Report No. 44843-UA

Ukraine
Agricultural Competitiveness

June 2008

Europe and Central Asia Region
Sustainable Development Unit

Document of the World Bank

Currency Equivalents
(Exchange Rate Effective June 18, 2008)

Currency Unit	=	Ukrainian hryvnia (UAH)
UAH 1	=	US$ 0.21
US$ 1	=	UAH 4.70

Fiscal Year
January 1 – December 31

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Table of Contents

Figures

TABLES

ABBREVIATIONS AND ACCRONYMS

BCI	Business Competitiveness Indicator
DDGS	Distillers' Dried Grain and Soluble
DEA	Data Envelopment Analysis
DRC	Domestic Resource Cost
EU	European Union
FAO	Food and Agriculture Organization
FAPRI	Food and Agricultural Policy Research Institute
FSU	Former Soviet Union
GAO	Gross Agricultural Output
GAP	Good Agricultural Practices
GCI	Growth Competitiveness Indicator
GDP	Gross Domestic Product
HACCP	Hazard Analysis and Critical Control Point
IAAE	International Association of Agricultural Economists
IER	Institute for Economic Research
IMF	International Monetary Fund
OECD	Organization for Economic Cooperation and Development
PAM	Policy Analysis Matrix
RCA	Revealed Comparative Advantage
SFA	Stochastic Frontier Analysis
SPS	Sanitary and Phytosanitary Standards
US	United States
USA	United States of America
VAT	Value-added-Tax
WEF	World Economic Forum
WTO	World Trade Organization

ACKNOWLEDGEMENT

This Policy Note is a product of the Sustainable Development Unit of the Europe and Central Asia Region of the World Bank. It was prepared by Stephan von Cramon-Taubadel and Oleg Nivyevskiy (Consultants, University of Göttingen, Germany) and Matthias Grueninger (Senior Agricultural Economist, ECSSD, and task team leader), with guidance from and final review by Will Martin (Lead Economist, DECRG) and John Nash (Lead Economist, LCSSD). Further guidance was received from the peer reviewers Martin Raiser, Sergiy Zorya, and Alex Kramer, which was greatly appreciated.

The team is grateful to the many staff at the World Bank and partner institutions who made substantive contributions to this Note. In particular, the team would like to thank Antje Wagener in Göttingen for her organizational support, Veronika Movchan (Institute for Economic Research and Policy Consulting) and Heinz Strubenhoff (German-Ukrainian Agricultural Policy Dialog) in Kyiv for providing data and useful comments, and Olena Tranina and Irene Bomani of the World Bank for their support in publishing the final draft.

This policy note is part of a programmatic effort to support agricultural policy reform and investments in Ukraine. Several topics covered in this Note are the subject of more detailed analyses in separate products currently under preparation, including issues related to bio-energy production and agricultural trade. The results and conclusions presented in this Note should be understood as work in progress, disseminated to encourage further professional exchange. Feedback and suggestions are welcome and invited and should be sent to the task team leader, Matthias Grueninger (mgrueninger@worldbank.org).

EXECUTIVE SUMMARY

i. The agri-food sector is an important part of the Ukrainian economy. Agriculture could make an even larger contribution to economic growth and the vitality of rural areas in Ukraine than is currently the case. Ukraine has the agro-climatic potential to be a major player on world agricultural markets.

ii. However, as agricultural competitiveness is increasingly determined by transformations that take place post-harvest in complex food chains, the importance of natural conditions is declining. Ukraine's most important agricultural handicap and the essential constraint to its competitiveness in agriculture is that its endowment of high agro-climatic potential and strategic geographic location is currently not combined with sufficient quantities and qualities of complementary inputs such as a supportive policy framework, human capital, and information and marketing systems.

iii. International agricultural trade has expanded considerably and prices are strong. While current price peaks may not last, high prices and growing international agricultural trade are expected to persist in the medium term. Hence there is significant potential for expansion of Ukrainian agricultural exports, if competitiveness constraints are addressed successfully. Of course, forecasts of developments on world agricultural markets are notoriously difficult. However, Ukraine is not taking full advantage of the window of opportunity offered by current favorable conditions, and this – along with the immediate costs it implies – will certainly not make things any easier if and when world market conditions become less favorable.

iv. Ukraine's recent WTO accession and the start of negotiations of a free trade agreement with the European Union (EU) offer attractive opportunities but also put additional pressure on Ukraine's agricultural sector to compete in domestic and international markets. Private and public players in Ukraine's agriculture sector have recognized these challenges and are seeking ways to enhance the sector's competitiveness. The World Bank, through its analytical work, is supporting this process of identifying and choosing between options that are available to Ukraine. This Policy Note is the first in a series of analytical pieces that provide insights into the issues and options of Ukraine's agricultural sector development.

