Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz

INSTITUTE FOR ECONOMIC RESEARCH AND POLICY CONSULTING

German – Ukrainian Agricultural Policy Dialogue

Reytarska 8/5-A, 01034 Kyiv
Tel. (+38044) 278-6342, 278-6360, Fax 278-6336
E-Mail: agro@ier.kiev.ua, http://www.ier.kiev.ua

3C Group
The Carbon Credit Company

BIOMASS

Policy Paper No. 15

Financing GHG Emission Reduction Projects in Agriculture in Ukraine

- Use options for markets related to the Kyoto Protocol -

Disclaimer:

This paper was prepared by the authors using publicly available information and data from various sources. All conclusions and recommendations included in this article in no circumstances should be taken as the reflection of policy and views of the German Federal Ministry of Food, Agriculture and Consumer Protection.

Executive Summary

1. Agriculture and food are important sectors in Ukraine with growing opportunities on international commodity markets driven by increasing demand for food, feed and renewable energy. At the same time Ukraine's dependency of fossil energy leads to the search for new energy supply concepts. Therefore, decentralised energy production and energy saving is on the top policy agenda. 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 Ukrainian investment projects** proposed as JI projects so far, **only two are associated to agriculture**.
2. According to the **national GHG inventories** and expert estimations, the theoretical annual emission reduction potential in Ukraine totals 170 mtCO2e/ year (table 1.2). The largest share (39%) could be contributed from biomass for heat production (58 mtCO2e/year). According to national eligibility requirements, a project must result in 20,000 tCO2e minimum to be eligible as JI project.
3. 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 large; resulting in a competitive disadvantage of these projects compared to emission reduction projects in other sectors.
4. In the **current JI pipeline**, the largest amount of emission reductions comes from coal mine methane projects (20 $mtCO_2e$ until 2012), followed by energy efficiency projects in the industrial sector (13 $mtCO_2e$ until 2012).
5. In addition to the **JI mechanism** this paper shows use options of a financing scheme that is not officially related to the Kyoto Protocol but is evolving around the discussion of selling government owned emission reduction units: the **Green Investment Scheme**.
6. **Two case studies** are presented, whereas the first case shows an investment into a biomass boiler (for sunflower husk burning) and CHP plant at a large financially viable agribusiness holding in the edible oil sector. The second case study is a straw-fired biomass boiler at a medium sized agricultural enterprise that sells heat to the neighbouring village.
7. **The first case study has a low risk profile.** Input supply is secure and the project produces two asset streams. The contractual set-up, with the Holding as owner of the JI project and the oil processing plant as client of the JI project is quite unique. The interest of the Holding is to increase oil production, whereas a steam based process is a means to increase oil extraction efficiency. This structure assures a high sense of ownership of the Holding for both enterprises, whereas it creates semi-market conditions where the CHP plant has to compete with conventional heat and power prices. This project is expected to produce app. 40,000 tCO2e annually and is sufficiently large to attract foreign buyers of carbon credits under the JI mechanism.
8. **The second case study has a high risk profile for a JI project.** It is by far too small with app. 500 tCO2e year to attract foreign buyer's interest. Ten of these projects would have to be bundled to reach an interesting size for a foreign buyer of carbon credits. Project bundles of this size increase risk perception from a buyer's perspective. If too many stakeholders are involved, the project becomes too complex and too difficult to handle. A number of contracts would have to be in place with several private and public actors. Performance would have to be checked at each site which would lead to high transaction costs. Finally the return per project from carbon credit sales for the stakeholders will most likely not be high enough to assure willingness to cooperate within a bundle of 10 projects. This project type would have a larger replication potential under a Governmental Green Investment Scheme (GIS).

9. The biggest obstacles that prevent more emission reduction projects in Ukraine from being realised are lacking funding sources of potential project owners. **Carbon co-finance is not the overall remedy to secure investments in a field where Ukrainian entities themselves do not invest.** The returns from carbon credit sales occur when the project is running and producing emission reductions. So, they help to cover operational costs and assure smooth debt repayment. But the largest hurdle has to be overcome prior to the project with the financial closure of the project.

10. In a usual set-up, **carbon credit returns are not suitable for covering investment costs.** Buyers of carbon credits would provide a certain amount of up-front payment which could add to financial closure. Still, to provide upfront payments, buyers act as every debt provider would act: they ask for bank guarantees or other collaterals. But, access to bank guarantees and loans for agricultural enterprises is limited since land or other assets of the enterprise cannot be used as collateral. Municipalities are legally not allowed to use their property (e.g. parts of the existing district heating infrastructure) as collateral for loans.

11. An international carbon buyer would not be willing to provide upfront payment to an agricultural enterprise, if this enterprise is not considered **creditworthy** by local institutions.

12. Accordingly, under the current framework conditions, international carbon buyers will focus on **large projects at large enterprises with sound financial standing.**

13. The **two funding options** proposed in the case studies (JI vs. GIS) shall serve to illustrate characteristics and strength of the two mechanisms. However, this paper does not emphasize to draw a strict division between both funding streams. Instead applicability should be assessed on a project by project basis.

14. In order to allow for funding options under both mechanisms JI and GIS, **improvement of the national framework conditions** are needed.

15. To create an equal-level playing field for small and big energy suppliers a **feed-in tariff** is considered a core step towards achieving the policy goal to increase the share of renewables and to reduce dependency of fossil fuel imports from Russia. Accordingly, it is highly recommended to maintain the discussion of calculating a fair tariff for small producers.

16. The carbon market is just starting and several procedures and rules are still being designed. Thus, **proactive contribution to discussions at national level** of agricultural interest groups is necessary to assure agricultural sector representation in the design of national programs.

17. **Current discussions on the Green Investment Scheme at national level** in Ukraine are directed towards using this mechanism to allow for projects that are not eligible under the JI (e.g. due to weak additionality). This would foster the development of large projects in the industrial sector leading to exclusion of most biomass projects. Under this scenario, again the agricultural sector would only marginally benefit. It can be expected that the international Government buying so called 'greened' AAUs from a GIS will pose some criteria on the scheme (to reflect their policies for international cooperation with Ukraine and their negotiation status under the Kyoto Protocol). Thus, most likely, the Ukrainian Government might face difficulties marketing a GIS stream that does not reflect international Kyoto market standards.

