary to figures 22, 23 and 24, however, these figures do not take into account that absolute trade volumes of the countries displayed vary within a wide range and large countries in terms of GDP are not necessarily associated with large trade volumes.

Figure 26a and 26b: PROJECTED CHANGES OF BUTTER TRADE VOLUMES RELATIVE TO THE YEAR 2007



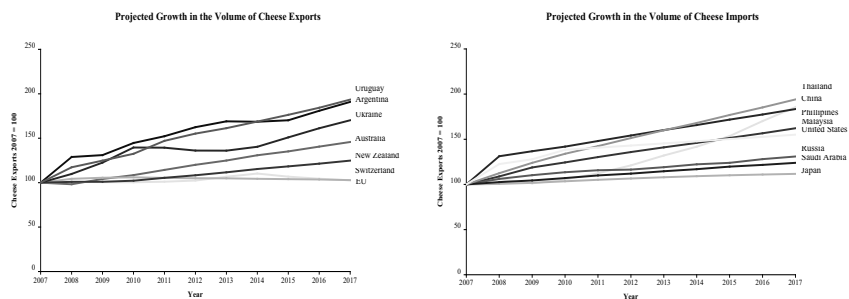
Source: Own presentation. Data: FAPRI 2008.

It has to be emphasized that there is a clear distinction between the growth prospects of a market and its overall size. The EU has frequently subsidized exports and therefore «bought» part of its market share on export markets. The moderate competitiveness of European dairy farms in comparison to dairy farms located in countries such as Australia and New Zealand on the one hand and the huge demand on the internal EU market on the other, will likely cause EU dairy exports to stagnate or even decrease, especially since an elimination of European export subsidies is almost certain after 2013. Overall, the projections show that a number of transitional and developing countries only are just emerging as buyers and sellers for dairy products. Despite small size in absolute terms the fast pace of projected growth for some of these importing markets will provide opportunities for emerging suppliers such as Ukraine. Compared to the current situation, the EU is even likely to become less of a competitor. According to the projections and contrary to the foreseen developments in the EU, the USA are expected to extend imports for cheese and milk powder. With regard to butter, the USA will remain an exporter in the short run. But this position is expected to turn around 2012. By then, the USA will likely be in a net import situation for butter although import quantities are expected to remain small.

The countries presented in Figures 25 to 27 constitute a selection of the ten to fifteen most important exporters and importers in the year 2017 according to FAPRI projections. Figure 25a presents the projected relative increase in milk powder exports, Figure 25b the corresponding graph for the most important importers expressed in relative terms. Figures 26a, 26b, 27a and 27b show exports and imports of butter and cheese, respectively.

Ukraine is projected to almost double its exports of milk powder and cheese within the next ten years, and exports of butter according to Figure 27a will be four times larger than in the year 2007. On the other hand, EU exports of milk powder, cheese and butter will remain fairly constant within the next ten years, with even a slightly declining trend for butter and cheese. Similar trends can be observed for other well established exporters of dairy products such as New Zealand and Australia. These countries are still expected to expand their exports; however, the projected pace of their export expansion is slower than export growth for Argentina, Canada and Uruguay.

Figure 27a and 27b: PROJECTED CHANGES OF CHEESE TRADE VOLUMES RELATIVE TO THE YEAR 2007



Source: Own presentation. Data: EAPRI 2008.

On the import side, China is expected to be the market that will develop most dynamically within the next ten years. China's demand for butter will grow at steady pace, while imports of milk powder and cheese are not expected to take off before the year 2012. Certainly, the quantities of dairy products demanded by China are also large (not displayed in Figure 25 to 27), but will for instance in the year 2017 only be about 1/3 of Japan's total cheese imports and close to 1/4 of Russia's cheese imports by then. Demand for dairy products in Russia will be growing at a much slower pace than China's import demand. However, with regard to butter, cheese and milk powder, the total Russian import demand in any year of the upcoming decade will be 3 to 4 times larger than China's imports.

6. CATCHING POTENTIAL OPPORTUNITIES: UKRAINE AS AN EXPORTER OF DAIRY PRODUCTS

The analysis has shown that most long term projections currently are quite optimistic with regard to world dairy market developments. This is because demand is projected to grow faster than supply, especially in developing countries. With regard to EU policy, a further exposure of European farmers to world market conditions is under way. This, however, does not imply that the EU is likely to buy any shipment of dairy products of low price. Instead, the European dairy industry has been through a long period of restructuring and investments into quality standards that are supposed to protect consumers. Therefore, the EU dairy industry can be regarded as highly productive and highly competitive especially with regard to exports of processed dairy products and high value specialties. In the short run, however, the EUR/USD exchange rate as well as high prices for production inputs squeeze profit margin for farmers and may slow response to high prices. In addition, it is not clear, how fast structural change will react to policy changes in the EU after the «Health Check». This may also imply that EU dairy production is not going to grow very fast in the near future.

With regard to Ukraine, all forecasts currently consider its dairy industry as a potential global player for all important dairy products. However, a closer analysis reveals that at least in recent years Ukraine has failed to match optimistic assumptions about growth in its dairy sector. At the same time, the Ukrainian dairy sector has currently no access to the EU market and may even face severe competition on foreign export destinations, e.g. from South American suppliers as soon as weather conditions there become more favourable again.

The EU as the largest single market in the world with policy makers and consumers being extremely concerned about food quality and food safety will under no circumstances and with no other non-EU country make any concessions with regard to the quality of its dairy product standards. This is even more the case since the EU dairy sector in principle is able to supply more milk than is currently consumed in the EU.

On the other hand, the EU will increasingly be interested in dairy product imports that fit into the supply and processing chain due to low price, or that constitute a special variety that is appreciated by EU consumers. Therefore, there is a high chance that the EU commission would support Ukrainian efforts to match EU import standards of dairy quality. The EU has published easy to follow guidelines (see chapter 2). In addition, EU food processing companies and retailers may demand additional certificates, as the experience with the new EU member states from Central

and Eastern Europe has shown. This, however, can be expected to be solved on the commercial level and should be less of a concern for policy makers.

At the same time, Ukraine may find it profitable to diversify the structure of its exports. Asian markets are expected to grow fast in the near future. Especially China, Indonesia, and Malaysia offer interesting alternatives for Ukrainian dairy exports and are less demanding in terms of food security and quality issues.

A NOTE FOR UKRAINIAN DAIRY PRODUCERS, DAIRY INDUSTRY AND POLICY MAKERS ON THE FUNCTIONING AND FUTURE PERSPECTIVES OF THE EU DAIRY POLICY

1. HOW THE EU DAIRY POLICY DEVELOPED

The milk quota system introduced in 1984 has put a limit on the amount of milk EU dairy farmers produce each year. Before, due to effective protection of the EU market and subsidies the dairy market was characterized by constant over-supply leading to gigantic stocks and increasing expenses for export subsidies. So, the quota system ended the long discussions on «milk lakes» and – although criticized by economists to reduce structural change in the sector – it was effective in limiting production in the EU.

Under the quota system each Member State received a certain volume to be distributed to regions and farmers. The main criteria for establishing the quota was the level of previous production. If a farmer delivers more milk than his quota in any year he can be penalized financially. This involves paying a special levy on the over-quota amount making overproduction unprofitable. Quotas are split between deliveries to dairy processors and direct sales from the farm. Milk quotas are valid until 31 March 2015. Recently, due to favorable conditions on world dairy markets and rising prices in the EU, quotas have been increased by 2 %. For the EU accession candidate countries specific milk quotas have been negotiated during the accession process.

Milk quotas in the EU-27 are based on Council Regulation COM (2007) 802 amending Regulation (EC) No 1234/2007.

The EU's dairy market regime for milk and milk products was set up in 1968. It included the typical EU support system for farmers and processors:

- a) High support prices sustained by subsidized withdrawal and storage of surplus product;

- b) Protection of the EU market by import restrictions;
- c) Export subsidies for surplus produce on world markets.

This system was created at a time when the EU was not self-sufficient in dairy products and a net importer. It collapsed because of huge surpluses and huge amounts of money needed from the EU budget for storage and export of surplus production. Therefore, milk quotas were introduced in 1984.

The 2003 reform of the Common Agricultural Policy fundamentally changed the way the CAP operates. Market interventions should be minimized and payments to farmers were decoupled from production. As a consequence public intervention (buying into storage) for butter and skimmed milk powder has become a measure of last resort and should be avoided. Intervention agencies may only buy in butter during the period from 1 March to 31 August of any year at peak periods of production. When the quantities of butter offered for intervention exceed the thresholds indicated below (during the period 1 March to 31 August) the Commission may suspend conventional intervention buying and continue buying using a tendering procedure. The thresholds are 50 000 tons in 2006, 40 000 tons in 2007 and 30 000 tons in 2008 and subsequent years.

It was also agreed in 2003 that the butter intervention price would be reduced by 25 % over a period of four years. The SMP intervention price was reduced by 15 % over a period of three years.

The EU dairy industry continues to have access to specific support measures with a tendency to decline:

- dairy products for NGOs and ice cream manufacture;
- SMP use in animal feed;
- Skimmed milk for the manufacture of casein;
- Dairy products for poor people
- School milk
- Private storage aid for butter and cheese

It is important to note that the consumption of dairy products in the EU is changing due to increasing incomes. Butter consumption in the EU has been declining slowly for many years. Cheese consumption, on the other hand, has been steadily rising. This trend will most likely continue with

a per capita consumption growth rate of 1.5 % per year. Almost 40 % of EU milk is consumed as cheese. The biggest cheese producers are Germany, France, Italy and The Netherlands. Milk powder consumption appears to be falling slowly. The markets for fresh products such as cream, yoghurt or products of high nutritional value or specialized milk products for the food industry are growing.

Milk prices in the EU are determined by EU and global markets but highly influenced by the dairy market intervention system. Milk prices are higher inside the EU than on world markets. However, due to the recent reforms the EU intervention prices have been adapted to market situations so that prices now and in future will be more in line with world market developments.

To compensate cuts in intervention prices from 2004 to 2007 milk producers received additional dairy premium payments.

The dairy market regime was taken over by the New Member States in 2004 at the day of accession to the EU.

2. PERSPECTIVES OF FUTURE EU DAIRY POLICIES

The EU market reform in 2003 changed the Common Agricultural Policy in a way that subsidies for market intervention and farm production have been bundled and decoupled from production. Each EU farmer now receives a single payment including dairy subsidies (Single Payment Scheme). The payments are conditional on the fulfillment of «Cross Compliance» requirements whereby farmers receive payments provided they comply with environmental, health and welfare standards. Farmers are free to produce what the domestic and world markets require.

Member States introduced the Single Payment Scheme during 2005 to 2007. A maximum amount of money has been calculated for each Member State. The reference amount for each farmer has been calculated by taking the average annual direct aid he received in 2000, 2001 and 2002. The reference period for dairy farmers was their reference quantity produced on 31 March of the calendar year before introduction of the Single Payment Scheme in a given country. Member States could opt for two models on how they calculate and make payments to farmers either individually or based on certain regions. Germany opted for the regional model. Thus, the payments in a defined region are equal for each farmer. However, the payments for different regions may differ. The average payment in Germany in the year 2005 was about 400 Euro/ha decoupled payment. It includes (i) product based payments: area payments, livestock premiums, environmental payments and (ii) payments for some specific regions. It contains also investment support.

Although the dairy subsidies are included in the Single Payment Scheme the milk quotas until the year 2015 are contradicting reforms. Quotas limit production and from an economic point of view it limits productivity increases because structural change is practically very slow and only possible through trade of milk quotas. Economists argue that milk should be produced in those regions with comparative advantage to make EU dairy production more competitive on world markets.

The European Commission on behalf of the European Council prepares a so-called Health Check in view of the effectiveness of the current policies. In this view many observers expect a certain change in the EU dairy market regime in the year 2014/15⁸. The previous commissioner of the EU indicated that she prefers lifting the milk quotas.⁹ The European Commission is arguing that due to international obligations (Doha Round on trade) the EU has committed itself to phase out export refunds (subsidies) until the year 2013. This means this instrument would not be available for the dairy sector in future. Linked to the question of export subsidies is the question of dairy market intervention through public purchases and intervention prices. Due to effective reduction of milk production through quotas, lowering of intervention prices and rising world market prices the stocks of dairy products in the EU are history. Intervention stocks have been emptied during the past years through sales on the world markets.

The phasing out of milk quotas is a highly controversial topic in the EU. It splits dairy producers in two groups:

- a) conservative dairy farmers fighting for the status-quo
- b) progressive dairy farmers opting for change to facilitate structural change and growth

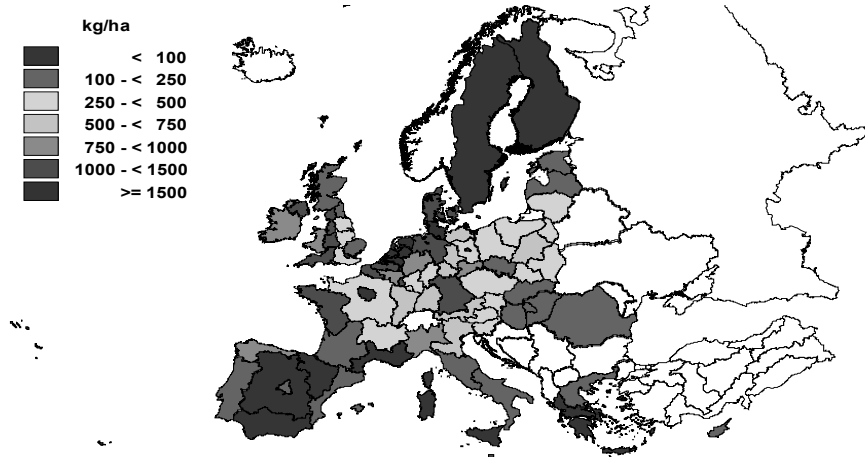
Highly productive regions and countries in Northern and Central Europe with advanced structural change and bigger dairy farms are favoring change.

8 *The EU is planning its budget in a 7 year cycle. The discussions on the budget and its implications for European farmers are taking place years ahead of the actual Council decision.*

9 *Speech of Commissioner M. Fischer-Boel on June 26, 2007 in Brussels*

Graphical presentation:

SPATIAL DISTRIBUTION OF MILK PRODUCTION IN EUROPE (MILK SOLD KG/HA 2004)



The milk quotas have been introduced at a time when the EU had «milk lakes» and a huge problem with public intervention stocks. The EU policy was aimed to guarantee a certain price level to dairy farmers. Currently, without these stocks and a promising world dairy market, driven by increasing demand mainly from Asia, the policy focus is shifting towards competitiveness. Milk quotas, however, limit structural change and hence productivity growth and competitiveness. European dairy production is considered to be competitive with the USA provided that the production is efficient and takes place on farms that are big enough to reduce costs per cow. The most competitive producer in the world is New Zealand with abundant grazing land and favorable climate conditions to allow pasture grazing also in winter. Feed and construction costs are lower than in North America and Europe.

Currently, the discussion between the Member States and the EU is in full swing. It is likely that the milk quotas will be phased out but with a «soft landing» devoting support measures, e.g. for rural development to those regions where dairy farming is considered to have certain environmental or social function (for instance mountainous regions).

The impact of the possible lifting of the quotas will be very important for EU dairy farmers but also for international competitors on world markets (USA, New Zealand). It will increase trade volumes and thus have also an impact on possible exporters of dairy products to the EU including Ukraine.

3. CONCLUSIONS FOR UKRAINIAN PRODUCERS

The European dairy market policy will change. Ukrainian producers should take into consideration some important trends. In the past, EU dairy prices have been about 50% above world market prices. This was achieved through a combination of high import tariffs (partly higher than 100%), Tariff Rate Quotas, high export subsidies and intervention purchases to stabilize EU prices on dairy markets. High EU milk prices would have resulted in a huge overproduction. Therefore it became necessary to establish the milk quota system in 1983. But quotas at a 115% self sufficiency rate can only work, if the surplus is constantly removed. This is done by export subsidies. However, export subsidies are the worst thing in international trade negotiations and forbidden by WTO. So, the EU has to finally accept it and will have to abolish export subsidies.

When export subsidies will be abolished, EU prices will converge to world market prices despite of the quota system. The reason is a constant surplus of milk. Therefore, the quota system will disappear in 2015. This will have an impact on EU and on world markets. World market prices will increase and EU prices will decrease. EU dairy farmers will operate at (increased) world market prices. This in turn will shift the policy focus from protection to support of competitiveness of dairy farming in Europe.

The international competitiveness of dairy farming is determined by a number of relevant factors. The most important one is the availability of cheap labor, construction and feed costs. The lowest production system in the world is located in New Zealand with year round grazing. Dairy production in the USA and in Europe has higher costs because of a different winter feeding system. Both production systems are similar with some disadvantages in Europe due to smaller herd sizes and unfavorable farm structures. However, similar farm sizes in the USA and in Europe show similar competitiveness.¹⁰

Ukraine should have a good potential to develop its dairy sector. However, some important obstacles have to be overcome. The advantages are: competitive feed production, low land costs, big farms and its expansion potential. However, the value chain needs heavy investments and Government support to develop dairy export markets.

The International Farm Comparison Network (IFCN) regularly compares production costs of various production systems around the world. The results show that Central and Eastern Europe is competitive if the milk is produced in large herds with modern farm management. The optimal herd size for dairy farming is considered to be between 500 and 1.000 cows per farm.

10 *Results of agribenchmark an international comparison of dairy production costs, Braunschweig-Vöelkenrode.*

The world market offers growing opportunities but Ukraine is still not an important player. Dairy production and exports are not growing. What are the bottlenecks?

- About 80 % of the milk is still produced in low input / low output household systems;
- Traditional markets (Russia) are banning or «steering» dairy imports;
- EU markets are still closed for Ukrainian producers;
- Efficiency of dairy production systems are still low;
- Government support system ineffective;
- Value chains need heavy investments.

Today, investments in raw material supply are not sufficient to stimulate the sector. Current profitability and risks are too high.

However, in a long-term view Ukraine could be a good place for dairy investments if the bottlenecks could be overcome.

What are the tasks for policy makers?

- Make the country attractive for international capital (deregulation, rule of law, ensure property rights, fight corruption);
- Make the country attractive for smart young people (ensure safety, performance orientated promotion and salary systems, fair wages & taxes);
- Ensure sufficient competition, even at regional level;
- Spend public budget on rural infrastructure (electricity, energy supply, schools, roads);
- Replace the subsidies by transparent investment promotion programs;
- Establish levy-financed systems to promote branches (e.g. supply chain management, food safety, genetic improvement, applied research, technology transfer, export marketing).