18. In contrast, **biomass projects are likely to attract interest from international Governments under a Green Investment Scheme.** It is highly recommended that the Ministry of Agriculture contributes to the discussion around the design of a GIS with the Agency of Environmental Investments under the Cabinet of Ministers. In parallel to the discussions at national level, discussions should be started with foreign governments to promote a potential program under a GIS for agriculture.

19. A **micro credit communal investment program** could be a suitable set up for a GIS program for municipalities and small and medium enterprises. Applicable collaterals for loan applications could be defined under a communal investment program to assure credit access for communes. Since needed investment volumes are relatively small, the minimum loan size of such a program should be around 60,000€.

Glossary

Assigned amount unit (AAU) - A Kyoto Protocol unit equal to 1 metric tonne of CO2 equivalent. Each Annex I Party issues AAUs up to the level of its assigned amount, established pursuant to Article 3, paragraphs 7 and 8, of the Kyoto Protocol. Assigned amount units may be exchanged through emissions trading.

Certified emission reductions (CER) - A Kyoto Protocol unit equal to 1 metric tonne of CO2 equivalent. CERs are issued for emission reductions from CDM project activities. Two special types of CERs called temporary certified emission reduction (tCERs) and long-term certified emission reductions (lCERs) are issued for emission removals from afforestation and reforestation CDM projects.

Combined Heat and Power (CHP) - Combined heat and power (CHP) systems (also known as cogeneration) generate electricity and useful thermal energy in a single, integrated system. This contrasts with the common practice of separate heat and power (SHP) where electricity is generated at a central power plant, while on-site heating and cooling equipment is used to meet non-electric energy requirements.

District Heating System (DHS) - District heating systems distribute steam or hot water to multiple buildings. The heat can be provided from a variety of sources, including geothermal, cogeneration plants, waste heat from industry, and purpose-built heating plants.

Emissions trading - One of the three Kyoto mechanisms, by which an Annex I Party may transfer Kyoto Protocol units to or acquire units from another Annex I Party. An Annex I Party must meet specific eligibility requirements to participate in emissions trading.

Emission Reduction Unit (ERU) - A Kyoto Protocol unit equal to 1 metric tonne of CO2 equivalent. ERUs are generated for emission reductions or emission removals from joint implementation project.

EU Allowance (EUA) – is the carbon credit unit equal to 1 metric tonne of CO2 equivalent used in the European Emissions Trading Scheme.

Global warming potential (GWP) - An index representing the combined effect of the differing times greenhouse gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation.

Greenhouse gases (GHGs) - The atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO2), methane (CH4) and nitrous oxide (N20). Less prevalent --but very powerful -- greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6).

Green Investment Scheme (GIS) - The GIS is no instrument of the Kyoto Protocol. It is a voluntary commitment of national governments to dedicate the incomes from sales of state-owned emission reduction certificates (AAUs) to national emission reduction projects.

Joint Implementation (JI) - A mechanism under the Kyoto Protocol through which a developed country can receive "emissions reduction units" when it helps to finance projects that reduce net greenhouse-gas emissions in another developed country (in

practice, the recipient state is likely to be a country with an "economy in transition"). An Annex I Party must meet specific eligibility requirements to participate in joint implementation.

Kyoto Protocol - An international agreement standing on its own, and requiring separate ratification by governments, but linked to the UNFCCC. The Kyoto Protocol, among other things, sets binding targets for the reduction of greenhouse-gas emissions by industrialized countries.

LoA (Letter of Approval) – An official document for projects that are approved by the Government under the JI Mechanism. LoAs are issued by the Ministry for Environmental Protection in Ukraine. The letters states that the Government will convert the equivalent of state owned AAUs to project owned ERUs, which is a precondition for every ERU transaction between the Seller and the Buyer of carbon credits.

LoE (Letter of Endorsement) - An official document for projects that are endorsed by the Government under the JI Mechanism. LoEs are issued by the Ministry for Environmental Protection in Ukraine. The letters states that the Government accepts the project to apply under the JI Mechanism and considers converting AAUs to ERUs for the project.

UNFCCC - United Nations Framework Convention on Climate Change.

Introduction

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 it's 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 with growing opportunities on international commodity markets driven by increasing demand for food, feed and renewable energy. At the same time Ukraine's dependency of fossil energy leads to the search for new energy supply concepts. Therefore, decentralised energy production and energy saving is on the top policy agenda. 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 two are associated to agriculture.

According to national eligibility requirements, a project must result in 20,000 tCO_2e 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 this paper will discuss use options of a financing scheme that is not officially related to the Kyoto Protocol but is evolving around the discussion of selling government owned emission reduction units: the Green Investment Scheme (GIS).

In a first step, this paper explores the technical potential for emission reduction projects in Ukraine and Eastern Europe and discusses the current pipeline of JI projects by technology type. In a second step, this paper brings some light into the carbon markets under the Kyoto Protocol and the competitive disadvantage of emission reduction projects in agriculture. The third chapter provides further insights in characteristics of emission reduction projects in agriculture and provides two example projects (one under JI and one under GIS) with good expected replication potential in Ukraine. Last but not least, main barriers are identified and measures to overcome these barriers are proposed.

This paper is meant to discuss issues and options, instead of providing solutions.

1 GHG Emission Reduction Projects in Ukraine and Europe

GHG emission sources

In order to illustrate the potential leverage of emission reduction projects in agriculture to reduce overall national emissions, a discussion of main emission sources is central. The distribution of emissions by sources in Ukraine depicts the trend in EU member states.

Table 1.1. Sources of GHG emissions

Sector	GHG Emissions in Ukraine				GHG emissions in the EU-27			
	1990		2004		1990		2005	
	mtCO2e	% of total national emissions	mtCO2e	% of total national emissions	mtCO2e	% of total EU emissions	mtCO2e	% of total EU emissions
Energy	687.6	74.30%	282.5	68.32%	4320	76.84%	4,131	79.78%
Industrial processes	128.1	13.84%	91.4	22.10%	475	8.45%	412	7.96%
Solvent and other product use	0.4	0.04%	0.3	0.07%	13	0.23%	10	0.19%
Agriculture	101.4	10.96%	30.4	7.35%	595	10.58%	476	9.19%
Waste	7.9	0.85%	8.9	2.15%	219	3.90%	149	2.88%
Other	0	0.00%	0	0.00%	0	0.00%	0	0.00%
TOTAL	**925.4**	100.00%	**413.5**	100.00%	**5622**	100.00%	**5178**	100.00%

Sources: Annual Ukrainian National GHG Inventory 1990-2004,
Annual European Community greenhouse gas inventory 1990-2005 and inventory report 2007

Table 1.1. illustrates that energy production counts for three third of overall GHG emissions in Ukraine and EU-27. In 1990, agriculture ranked third with almost 11% of the total emissions after industrial production processes with slightly more than 13%. In the EU context, emissions from agriculture exceed emissions from industrial processes. This trend is not reflected in data from Ukraine. Instead, emissions from the industrial sector now contribute more than 22% to total national emissions, while the share from agriculture reduced to 7.35 %. These changes have to be seen in the light of the sharp decrease of the overall emissions in Ukraine by more than 50% from 925 $mtCO_2e$ in 1990 to 413 CO_2e in 2004. This reduction is a result of economic recession and the break down of industrial production in Ukraine, which touched upon both, agriculture and industry sectors.

GHG emission reduction potential

According to the national GHG inventories and expert estimations, the theoretical annual emission reduction potential in Ukraine totals 170 $mtCO_2e$/ year (table 1.2). The largest share (39%) could be contributed from biomass for heat production (58 $mtCO_2e$/year), whereas the potential for power production is relatively small.

Table 1.2. Technical Potential for Emission Reductions in Ukraine (2005)

Sector	Project Type	Energy production potential		ER potential
		mtce	% of total consumption	$mtCO_2e$
Energy efficiency	Industry: CHP	8.12	4.05	23.39
	Insulation of Houses	1.93	0.96	5.56
	Restoration of DHS	6.12	3.05	17.63
Bioenergy	Biomass for Heat	20.30	10.12	58.46
	Biomass for Power	0.60	0.30	1.73
	Biofuels	2.20	1.10	6.34
Avoided methane emissions	Landfills	0.30	0.15	3.88
	Coal Mines	9.90	4.93	28.50
	Fixing gas pipelines	0.40	0.20	8.30
	Crop waste*	0.00	0.00	0.00
	Manure management*	0.00	0.00	0.00
Renewable energy	Wind	0.70	0.35	2.02
	Solar	0.27	0.13	0.78
	Hydro (small)	1.30	0.65	3.74
	Geothermal	1.09	0.54	3.14
Avoided industrial gases emissions	N2O			6.84
	SF6			0
	HFC23			0
	TOTAL	53.22	26.53	170.30

Sources: (1) Geletukha G.G., Dolinsky A.A. Presentation at Third International Conference on Biomass for Energy (18-20 September 2006, Kiev, Ukraine);
(2) Expert estimate of SEC Biomass;
(3) Energy Strategy of Ukraine for the Period till 2030;
(4) Annual National GHG Inventory (1990-2004);
* no data available

Table 1.2 shows that avoiding methane emissions at coal mines has the second largest potential to reduce GHG emissions (28 $mtCO_2e$/year), followed by energy efficiency measures in the industrial sector (Combined Heat and Power Production) which could potentially lead to a reduction of 20 $mtCO_2e$/year. Due to a lack of data, table 1.2 does not provide figures on potential emission reductions from avoided methane emissions in agriculture (e.g. improved manure management and avoided/ improved dumping of organic waste). Thus, the overall potential for agriculture is expected to be higher due to the high global worming potential of methane (see table 1.4).

ER project pipeline in Ukraine

For the time being, the Government of Ukraine does not apply selection criteria for emission reduction projects. Basically all projects that safe 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). To date, 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 1.3. Projects with LoE and LoA from the Ukrainian Government

Project type	No.of projects	Average size ($mtCO_2e$)	Min. size ($mtCO_2e$)	Max. size ($mtCO_2e$)	Total ($mtCO_2e$)
Projects with Letter of Endorsement (LoE)					
Coal Mine Methane	11	1.89	0.26	8.7	20.83
Energy Efficency	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 Efficency	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

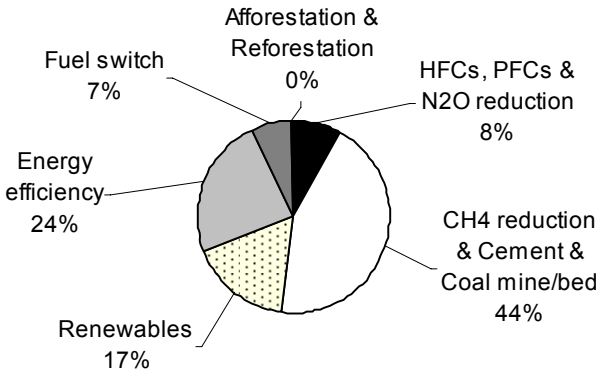
Table 1.3 depicts the current pipeline of JI projects in Ukraine. The largest amount of emission reductions comes from coal mine methane projects (20 $mtCO_2e$ until 2012), followed by energy efficiency projects in the industrial sector (13 $mtCO_2e$ until 2012). Of the total 74 projects in the pipeline, three projects are related to agriculture and forestry. Two of them are about utilization of sunflower husk for steam and electricity production 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 CO_2e significantly lower than the average size of coal mine methane projects (1.9 $mtCO_2e$) or energy efficiency (1.2$mtCO_2e$). 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 agriculture. The district heating projects foresee switching from fossil coal to fossil gas.

ER project pipeline in all JI countries

This trend described for Ukraine is similarly reflected in all JI countries[1]. The current pipeline of all JI projects counts 183 projects that are in advanced planning stage (validation or determination[2]), totalling in a potential volume of 36.6 m ERUs (or $mtCO_2e$) until 2012.

Figure 1.a: ERUs until 2012 (%) in each category



Source: CD4CDM, JI pipeline, UNEP Risoe Centre, status: 27.08.07

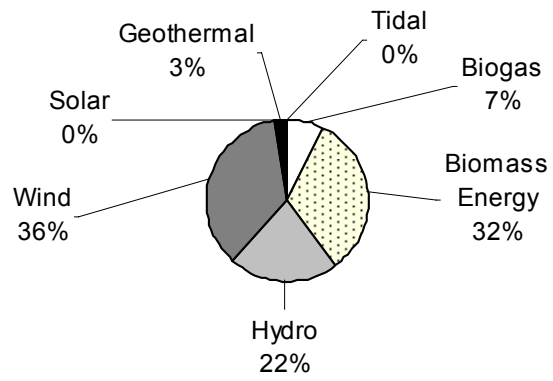
Figure 1.a is based on data for projects in the pipeline in all JI countries. It shows that more than 50% of this volume comes from non-CO2 gases (CH4, N2O, HFCs, PFCs). In terms of number, projects producing renewable energy contribute the largest share (78 out of 183 projects, counting for 42%).