What are tasks for dairy companies?

- Invest in food quality systems and marketing;
- Invest in raw material supply (genetics, milking and cooling equipment, transport);

What are tasks for dairy farms?

- Make the farm management and work force more efficient (pay performance-orientated wages);
- Keep the production system simple;
- Benchmark production and production costs.



EUROPEAN MARKETS FOR MEAT: Real Opportunities for Ukraine

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EXECUTIVE SUMMARY

1. Meat products constitute an important part of the diet of the majority of European consumers. The most common sources of meat consumed in the European Union (EU) are beef and veal, pork, poultry (of which chicken and turkey are by far most important) as well as lamb. In addition, various niche markets, e.g. for game, exist.
2. For each animal production sector the Common Agricultural Policy (CAP) of the EU has different approaches with regard to protection of producers and consumers. Traditionally, market protection in favor of EU producers had been high for beef and sheep production, but low for pork and poultry production.
3. The supply of beef within the EU is closely related to the size of the European dairy herd due to the number of calves not retained for dairy cow replacement and due to the number of cows that exit milk production. Both contribute an important share of EU beef supply. Therefore, the EU dairy policy also partly influences the EU markets for bovine meat.
4. Similarly, EU agricultural policy with regard to grain and oilseeds directly affects fodder prices for pork and poultry production, but also for beef, since a large share of EU beef comes from «intensive» in-door production based on feed ratios rich in corn and grain. Beef production based on «extensive» pasture is common especially in Britain and Ireland.
5. Within the European public, for at least twenty years a wide range of controversial political discussions has been going on about whether meat production should be taxed or subsidized. Important elements of these discussions are that animals absorb scarce natural resources that could well be used for the making of plant-based products for human consumption or for bio-energy purposes, and large scale meat production is known to pollute water (nitrification) and add greenhouse gases to the atmosphere (especially methane). On the other hand, the EU Commission emphasizes that beef and sheep production in particular can be beneficial in order to maintain the multifunctional character of the countryside in marginal areas.
6. Recent food scandals involving the illegal distribution of rotten meat, cases of humiliation of animals during transport and production as well as animal diseases with potentially hazardous effects for humans such as BSE have received considerable media attention in Europe and have contributed to the fact that the average European consumer can perhaps be described as having comparatively high purchasing power and generally high preferences for meat and meat products, but only as long as these products can be regarded safe for health and environment.

7. The CAP addresses these issues in its recent and ongoing policy reforms. The former system of market price support and export subsidies especially for beef has been almost completely eliminated. Import preferences based on Tariff Rate Quotas (TRQs) are increasingly granted, and European producers receive direct payments that will remain coupled to production only to a small extent after the so called «health check» of the current CAP system. At the same time, EU wide regulations with regard to the quality and traceability of meat from domestic and imported sources have been tremendously increased, now typically posing much higher barriers to market access than conventional, tariff-based import restrictions.
8. Beyond these political and administrative aspects, self sufficiency of the EU with regard to most meat products is expected to remain high. Nevertheless, due to the vertical integration of the European meat industry there are a vast number of market opportunities for importers, especially if very specific segments of the meat processing chain can be served at competitive prices, or if special processed products can be advertised and sold successfully to European consumers.
9. The EU is likely to remain not only the largest single market for meat products, but also the most demanding in terms of safety standards, and one of the most competitive ones in terms of prices in the near future. This is because all large exporters of meat such as Brazil and Australia are seeking market shares in the EU. Global projections of supply and demand for meat products are, however, carefully optimistic about rising world meat prices in the next decade.
10. Ukraine may consider the implementation of EU standards as a benchmark. If Ukraine can establish the structures required for exporting meat into the EU, it will easily be able to match the standards of all other potential export destinations that are currently emerging worldwide. Despite the fact that for 2006-2008 meat imports prevailed over its exports, meat external trade became more differentiated, gradually switching destinations from CIS to EU Countries.

INTRODUCTION

Meat production and meat processing together constitute one of the most important sectors of modern global agribusiness. Meat from pigs, poultry, cattle, sheep, and game does not only account for a large proportion of agricultural value added, it also absorbs an important share of consumers' expenses for food, and this share has been observed to rise along with income. But meat is not only from an economic point of view an important part of the agricultural supply chain, it also has humans ever since allowed to utilize grazing land that was otherwise of little value for food production. Furthermore, meat production tends to be labor intensive, and thus potentially helps to secure jobs on farms and within rural areas.

However, critical aspects have in recent years been added to these positive sides of meat production: Environmental concerns due to Nitrogen emissions, food safety issues and other environmental problems are rising as meat production globally expands. Furthermore, meat production nowadays faces high opportunity cost because pigs, poultry and cattle from intense production systems increasingly compete with humans for grain and oilseeds, and the rising demand for bioenergy may in the long run suggest alternative utilizations for grazing land other than feeding cows.

Political interference with meat markets has traditionally been high in many countries such as in Ukraine and in the EU. However, due to these ongoing trends it can increasingly be observed that political actions with regard to meat production are shifting their focus away from producer support towards the protection of consumers and the environment through tight quality controls of domestically produced and imported meat products.

This policy paper therefore examines ongoing trends within world meat markets in general and, more specifically, within the world's largest market for meat: The European Union. In this context, it is the goal of this paper to evaluate potential opportunities for Ukrainian meat producers that may arise not only from the geographical proximity of these two neighboring regions, but also from the large potential that Ukraine has with regard to agricultural production. In addition, this paper seeks to provide Ukrainian policymakers with an easily accessible and up to date summary of the most important trends and facts about EU meat policies that might be relevant with regard to strategic policy design for Ukraine.

The paper is organized as follows: the next section summarizes facts and figures about the current structure of Ukrainian meat production and trade; the subsequent chapter presents equivalent information for the European Union. Building on this information, a detailed analysis of ongoing trends especially within European policymaking and within the European food processing business is undertaken. Finally, conclusions are drawn with regard to the potential opportunities that may arise from these trends to Ukrainian producers.

1. RECENT MEAT MARKET DEVELOPMENTS IN UKRAINE

As a result of WTO accession, Ukraine recently had to reduce import tariffs for bovine and poultry meat down to 12-15%, for pork to 12%, for sheep and goat meat to 10%¹. Before that, the declared ad valorem rate was between 10% and 30%. Thus, the adoption of new import duty rates together with the removal of free economic zones is currently leading to the formation of a more transparent and more competitive market² for (imported) meat within Ukraine that could potentially set out for a dynamic development in the near future. This chapter therefore analyses the preconditions that meat production in Ukraine currently faces in terms of production, consumption, trade, and policy settings.

1.1 Production

Bovine, swine and poultry meat constitute the by far largest share of total Ukrainian meat production. In 2007 poultry meat accounted for the largest share of 36%, followed by swine with 33% and bovine for 29%. Other sources of meat (like mutton and goat, rabbit, horse) have never exceeded 2% of total meat production in Ukraine. Agricultural production of meat demonstrated stable annual growth of 11-12% in the period 2006-2008³. Slaughter weight meat production increased by 24% for this period. However, production of the meat processing industry fluctuated somewhat after a growth of 26% during 2006-2007 and a decline of 21% afterwards until November 2008.

General problems for meat production in Ukraine are its prevailing concentration in households and frequently changing government regulations. Meat producers benefited from less pricy feeds

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- 1 See Report of the Working Party on the Accession of Ukraine http://www.wto.org/english/thewto_e/acc_e/a1_ukraine_e.htm These tariffs are applicable by the Order # 14/655-EP but «old» Custom Tariff still remains in force (see the Law of Ukraine # 1109-V «On the Custom Tariff of Ukraine» from May, 31 2007) that creates a contradiction in Ukrainian legislation.
 - 2 According to the Law of Ukraine # 923-VI «On the introduction of changes to some Ukrainian laws to improve the state of Ukrainian balance of payments connected with the World financial crisis» from February, 4 2009, import tariffs on bovine meat (frozen), pork (fresh), bovine, pork, sheep, goat, horse, donkey and mule subproducts, poultry meat and poultry subproducts, other meats and subproducts, different kinds of fat and so on is to increase by 13% from March, 6 2009 to renew the equilibrium of balance of payments, the state of which is defined as critical (according to active norms).
 - 3 2008 year is considered here as January-October of 2008.

during active grain export quotas (the strongest lobbying force for that was from the side of poultry producers), but they lost from uneven production and trade policies. Existence of 15% trade margin ceiling, high loan rates (despite governmental programs), and governmental disability to secure smooth subsidy flows are just some examples that currently limit production incentives. However, the picture differs substantially between the major meat categories, as the subsequent analysis will reveal.

Pork and Poultry Production in Ukraine

During 2006-2007 agricultural poultry meat production increased by 17%, pushing its market share from 34% to 36%, while almost at the same time the processing industry grew by 24% during 2006-2008. In particular, fresh poultry meat grew by 41%, while frozen poultry meat declined by 36%. In general, Ukrainian poultry shows a tendency towards increased industrial production (= production in large agricultural enterprises). This overlaps with an observed decrease in household production. Poultry production in Ukraine is mostly carried out by two big vertically integrated companies (Myronivsky Khleboproduct and Agromars) which invest a lot to improve their poultry production. Remaining household poultry production in Ukraine is considered to be low-cost. Thus, poultry meat production is rather effective.

Slightly different from poultry, pork meat production still depend much more on household production. Together with the increase of agricultural swine meat production by 21%, it added 2% more to its production share, reaching 33% of total meat production in 2007. However, for 2006-2008 overall the fresh pork production has declined by 17% and frozen pork production went even down by 54%.

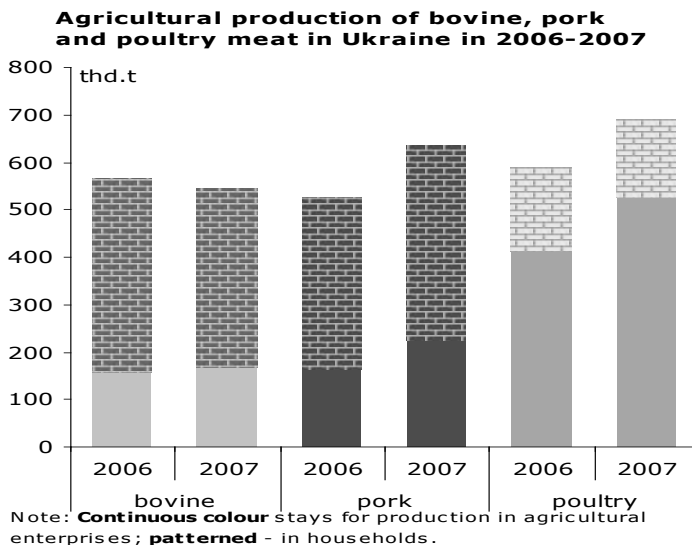
Bovine Meat Production in Ukraine

Bovine meat production has demonstrated no sign of recovery in 2008. The number of animal heads continues to fall. Partly, the bovine industry remains to be a derivative of the dairy industry, being highly dependent on milk prices. Special beef animals account for a very low number in the total livestock herd, making Ukrainian beef production a residual of milk production with very little high quality beef being produced.

Bovine meat production in agriculture declined by 4% in 2006-2007, while the processing industry grew slightly by 10%. Relying on rather inefficient households remains the major problem for Ukrainian meat production. Households are not able to apply modern production methods; they are also often not using high quality genetics nor can they comply with veterinary regulations. The majority of these producers do not manage to invest at a larger scale into the technological improvement of their production process. Despite the positive tendency of household shares to

decrease throughout 2006-2007, they will remain major producers of bovine and pork meat in 2009. In 2007 their shares were 69% and 65% for bovine and pork meat respectively (for small-scale meat varieties, such as rabbit, horse-flesh, mutton and goat, in 2007 households possessed 99%, 87% and 95% respectively (see Figure 2.1).

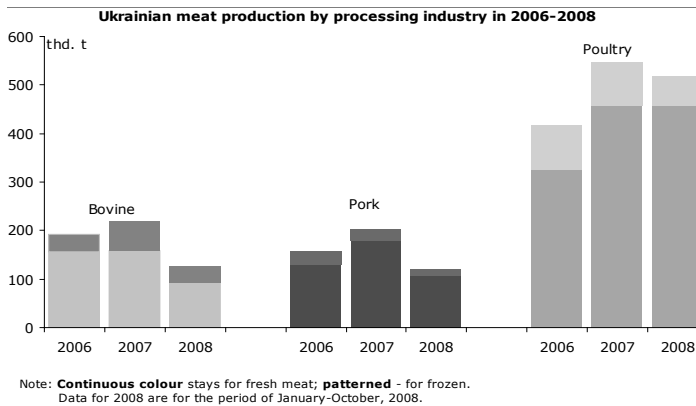
**Figure 2.1 : AGRICULTURAL PRODUCTION OF MEAT IN UKRAINE
IN 2006-2007**



Source: State Statistics Committee of Ukraine.

As for other kinds of meat (rabbit, horse-flesh, mutton and goat) each production share is about 1% only. The majority of such meat (up to 99%) is produced by households, but their share is decreasing.

Figure 2.2: UKRAINIAN BOVINE, PORK AND POULTRY MEAT PRODUCTION BY PROCESSING INDUSTRY IN 2006-2008



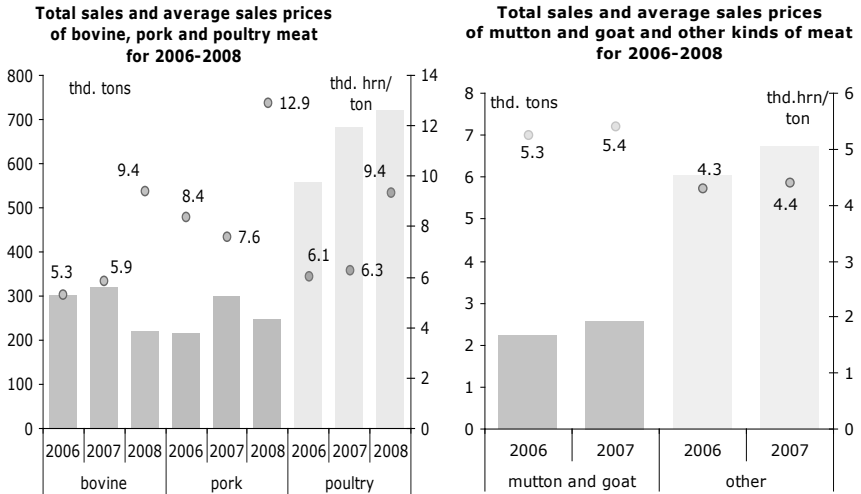
Source: State Statistics Committee of Ukraine.

In general, in 2006-2008 frozen meat accounted for a lower production share than the fresh meat. Also for bovine, pork and poultry meat there was a similar tendency of production increase between 2006 and 2007, but a decrease by the end of 2008 in comparison with 2007.

1.2 Sales and consumption

As a result of rising prices, sales of most types of meat have been declining in Ukraine recently (e.g. sales of bovine and pork meat in 2008 have decreased by 31% and 17% respectively compared to the pre-year level. The crisis within the bovine meat market, however, started long ago: sales have dropped even in comparison with 2006 (by 27%). For the same time pork sales grew by 14%. Poultry meat sales were showing a more stable growth pattern: in 2008 they increased by 29% in comparison with 2006, and by 6% in comparison with 2007.

Figure 2.3: SALES AND PRICES OF MEAT IN UKRAINE IN 2006-2008



Note: Data for 2008 are for January-November, 2008

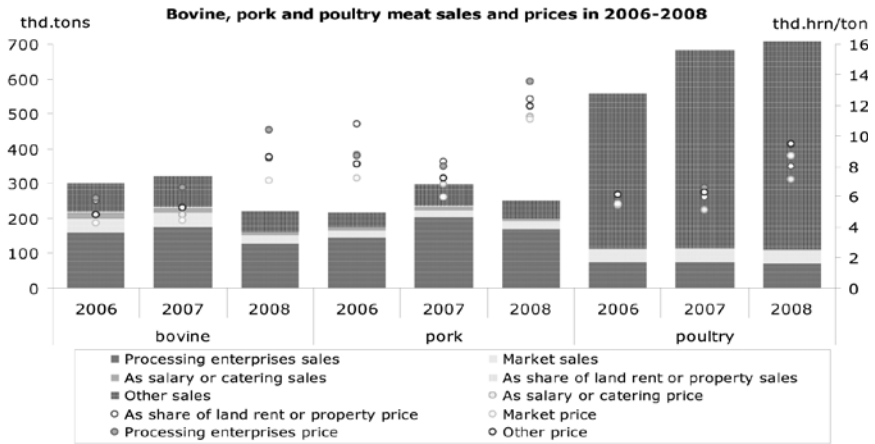
Source: State Statistics Committee of Ukraine.

Average nominal income of Ukrainian consumers grew in January-October, 2008 by 42.1%. At the same time, consumer prices each month grew by 1-2%. Moreover, pushed by the financial crisis the level of unemployed is currently rapidly increasing. Thus, the demand for meat is unlikely to rise sharply in the nearest future.

Traditionally, Ukrainian consumers favor pork over other types of meat. During the last years the price gap between pork and poultry meat increased from 2.36 thd. hrn per ton in 2006 and 1.33 thd. hrn per ton in 2007 to 3.52 thd. hrn. per ton in 2008. Together with economic difficulties imposed by the financial crisis, it leads some consumers to shift from pork to poultry meat. In addition, despite lower price gap between bovine and poultry meat, some consumers prefer poultry due to lower quality of bovine meat.

During 2006-2008 pork, bovine and poultry meat were mainly sold by Ukrainian producers to processing enterprises. Smaller quantities were sold at regional markets, for catering (or as salary) needs, as shares of land rent or property, etc. (for details see Figure 2.4).