[1] JI countries in this pipeline are: Russia, Ukraine, Bulgaria, Czech republic, Romania, Poland, Hungary, Estonia, Latvia, Lithuania, Slovakia, Germany, New Zealand

[2] 'Validation' is a third party check of the project by an accredited certification company. 'Determination' refers to the step in the JI project cycle, where the project is presented to the official UN body for the mechanism, the JI Supervisory Committee (JISC).

Figure 1.b provides further insights into the category of renewables that in total contribute 17% of emission reductions in above figure 1.a. The largest contribution comes from wind projects, followed by biomass projects and hydro power projects.

Figure 1.b: ERUs until 2012 (%) from renewables by technology



Source: CD4CDM, JI pipeline, UNEP Risoe Centre, status: 27.08.07

Biomass use contributes 32% to expected emission reductions in the renewable energy sector. This corresponds to a contribution of 6% to the total volume of expected emission reductions.

In real numbers, a total of 19 biomass energy projects are in an advanced planning stage, with a combined expected volume of slightly more than two million ERUs. This results in an average project size of 100,000 ERUs until 2012, and 20,000 ERUs per year (from 2008 to 2012).

The cost of emission reduction

Although the enormous potential of bioenergy projects is evident, these projects currently dont get off the ground. One major reason for that are the comparatively high carbon abatement costs of bioenergy projects. This partly lies in the nature of green house gases. Carbon dioxide is less harmful to the atmosphere than other gases. Avoiding one ton of Hydrofluorcarbons (HFC 23 is a by-product from HCFC 22 production. HCFC 22 is a cooling liquid in air conditions and fridges) is equivalent to avoiding app. 10,000 t of CO2. HFC 23 emissions can be avoided through filtering or burning the emission gas at high temperatures. This process costs less than 1€/ tCO_2e. Instead, avoiding one ton of carbon through a bioenergy project will likely lead to abatement costs between 20 and 50 €/ tCO_2e (Mc Kinsey, 2007). Table 1.4 depicts the Global Warming Potential of the gases treated under the Kyoto Protocol.

Table 1.4: The Global Warming Potential (GWP) of Greenhouse Gases

Greenhouse gas		GWP
CO2	Carbon dioxide	1
CH4	Methane	21
N2O	Nitrous oxide	310
HFCs	Hydrofluorocarbons	140 - 11.700
PFCs	Perfluorocarbons	6.500 - 9.200
SF6	Sulfur hexafluoride	23.900

2 The Carbon Market in Central and Eastern Europe– a short overview

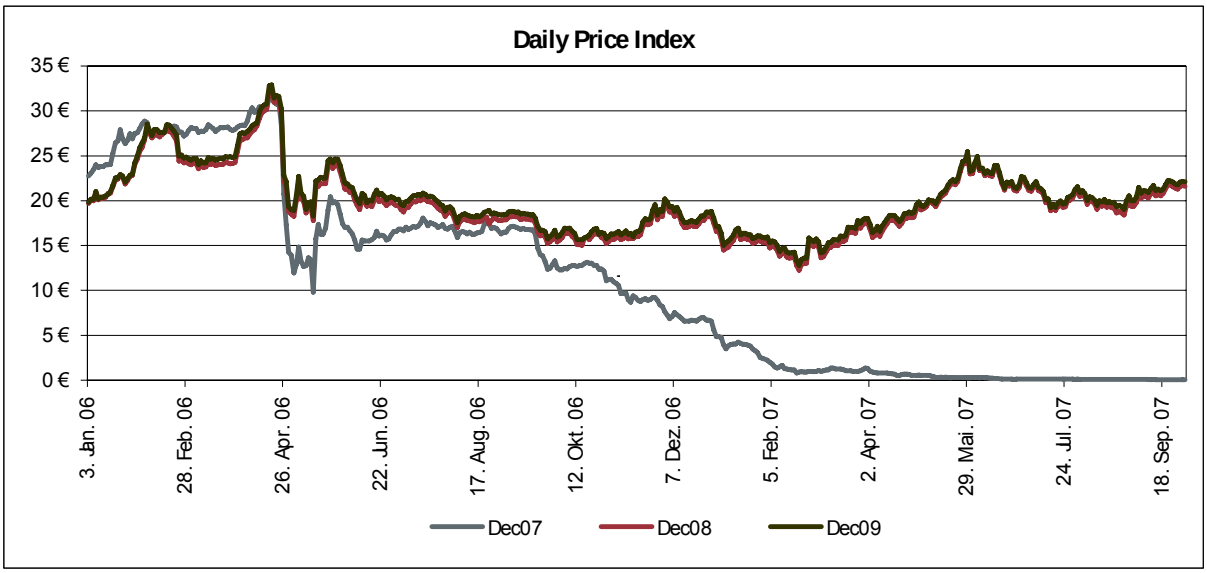
Carbon credit units

The carbon market is a general term meaning transactions of different carbon units (all of them being equal to one metric tone of carbon dioxide) on three markets:

1. **EU internal**: Governments and private companies within the EU-15 trade **EUAs** (within the framework of the EU-ETS[3]).
2. **Inter Governmental**: Governments from economies in transition with surplus **AAUs** can sell AAUs to other Governments.
3. **National project to international government or private company**: Project owners of emission reduction projects can sell the emission reductions as **ERUs** to governments or private companies[4].

Every unit is equal to one metric ton of carbon dioxide, but prices for the units are different. A discussion of prices and price drivers for the different commodities would clearly exceed the purpose of this paper. Buyers and sellers in the JI world often use the EU internal EUA price as index for ERU prices. ERU prices in a flexible price scenario consist of a fixed floor price plus a flexible price indexed to the EUA. In the EU-ETS, EUAs are valid for certain years.