Figure 2.4: SALE CHANNELS OF BOVINE, PORK AND POULTRY MEAT IN UKRAINE IN 2006-2008

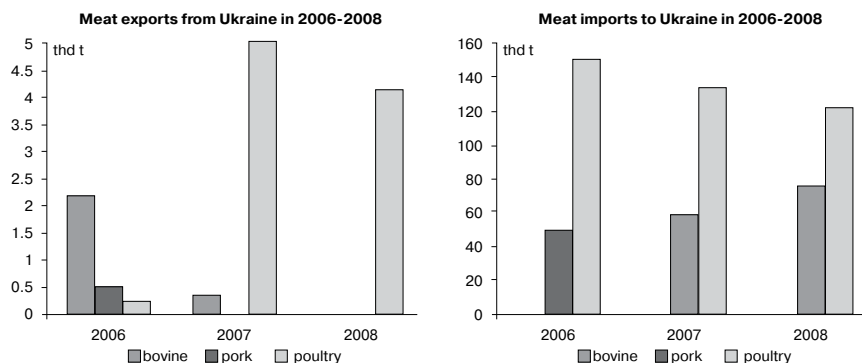


Source: State Statistics Committee of Ukraine.

1.3 Export and import trends

In 2006-2008 import flows for almost all kinds of meat have been prevailing over export flows (except bovine meat in 2006-2007). International trade in poultry meat constitutes the largest part in Ukrainian meat trade. Its import flow has exceeded 1.7-3.2 times imports of pork, and up to 1.5 mln times bovine meat imports for 2006-2008. Except for 2006, its exports have been also above the bovine and pork export volumes.

Figure 2.5: UKRAINIAN MEAT TRADE FLOWS IN 2006-2008



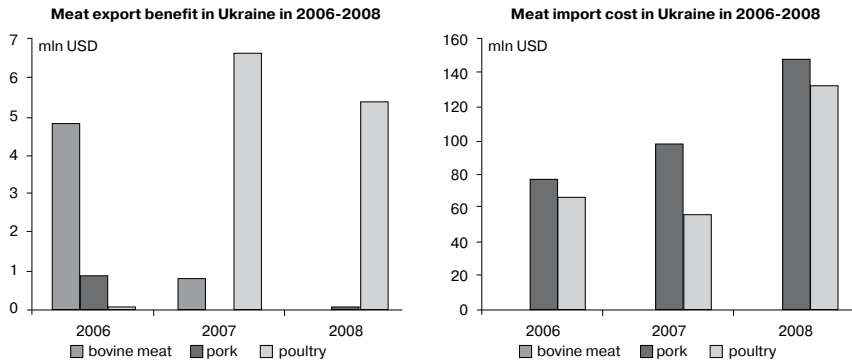
Source: State Statistics Committee of Ukraine.

Poultry export volume increased 19 times from 2006 to 2007, and after that decreased by 18% by August, 2008. Its import volume has been slightly decreasing throughout 2006-2008. Thus, it showed 13% decrease between 2006 and 2007, and 8% more decrease by August, 2008.

Pork export volume dropped between 2006 and 2007, and after that it grew 134 times by August, 2008. In contrast, pork imports were always growing: by 32% from 2006 to 2007, and by 17% from 2007 to 2008.

Bovine exports decreased by 84% from 2006 to 2007, and by 100% for 2007-August, 2008. Its import volume showed 40% drop during 2006-2007, and after that 37 times growth till August, 2008. Together with bovine, pork and poultry meat export decline, monetary export benefit also decreased. Thus, bovine meat export benefit decreased 2 times during 2006-2008, i.e. by 81% from 2006 to 2007, and by 99% from January, 2007 to August, 2008. Pork meat export benefit showed a decline as well. Bovine imports constitute a lower share than pork and poultry in total Ukrainian meat imports. Nevertheless imports fluctuate a lot. Pork import cost was constantly increasing in line with pork import volume growth: by 34% and 53% in 2006-2007 and 2007-2008 respectively, making in total 106% growth. Poultry import cost increased 98% during 2006-2008 (i.e. after 13% decrease in 2006-2007, it showed 127% increase in 2007-2008).

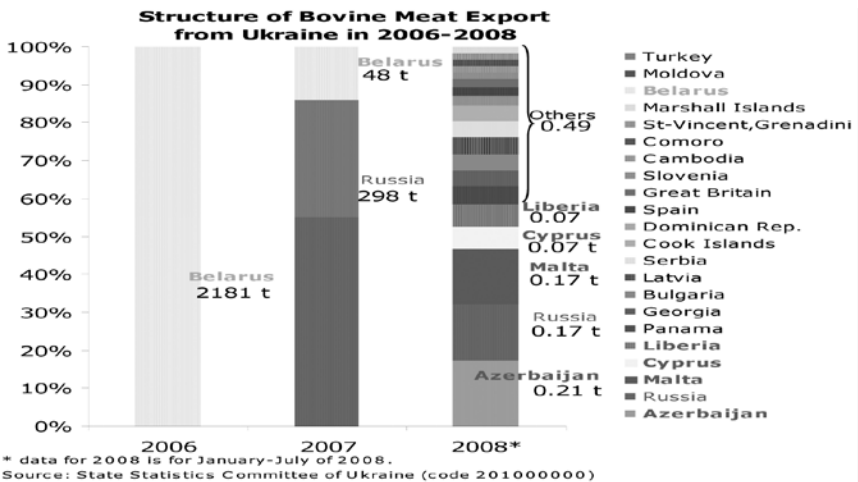
Figure 2.6: UKRAINIAN MEAT MONETARY TRADE FLOWS IN 2006-2008



Source: State Statistics Committee of Ukraine.

The structure of bovine meat exports became more differentiated from 2006 to 2008. The number of export partners increased from 3 to 19. In 2006-2007 only CIS countries (except 25 kilos directed to Turkey in 2006) were Ukrainian trade partners in beef and veal exports. In particular, in 2006 main export partner was Belarus; in 2007 one additional big partner, Russia, appeared.

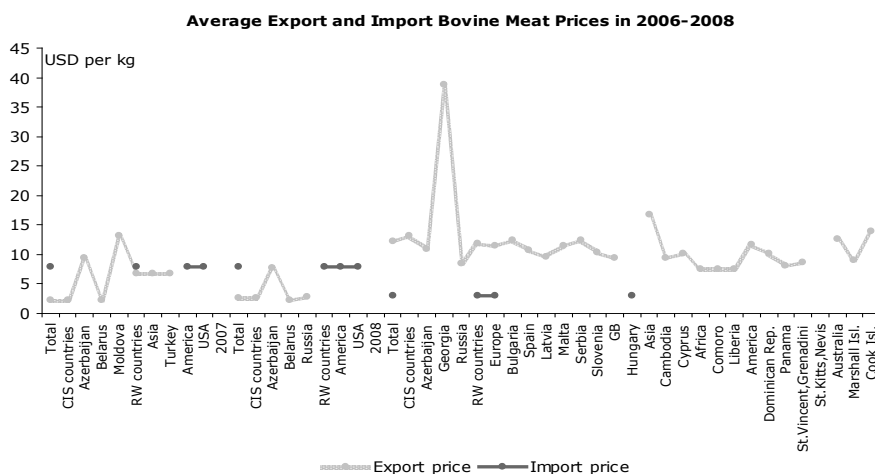
Figure 2.7: GEOGRAPHICAL STRUCTURE OF BOVINE MEAT EXPORT FROM UKRAINE DURING 2006-2008



In 2008 Azerbaijan, Russia and Malta were the top three. Moreover, in 2008 export to RW countries (Rest of the World) prevailed over CIS exports. Especially, 33% directed to European countries, 8% to Asian and African countries, and 9% to American.

Ukraine has had only two partners in bovine meat imports for 2006-2008. They are USA for 2006-2007 and Hungary for 2008. About 1.5 t and 0.9 t of bovine meat were imported from USA in 2006 and 2007 respectively. Hungary delivered 33.6 t for seven months of 2008. Average import prices exceeded average export prices by 262% and 195% in 2006 and 2007 respectively. During 2006-2008 average export prices increased by 434%, and average import prices decreased by 62%. It led to the fact that in 2008 average bovine meat export prices prevailed over its average import prices by 75%. Bovine meat import pricing did not show significant variation across different countries of origin through 2006-2008. But export prices varied a lot. A more detailed picture on export and import price variation across Ukrainian trade partners can be found in Figure 2.8.

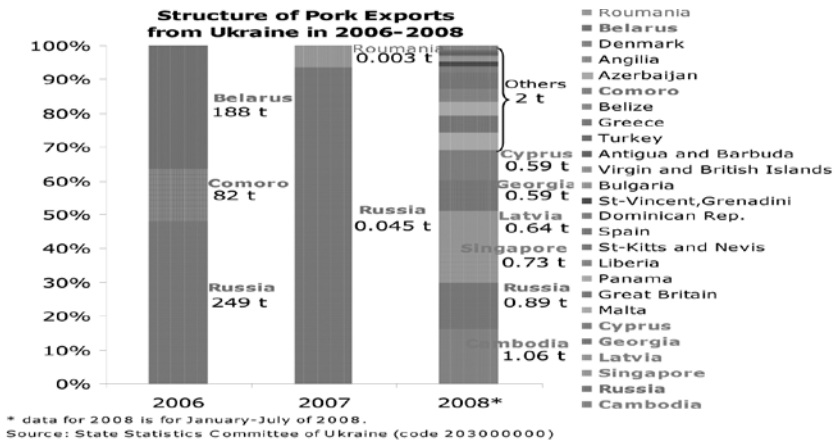
Figure 2.8: AVERAGE EXPORT AND IMPORT BOVINE PRICE TREND DURING 2006-2008



Source: State Statistics Committee of Ukraine

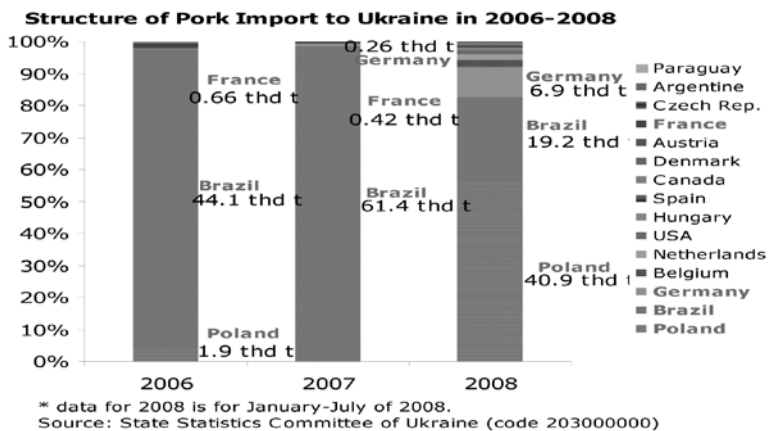
Pork similar to the bovine meat export structure showed the tendency towards trade partner diversification during 2006-2008. Thus, in 2006 and 2007 main pork export partners were mostly CIS countries and in 2008 the number of export partners increased from 2 to 24 with 24% of exports directed to the European countries.

Figure 2.9: GEOGRAPHICAL STRUCTURE OF PORK EXPORT FROM UKRAINE DURING 2006-2008



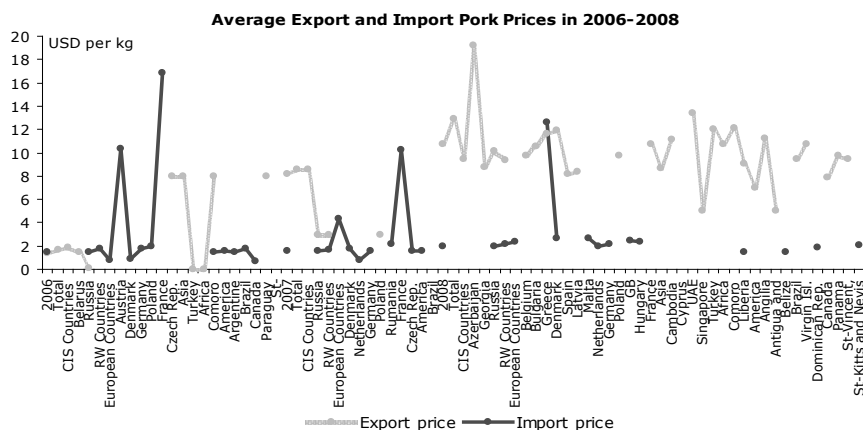
Pork imports from European countries increased by 18 times within the first 7 months of 2008 relative to 2006. Average export prices exceeded average import prices by 81% in 2007 and 2008. In 2006 the inverse relationship was still present. Through 2006-2008 average export prices grew by about 7 times: from 1.4 to 10.8 USD/kg. Average import prices demonstrated less growth of only 33%: from 1.5 to 2 USD/kg. 37% of total 2008 pork export directed to Asian countries, 24% to European, 12% to American and 4% to African countries.

Figure 2.10: GEOGRAPHICAL STRUCTURE OF PORK IMPORT TO UKRAINE DURING 2006-2008



Important export partners of 2008 were Cambodia, Russia, Singapore, Latvia, Georgia and Cyprus. Detailed geographical structure of pork exports through 2006-2008 is presented in Figure 2.9. Through 2006-2008 pork imports have been geographically more differentiated than bovine meat imports. Brazil was always in the top three. European countries like Poland, Germany and France remained among leaders for 2006-2008. There were no imports from CIS countries. Pork import from European countries increased 18 times in the first 7 months of 2008 in comparison with the whole year of 2006. A more detailed geographical structure is presented in Figure 2.10. The most expensive imports in 2006 and 2007 were received from Czech Republic in 16.9 and 10.3 USD/kg respectively. In 2008 the most expensive import came from Denmark with the price of 12.7 USD/kg.

Figure 2.11: AVERAGE EXPORT AND IMPORT PORK PRICE TREND DURING 2006-2008



Source: State Statistics Committee of Ukraine

The most beneficial export in 2006 was directed to Asian and American countries (i.e. Turkey and St. Vincent Islands) with the price of 8 USD/kg; in 2007 and 2008 – to CIS countries (i.e. Russia and Georgia) in 8.5 and 19.2 USD/kg respectively. The shares of those countries in total export differ (0.007%, 94% and 9%), but not very low, thus influencing total benefits from pork exports. Broader picture on price variety and increasing gap between average export and import pricing across different countries during 2006-2008 can be found on Figure 2.11.

The number of poultry export partners increased from 7 to 34 during 2006-2008. But Vietnam, China (and Hong Kong) and Kazakhstan remained among leaders. Only in 2006 RW exports prevailed over the CIS»: its common share decreased from 99.97% in 2006 to 41.27% in 2007, and therefore increased to 47.37% in 2008. The quantity exported to Vietnam decreased 4 times between 2006 and 2008, which made the decrease of Vietnam share in total poultry exports from 79% to 24%.

Figure 2.12: GEOGRAPHICAL STRUCTURE OF POULTRY EXPORT FROM UKRAINE DURING 2006-2008

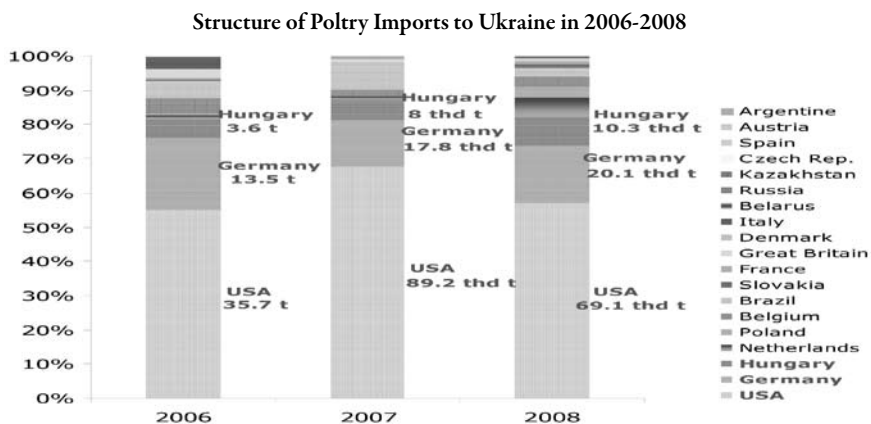


The poultry export quantity to China (including Hong Kong) increased by 94%, however, its share in total poultry exports decreased by 1% through 2006-2008, and equaled to 20.7% or 0.86 t for 7 month of 2008. Poultry exports to Kazakhstan decreased by 28%, thus making reduction in total poultry exports from 58% in 2007 to 50% in 2008. However, poultry exports became more differentiated signaling about poultry export development (see Figure 3.12).

The geographical structure of poultry imports does not demonstrate so huge and noticeable trade partners» increase as its export structure. The increase through 2006-2008 was just from 12 to 16 partners. It speaks for better development of poultry import flows in comparison with its exports. It differs by sustainable partnership with USA, Germany and Hungary being in top three for the whole period from 2006 to 2008. The exception was 2007 when Hungary was shifted by Brazil.

In general, the largest poultry import share belongs to USA. It had 47% in total poultry imports in 2006, 68% in 2007 and 57% in 2008. Germany accounted for 32% in 2006, 14% in 2007 and 17% in 2008. Hungary had the smallest but constantly growing among leaders share: 5% in 2006 6% in 2007 and 9% in 2008. Their changes in shares are associated with changes of imported by Ukraine poultry volumes. For visual a presentation see Figure 3.13.

Figure 2.13: GEOGRAPHICAL STRUCTURE OF POULTRY IMPORT TO UKRAINE DURING 2006-2008

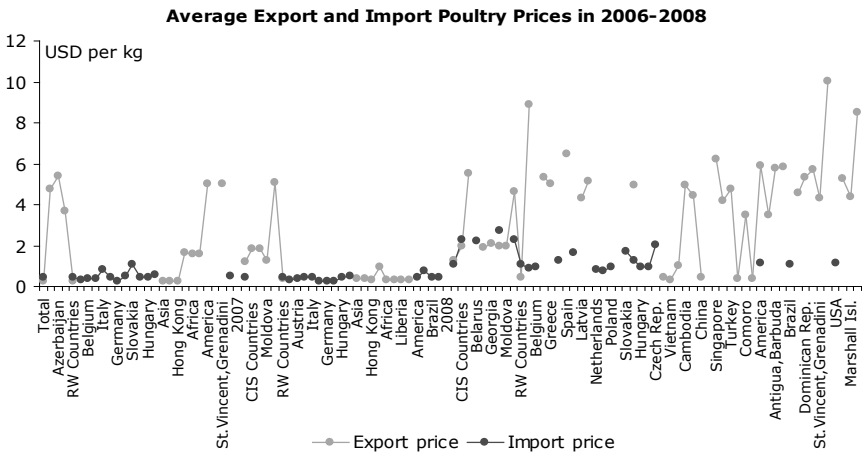


** data for 2008 is for January-July of 2008.*

Source: State Statistics Committee of Ukraine (code 207000000)

Average import prices for poultry meat exceeded average export prices only ones, in 2006 by 65%. In 2007 and 2008 there was normal reverse relationship between them: average export prices were over average import prices by 65% and 16% respectively. Average export prices grew about 4 times between 2006 and 2008: from 0.26 to 3.88 USD/kg; average import prices grew about 1.5 times: from 0.43 to 1.06 USD/kg.