Figure 2.a: Daily EUA price index



Source: ECX Status: 12.02.2008, cited in 3C Marktreport, 02.10.2007, internal publication, 3C Markets AG

Figure 2.a shows EUA daily price indexes for the period January 2006 to September 2007, as noted by the London based European Climate Exchange (ECX). In the beginning of 2006, the market was bullish showing increasing prices until April 26th. That day, a report of the European Commission became public by accident, providing figures showing an over allocation of EUAs for the year 2007. EUA prices dropped sharply, of which the price for EUAs for 2007 (Dec07) not recovered and continued to loose value. EUA prices for 2008 (Dec08) and 2009 (Dec09) went down to a minimum of 13.50 € early this year, climbed again to the 20€ benchmark and are currently being traded at slightly above 21€ at the moment. Power, carbon and gas are the main commodities affecting EUA prices. Information

[3] The EU-ETS is the European Emissions Trading Scheme, set up according to article 17 of the Kyoto Protocol.

[4] Some countries allow for unilateral projects, these are projects where seller and buyer are from the same country. However, to date not such unilateral project is being observed.

about EUA prices can be obtained at European stock markets (e.g. Nordpool, Powernext, EXC, for websites see Annex 1).

Since no AAU transaction took place so far, no prices can be reported[5]. However, prices are expected to be lower than for ERUs due to the enormous over supply.

ERU prices are negotiated between the seller and the buyer. Main price drivers for ERUs are:

- Size of the project (amount of ERUs)
- Payment schedule for ERUs (advance payment necessary?)
- Country risk (any changes in tax and property regulation etc.?)
- JI related risk (e.g. will the project receive a Letter of Approval from the Government?)
- Project specific risk (technology risk, financial risk, counterparty risk, environmental risk)
- Contracting risk (how many counterparties are involved? Are there conflicts of interest?)

In the evaluation report of the carbon markets in 2006, the World Bank reported prices for ERUs to range between 4 to 10 US$/ ERU (State and trends of the carbon markets, 2006, IETA and WB, 2006).

Carbon credit buyers

Buyers of carbon credits can be governmental procurement vehicles (e.g. governmental carbon funds), mixed public/ private funds or private companies (e.g. commercial funds, foreign power utilities etc.) from an industrialised country. Annex 2 depicts an indicative list of main buyers active in Ukraine.

Carbon credit sellers

The sellers of carbon credits can be private or state-owned companies or organisations who own a project that reduces emissions. This can be a municipality that owns a district heating system and aims to install a biomass boiler, or a medium size private agricultural enterprise that invests in biogas production and utilisation or a large power utility that installs a turbine to use waste heat of power production and increase energy efficiency.

Institutional framework for carbon markets in Ukraine

The Supreme Council of Ukraine ratified the Kyoto Protocol (KP) on February 4th, 2004. Since then, a number of Laws and Decrees were ratified to steer implementation of KP mechanism. Annex 3 depicts an overview of the legal framework for Kyoto Protocol implementation in Ukraine. Administrative implementation of the Orders and Decrees lies with two authorities:

1. The Ministry of Environmental Protection of Ukraine (MEPU) is the so-called 'Designated Focal Point' according to JI terminology. The MEPU is authorized by the national Government and the UNFCCC to coordinate all Kyoto related activities in Ukraine.

2. The National Environmental Investment Agency of Ukraine that was created on April 4th 2007.

The carbon market in countries in transition (including Ukraine) allows for two types of institutional set-ups for carbon transactions: (i) the project based Joint Implementation mechanism as defined in article 6 of the Kyoto Protocol, and (ii) the Green Investment Scheme that is a voluntary framework that is being discussed for selling state-owned emission reduction certificates.

[5] Latvia is planning for the first AAU transaction of 5 million AAUs until the end of 2007. Ukraine, Czech Republic, Hungary and Poland are considered to be second first mover in setting up internal AAU selling procedures.

In Ukraine, **the Joint Implementation mechanism** is managed by the Ministry of Environment through the Department for the Support of the Kyoto Protocol Implementation and Regulation of Ozone depleting. The Ministry of Environment is the key authority to deal with all UN related issues and the Kyoto Protocol, having a legal basis on resolution No. 206, 273, 341 and order No. 342 (Annex 3).Projects that are seeking to generate incomes through carbon credit sales, submit relevant project documentation to the Department. In a first assessment, the agency approves projects through submitting Letters of Endorsement (LoE). After this, projects may apply for Letters of Approval (LoA), which is then equal to a guarantee of the government that the project will be allocated the required amount of emission reductions (in form of AAUs) for selling ERUs.

Main actors in Joint Implementation (JI) projects are:

- Project owner (e.g. the municipality owning a district heating system/ a private company owning a factory)
- Project developer (a consulting company that supports the project owner in developing JI related documentation and obtaining relevant national approvals)
- Ukrainian Government through the Ministry of Environmental Protection, Department for the Support of the Kyoto Protocol Implementation and Regulation of Ozone-depleting
- Buyer of carbon credits.

In the JI mechanism, emission reductions of each project are approved by the national Government, which then puts aside the equivalent amount of AAUs. This setting aside of AAUs converts the project owned emission reductions from state to private property and turns them to the unit ERU (Emission Reduction Unit) which is tradable between the project owner and the carbon buyer. A future contract is closed for the delivery of ERUs between the project owner and the buyer.

Box 1
AAUs – Assigned Amount Units
With the ratification of the Kyoto Protocol, industrialised countries have agreed to reduce their GHG emissions. The emission rights are capped for industrialised countries and economies in transition according to emissions in the base year 1990. These capped emission rights are defined as assigned amount units. Due to the economic contraction in Ukraine after 1990, GHG emissions these days are less compared to 1990. Ukraine has a surplus of AAUs that they can sell to other industrialised countries in need of additional emission rights. Estimations of the Ministry of Economy of Ukraine project a total of 2.225 billion surplus AAUs, of which 200 mio AAUs per year shall be used for GIS, 50 mio AAUs per year shall be used for JI and the remaining amount shall be held as a reserve.