Figure 2.14: AVERAGE EXPORT AND IMPORT POULTRY MEAT PRICE TREND DURING 2006-2008



Source: State Statistics Committee of Ukraine

The highest poultry export price was set for Azerbaijan in 2006, Russia in 2007, and for St. Kitts and Nevis in 2008. However, their common share in total exports was just 0.024%. In contrast, export pricing of top trade partners (Vietnam, China (incl. Hong Kong) and Kazakhstan) was much lower, but total export benefit from them for 2006-2008 accounted for 10.77 mln USD or 94% of cumulative poultry export benefit for this period. For more details see Figure 2.14.

Export quantities of mutton and goat’s meat are very small. However, import quantities of mutton and goat meat increased about 58 times during 2007-2008 while import volume growth has not stipulated a diversification of trade partners since the world market for these products is dominated by Australia and Oceania.

Ukraine is involved in export-import operations with by-products of different kinds of meat (i.e. bovine, pork, sheep, goat, horse, donkey, and mule). Total by-product exports decreased by 89% from 2006 to 2008. In contrast, their imports increased by factor 1.6 during this period. Main export partners of Ukraine in its by-product trade were CIS countries in 2006 and 2007 (Azerbaijan and Georgia accounted for 99% and 90% respectively), and in 2008 the exports were almost equally distributed between CIS and Asia⁴. Average export price charged in 2006 was

4 The largest export destinations in 2008 were China (47.8%) and Georgia (50.3%) while total number of export partners equaled 17 (in comparison, in 2006 and 2007 number of export partners for meat by-products was 3 and 4 respectively). Together with total export quantity decrease, total export benefit decreased by 90% from 100.8 to 10.4 thd USD.

0.52 USD/kg, in 2007 – 0.45 USD/kg and in 2008 – 0.5 USD/kg. Standard deviation of those prices was around 3.01 in 2006, 2.3 in 2007 and 3.55 in 2008. Main Ukrainian import partners in meat by-products trade were Argentina, Poland and Hungary in 2006, Argentina, USA and Hungary in 2007, and Poland, Germany and USA in 2008. Meat by-product import cost increased by 2.2 times.

In summary, Ukrainian exports during 2006-2008 declined for pork and bovine meat but tend to fluctuate strongly. Poultry exports have grown in total by factor 15 during the years 2006-2008. Despite remaining technical barriers to trade on Ukrainian side, imports of meat products were constantly growing throughout 2006-2008. However, it should be noted that export and import prices during the last three years have occurred under the so called «World Food Crises» which implied high world market prices for agricultural raw materials between 2007 and early 2008. The near future may likely show a further increase of pork and poultry imports to satisfy domestic Ukrainian demand. Exports will go down due to unsatisfied domestic demand, but also due to low and inefficient production that often fails to comply with foreign quality standards. Bovine meat exports are currently unlikely to occur at a larger scale. However, after WTO-membership Ukrainian meat markets remain sensitive to changes on foreign markets, but also to domestic (trade) policy changes.

1.4 Ukrainian meat market policies

The Ukrainian meat markets are still heavily influenced by the government. According to specific regulations on local levels, extra charges to finished meat products are limited to 15%. This concerns extra charges to wholesale producer prices (or custom value) for bovine, pork and poultry meat (not taken transportation costs). Limited to 10% extra charges to competitive sales price of State Reserve are also set by the government. Finally, wholesale prices for bovine, pork, poultry meat and cooked meats are under government control by the same law⁵.

Technical trade barriers have created obstacles for meat exports into Ukraine. Previously, trade in beef and pork was a sensitive political issue and the volume of imports was directly correlated to court decisions and political deals associated with the free economic zones (FEZs) privileges. In late 2007 FEZs that accounted for over 90% of pork imports in 2006 were closed, which allowed Ukraine to get rid of grey import schemes. But some governmental measures (such as state purchased imports of red meat, the recent intention to introduce a pork import quota, recently introduced and then cancelled 13% increase to import tariffs etc.) still have a great impact on trade

5 *Resolution of the Cabinet of Ministers of Ukraine # 1548 «On empowerment of executive bodies and executive local bodies to regulate prices (tariffs)» from December 25, 1996 (with last changes made by Resolution # 36-2009-n from January, 28 2009).*

of meat. In addition, the Ukrainian government was criticized for high meat prices and high inflation, and for significant state purchases of poultry meat. Therefore, trade forecast for 2009 highly depend on crucial Ukrainian trade policy changes.

Meat producers often blame Ukrainian government for low levels of financial support. They demand privileged credits, an increase of direct subsidies, as well as guaranteed minimum prices and stepped-up import restrictions. As a response by the Budget Law for 2009⁶ (in comparison with the last changes introduced in the Budget 2008⁷) support of cheaper credit resources was decreased by 82% to 0.3 bln. hrn. and the budget for animal subsidies was reduced by 84% to 0.5 bln hrn. Also 30 mln hrn are aimed at selection purposes of animal breeding and poultry farming, 20 mln hrn to support of farming (households), 1.5 mln hrn to prevent animal illness extension, and the total of 1.1 bln hrn for different veterinary purposes. Thus, the WTO requirement to gradually decrease yellow box measures is fulfilled even at a faster than expected pace.

The Law of Ukraine # 922-VI (the correspondent Draft Law number is 3353) «On introduction of changes to some laws of Ukraine regarding the prevention of negative consequences of World financial crisis for agricultural development» was signed by the Head of Verkhovna Rada of Ukraine on February, 7 2009 (but the President has already vetoed it two times; the veto was overcome by Verkhovna Rada on March, 3 2009, and, finally, the Law was signed by the President on March, 13 2009.). According to this Law, meat and meat products are not allowed to be imported by the scheme «goods made on commission». Also from the time of Law adoption prices for services of veterinary medicine and quarantine inspection will be under governmental control. Besides, commercial banks are to prolong credits for agricultural businesses attracted in 2005-2008 with no change of interest rates and any other extra charges for a one year period (National Bank of Ukraine will provide refinancing to these banks). Also new standards for meat products will have to be worked out, and VAT tax paid by processing enterprises for sold meat products will be directed to agricultural producers as a subsidy.

In addition, some other governmental initiatives may lower Ukrainian meat industry competitiveness (imposition of minimal prices and «hand» price regulations, a complicated VAT system, intention to increase import tariffs for some goods, etc.) However, while much still needs to be done, the Ukrainian meat industry has demonstrated a positive development, including slow but gradual shift of agricultural meat production from households to industry, improvement of quality and effectiveness of meat production at several processing enterprises and so on. Suspended governmental policy can facilitate further positive trends. Thus, the government should utilize the

6 *Law of Ukraine # 835-17 «On State Budget of Ukraine for 2009» from December 26, 2008.*

7 *Law of Ukraine # 589-VI «On introduction of changes to the Law of Ukraine on State Budget of Ukraine for 2008» from September 24, 2008.*

benefits from WTO membership, such as increased export opportunities, to push for the development of a competitive Ukrainian meat industry. Meanwhile its current legislative work is intended to minimize the negative effect of the financial crisis, and also to provide food security and competitive agricultural production⁸ through provision of sustainable financing of agricultural businesses, purchases of high genetic quality cattle and poultry by financial leasing schemes, gradual shift from general governmental support to direct subsidies, partial compensation of development expenses for agricultural producers (including investment projects), development of the insurance system, etc. In this context, collaboration with international organizations and foreign countries will also hopefully contribute to a rising competitiveness of the Ukrainian meat industry.

2. MEAT PRODUCTION IN THE EU: FACTS AND FIGURES

For decades, the meat sector has been one of the most important of the European Union's (EU) agriculture. Half of all EU farms have livestock. Some 90 % of farmers with ruminant animals (cattle, sheep and goats) are specialist livestock producers. And livestock and meat products also have been among the fastest growing components of the global agri-food industry.

Traditionally, meat is a major source of protein and constitutes an important part of the European diet. Therefore, the policies of the EU in the meat sector and especially under the regime of the Common Agricultural Policy (CAP) are designed to encourage the production of safe, nutritious and affordable meats.

Nowadays, a large number of animals in the EU is being kept indoors and/or being fed with prepared feeds (e.g. grain). The white meats (pork and poultry) tend to be produced away from the land (i.e. in a number of types of barn or enclosed systems), though outdoor husbandry is increasing gradually – especially as part of ecological farming systems. Feeds are prepared from home-grown or purchased ingredients, often grain-based, or bought in as prepared «compound» feedstuff.

The modern European consumer demands a higher share of convenience products and eats out more frequently, which does have an impact on the industry. By increasing product development, showing larger market flexibility and improving responsiveness, producers try to optimize their focus on meeting the consumer need.

8 *Draft Resolution of the Cabinet of Ministers of Ukraine # 1360 «On the Program of activity of the Cabinet of Ministers of Ukraine «On the overcoming of influence of the World financial-economic crisis and sustainable development» from December 23, 2008.*

In the EU, however, consumer confidence in the industry has declined in recent years as a number of animal diseases, such as Bovine Spongiform Encephalopathy (BSE), foot-and-mouth disease (FMD), avian influenza or the severe acute respiratory syndrome (SARS), have all had a dampening effect on overall meat demand and prices. Hence, the development in the European meat sector is characterized by changes in demand, consumption and demographics towards more attention to soft product quality traits such as animal welfare, «ethical products» and product origin.

Today, politicians but also most market participants are aware of the fact that animal health scares can potentially destabilize the industry and put it under pressure. So to safeguard animal and public health the EU maintains its strict legislation, a high level of standards and a policy to fulfill consumer needs for enhanced information, while producers try to improve both the quality of farm management and the vertical integration of the whole production chain.

Together the four major meat types bovine, pig, poultry as well as ovine account for 25 % of total EU agricultural output. In addition, there is a small volume niche market for a wide range of (farmed) game traded at premium prices. Of course, the markets for these five meat categories exhibit different development paths. On the supply side, this is due to individual biological production cycles; differences in feedstuffs used as well as feed conversion efficiencies but also varying sales channels and marketing contracts. In the following paragraphs the EU meat market and the four plus one meat categories will be considered in more detail.

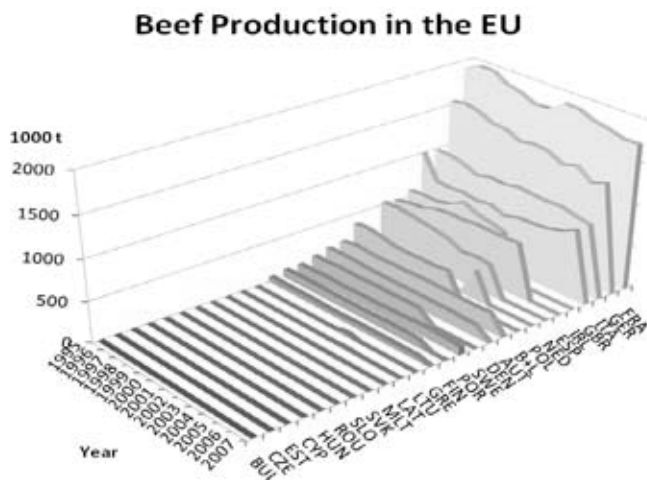
2.1 Bovine meat

World production of bovine meat rose by 2.3 % in 2007, and is projected to rise a further 1.1 % in 2008 to 68 million tons. All of the increase in production will take place in developing countries, which now account for 56 % of the global total.

In the EU, bovine meat production continues to display a slight downward trend with a decline in production of less than 1 % because animals are being retained to increase the size of the dairy herd, following the increase in milk quotas. But since there are reduced imports from Brazil this should have a stimulating effect on the industry.

Figure 3.1 shows that the largest producers are Germany and France but each with declining production levels since the mid-1990. On the contrary, beef production in Great Britain and Ireland has been on the rise again after the BSE crisis in 2001.

Figure 3.1: BOVINE MEAT PRODUCTION IN THE EU 1995-2007



Source: Eurostat (2008).

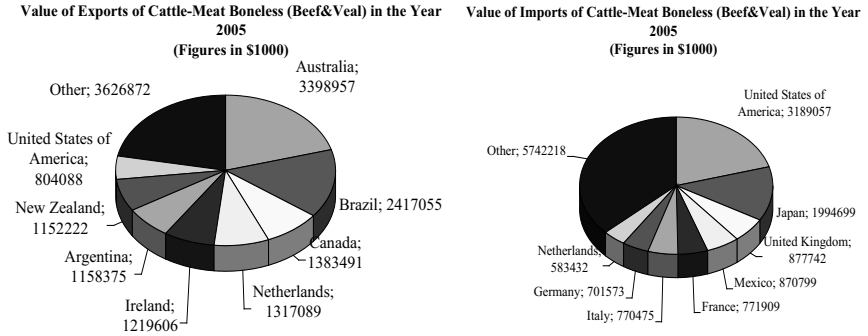
Neither in the new Central and Eastern European (CEE) member states nor in Scandinavia beef production plays a major role. At a first glance, this seems to be surprising because these countries all have relatively abundant grazing land.

As indicated by Figures 3.2a and 3.2b, the market of beef and veal exports is much more concentrated than the same market on the import side.

While the eight largest beef exporters account for roughly 80 % of world beef exports, on the import side the eight largest importers absorbed about 33 % of world imports. Furthermore, the United States as well as the Netherlands appear to be large exporters as well as large importers all at once, which can be explained by the fact that beef and veal are by no means homogeneous products. Instead, intra-industry trade plays an important role and points to the fact that different beef varieties as well as the structure of the processing industry have their own impact on trade data.

Figures 3.2a and 3.2b: WORLD'S LARGEST IMPORTERS AND EXPORTERS OF BEEF AND VEAL

In Terms of Value

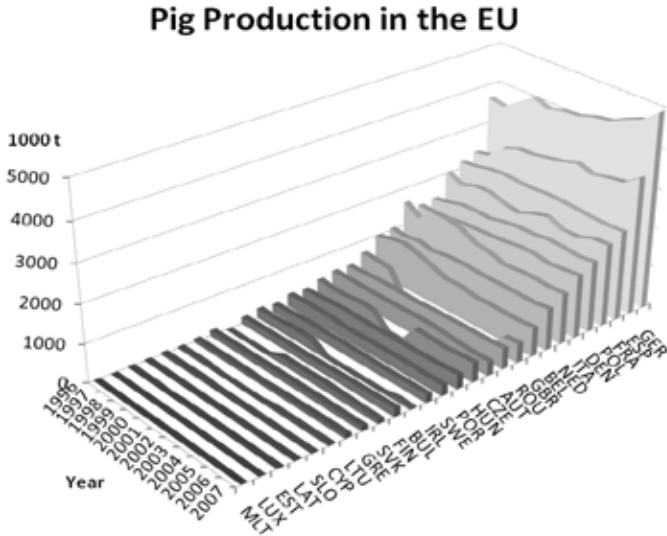


Source: Own depiction based on FAOSTAT.

2.2 Pork

pork is the most widely eaten meat in the world, providing about 38 % of daily meat protein intake worldwide, although consumption varies widely from place to place. This is despite religious restrictions on the consumption of pork and the prominence of beef production in the West.

Figure 3.3: PIGMEAT PRODUCTION IN THE EU 1996 – 2007



Source: Eurostat (2008).

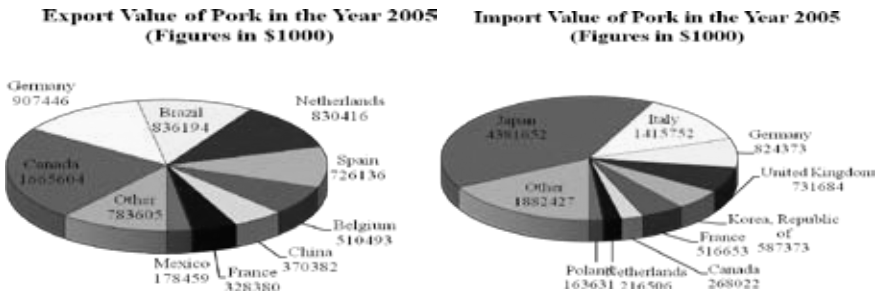
The EU has a high degree of self-sufficiency with regard to pork and therefore imports only small amounts. Import quotas are not filled because some licensed countries do not meet the veterinary standards. Therefore, imports are effectively banned, although tariff rate quotas would be favorable. The EU does not interfere with the domestic market for pork, nor do export subsidies play a major role. But EU exports by themselves are also vulnerable to sanitary and veterinary restrictions imposed by importing countries.

Figure 3.3 shows the contribution of each member state to the European pork output in 1000 metric tons. Again, the largest countries tend to be the largest producers, with significant shares contributed by Poland and Romania, the Czech Republic and Hungary. On the other hand, especially the Danish and Dutch pork industries are export driven. Denmark, for example, is one of the world's largest pork exporters with over 75 % of its output going to some 100 countries.

Figures 3.4a and 3.4b display the world's largest importers and exporters of pork, respectively. Pork in the definition used here refers to slaughtered meat from pigs at a low level of processing.

Figures 3.4a and 3.4b: WORLD'S LARGEST IMPORTERS AND EXPORTERS OF PORK

In Terms of Value



Source: Own depiction based on FAOSTAT.

International trade statistics show various other categories of meat from swine. Compared to the world's trade with beef and veal, trade of pigmeat is even more concentrated on a small number of countries. This is supported by the fact that the share of other countries is in either case less than 20 %.

In addition, intra-industry trade also plays an important role, but it appears that some major players such as Germany, the Netherlands and France, all are part of the EU. It should also be noted that the importance of China for global pork exports might be somewhat understated by Figure 3.4a due to exchange rate effects when converting all exports into US dollar values. In terms of quantity in metric tons China is a leading and major exporter of pork.

On the import side, a number of European countries also appear to be large markets, while the share of «other» countries points to at least limited alternatives for potential Ukrainian exports. Due to geographical proximity especially Poland may qualify as an emerging market for Ukrainian pork producers.

2.3 Poultry

poultry meat is a heterogeneous group of meat varieties, ranging from chicken, turkey, geese, ducks to guinea fowls. Chicken meat accounts for 70 % of EU poultry production, turkey meat follows

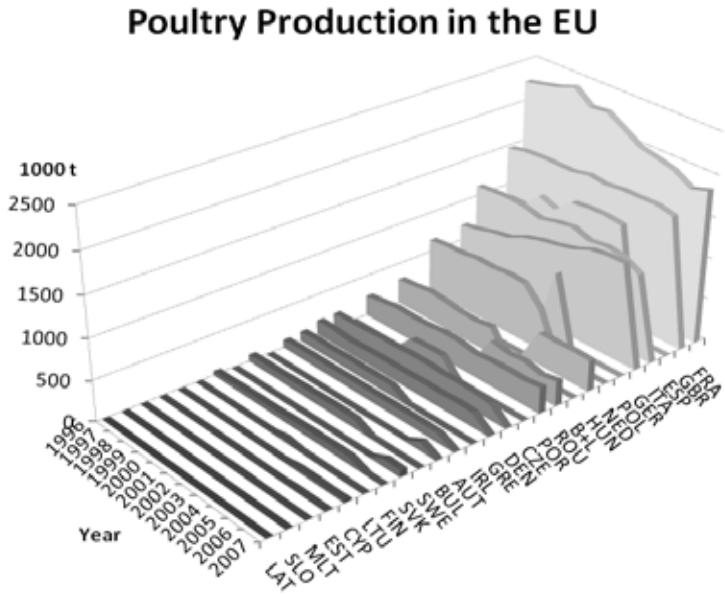
with 20 %. All others constitute the remaining 10 % of EU poultry output. Poultry production is typically vertically integrated, with specialized operations for each part of the bird life cycle: breeding and hedging stations deliver the birds to feeding operations.

From there, specialized transportation companies bring them to slaughterhouses. With the exemption of organic production systems, poultry production in Europe is a pure indoor activity, typically along with a high concentration of birds at a certain place.

Therefore, from a civil-society perspective, a number of environmental concerns are associated with poultry production. Because they are afraid of expected emissions from new poultry operations, local residents in a large number of cases have already politically opposed the expansion of existing poultry farms.

On the other hand, EU agricultural policy does not directly interfere with poultry markets through price support or direct payments. However, feed costs are crucial for this sector and therefore EU policies with regard to grain and oilseeds certainly have a severe impact on the poultry sector as well.

Figure 3.5: POULTRY PRODUCTION IN THE EU 1996 – 2007



Source: Eurostat (2008).

Figure 3.5 shows the contribution of each member state to the European poultry output in 1000 metric tons. Major producers are France and Great Britain followed by Spain, Italy and Germany. Intra-industry trade for poultry is significant within the EU, with Poland and Hungary.

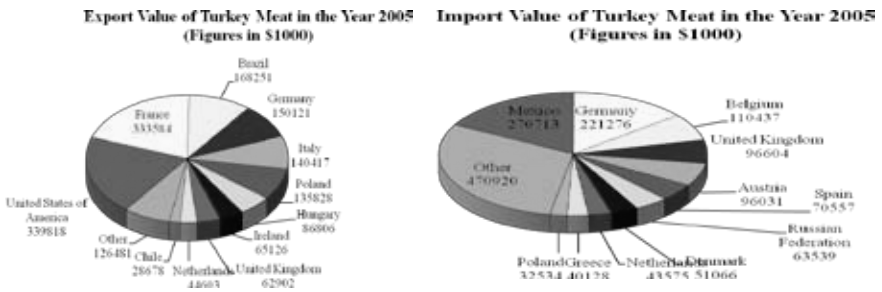
The market for poultry has been especially fast growing in recent years in Europe because chicken and turkey meet the changing preferences of health-aware European consumers, who demand lean, white meat that is associated with a well-balanced diet.

On a side note, in Germany during Christmas time, consumption of goose and duck meat traditionally reaches its annual peak and is mainly accommodated with demand for imports from Poland and Hungary.

As indicated by Figures 3.6a and 3.6b, the USA, France and Brazil dominate half of the market for turkey exports, while Mexico, Germany, Belgium, the UK and Austria as the largest importers absorb about 50 % of world imports. From a Ukrainian perspective it is noteworthy that the Russian Federation in 2005 has received turkey meat imports to the amount of more than 63 million USD making it the eighth biggest importer on a global scale.

Figures 3.6a and 3.6b: WORLD'S LARGEST IMPORTERS AND EXPORTERS OF TURKEY

In Terms of Value



Source: Own depiction based on FAOSTAT.

2.4 Ovine Meat

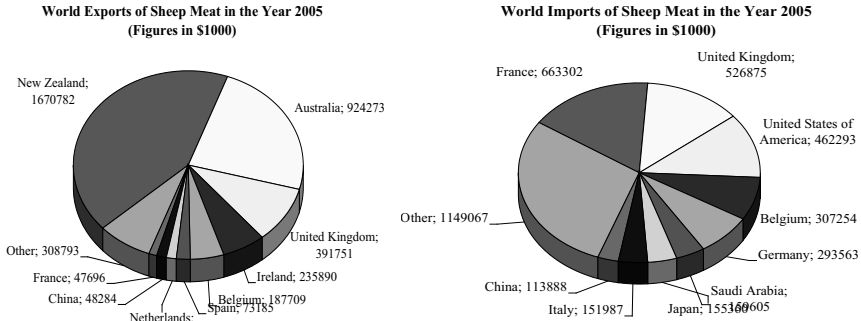
According to the EU Commission, the European ovine meat sector shows a shrinking tendency in the long run. This is primarily due to relatively small incomes being generated from sheep husbandry while costs for feed and energy are on the increase. Furthermore, European sheep keepers display a rising average age indicating that young farmers do not invest into the sheep business any more. The meat industry anxiously watches the decline in sheep and goat numbers as managers are afraid of inefficient slaughterhouse and plant utilization possibly preventing them from cost-effective production in the near future.

Several large countries within the EU exhibit comparatively small levels of sheep production. Exemptions are Great Britain and Spain. However, in the UK, sheep production has severely suffered from Scrapy along with the BSE crisis. The world market for sheep displays an unusual structure: Sheep and goats are small ruminants that are able to live and grow even on marginal land. Therefore, raising them is less capital and labor intensive than many other branches of agriculture. So theoretically, a large number of countries could potentially build a competitive sheep producing industry in those geographical areas where the opportunity costs of sheep production are low. However, so far only Australia and New Zealand have managed to build such an industry, and currently those two countries are by far the most competitive suppliers of premium quality sheep meat exports (see Figure 3.7a).

On the other hand, world imports largely follow the overall market size for food, implying that domestic sheep production in none of the EU countries actually meets domestic demand. Furthermore, in European countries that are experiencing a mounting immigration of Muslims, a growing market exists for less than premium sheep meat.

Figures 3.7a and 3.7b: WORLD'S LARGEST IMPORTERS AND EXPORTERS OF SHEEP MEAT

In Terms of Value



Source: Own depiction based on FAOSTAT.

For instance, Germany nowadays has more than 3 million residents that have strong cultural preferences for sheep meat consumption. At the same time it is estimated that 30 % – 40 % of domestic sheep production in Germany is marketed through informal channels, serving especially the Muslim community. Therefore, reliable data about sheep production and consumption in Germany are not available. But it can be assumed that a large share of this production does not constitute premium quality lamb.

For Ukraine as a potential exporter especially the market for high quality lamb could open interesting perspectives for certain Ukrainian enterprises that may face a competitive advantage in sheep production and at the same time manage to provide quality that matches the high level of exports from Oceania.

2.5 Game

game meat potentially constitutes an interesting niche market because game typically sells for premium prices. Therefore, as Figures 3.8a and 3.8b reveal import and export values of game to and from Europe are quite substantial, e.g. in comparison to poultry or ovine meat. Venison is bought by consumers with comparatively high income, and a large share of game is consumed directly in restaurants.

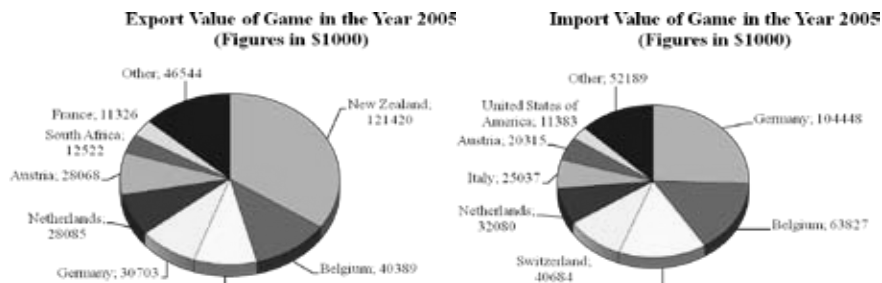
Figure 3.8a points to Belgium and the Netherlands as major game exporters, which deserves explanation, since neither of these two countries is known for vast areas of wilderness as a potential habitat of wild animals: The EU administration clearly distinguishes between meat from wild game, and meat from farmed game animals:

«Farmed game» means land mammals or birds which are not considered as domestic, but which are farmed as domestic animals. «Wild game» means wild land mammals which are hunted, but also wild mammals living within an enclosed area under conditions similar to those they would have in freedom. Also considered «wild game» are wild birds which are not covered by the EU farmed game meat directive.

In other words, it is common in the EU to keep especially deer and wild boar, but also rabbits and various wild birds in fenced-in areas in order to control the process of game meat production much more closely than it would be possible with animals living in forests or elsewhere without control. However, with regard to gourmet restaurants or delicacy stores, consumers often still distinguish between the quality of farmed game meat and the premium quality of «true» venison.

Due to its proximity to the EU market and due to its abundant nature Ukraine may have a large potential to export either farmed or «true» game to this premium market in the EU. Thus, this sector may constitute an interesting alternative for some Ukrainian enterprises to specialise in. However, key requirements to export venison to the EU are identical to the general principles for exporting other meat products, which are outlined in Chapter 4.

Figures 3.8a and 3.8b: WORLD'S LARGEST IMPORTERS AND EXPORTERS OF GAME



Source: Own depiction based on FAOSTAT.

3. MEAT MARKETS, POLICIES AND REGULATIONS IN THE EU

Europe constitutes the largest single market in the world and at the same time qualifies as one of the largest agricultural exporters in the world. Due to the growing liberalization of world markets and the continuing European integration, agriculture in the EU is undergoing constant restructuring in order to meet the demands of global competition. The competitiveness of market participants is dependent on efficient production and marketing processes. Apart from that, it is also determined by process efficiency on the input supplying (farm), and output demanding (retail) level to a large extent.

However, farm handouts under the CAP remain the single biggest spending item in the combined EU budget, accounting for about 43 % of the whole – around 40 billion EUR.

3.1 How the EU's Common Agricultural Policy addresses the Meat Sector

When the Marrakesh Agreement of 1994 brought an end to the General Agreement on Tariffs and Trade (GATT) Uruguay Round and created the World Trade Organization (WTO), trade disciplines were put in place that also apply to the EU's meat sector.

In the beef sector, this has brought about reduced expenditure on domestic market support, put downward pressure on export refunds and lowered border protection via tariff cuts and increased access to EU markets.

Due to the lack of domestic market support in the pig meat sector, here the reduction of export refund has had the biggest impact.

For the poultry meat sector that is also without particular domestic market support measures, the pressure has come via increased competition on the EU market from imported products.

While gradually phasing out conventional market support for meat, the EU has started build a reputation for high quality goods and tries to keep risks to a minimum through a comprehensive food safety strategy. The food and hygiene standards apply «from the farm to the fork», whether the food is produced in the EU or is imported from a non-member state.

The following chapters summarize important components of the CAP on the one hand, and of the «farm to fork»-system to monitor meat quality on the other.

3.1.1 Development and Principles of the CAP

The CAP went into effect in 1962 with the introduction of the first Common Market Organisations (CMOs) and qualifies as an integral part of the agreements that established the European Community (EC). It is among the most expensive EU policies commonly administered and funded by member states. The four initial objectives of the CAP were already laid out in 1953 in Article 39 of the Treaty of Rome. They include:

- increasing agricultural productivity through technical progress and efficient allocation of resources in order to ensure a fair standard of living for farmers;
- stabilizing internal markets;
- assuring availability of food supplies; and
- ensuring reasonable prices to consumers.

As a consequence, this led to efforts to comprise fluctuations in terms of the absolute level of prices as well as in terms of variations over time that could potentially harm individual producers. The CAP is based on three fundamental principles: free trade within the Community based on common prices, preference for Community produce in Community markets, and joint financial responsibility.

Until the CAP reform of 1992 (for beef and veal) and 2001 (for sheep meat and goat meat), support systems for cattle and sheep farmers linked prices and/or production levels. The market regimes were geared towards either sustaining a high price for the animals and their meat respectively, or making support payments direct to farmers based on the number of animals they kept on their farms. This has been gradually reduced and farmers are now offered direct aid payments instead to sustain their incomes.

The EU's assistance to the sector has been limited to export refund (i.e. one form of export subsidy used by the EU) and border protection, and limited use of aid for private storage (for pig meat mainly), which help to stabilize the internal EU market price. These trade-related measures are subject to World Trade Organization (WTO) disciplines.

The EU beef support regime with the practice of subsidized «intervention» buying of surplus beef from the market was altered significantly in 1999 and being reduced to a minimal «safety net» as part of the «Agenda 2000» CAP reform process. Since then, farmers receive direct aid in the form of premiums based on the number of cattle they held in a certain pre-reform reference period as compensation for the reduction in market price support.

The ovine meat support regime was reformed in 2001. The previous system of premiums paid to farmers on the basis of the market price was replaced by a single premium fixed for several years ahead.

Given their historical lack of direct support systems, the pork and poultry sectors (the white meats) have been relatively unaffected by the CAP reform process. Implicitly, however, producers of pig meat and poultry meat have benefited from the reduction in cereals prices resulting from CAP reforms in 1993 and 1999 as this has lowered feed costs.

3.1.2 Ongoing and Future Reforms: «Mid-Term-Review» 2003 and «Health Check» 2008

The 2003 «Fischler reform» or «Agenda 2000 Mid-Term-Review» (MTR) has completely changed the way the EU supports the agri-rural sector. All livestock and other direct aid payments under the CAP are being converted, over time, into a «single farm payment». Today, aid payments are no longer linked to what farmers actually produce (i.e. they are «decoupled» from production) but to the total of land they farm plus certain cattle premiums.

Under the so called «cross compliance concept» aid payments are linked more closely to farmers» delivery of environmental and welfare benefits. Farmers receive the direct payment as long as they manage their land in an environmentally correct way. In the case of livestock they also have to meet minimum animal husbandry welfare standards. Farmers who do not respect the rules face cuts in their support.

Direct support to farmers by the EU is thus increasingly aimed at offering a predictable level of aid to supplement their income from the meat markets. The certainty of aid payments over a period of years allows farmers to concentrate on improving their production methods, product quality and marketing. Assistance is also made available via the rural development measures co-funded by the EU and Member States.

Although it can be assumed that CAP measures in connection with the meat sector will be subject to further reforms in the future, currently it does not seem that the EU will completely eliminate its original market intervention policy for the markets in beef and veal (Council Regulation (EC) No 1254/1999 of 17 May 1999), pig meat (Council Regulation (EEC) No 2759/75 of 29 October 1975), poultry meat (Regulation (EEC) No 2777/75 of the Council of 29 October 1975) as well as sheep meat and goat meat (Council Regulation (EC) No 2529/2001 of 19 December

2001). In addition, the various regulations with regard to veterinary standards, animal welfare and cross compliance are likely to persist and to be extended following consumer demand.

The ongoing and future political reforms called the CAP Health Check will further break the link between direct payments and production and thus allow farmers to follow market signals to the greatest possible extent. For the meat sector, the following projected measures are of importance:

Decoupling of support: The EU Commission proposes to remove remaining «coupled» payments and shift them to the so called «single payment scheme» described above. For suckler cow, goat and sheep premia, however, member states may maintain current levels of coupled support.

Cross Compliance: The so-called «cross compliance» will be simplified, by withdrawing standards that are not relevant or linked to farmer responsibility. New requirements will be added to retain the environmental benefits of set-aside and improve water management.

Assistance to sectors with special problems: Currently, Member States may retain by sector 10 percent of their national budget ceilings for direct payments for environmental measures or improving quality and marketing of products in that sector. The Commission wants to make this tool more flexible. The money would no longer have to be used in the same sector; it could be used to help farmers producing beef, goat and sheep meat in disadvantaged regions; it could also be used to support risk management measures such as mutual funds for animal diseases.

Intervention mechanisms: The Commission proposes to abolish intervention for pig meat. For feed grains, intervention will be set at zero.

It seems that traditional CAP spending through price interventions and direct transfers («first pillar») has become unpopular among voters in Western Europe. So currently there even is no need for the WTO to pedal the EU to induce further CAP reforms. These reforms will not phase out spending on agriculture but shift payments towards the so called second pillar of the CAP – a budget largely flexible with regard to local initiatives and not tied to agricultural output.

The EU Commission is constantly increasing market orientation of farm policy and currently proposes the removal of most of the remaining production control mechanisms.

Besides other reforms that all target towards market orientation but are not explicitly related to the meat sector, the Commission is also proposing to cut higher total sums of subsidies per farm («modulation») above EUR 100,000 in order to address taxpayer concerns. This will likely be done through a progressive rate starting from 3 % per EUR 100,000.

3.1.3 CAP Regimes for Major Meat Categories

The CAP is an integrated system of measures which works by maintaining commodity price levels within the EU and by subsidizing production. There are a number of mechanisms that cover only certain agricultural products. Following is an overview of the major policy regimes for each meat category; however, a detailed coverage of each of these policy systems is beyond the scope of this paper. Therefore, EU websites that briefly summarize the CAP regime for each one of the major meat categories and list the relevant EU legislation may provide further information.

Bovine Meat

The sector formerly benefited from direct payments to producers that now have been transformed into a single monetary aid per farm, based on a reference period of beef and veal produced in the past.

In addition, border protection through import tariffs is still in place and Tariff Rate Quotas (TRQs) have been granted for long; e.g. the «Hilton» quota for premium beef.

- Summary of legislation:
<http://europa.eu/scadplus/leg/en/lvb/l60009.htm>
- List of relevant legislation:
<http://eur-lex.europa.eu/en/legis/latest/chap036057.htm>

Pig Meat

The CAP aims to stabilize prices and secure income levels for pig farmers mainly through border measures (tariffs) and special trade agreements with third countries. No other domestic subsidies apply to pig production directly.