The Green Investment Scheme (GIS) has a different origin than the JI mechanism. The GIS is no instrument of the Kyoto Protocol. It is a voluntary commitment of the national government of Ukraine to dedicate the incomes from sales of state-owned emission reduction certificates (AAUs) to national emission reduction projects. Since the surplus amount of AAUs is a by-product of the economic collapse but not a result of good environmental policy, international actors strongly emphasize to link AAU sells to investments in clean energy sources in the own country. Due to the enormous supply of AAUs from Russia and Ukraine, particularly, it is expected that the demand side will focus on so-called 'greened' AAUs. So, 'greening' AAUs through a GIS is the most promising way for Ukraine to sell AAUs[6]. There is no official procedure on how to implement a GIS. Instead, it is to the Governments to design a scheme that fits in the national strategic plan and budget allocation. Since the demand for AAUs comes from other Governments (or public funds representing a number of Governments, like the Prototype Carbon Fund of the World Bank), it is likely that these Governments will want to be involved in the selection of project types eligible under a GIS financed from the revenues of their expenditure. It is not yet clear,

[6] The Hungarian Government just announced to have their Green Investment Scheme ready by January 2008. In order to assure the quality of projects financed through the GIS, the Government considers to use ISO 14064-3 standard for emission reduction verification (http://www.pointcarbon.com/article24779-472.html?articleID=24779&categoryID=472, 02.10.2007)

which Governments will purchase AAUs and what criteria they wish to apply. This will all be a matter of negotiation between the Ukrainian and the foreign Government.[7]

On April 4th, 2007, The Prime Minister of Ukraine approved a decree of the Cabinet of Ministers of Ukraine to establish the National Agency of Environmental Investment of Ukraine[8]. This Agency has been immediately established and is now responsible for AAU trading. Rules and procedures for set-up and operation of The Green Investment Scheme are currently being discussed.The Agency is mandated to prepare a law on International Emissions Trading and to submit it for approval during the parliamentary session in autumn. For contact details of the Agency, please refer to Annex 1. An organisational structure is depicted in Annex 4.

Main actors in GIS projects would be:

- Project owner,
- Project developer,
- Ukrainian Government through the Agency of Environmental Investment

According to recommendations of the World Bank (Ukraine, Options for designing a Green Investment Scheme under the Kyoto Protocol, Nov. 2006), a GIS could be designed as a targeted program in the Special Fund of the Ukrainian budget. This is reported to be in line with fiscal policy and would add to transparency in fund flows. It is reported that the Head of the Agency for Environmental Investments, plans to design a potential program under a GIS similar to a credit line that provides long-term loans. The idea is to avoid mere distribution of money (similar to a subsidy) and instead create a sense of ownership for the project and incentive to maintain the infrastructure in a well state in order to pay the credit back. However, conditions of this credit line are not defined yet. So, it's applicability to the bioenergy sector remains unclear.

3 Potential Emission Reduction Projects in Agriculture

3.1 Technical potential and implementation obstacles

According to Kyoto Protocol definitions, project types in agriculture can be divided in 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. Several authors have shown that biodiesel and bioethanol production in Ukraine is not yet competitive without substantial subsidies (IER 2006, IER 2007a). 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)

[7] E.g. the German Government has the objective to comply with emission reduction obligations under the Kyoto Protocol mainly through national measures. Only a small share is expected to be contributed under JI and no interest so far has been shown to engage in a GIS.

[8] Resolution of The Cabinet of Ministers of Ukraine №612 April 4, 2007, on establishing the National Agency for Environmental Investment

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 it's origin. If the project foresees to export the biodiesel, no revenues from carbon credit sales will occur. Due to 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 utilisation of energy crops (poplar, willow, miscanthus etc.) may be a good option in the future but are not yet in the pipeline in Ukraine.

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 (table 3.1). 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 farms (SEC Biomass, expert estimate, Oct. 2007). Larger biogas projects are associated to gas extractions at landfills or sewage water treatment plants.

Table 3.1: Characteristics of average ER projects in the agricultural sector in Ukraine

Technology	Installed capacity (MW)	Capital requierements (m€)	ER potential (tCO2e/yr)	Project IRR (%)	Payback period (years)
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 (Annex 5a). **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. To date, 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 table 1.3, the average size of a JI project in the fat and oil sector can be estimated at 30 MWth with app. 50,000 t CO_2e/year. Expert estimates indicate that there is a potential for app. 20 projects of this size in Ukraine (SEC Biomass, expert estimate, Oct. 2007).

Another promising project type is the introduction of **straw** fired boilers. Estimates show that app. 5.6 mtce are annually could be obtained from surplus straw (see Annex 5b for further calculations). 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, table 3.1 shows that the implementation of one boiler is with app. 575 t CO2e/year far too small to serve as 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 Ukraine (SEC Biomass, expert estimate, Oct. 2007).

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 50m € investment costs, thus experts consider this technology not competitive in Ukraine. Still, there is one project being planned (large-scale enterprise “Mironovskiy Khleboproduct”) where it seems to be economically viable.

3.2 Case Studies

In order to provide further insights in two project types that have good replication potential in Ukraine the following two chapters discuss two selected case studies. The first case study shows an investment into a biomass boiler and CHP plant at a large financially viable enterprise. This project is expected to produce app. 40,000 tCO_2e annually and is sufficiently large to attract foreign buyers of carbon credits under the JI mechanism. The second case study is a biomass boiler at a medium sized agricultural enterprise that sells heat to the neighbouring village. This project produces a very small amount of emission reductions (575 tCO_2e annually), which makes it less interesting for foreign carbon credit buyers and more interesting under a Governmental Green Investment Scheme (GIS).

3.2.1 Case Study 1: Sunflower husk fired boilers under JI

The example project is being implemented at an edible oil plant, which is owned by an Open Joint Stock Company (OJSC). The company is one of the leading edible oil producing companies in Ukraine and belongs to a bigger holding company. The plant has a comprehensive infrastructure of pre-treatment, hulling and winnowing, pressing, extraction and auxiliary division. The plant was modernized and partly reconstructed during the past years. As a result of these measures, the company increased its production capacities, including all parts of the production process – from storage to processing capacities.

The objective of the project is to redesign the energy supply system of the oil plant so that 100% of the sunflower seed husks are used for heat and power production. The company calculates with an extension of the production capacity, which will lead to increasing heat and power demand. The purpose is to supply heat and power to the enterprise at the expense of husk combustion, to reduce dependency on fossil fuel and avoid purchasing power from grid, and to avoid dumping of husk at landfills.