- Summary of legislation:
<http://europa.eu/scadplus/leg/en/lvb/l11046.htm>
- List of relevant legislation:
<http://eur-lex.europa.eu/en/legis/latest/chap036052.htm>

Eggs and Poultry

Similar to regulations for pig meat, trade with non-EU countries is regulated through a system of preferential trade agreements. Direct subsidies to EU producers do not play a major role.

- Summary of legislation:
<http://europa.eu/scadplus/leg/en/lvb/l11057.htm>
- List of relevant legislation:
<http://eur-lex.europa.eu/en/legis/latest/chap036053.htm>

Ovine Meat

Similar to beef and veal policies, direct payments have been transformed into single farm aid based on a reference period. Trade is regulated through a system of preferential agreements.

- Summary of legislation:
<http://europa.eu/scadplus/leg/en/lvb/l11067.htm>
- List of relevant legislation:
http://europa.eu/eur-lex/en/lif/reg/en_register_036068.html

At this point, it should be stressed that most economists and even EU-policymakers would agree that the CAP is far from being perfect. In fact, throughout EU member states, subsidies from Brussels allow many small, outdated, or inefficient farms, which otherwise would not be viable anymore, to continue to operate. From a textbook of economics» point of view, it would certainly be better to end the political interference allowing the market to find its own price levels, and for uneconomic farming to cease. Parts of the EU budget currently used in the agri-rural sector could then be allocated to other sectors, such as infrastructure, education or healthcare, which might serve the public's general interest much better.

3.2 Principles of EU Food Law, Trade Conditions and Pertinent Requirements

EU agricultural and food policies address not only prices that domestic producers receive, but cover the whole «food chain». The EU has laws covering how farmers produce food (including what chemicals they use when growing plants and what they feed their animals), how food is processed, how it is sold and what sort of information is provided on the labelling. The EU also has laws regulating the safety of food imported into the EU, laws to prevent the spread of animal and plant diseases in the EU and laws on the humane treatment of farm animals.

The EU's «farm to fork» or «stable to table» strategy to maintain consumer confidence in the

safety of food products is based on a combination of high standards for food, animal health and welfare, and plant health. These standards apply both to food produced inside the EU and food imports. There are three pillars to this strategy:

- legislation on the safety of food and animal feed;
- sound scientific advice on which to base decisions;
- enforcement and control.

This means that every single food and feed business has to guarantee that all foodstuffs, animal feed and feed ingredients are traceable right through the food chain. In addition to the umbrella legislation for all food and feed, a targeted legislation on specific food safety issues and foodstuffs has been adopted by the EU. It comprises the use of pesticides, food supplements, colorings, antibiotics and hormones in food production, addition of vitamins, minerals and similar substances to foods, products in contact with foodstuffs, such as packaging, meat, gelatin and dairy products. In addition, there are stringent rules governing release, marketing, labeling and traceability of crops and foodstuffs containing genetically modified organisms (GMOs).

But from a socio-political point of view, maintaining consumer confidence involves more than a meticulous legislation and harmonized standards to reassure health aspects but has to focus on animal welfare concerns and environmental protection as well. Besides, a watchful media and highly active consumer, animal rights and ecology lobby groups force producers to meet the strict food production requirements in the EU.

Animal welfare in particular has been a main topic of the discussions over the future of the meat sector. In response to concerns voiced by the public, the EU Commission has continuously upgraded the legal requirements. For example minimum standards for living space, a minimum weaning age or the necessity of higher levels of training and competence amongst stockmen in charge of the animals were introduced and export subsidies on cattle destined for slaughter were restricted in order to decrease the number of live animal transports.

3.2.1 Shedding Light on the EU's Approach to Imports of Meat and Meat Products from Non-Member States

This chapter intends to address some of the practical matters involved when a country's meat producing industry wants to implement adequate capacities and processes to meet the criteria that need to be fulfilled in order to become an officially approved exporter of meat and meat products to the EU.

The pertinent regulations merely reflect the growing concern of EU policy makers to protect consumers from any harmful effect that may arise from the consumption of food regardless of whether it has been produced within or without the borders of the EU.

The European Food Law forms the basis for EU import rules. Import rules for meat and meat products are fully harmonised and the European Commission acts as the competent authority on behalf of the 27 member states. Thus, the EU Commission is the sole negotiating partner for all non-EU countries in questions related to import conditions for meat and meat products.

Detailed EU legislation in the veterinary field lays down the conditions that apply to the imports of live animals and products of animal origin from third countries. The responsibility for this area as well as for food safety lay within the domain of the European Commission's Directorate-General (DG) for Health and Consumer Protection.

The DG has issued a so called „Guidance Document» which is directed at competent authorities and food businesses in the EU member states and in third countries. It aims to give guidance on certain key questions with regard to the implementation of the new food hygiene import requirements and on official food controls. The document can be downloaded from:

http://ec.europa.eu/food/international/trade/interpretation_imports.pdf.

The import rules for meat and meat products are designed to guarantee that all imports fulfill the same high standards as products from EU member states. The import rules do not only focus on hygiene and all aspects of consumer safety but also on the animal health status.

In order to export their products to the EU, companies have to meet all pertinent EU requirements by adequately addressing the rules and regulations that result from this legal framework.

Along these lines, The EU Commission has also published an easily accessible user guide for the import of live animals and animal products from non-EU countries. This document provides

guidance to the national authorities in those countries that are interested in exporting say domestic meat products to the EU. It can be downloaded at the following website:

http://ec.europa.eu/food/international/trade/guide_thirdcountries2006_en.pdf

Besides the efforts of the EU itself, countries that are already exporting meat products to the EU commonly also make the required information available online for their national enterprises and keep this information up to date. An example is the «Export requirements for the European Union» as issued by the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA). The entire material can be accessed online at:

http://www.fsis.usda.gov/regulations//European_Union_Requirements/index.asp#XV

This collection of publicly available websites is also an example of how the US administration, for example, tries to help its domestic industry to stay competitive on EU markets. Similar material, however, can be obtained from Australian or Canadian official websites. It might be interesting for the Ukrainian government to also engage in such a way and to offer this kind of information to domestic stakeholders of the agri-rural sector.

Generally speaking, the EU is open for and interested in receiving imports from non-EU countries. Imports to the EU require that a consumer or a company within the EU is willing to buy the relevant goods and that the various quality criteria are matched. Especially in times of high international food prices, exports to the EU are likely to become easier than in times of low prices.

Nonetheless, exporters of meat and meat products from non-EU countries should anticipate that market conditions within the EU reflect the market situation outside the EU only partially. This is due to the system of the CAP. Understanding markets for agricultural products and especially for animal products within the EU therefore requires understanding the goals, instruments, and future directions of the CAP (see Chapter 3.1).

According to the EU Commission, inquiries from competent veterinary authorities of third countries concerning imports of animals and animal products into the European Union or their transit should be addressed, in the first instance, to: Directorate D, Health and Consumer Protection Directorate-General, European Commission

Internet: http://ec.europa.eu/food/index_en.htm

All other interested parties and private businesses should contact their competent veterinary authority.

The European Community provides technical assistance and facilities for institutional capacity building to help developing countries comply with EU rules. Additional, national and regional development programs of the EU are available in individual countries, as well as bilateral aid projects of the member states. The delegations of the EU can provide detailed information on such assistance. Further information is available under:

http://europa.eu.int/comm/external_relations/delegations/intro/web.htm

General guidance on EU import and transit rules for live animals and animal products from third countries can be found at the following website address:

http://ec.europa.eu/food/international/trade/importing_en.htm

The EU also assists third countries to familiarize themselves with EU import requirements. For this purpose, training organized for member states in the EU are often also open to participants from third countries. Specific training sessions may also be organised for third country participants on the spot. For more details, see:

http://ec.europa.eu/food/training/index_en.htm

3.2.2 Key Obligations of Food and Feed Business Operators

Whether they produce in the EU or import their products from a non-member state, food and feed business operators can derive seven key obligations from the EU food safety legislation. The European Commission's Directorate-General (DG) for Health and Consumer Protection accurately verbalizes these key obligations as follows:

Safety: Operators shall not place on the market unsafe food or feed.

Responsibility: Operators are responsible for the safety of the food and feed which they produce, transport, store or sell.

Traceability: Operators shall be able to rapidly identify any supplier or consignee.

Transparency: Operators shall immediately inform the competent authorities if they have a reason to believe that their food or feed is not safe.

Emergency: Operators shall immediately withdraw food or feed from the market if they have a reason to believe that it is not safe.

Prevention: Operators shall identify and regularly review the critical points in their processes and ensure that controls are applied at these points.

Co-operation: Operators shall co-operate with the competent authorities in actions taken to reduce risks.

Of course, these obligations are further detailed in the guidance document on the implementation of the main General Food Law requirements that can be downloaded from the following website:

http://ec.europa.eu/food/food/foodlaw/guidance/guidance_rev_7_en.pdf

3.3 Industry Standards to Control Meat Product Quality

From a non-EU perspective, the various quality regulations imposed by EU legislation may appear largely as an attempt to protect European markets against competing imports from abroad without having to rely on obvious measures such as tariffs that could be subject to WTO complaints. However, the vast number of quality schemes that have evolved and are in place besides and on top of the existing legal framework in Europe suggest that conventional protectionism is unlikely the main reason for the increase in quality legislation. Instead, efforts to establish even stricter quality regulations are undertaken not only by the EU Commission but also by European meat processing firms, local producer associations and retailing chains. In other words, the growing number of meat labels and certification schemes within the meat processing industry can be interpreted as the industry's attempt to exploit willingness to pay that various groups of consumers have for specific aspects of product quality, processing standards or environmental benefits of the final products that they consume.

In fact, with regard to the standard setter it can be distinguished between private and public standards. Public standards are laid down by the EU (Regulations (EC) 2092/91 and 510/2006) or by national or regional governments. Private standards can be laid down by customers (BRC Global Standard, International Food Standard), suppliers (Assured Farm Standards in the UK), norming institutions (ISO 9001, ISO 22000), inspection and certification institutes (Food TUEV Tested; Fresenius Quality Seal) or nongovernmental organizations (NGOs), e.g. (Fair Trade, Freedom

Food). The German Q&S system provides an example of industry associations representing different stages of the supply chain that have jointly set a standard. Another example in this regard is the French Label Rouge (various organizations together seek to ensure high quality of their food products). (Theuvsen, Plumeyer and Gawron 2007)

Figure 4.1 illustrates this duality of public and private quality enforcement within the stylized supply chain for meat that is marketed in Europe. The figure presents in a stylized manner the supply chain from feet input to the final meat product which is sold in a retail store.

The two columns on the right hand side of Figure 4.1 depict typical aspects of quality control that take place at various stages. It can be seen that in principle the legal frameworks constitute also minimum standards for the private quality scheme. However, in few regards private and public standards deviate from each other and require parallel structures for their implementation. In other words, in reality a firm exporting and selling meat products to markets in the European Union will most of all be concerned about complying with the private standards that are imposed e.g. by the retail chain buying and selling the final product because these private standards will normally comprises most of the legal requirements anyway.

According to Den Hartog (2004), a successful future of pork (and other meat) production rests on the following components:

- food safety,
- quality assurance and transparency,
- sustainability in production, and
- a variety of products which are easy to prepare (convenience food).

These components of successful meat production in principle apply to the beef, veal, pork and poultry sectors, but the beef, veal and lamb sector currently also begins to establish integrated programs that force farmers to document for each specific animal every treatment during the production process. However, it is very plausible that the strict enforcement of governmental and private supply chain controls, quality certifications systems and brands with regionally traceable origin of meat have significantly contributed to the quick recovery of the sector after the BSE crisis in 2001.

Potential exporters of meat and meat products to EU markets should be aware of the fact that complying with the EU legal framework is only a necessary, but not a sufficient condition for

market access in the EU! Nevertheless, policy makers in a potentially exporting country such as Ukraine should primarily be concerned about fulfillment of EU legal standards in order to create and maintain the administrative structures that are necessary in order to have private enterprises start doing the actual business. As soon as firms start to look for actual marketing opportunities within Europe, the adoption of the necessary quality schemes will follow as part of the business to business cooperation.

Figure 4.1: SCHEME OF LEGAL AND VOLUNTARY COMPONENTS OF THE SUPPLY CHAIN CONTROL FOR MEAT MARKETED IN THE EU

Level of the Meat Supply Chain (Arrows represent information flows based on continued process documentation)	Typical Requirements of EU Legislation	Requirements of a typical industry standard / certification scheme	vertical integrated system
Feed industry ↓ ↑	Feed from EU and non-EU origin, produced according to EU legislation	- certified feed - information on feed ingredients	
Farm that raises animals for meat production; intra- or extra EU ↓ ↑		- animal number / marking individual animals - documentation of transport - hygiene requirements - mandatory test for animal health - slaughter account	
Slaughterhouse; intra- or extra EU ↓ ↑	- hygiene requirements	- certified meat according to industry standard - batch number	
Meat Processor ↓ ↑	- hygiene requirements - EU legislation retailing	- certified meat according to industry standard - batch number	
Retailer			

Source: Own presentation based on Theuvsen, Plumeyer and Gawron (2007).

For these reasons the purpose of this chapter is merely to provide an overview of important quality schemes and standards that currently exist. Gaining an intuition of their specific objectives and underlying principles should make clear that complying with the overall framework of EU meat quality legislation already sets the cornerstones for the business to business (B2B) implementation of most other voluntary quality schemes.

Table 4.1 presents a selection of important quality schemes and voluntary programs that apply especially to meat processing, but to some extent also to other processed food products such as dairy products marketed within the EU. Table 4.1 points out that the HACCP standard is at the back of many principles of the EU meat quality legislation. The principles behind this standard are as simple as they are strict: Meat processors should just avoid anything that may at any stage of production and under any circumstance introduce hazardous effects into the product! In order to reach this goal the standard requires the development of objective and transparent process routines that are frequently monitored, benchmarked and documented.

Furthermore, Table 4.1 points out that quality certificates can be either targeted towards other businesses or towards consumers or towards both. Business-to-Business (B2B) standards are not communicated to the final consumers, who are often unaware of the existence of these standards (e.g. BRC Global Standard, IFS, ISO). B2B standards intend to remedy asymmetric information between different stages of the food supply chain.

Table 4.1: OBJECTIVES AND ORIGIN OF QUALITY SCHEMES IN THE EU MEAT PROCESSING INDUSTRY

Name	Countries	Sectors	Business to Business (B2B)	Business to Consumer (B2C)	Objectives:
HACCP quality concept for food processing («Hazard Analysis and Critical Control Point«)	World wide, recommended as standard for food processing by the FAO. This concept is foundation of all legal EU quality standards in food processing!	Food	Yes	no	Analyze all risks with regard to food safety. Develop process flows that enable detection and remedy of hazardous steps. Frequently test process flows with regard to food safety. Document all steps.
Protected Destination of Origin (PDO)	Introduced with support from EU commission	Food	No	yes	Ensure consumers about aspects of food quality
Protected Geographical Information (PGI)	Introduced with support from EU commission	Food	No	yes	Ensure consumers about aspects of food quality

Traditional Specialty Guaranteed (TSG)	Introduced with support from EU commission	Food	No	yes	Ensure consumers about aspects of food quality
ISO 9001:2000	World wide	All except primary agriculture	Yes	no	Monitors management systems
GlobalGAP	Europe	Primary agriculture	Yes	no	Improvement of food safety through monitoring of management systems with regard to minimum standards
Q&S	Germany, other EU countries	Agriculture and food processing	Yes	yes	Monitors the quality of management systems; covers the whole supply chain from agriculture to the final consumer; ensures minimum standards.
BRC Global Standard	Britain; other EU countries, Rest of the World Initiated by retailers	Food processing chain	Yes	no	Guaranteeing minimum standards, monitors quality of management systems, audits in food processing companies
International Food Standard (IFS)	Germany; other EU countries, Rest of the World Initiated by retailers	Food processing chain	Yes	no	Guaranteeing minimum standards, audits in food processing companies.
Organic Production Certificates, e.g. Demeter, Bioland	Europe; wide range of EU labels and national labels	Primary production of agricultural products, but also food processing	Yes	yes	From imposition of minimum standards to complete control of the entire food processing chain according to own criteria (e.g. Demeter!)

Source: Own presentation based on Theuvsen, Plumeyer and Gawron (2007).

On the other hand, Business-to-Consumer (B2C) schemes address the final consumer, typically by displaying a logo on the products produced by certified farms and firms (PDOs, PGIs, TSGs, Demeter). The B2C standards represent the majority of certification schemes in the EU but tend to capture the purchasing power of very specific groups of consumers and therefore have a limited potential to grow. Few schemes address not only consumers but also other businesses and typically represent major parts of the market, for instance, Q&S accounts for about 80 % of the German pork market and Little Red Tractor for 65 % (beef) to 90 % (pork, poultry) of the British meat market (cf. <http://www.defra.gov.uk>; Theuvsen, Plumeyer and Gawron 2007).

Certification schemes have various objectives, ranging from the improvement and protection of food safety to the remedy of quality uncertainties. Public authorities often have only a limited capacity to control each specific step of the meat supply chain and therefore the enforcement of minimum legal standards is typical for many B2B schemes (BRC Global Standard, EurepGAP, IFS).

In the northern and western parts of Europe, schemes that control the production process with regard to the compliance with minimum standards are most important. In the Mediterranean countries however a stronger tradition of high quality, regional specialties has led to the spread of differentiation systems such as PDOs and PGIs. With regard to these geographical certification schemes in the EU it is noteworthy that some regional labels set standards on the one hand, but admit only local producers and processors as partners, which is the case for many PDOs and PGIs. Regional certification schemes are often founded by regional governments or medium-sized processors in order to protect their products against low-price imitation from abroad (e.g. special sausages, bacon, etc...). For Ukrainian producers this can become relevant if specific meat products of high quality shall be marketed within the EU under a certain name: It has to be checked whether this name is already legally protected as part of a regional quality scheme within the EU.

In summary, public and private certification schemes in the EU at a first glance reveal a very heterogeneous picture with regard to focus and geographical location. However, with regard to the underlying principles it is obvious that the key objectives of most schemes follow the general idea to eliminate various types of risks that can be introduced into the final products at any stage of the processing chain. In addition, some labels and schemes intend to remedy asymmetric information with regard to the origin of the final products and the way how they have been produced. A tendency can be observed that those voluntary programs that regulate the production process more strictly than others typically serve also a smaller market segment.

Ukrainian policymakers should primarily be concerned about the establishment of administrative structures that comply with the general legal EU framework. The experience within the EU has shown that the private market will generate solutions to properly implement these and additional regulations into the production process, because obviously a huge market does exist within the EU for meat products that comply with various quality standards!

4. CURRENT TRENDS ON MEAT MARKETS IN EUROPE AND THE WORLD

4.1 Understanding Consumer Demand for Meat and Meat Products in the EU

World meat markets are currently characterized by high prices for feedstuff and high opportunity cost for land (partly due to the rush for biofuels). On the other hand, global meat markets face a rising world population and rapidly growing incomes in major developing countries (China, India and Brazil). White meats, namely pork and poultry, experience the highest increase in demand but at the same time they are the most vulnerable ones with regard to high factor prices for grain and oilseeds.

However, the production of beef and veal also critically hinges upon grain prices because corn, cereals and oilseeds constitute a major share of feed ratios in intense beef production such as feedlots or indoor beef production that is especially common in the EU. Furthermore, processed beef often is obtained from dairy cows, and the number of calves available for veal and beef production partly is also a function of the size of the global dairy herd. Therefore, in the medium term changes of major dairy policies such as quota abolishment in the EU can also be expected to have an impact on beef supply. In Europe an increase in the number of dairy cows will automatically result in a mounting number of male calves for fattening. However, current trends on dairy markets do not project a dramatic increase in dairy cows in Europe.

With regard to meat production other than beef, veal, pork and poultry, markets tend to be much smaller. Especially the production of lamb face slow opportunity cost since sheep utilize marginal grazing land and bigger amounts of grain are typically not part of feed ratios. However, demand for lamb in developed countries remains constant, and especially within Europe a large share of the Muslim population seems to rely on local, informal sources with regard to lamb. Therefore, the only official market for lamb in the EU is for premium quality, which in turn is dominated by exporters from Oceania.

In order to understand current trends on global meat markets, the EU market can be seen as setting the stage with regard to the development of demand and policy. Other affluent countries, such as Japan or the USA, tend to exhibit similar patterns. However, consumers may have slightly different tastes and different attitudes towards risk and environment, and therefore political regulations will tend to differ slightly with regard to the specific regulations. Nevertheless, exporting meat to the US or to Japan nowadays requires similar procedures of approval as it takes to export

to the EU. At the same time, developing markets such as India, China or Brazil can also be expected to develop food safety regulations sooner or later- if not for pure reasons of consumer protection, they may also consider do so in order to retain a way to control imports beyond tariff-based market protection. For these reasons, it is useful to investigate the European market for meat more closely.

Chapter 4 has shown that European consumers increasingly care about how meat is produced. In this respect, especially the poultry industry but also the pig industry to some extent have a bad reputation among European consumers and are regarded as production systems that make animals suffer and are environmentally damaging. Therefore, the poultry industry in Europe in particular faces an increasing challenge to develop production methods that are both competitive and accepted by the consumers, which tends to raise total cost of production. Recent studies with consumers in EU countries have pointed towards very strong attitudes of consumers in favor of domestically produced poultry that guarantees animal welfare and certain consumer health aspects.

Consumers furthermore expect traceability of meat products and are to some extent willing to— encounter higher prices if they can trace the origin of the meat. For European farmers, this has led to detailed regulations about how to mark each individual animal soon after birth and how to document this animal's entire life on the farm. However, the European approach with regard to strict meat quality regulations does not imply that European consumers would pay any price for meat if only their expectations with regard to animal welfare and environment are matched. In fact, rather the opposite is true: European consumers are aware of prices and expect animal welfare and environmental concerns to be matched at the same time.

It has already been mentioned that the EU Commission and the national governments have implemented a dense system of tracking meat products «from farm to fork» and on transport routes across Europe. In addition, the environmentally damaging side effects of meat production are regulated and/or taxed, and a horizontally and vertically ever more integrated meat industry is increasingly more threatened by diseases such as foot and mouth, BSE or avian influenza. Consumers tend to react extraordinarily sensitive to an outbreak of such a disease, and usually the loss in market shares after a diseases is many times more costly to producers than the actual loss of animals.

All this applies in principle to all types of meat produced in Europe and raises the cost of production. For instance, according to recent studies, the cost of pork production in Western Europe, as an average, is higher than in the US, Canada and Brazil.

Den Hartog (2004: 21) concisely summarizes the challenges that European producers of pork currently face: «European consumers expect attractive, nutritious and safe food from environmentally responsible and sustainable sources for a fair price.»

4.2 Understanding Ongoing Trends within the European Supply Chain for Meat

As mentioned before, and partly as a reaction to recent diseases (e.g. BSE) that have shattered consumer confidence, EU farmers, slaughterhouses and retail chains have established programs to certify the supply chain for meat products, and in some instances these requirements even exceed governmental regulations. To some degree, however, retailers have been able to gain and to expand market shares due to the imposition of quality standards that more convincingly address consumers' concerns than those of their competitors. In this respect, certified organic production systems constitute an extreme case of supply chain monitoring that even frequently reaches price premia.

The development of integrated supply chains has been initiated either by farmers, slaughterhouses or retail chains. Typically, the initiators of a specific program enjoy increased bargaining power at least during the initial period of the new program. Classic meat supply chain programs cover all stages from breeding, feeding, husbandry, slaughter, processing and marketing of the final product (see Chapter 4.3). It has to be emphasized that this vertical integration, although common in the poultry sector and increasingly dominating European pork production, nevertheless is also likely to serve as a model for the European beef production in the near future. In this respect it does not necessarily matter whether cattle is raised under «intensive» (=indoor, high energy feed) or «extensive» (=outdoor, grass and green land pasture) conditions: Since transportation cost tend to be low within Europe due to good infrastructure, even marginal land and remote areas will increasingly be reached by supply chain programs that certify, monitor and sell specific attributes of meat to consumers.

In turn, this will also increasingly involve breeding companies closely working together with marketing teams of retail companies in order to anticipate changing consumer preferences early enough to adequately react to in order to gain market shares, e.g. through an introduction of new meat products such as lean meat.

Backhus and Dijkhuizen (2002) characterize the European supply chain for pork as a saturated market that is shaped by the following components (adapted):

- Farmers, slaughterhouses and retail companies all experience strong economies of scale. This leads to an ever increasing specialization of individual companies into very specific tasks during the production process (e.g. breeding, hedging, etc. as separate tasks for specialized operations).
- Profit margins at each stage are small per unit of output unless there is a premium for

quality or brand names.

- Bargaining power of those with high fixed costs, small market shares and least market diversification is smallest.
- Products without clearly distinguishing features are subject to fierce competition from domestic as well as from foreign sources. Therefore, supply chains increasingly try to tie consumers through provision of additional environmental and safety attributes attached to the final product.

On the other hand, some farmers have tried to escape the process of specialization as part of a vertically integrated supply chain and have tried to keep value added at their farm through on-farm breeding, feeding and processing or to do so within small cooperatives often operating according to organic production technologies. These initiatives also address the demand of some consumers for «alternative» meat that involves short distances of transportation, organic production strategies and authentic regional origin of meat products or special «gourmet» quality due to (protected) food preparation and culinary arts recipes. While the bulk of production happens under conditions of saturated markets, fierce competition and small profit margins, the latter way of «alternative» production typically bears the potential for high profit margins. At the same time, however, this strategy makes it difficult to reap economies of scale and usually has to cope with a much smaller market potential as products can only be sold at the local or regional markets.

4.3 Pre-Requisites for Imports of Meat and Meat Products into the EU

The previous chapters have shown that increasingly vertically integrated supply chain systems for meat have been installed as a large scale reaction to consumer preferences by incorporating all standards required. On the other hand, a niche market exists for premium and/or organic products and regional specialties. The supply chain for this niche market typically is controlled by few actors who control most of the value added. The downside of this is typically a limited capacity to expand.

Neither EU policy makers nor consumers oppose meat imports in general, since they add to the varieties of products being available, and partly keep the negative side effects of intensive animal production out of the EU. Therefore, although the EU meat market can be considered as «saturated», there is plenty of potential for imports at various levels of the supply chain. However, in any case the EU regulations with regard to meat imports constitute the first key challenge, before

the second major challenge – establishing a marketing channel – can be addressed:

Challenge 1: EU Legal requirements (adapted from the EU commission Website, for more detailed information see the links provided in Chapter 4 and in the Appendix):

- EU officials check status and administrative efficiency with regard to the following issues:
- Legislation of the third country;
- health status of livestock, of other domestic animals and wild life;
- regularity and rapidity of information on infectious animal diseases provided by the third country to the Commission and the World Organization for Animal Health;
- the country's rules on the prevention and control of animal diseases, and
- the organisation, structure, competence and power of the veterinary services in the country of origin.

A potentially interesting option for Ukraine is the possibility to regionalize the country. This means that only a certain part of a specific country may be authorized to export (fresh) meat to the EU.

However, all imports of fresh meat into the Community must come from EU approved slaughterhouses, cutting plants etc. The EU commission has posted guidelines on how to get this approval. The general procedure requires that the Commission's Food and Veterinary Office (FVO) carries out a mission to verify that all the criteria provided for under Community legislation are properly fulfilled. Depending on the results from this mission, the third country may be added to the list of third countries authorized for the export of fresh meat. In addition, an assessment of the specific disease situation is carried out. In order to export fresh meat, third countries must also comply with certain public health requirements, a country is required to have an approved «residue» plan, and implement certain conditions in relation to BSE. In addition animal welfare requirements at slaughter must be met in accordance with Community legislation.

Imports of meat products into the EU in principle have a chance in the vertically integrated, large market segment, but also in terms of specialties that fill niches. Therefore, Ukraine may become a supplier of meat to the European food processing industry, but may very well be able to develop Ukrainian meat products that are delivered to European retail chains directly and bear the potential to retain much more value added to production within the country. In other words, it is up to Ukrainian producers whether they decide to compete with European farmers through provision of cheap meat as an input to the European meat

processing industry, or whether they enter the EU market directly with products that consumers would only buy from them (for a detailed assessment see e.g. Spiller and Schulze 2008).

Challenge 2: Connecting to marketing channels within the EU

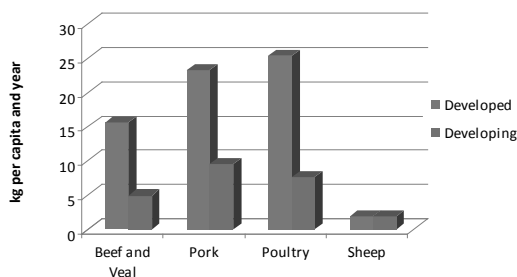
Obviously, the vertical linkages from meat producing farms via slaughterhouses to the retailing stores have to be included into any analysis of the overall market situation. Retailing companies are likely to bundle consumers' preferences with regard to meat products and can be expected to pass these preferences on through the supply chain back to the breeding company (Spiller and Schulze 2008). In this regard, the enlargement of the EU towards CEE enables useful comparisons for Ukraine because it shows how the food industry within the EU has introduced standards that comply with legal EU requirements and match the preferences of retail chains and consumers on the one hand, while dealing with the specific transitional situation of formerly planned economies on the other.

For instance, certification schemes are gaining more and more importance in CEE countries and often exceed legal EU requirements with regard to transparency and information traced during the production process (compare Chapter 4.3). It has to be emphasized that certification schemes are voluntary schemes used by the food processing industry in order to give quality signals to retail chains and consumers.

4.4 Ongoing Trends on Global Meat Markets

Meat consumption generally tends to rise with income per capita, however, it can be observed in developed countries that the total amount of meat consumed remains constant while the demand for higher quality increases.

Figure 5.1: WORLD MEAT CONSUMPTION PER CAPITA, DEVELOPED AND DEVELOPING COUNTRIES, 2002-2006



Source: OECD (2008).

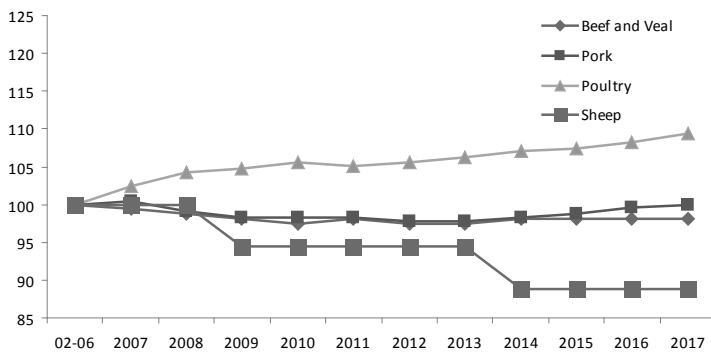
Furthermore, along with increasing income, beef and veal tend to substitute for pork, and recently in many European countries one can observe that poultry tends to replace some of the additional meat consumption that would otherwise have happened. In this regard, ongoing trends within most developed countries are:

- an increasing demand for lean meat,
- an increasing awareness of the negative side effects of intensive, large scale meat production,
- substitution away from beef and pork towards poultry, and
- an increasing number of people who reduce the absolute amount of meat in their diet to a minimum (vegetarians).

For these reasons, developed countries» markets for meat are large in absolute terms and still growing at slow pace on the one hand, but must be considered saturated markets overall. Growth potentials on these markets will mostly be in the area of premium quality and meat products with a high level of processing (convenience food).

Figure 5.2 shows a recent forecast issued by the Organisation for Economic Co-operation and Development (OECD) for consumption levels in developed countries, with rising consumption estimated for poultry, while quantities consumed of beef, veal and pork are nearly constant. Consumption of sheep meat, however, is predicted to decline.

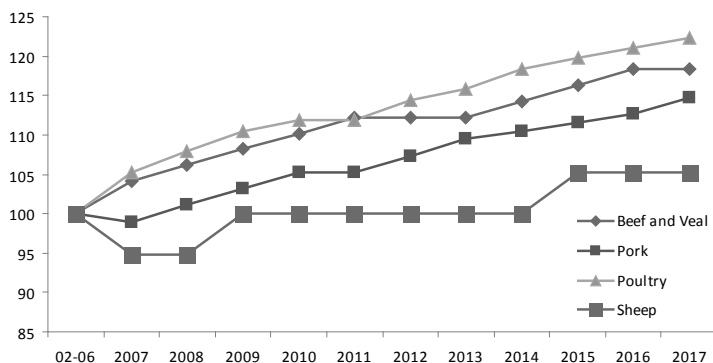
Figure 5.2: MEAT CONSUMPTION IN DEVELOPED COUNTRIES
RELATIVE TO AVERAGE, 2002-2006



Source: Own calculations based on projections by OECD (2008).

In developing countries, current meat consumption in general is still much lower than in developed (=OECD) countries. Therefore, large developing countries with rapid economic growth, such as China and India, are going to develop as dynamic markets for meat products in the near future. The OECD predicts meat consumption in developing countries to constantly rise in the upcoming decade. However, the regional distribution of these increases is unlikely going to follow the same average pattern as outlined by Figure 5.3. Instead for each geographical region it has to be considered how overall income, but also the distribution of income will develop, and whether consumers have special preferences for certain types of meat, e.g. due to religious reasons.

**Figure 5.3: MEAT CONSUMPTION IN DEVELOPING COUNTRIES
RELATIVE TO AVERAGE, 2002-2006**



Source: Own calculations based on projections by OECD (2008).

4.5 Current Trade Situation and Prospects for the Future

4.5.1 World Beef and Veal

World markets for beef and veal are currently shaped by slow recovery after a sharp decline in Europe and the US during the years of the BSE crisis. At the same time, growing demand in developing countries and soaring feed prices on a global scale are boosting price increases in the short run. Long term demand in Europe, however, is on a constant or even slightly declining trend, with

changing preferences of consumers in favour of poultry and meat-free diets offsetting the increase of beef demand especially due to rising incomes in the new member states.

World supply response is driven especially by Brazil, that is expected to reap more and more market shares from established beef exporters, such as Australia, New Zealand and Argentina. In contrast, supply response in Europe is expected to be slow, and the EU as well as China will become major net importers in the next decade. China itself also produces beef, but supply is expected to remain constant due to geographical conditions in China that are short of high quality pasture land.

4.5.2 World Pork

Import demand for pork world wide is –similar as in the case of beef– expected to remain about constant in developed countries such as the EU, and will grow strongly in developing countries such as Mexico. As in the case of the other main meat categories, short term import demand shifts can occur as a result of food scandals or diseases in any of the major importing or exporting countries.

With regard to supply response, again, Brazil is expected to improve its sanitary standards and will increase its exports substantially. On the other hand, world exports from the EU are unlikely to expand much beyond its current level because of the costs of its strict environmental standards and the appreciating Euro.

Pork production in China is expected to grow slightly slower than demand. If these projections hold, China would be a net importer of pork by the end of the next decade.

4.5.3 World Poultry

As in the other meat markets, global poultry consumption in the next decade is also expected to rise slightly faster than global production. If this projection is right, stable and rising prices will be the result. However, projected differences in growth rates for production and consumption are rather narrow in countries such as Brazil, Thailand and China, and therefore it has to be anticipated that the supply response could be faster or demand increase somewhat slower than projected, leaving the world poultry market balanced at comparatively low prices.

Currently, especially Brazil supports domestic investment into poultry production and is expected to

rapidly gain market shares on world export markets. Internationally competitive poultry production is vertically highly integrated and capital intensive, but at the same time life cycles for broilers are short, implying that supply response is much more flexible in the short run than e.g. with beef production.

After avian influence, EU poultry exports are recovering but remain under constant threat of new outbreaks. Therefore, and due to fierce competition at traditional export destinations, the EU's trade prospects are not very strong. In addition, the introduction of an import quota by Russia, high feed costs, strict animal welfare rules, and other environmental regulations are slowing down international competitiveness of the EU's poultry production.

5. MEAT MARKET OUTLOOK: PROJECTIONS AND REFLECTIONS

As the previous chapters have shown, producer prices for meat in the EU are determined by a wide range of influencing and partly interrelated factors; however, a set of key parameters can be isolated that has to be considered for any evaluation of future trends on EU and global meat markets:

- Supply response and demand shifts on the internal EU market as well as on domestic markets of key exporters and importers,
- currency exchange rate fluctuations,
- changing quality requirements and industry standards, as well as
- policy interference with regard to environmental standards and CAP measures not only involving meat production directly, but also dairy policy and policies altering EU market prices for feedstuffs (grain, oilseeds);
- future development of world markets for feedstuff, namely grain and oilseeds, but also the opportunity cost of land, e.g. as a result of increasing bio fuel production.