Box 2

Key features – case study 1

- Installed capacity: 30 MW_{th} + 2.5 MW_{el}
- Capital requirements: investment 6 m Euro, operational costs 118 t Euro/yr, JI development 25 t Euro
- Heat output per year (GWh/year): 180
- Power output per year (GWh/year): 12
- Amount of natural gas replaced (mio m^3/year): 14
- Grid emission factor (tCO_2/MWh): 0.896
- Emission reductions from fuel switch (ERUs): 25,000 tCO_2e/yr
- Emission reductions from avoided methane emissions (ERUs): 16,000 tCO_2e/yr
- Buyer of heat output: CHP plant sells heat to the company
- Buyer of electricity output: CHP plant sells heat to the company
- Additional revenue of the project: none
- Fuel supply: 52 t sunflower husks/yr
- Annual operating time (hours/ year): 8,000

Input supply:

Core business of the company is to process sunflower seeds and produce edible oil. The company is one of the leading edible oil producers in Ukraine, thus input supply is considered stable and permanent.

Income streams:

The JI project has two income streams: (a) the revenue of carbon credits (ERUs), and (b) incomes of the CHP from heat and power sales to the oil production plant (except from losses and own consumption).

Ownership of the project:

The CHP plant is owned by the holding.

Project Finance:

Share financed through equity: 76%

Share financed through debt: 0%

Share financed through JI: 24%

Stakeholders involved in the project are the Holding and the oil production company. The Holding covers 100% of the investment costs with own equity. The ERU income stream will be used for covering operational costs and debt repayment. This will lead to a payback period of 5 years.

This project has a **low risk profile**. Input supply is secure and the project produces two asset streams. The contractual set-up, with the Holding as owner of the JI project and the oil processing plant as client of the JI project is quite unique. The interest of the Holding is to increase oil production, whereas a steam based process is a means to increase oil extraction efficiency. This structure assures a high sense of ownership of the Holding for both enterprises, whereas it creates semi-market conditions where the CHP plant has to compete with conventional heat and power prices.

As JI project this is a perfect set-up where no upfront payments of the certificates are needed since investment costs are covered by the Holding.

3.3 Case Study 2: Straw fired boilers financed under GIS

The owner of the project is a private agricultural enterprise specialized in cereal production. The purpose of the project is to switch natural gas based heating systems to straw based heat production. For the purpose a 600 kW straw fired boiler is planned to be installed. Produced heat will be used for own needs of the enterprise and for heating social and other objects of the neighbouring village (school, kindergarten, administrative buildings).

Box 2

Key features – case study 2

- Installed capacity (MW net energy output): 0.6 MW
- Capital requirements: investment costs 61,000 €, operational costs 12,500 €/yr, development for JI or GIS financing 11,000 €
- Heat output per year (GWh/year): 2.58
- Amount of natural gas replaced (th. m3/year): 293
- Emission reductions from fuel switch (ERUs): 575 tCO_2e/year
- Buyer of heat output: neighbouring village
- Additional revenue of the project: ---
- Fuel supply: 746 tonnes of straw/year
- Annual operating time (hours/ year): 4,000

Input supply

The agricultural enterprise is financially viable and shows a stable production throughout the last years. Annual straw production totals 3,200-3,600 tonnes. App. 2,000 tonnes are used

for livestock production, leaving an annual surplus of 1,500 tonnes. This unused straw surplus is twice as much as what is needed it to run the boiler at full load. Thus, input supply is considered to be stable and safe.

Income streams

The project draws on two income streams:

1. Heat sales to the village (paid by local administration)
2. Sale of carbon credits

Additionally, the company has fewer expenses for natural gas, which adds to the positive financing balance.

Ownership and operation of the project

The contracting set-up is straight forward. The agricultural enterprise owns and operates the boiler. A sales contract between the farm enterprise and the local administration about the heat sales is in place.

Project Finance

Share financed through equity: 100%

Share financed through debt: 0%

Share financed through carbon credits: 0%

The project owner covers 100% of the investment costs. Incomes from carbon credit sales are expected to cover 38% of the project costs, which will be used to cover operational costs and debt repayment. The payback period of this investment is 2.2 years.

This case study is an example, where the agricultural company is capable to do 100% financing of the project. However, this is an exeption rather than a common set-up. In Ukraine, small and medium sized agricultural enterprises have limited financial capacity which does usually not allow for such an investment in addition to their agricultural activities requiring considerable pre-financing. In order to make use of the technical replication potential of this project type a credit line from local banks allowing for loan durations of 3 years is required.

This project type has a **high risk profile** under the JI mechanism. For a JI project it is by far too small with app. 500 tCO_2e year. Ten of these projects would have to be bundled to reach an interesting size for a foreign buyer of carbon credits. Project bundles of this size increase risk perception from a buyer's perspectives. If too many stakeholders are involved, the project becomes too complex and too difficult to handle. A number of contracts would have to be in place with several private and public actors. Performance would have to be checked at each site which would lead to high transaction costs. Finally the return per project from carbon credit sales will most likely not be interesting enough to allow for a willingness to cooperate within a bundle of 10 projects.

Two main obstacles hamper the replication of this project type at larger scale: (i) heat producer and heat consumer are not the same entity. The farm enterprise (often private) owns the straw but has limited heating needs, whereas municipalities have large heat demand and run a pipe network but dont own biomass. This would require a contracting set-up that is not yet very common in Ukraine, (ii) Communal administrations as state entities are not eligible to receive bank loans and farm enterprises are not considered credit worthy due to lacking collaterals and credit history. With lacking funding options for the project at both sides, contractual hurdles between state and private enterprises can not be overcome.

Thus, a national program as buyer of the carbon credits would be an optimal set-up for this case, where the investment is relatively small and the emission reduction volume below 20,000 tCO_2e annually. A Green Investment Scheme could provide a framework for a credit line managed by the Government, allowing for small credit sizes and pay back periods of 2 to 4 years.

4 Main Obstacles

Financing Needsand Creditworthyness

The biggest obstacles that prevent more emission reduction projects in Ukraine from being realised are lacking funding sources of potential project owners. Carbon co-finance is not the overall remedy to secure investments in a field where Ukrainian entities themselves do not invest. The returns from carbon credit sales occur when the project is running and producing emission reductions. So, they help to cover operational costs and assure smooth debt repayment. But the largest hurdle has to be overcome prior to the project with the financial closure of the project.

In a normal set-up, carbon credit returns are not suitable for covering investment costs. Buyers of carbon credits would provide a certain amount of up-front payment which could add to financial closure. Still, to provide upfront payments, buyers act as every debt provider would act: they ask for bank guarantees or other collaterals. But, access to bank guarantees and loans for agricultural enterprises is limited if not lacking since land or other assets of the enterprise can not be used as collateral. Municipalities are legally not allowed to use their property (e.g. parts of the existing district heating infrastructure) as collateral for loans.