A number of well known institutions frequently issues long term market projections for the most important agricultural commodities, including meat products. These institutions are the Organisation for Economic Co-operation and Development (OECD), the Food and Agriculture Organization (FAO) of the United Nations, and the Food and Agricultural Policy Research Institute (FAPRI). Forecasts issued by the EU Commission and the United States Department of Agriculture (USDA)

can also be useful because they tend to express the political positions of these institutions.

Predictions and projections should never be considered as measurements. Even market projections issued by the best economic institutes and international organizations have frequently been turned out to be wrong with regard to future events. However, projections provide a summary of what leading experts currently think about future developments; and therefore provide guidance on how to think systematically about likely future developments; projections should not be seen as 1:1 forecasts of reality: On the one hand, it is impossible to foresee global events, such as natural disasters, or political crisis, such as 9/11. On the other hand, it is extremely difficult to correctly forecast global gross domestic product (GDP) and population growth. However, since most long term market projections have to incorporate these macroeconomic forecasts as well, small deviations from reality may cause a projection to digress significantly from what is actually going to happen in reality.

Projecting the future of world meat markets cannot do more than assessing those factors that typically determine prices and quantities traded at national and international markets. These factors are supply and demand. It has to be clearly distinguished whether supply and demand are analyzed for meat products in aggregate or for specific products because this determines to what extend substitution due to rising prices has to be taken into account.

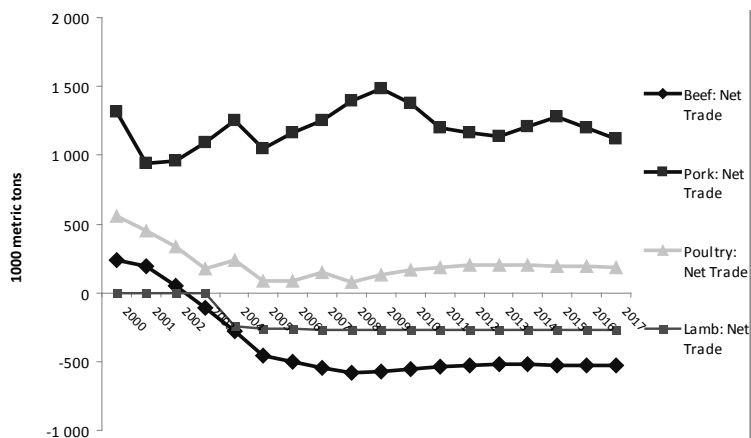
For meat products in general as well as for disaggregated meat products such as beef, pork and poultry, the EU Commission as well as the FAO, OECD and FAPRI, all project favourable conditions on world markets for the medium term. However, these prospects mainly rest on calculations about the development of supply and demand, and projections about demand growth are only slightly larger than projections of supply growth. Therefore, understanding future projections of world meat markets requires understanding factors that drive supply and demand for meat.

5.1 Projections of EU meat markets

Figure 6.1 is based on most recent projections by FAPRI (2008) and provides an overview on the net trade position of European meat products in aggregate. Especially on the market for beef, veal and lamb production the EU is expected to maintain its current net trade position. This is partly due to recent CAP reforms that have reduced coupled payments and faced out intervention storage of beef along with subsidized exports. However, the EU Commission has signaled that it is willing to declare beef as a sensitive product under WTO regulations, implying that the EU will keep import protection in the beef sector large in place, with liberalization according to domestic market requirements, but without putting the entire beef sector in the EU at risk (Fischer-Boel, 2008).

The market for lamb will remain a business of marginal areas and few specialized producers, while the constant domestic demand is projected to be filled in future times as in the past by imports from Oceania.

Figure 6.1: RECENT AND PROJECTED EU NET TRADE OF MAJOR MEAT CATEGORIES



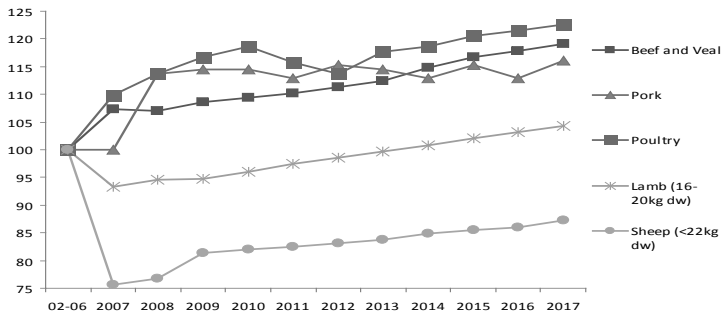
Source: Own depiction based on FAPRI (2008).

In the pork sector, the EU will retain its net export position, with now Spain rather than Denmark and the Netherlands having the lowest average cost of production.

The European poultry industry is expected to maintain its current level of exports; however, it is unlikely that this industry will expand much beyond the projected growth in domestic demand. Therefore, the EU is rather losing some of its current market share on world poultry markets.

But these projections of EU markets critically hinge upon trends on the global markets for meat, and therefore, it is easier to understand what will likely happen in Central Europe if probable trends on global markets for meat and meat products have been closely examined.

Figure 6.2: PROJECTED MEAT PRICES IN THE EU RELATIVE TO AVERAGE, 2002-2006



Source: Own calculations based on projections by OECD (2008).

Figure 6.2 is based on recent price projections issued by the OCED. Apparently, the trends outlined in this figure overall are in line with the conclusions from previous Figure 6.1: Prices of aggregated meat products within the EU are not expected to fundamentally change current relative price patterns and will largely follow the expected increase in income, with a slight decline in the relative price for pork because pork consumption in Germany is expected to decline.

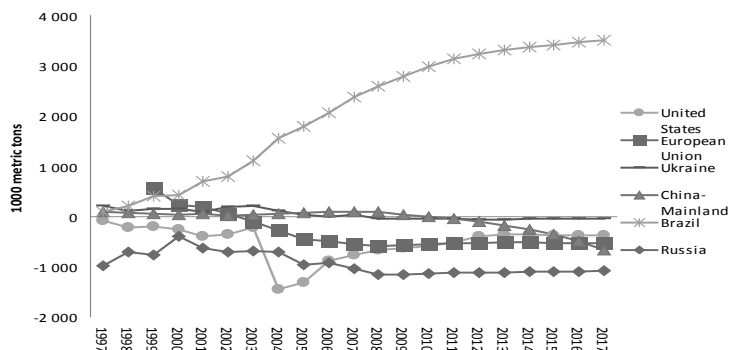
In summary, projections from different independent institutions estimate future developments of European meat markets to be shaped by the fact that this market is already saturated. Therefore, the future is estimated to look carefully optimistic because demand and income within the EU are projected to grow slightly faster than domestic supply.

5.2 World Meat Market Outlook

The actual projections of global food markets agree that the ongoing global «food crisis» will only to a limited extent increase demand for meat due to high feed cost and the fact that consumers especially in emerging markets will substitute away from meat products. In the long run, however, both institutions, the OECD as well as FAPRI, expect global demand for meat products to grow slightly faster than global supply. Therefore, increasing price levels are projected. The FAO World Food Outlook (FAO 2007) (not depicted here) is also in line with this reasoning, concluding that due to rising incomes and changing consumer preferences global meat demand is going to grow slightly faster than global supply in the medium term. However, none of the institutions

involved project meat markets to develop with extraordinary dynamics. This, however, does not imply that the market shares of world exports are safe of being significantly redistributed in the upcoming decade. The following paragraphs discuss several selected examples.

Figure 6.3: BEEF: NET EXPORTS OF SELECTED COUNTRIES



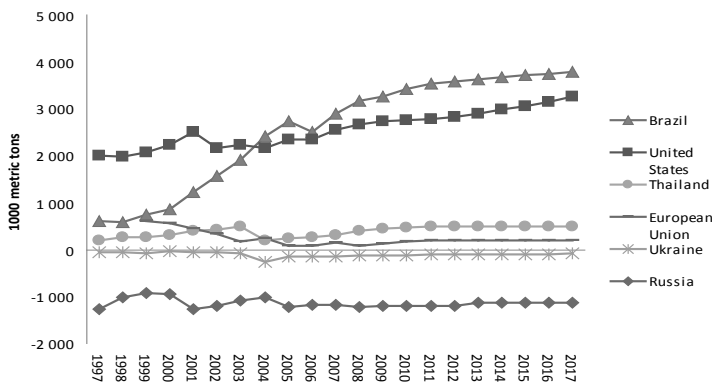
Source: Own presentation. Data: EAPRI 2008.

As can be seen from Figure 6.3, Brazil is expected to become the world's leading exporter of beef over the next ten years. Currently, however, Brazil is not allowed to export beef into the EU due to food safety issues. If these problems are resolved, Brazil still has a huge potential for expanding its beef production, and the potential for this growth is well beyond the growing domestic demand.

On the other hand, the EU will remain a net beef importer in the future, and the USA is also not expected to reach a net exporting position. Russia and China are both going to keep and extend their net importing position for beef. In china, this is largely due to a lack of high quality pasture; in Russia rather the slow recovery and restructuring of production is the reason.

For Ukraine, trade balance for beef is currently about even and will likely stay so, unless Ukraine manages to reach access to foreign markets and utilize its large agricultural potential also for beef production.

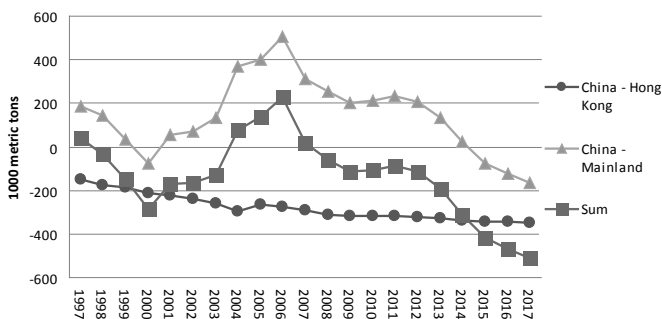
Figure 6.4: PORK: NET EXPORTS OF SELECTED COUNTRIES



Source: Own presentation. Data: FAPRI 2008.

However, with regard to pork production, consumption and trade, China is frequently cited as a major exporter, as well as a key importer. For these reasons, Figure 6.5 looks at China more closely. It reveals that with regard to China it has to be distinguished between mainland China on the one hand, which is a major exporter that currently exports about as much pork as Brazil, and Hong Kong on the other, which is a large metropolitan area with an increasing demand for pork. Therefore, in sum China's import-export balance for pork is already negative, implying a net import position, and this net import position is expected to remain.

Figure 6.6: BROILER: NET EXPORTS OF SELECTED COUNTRIES



Source: Own presentation. Data: FAPRI 2008.

Figure 6.6 presents some of the world's most important exporters of chicken meat. The market for chicken accounts for more than 70 % of all poultry meat and therefore may serve as an approximation to trends within this heterogeneous sector: Europe is going to lose some of its market share in global exports, but remains in a next export position. The emerging markets for chicken meat will mainly be served by Brazil and the USA, which is already an important producer of chicken meat, and will continue to expand its position in future. Thailand will only gradually recover from the consequences of the avian influenza outbreak and is expected to defend its level of exports, yet without major expansion. Russia and Ukraine, as in the case of beef and pork, are not expected to utilize their agricultural potential much beyond the current level and therefore will remain strong and slight net exporters, respectively.

Overall, global projections by OECD and FAPRI agree on the same directions of future trends within global meat markets. Their assumptions are shaped by a growth in demand that will exceed supply response. Brazil, according to these projections, will become the global meat supplier of the next decade. Obviously, it is assumed that Brazil will manage to comply with all important food safety standards at any export destination.

The EU has been a major meat exporter of the last decades, partly due to subsidized exports. In the future, the EU will continue to satisfy most of its domestic demand for meat from domestic production and will continue to export. However, the pork and poultry sectors that have been globally competitive in recent years are expected to suffer from rising cost due to the extraordinary high food safety and environmental standards. Therefore, European meat exports are not expected to grow much beyond their current level.

Finally, Russia and Ukraine are not expected to utilize their agricultural potential in a way that would put them into a net exporting position for any major meat product in the near future. These assumptions incorporate the fact that it might be easier especially for Ukraine to export grain and oilseeds in the short run than to invest into a meat producing sector that would match international standards and open export markets. The following chapter however will explain that Ukraine would be well advised to develop the pre-conditions for a competitive meat industry in order to have an alternative channel to utilize its grain harvest and add value to it if global meat market conditions are favorable.

6. IMPLICATIONS FOR UKRAINE AS A POTENTIAL MEAT EXPORTER TO THE EU

The analysis has shown that most long term projections currently are carefully, but not overwhelmingly, optimistic with regard to world meat market developments. This is because demand is projected to grow slightly faster than supply, especially in markets with high purchasing power. However, with regard to these projections it should be noted that agricultural supply response has repeatedly been underestimated in the past, especially in times of high world food prices. Therefore, a note of caution should be applied to all those projections that extrapolate primarily from the current, comparatively high international food price level.

Considering the future of EU markets, the CAP policy has always had a very severe impact on intra-EU prices. However, a further exposure of European farmers to world market conditions is – as in other key sectors, such as the dairy sector – under way. This implies that more and more imports will gradually be admitted and producer support is already largely decoupled from production.

On the other hand, in the meat processing sectors other than primary beef, veal and lamb production, did EU policy hardly ever interfere with markets in order to protect producers other than through import tariffs. The pig and poultry industry can be regarded as highly productive and competitive, especially with regard to exports of processed meat products of premium quality.

In the short run, however, the EUR/USD exchange rate as well as high prices for production inputs squeeze profit margins for farmers and may slow response to high prices. In addition, it is not clear, how fast structural change will react to policy changes in the EU after the CAP «Health Check». In this regard, the EU dairy sector plays an important role also for the development of beef, veal and lamb production, since these animals typically compete with dairy cows for pasture, and dairy herds provide a large share of beef production.

In addition, meat production has frequently been associated with food scandals, diseases, and damaging side effects to the environment (climate change, nitrification of ground water, etc.), and large scale animal farms are typically opposed to criticism by the neighboring population due to their high level of emissions. In order to address these concerns, the EU has imposed strict laws that guide and limit production processes, meat quality, animal welfare, and environmental side effects of European meat production.

All together, these facts are likely to imply that the EU meat production as an aggregate is not growing very fast in the near future, but will likely defend its strong position on the domestic market.

With regard to Ukraine, the meat producing sector currently has little access to the EU market and may also face severe competition on other foreign export destinations, e.g. from Brazil. Chapter 2 has shown that Ukraine's export and import partners, though already more diverse than few years ago, still fluctuate a lot. This indicates that Ukraine currently is far from having a stable set of reliable export destinations for meat products. The EU as the largest single market in the world with policy makers and consumers being extremely concerned about food quality and food safety will under no circumstances and with no other non-EU country make any concessions with regard to the quality of its meat product standards. However, the EU closely monitors meat quality and meat safety of its imports, but currently there is no sign that the EU would require importing countries to also impose the same restrictions on environment protection such as emissions of nitrogen. Expanding large scale animal production plants are unlikely to face the same legal and political problems in Ukraine as they already do in the EU. At the same time, feed input is readily available in Ukraine at low transportation cost. Intensive meat production in Europe increasingly lacks qualified personnel willing to work with animals under the sometimes tough conditions of large in-door stables.

All this potentially leaves Ukraine with a competitive advantage against European meat producers, and may suggest the proximity to EU markets as a natural advantage for Ukrainian producers compared to other meat exporters such as Brazil or Australia.

However, Ukraine is still dominated by backyard production of beef and pork (in mid-2007, households accounted for 64% (same as in 2006) of all cattle and 61% (1% drop from 2006) of all swine in Ukraine) with very little attention paid to animal genetics, feeding rations and animal health issues. Furthermore, as Chapter 2 of this paper has explained, backyard production of beef will likely continue to decline while industrial production of pork and poultry will increase. Ukraine continues to import pork and export domestically produced beef to Russia, although the volume of beef exports will likely be substantially lower in future than it is currently the case. Of course, export volumes remain highly dependent on the political situation in both Ukraine and Russia. Ukrainian production of pork will likely continue to grow, while beef production will continue to shrink due to the inefficient organization of many enterprises in that industry. Therefore, Ukraine's recent accession to the World Trade Organization would potentially alter the market situation only if quality standards of EU markets can be matched.

Would it be worthwhile for Ukraine to work towards a full implementation and full compliance with those EU meat quality standards at all? Since Ukraine clearly has a comparative advantage already to export grain and oilseeds, it might be tempting to think that it would not be necessary to pay too much attention to the development of a competitive meat producing and exporting industry. However, the example of e.g. Brazil shows that a country with a large agricultural potential can very well have both: Playing a leading role on world grain and oilseed markets on the one hand, and at the same time generate potentially large profits from value added in the meat export-

ing sector. Therefore, Ukraine as a large player on world agricultural markets should not forgo this opportunity to also benefit from value added in the meat sector. In addition- just as in Western countries, Ukrainian consumers will especially in urban areas in the long increasingly request information about meat safety and process quality, and Ukrainian policy makers will increasingly have to react to those concerns in a similar way as in Europe.

Therefore the EU market for meat may in the short and medium term perspective provide both for Ukraine. Marketing opportunities on the one hand, and opportunities to develop a way of how to deal with ever increasing meat quality regulations on the other. Much of the analysis in this paper has focused on the strict quality issues imposed by public and private institutions in the EU. Matching these requirements and still supplying meat products to the European market at competitive prices clearly constitutes a major challenge for almost any meat exporting country. On the other hand, if Ukraine moves ambitiously towards an implementation of some or even all of these standards, the EU Commission would support Ukrainian efforts. The EU has in this regard published easy to follow guidelines (see Chapter 4) because the EU meat industry is generally willing to import competitive meat and meat products.

If Ukraine works towards gradual implementation of higher quality standards in meat production and processing it will along the way likely be able to explore other emerging markets for meat and processed meat products much easier because global meat markets will clearly be dominated by an ever increasing amount of procedures to monitor, avoid and remedy risks and environmental side-effects. Therefore, by mounting efforts to comply with EU standards, Ukrainian policymakers and members of the Ukrainian agricultural administration would give a clear signal to any potential importer of Ukrainian meat products! In other words: Exploring marketing opportunities in Europe may currently constitute a major chance for Ukrainian producers because the gradual adoption of European standards for meat production will likely open up many other emerging markets in the near future as well!

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