An international carbon buyer would not be willing to provide upfront payment to an agricultural enterprise, if this enterprise is not considered credit worthy by local institutions.

Accordingly, under the current framework conditions, international carbon buyers will focus on large projects at large enterprises with sound financial standing.

Funding sources from international banks are lacking. In 2007, the EBRD launched a credit line with total volume 120 m US$ for energy efficiency and energy saving projects in Ukraine. However, there is no agricultural project in the pipeline so far. Loans are given under the conditions of commercial loans with a minimum size of app. 500,000 US$, whereas the loan duration is reported to be longer than the ones offered by national banks. However, this loan size is too large for most agricultural projects. Although the German Bank West LB shows a good track record in Ukraine, they do not have any agricultural project in their pipeline to date. Main reasons for this are too small loan sizes and difficult contracting set-ups for bundled projects.

National banks provide loans under commercial conditions looking at hard security and fixed assets, which can often not be offered by agricultural enterprises.

Complexity of the topicand awareness creation

Stakeholders in this sector often lack knowledge about carbon-finance options. Due to the scattered business structure, with many small and medium sized farms distributed over the whole country, awareness raising and capacity building is extremely difficult.

In the agribusiness sector, scepticism and lack of information regarding carbon co-financing in the top management level is common.

High transaction costs

For project owners in the country, JI projects come together with new contractual set-ups and arrangements that they are not familiar with. It is very common that the companies are not willing to take the transaction costs of informing themselves on the options and the market and arrange for JI project development.

Carbon buyers face the transaction costs related to the due diligence of the project, complex contracting set-ups and supervision of contract implementation. These costs make buyers reluctant to enter into agreements where too many stakeholders are involved and where the contracted emission reduction volume is too low.

National framework conditions

Several technical and institutional barriers exist in Ukraine effecting agricultural projects, particularly.

- Ecological legislation is weak or hardly enforced so that positive ecological benefits of bioenergetic use of biomass and organic waste can not be factored in (e.g avoided fines for uncontrolled disposal of organic waste, production of organic fertilizer).
- The country went through a period of political instability so that the country risk perceived by buyers of carbon credits and potential investors in bioenergy projects from abroad is perceived very high.
- National technology providers are scarce or missing, leading to high equipment costs.
- A feed-in tariff for producers of power from renewable sources is missing. For small power producers, the tariff is calculated at full costs whereas big power producers are usually calculating differently . The power distribution company at Oblast level chooses from which source to purchase power. Factoring in all production costs, small producers end up with higher power prices than large power producers that do not fully account for production costs at local level. Thus, without a feed-in tariff, small bioenergy producers are discriminated and will not be able to compete with large power producers using their power of monopoly.

5 Conclusions

The two funding options presented in the case studies (JI vs. GIS), should serve to illustrate characteristics and strength of the two mechanisms. However, this paper does not emphasize to draw a strict division between both funding streams. Instead applicability should be assessed on a project by project basis.

Despite existing problems, positive trends can already be noted. The banking sector is rapidly evolving in Ukraine, with new credit lines being offered. A national fund for innovation and energy conservation projects was created in Ukraine not long ago.

In 2008, a governmental program is expected to raise app. 1 billion UAH to provide grants to oblast administrations for reconstruction of oblast district heating systems. This could lead to investments in hundreds of straw-fired boilers, which could benefit from carbon co-financing.

A law for a ‘green’ tariff has been proposed and is currently under revision in the Verkhovna Rada and passed in the first reading. The law aimed at factoring in costs of gas cleaning stations in the power prices. This would lead to higher prices for conventional power and result in a doubling of feed-in prices for small producers. However, this law still has to go through the 2nd and 3rd reading and experts state that the initial approach of this law is already being watered. The final outcome will most likely not result in a law that provides an incentive for small power producers to take over ground.

However, a green tariff is considered a core step towards achieving the policy goal to create an equal-level playing field for all energy provoders. Accordingly, it is highly recommended to maintain the discussion of calculating a fair tariff for small producers.

In addition, further application of laws on environmental protection and imposing fines for environmental pollution would contribute to create a favourable environment for clean energies and foster the market for organic fertilizer.

Improving the business environment for the domestic manufacturing sector for biogas equipment and biomass boilers would lead to reduced investment costs for such projects on the long run.

However, all these measures are not likely to be effective unless the price for fossil fuel is not adjusted, factoring in all costs related to it’s production.

Set-up of a Green Investment Scheme

The carbon market is just starting and several procedures and rules are still being designed. Thus, proactive engagement in the discussions at national level is necessary to assure the representation of the agricultural sector in the design of national programs.

Current discussions on the GIS at national level in Ukraine are directed towards using this mechanism to allow for projects that are not eligible under the JI (e.g. due to weak additionality[9]). This would foster the development of large projects in the industrial sector leading to exclusion of most biomass projects. Under this scenario, the agricultural sector would only marginally benefit. It can be expected that the international Government buying so called 'greened' AAUs from a GIS will pose some criteria on the scheme (to reflect their policies for international cooperation with Ukraine and their negotiation status under the Kyoto Protocol). Thus, most likely, the Ukrainian Government might face difficulties marketing a GIS stream that does not reflect international Kyoto market standards.

In contrast, biomass projects are likely to attract interest from international Governments under a GIS. It is highly recommended that the Ministry of Agriculture contributes to the discussion around the design of a GIS with the Agency of Environmental Investments under the Cabinet of Ministers. In parallel to the discussions at national level, discussions should be started with foreign governments to promote a potential program under a GIS for agriculture.

A micro credit program could be s suitable set up for a GIS program for municipalities and small and medium enterprises. Applicable collaterals for loan application could be defined under a communal investment program to assure credit access for communes. Since needed investment volumes are relatively small, the minimum loan size of such a program should be around 60,000€.

Authors: Anna Lehmann, Tetyana Zhelyezna, Alexander Filonenko

[9] 'Additionality' is a Kyoto related concept to assure that emission reductions produced by the project provide an incentive to implement the project. Meaning that without the cash inflow from emission reduction sales, the project would not be financially viable. This concept is designed to assure technology transfer and to avoid that Kyoto mechanisms provide hidden subsidies for sectors that already do have access to capital.