v. In this first Policy Note, Domestic Resource Cost (DRC) analysis using a Ukraine-wide farm accounting dataset is used to generate DRC distributions that cast light on the competitiveness of Ukrainian agriculture. The results demonstrate that many Ukrainian farms are able to produce wheat, sunflower seed, barley, eggs, beef and milk competitively. In 2005, for example, 44% of all Ukrainian farms that produced wheat did so competitively. Corresponding shares for sunflower seed (41%), barley (25%), eggs (40%), beef (22%) and milk (20%) are lower but point to a sizeable competitive core. The lowest shares are found for maize (13%), rapeseed (10%), soybeans (8%), pork (8%), potatoes (6%), poultry (4%) and sugarbeet (2%). For all products, the majority of the farms in Ukraine are not able to produce sufficient surplus to cover the costs of domestic and tradable inputs. For many farms and products, the value of production does not even suffice to cover the cost of tradable inputs, indicating that production is subtracting, not adding value. Competitive farms account for a disproportionate share of Ukraine's total output of agricultural products; the 44% of the wheat producing farms that were competitive in 2005, for example, accounted for almost 56% of Ukraine's wheat production in that year.

vi. The fact that some farms are able to produce competitively bodes well for Ukraine's future international competitiveness in major temperate agricultural products and processed foods. Realizing Ukraine's competitive potential is a matter of: i) shifting the competitiveness distributions presented here so that the great majority of farms in Ukraine can produce as efficiently tomorrow as the best farms do today; and ii) developing marketing and processing systems so that Ukraine's ability to produce competitive raw products on the farm is translated into competitiveness on world markets and for high-value added agri-food products.

vii. Agricultural competitiveness in Ukraine is constrained first and foremost by an insufficiently transparent, predictable and market-oriented policy framework. Ad-hoc government interference in agricultural markets reduces the transparency and efficiency of price formulation on agricultural markets, increases uncertainty and risk, and provides opportunities for rent seeking. These factors discourage private investments and lead to inefficient public and private resource allocations. In addition, and although some improvements have been made recently, domestic support to the sector is still largely inefficient and often counterproductive. At the macroeconomic level, relative stability and growth since 2000 have benefited agriculture. However, persistent problems with export VAT refunds and over-regulation of the economy continue to hobble agriculture. At an intermediate level, the lack of a coherent rural development strategy that provides employment alternatives in rural areas and unburdens farms of 'social sphere' responsibilities is a barrier to competitiveness. At the level of agricultural policy, agricultural spending is high and growing, but often ineffective. Especially competitive products such as grains and oilseeds are taxed, while the least competitive of all, sugarbeet, is heavily subsidized. Subsidies are erratic over time and not distributed across farms according to any identifiable efficiency or equity criteria.

viii. Marketing chains in Ukraine are characterized by physical losses (due to poor harvesting and storage technology on the farm), inefficient and expensive infrastructure and processing between the farm gate and export positions, and inflated margins due to policy-induced risk. Policy has actively contributed to perpetuating these problems. The result is costly: if farmers in Ukraine had received roughly the same share of fob grain prices as their counterparts in Germany, the 2006 harvest of roughly 35 million tons would have resulted in an additional US$ 1 billion of farm revenue, equivalent to about one-half of total government spending in support of agriculture in that year.

ix. Agricultural competitiveness in Ukraine also suffers from inadequate systems to test and document food product quality and food safety. Ukraine's food safety control system is complicated and characterized by fragmented and often overlapping jurisdictions. Many standards applied in Ukraine are inconsistent with WTO provisions, with standards established by the responsible international bodies, and with accepted practices in international trade. Without improvements towards an efficient and internationally recognized food quality and safety control system, Ukrainian agriculture will find it increasingly difficult to sell into international markets and its products will not be able to command top prices. The ban on Ukrainian meat, eggs, fish, cheese, milk and butter imposed by Russia in mid-January 2006 provides an example of the disruptions that can result. This negative impact on competitiveness will be increasingly acute for more perishable products, higher-processed products and products that combine different agricultural raw materials – in other words many high-value added products.

x. Ukraine lacks a complete set of land markets and conditions for the enforcement of bankruptcy proceedings in agriculture. Land lease is possible, but a market for land sale, which is an integral element of the development of rural finance markets, has not been established. The ongoing moratorium on the enforcement of bankruptcy proceedings in agriculture has a similar negative impact on the development of agricultural finance. It also hinders the movement of scarce agricultural assets from less to more efficient farm managers by allowing the former to continue operations longer than would otherwise be the case.

xi. By limiting the development of agricultural credit markets, missing markets for land sale and the lack of bankruptcy enforcement have reduced especially medium- and long-term investments in farm machinery, on-farm storage, equipment for milking cows, cooling milk and drying grain, as well as manure treatment facilities, etc. Missing or outdated machinery and equipment in crop production results in sub-optimal input application, higher costs of production and lower yields, and greater harvest and post-harvest losses. In livestock production it results in sub-optimal feed preparation and storage, animal health problems, and an inability to invest in superior genetic material.

xii. Underlying and accentuating all of the barriers to agricultural competitiveness in Ukraine is a shortage of human capital. Farm managers often claim that a lack of capital for investments in modern technology is their biggest constraint. However, these same managers rarely make the best possible use of the – admittedly scarce – capital that is at their disposal. Producers and agri-food businesses often lack skills in business administration and farm organization and knowledge of markets and marketing, including quality requirements in target markets and how to work towards fulfilling these requirements on the farm and in the food chain. Public institutions, such as the ministries responsible for identifying policy needs and formulating and implementing appropriate responses, often suffer from a lack of analytical capacity and an inability to distinguish between private and social costs and benefits.

xiii. The agricultural research and education establishment in Ukraine is not delivering the trained young professionals Ukrainian agriculture needs, and it fails to serve as an independent voice that informs policy makers and other stakeholders by subjecting policy proposals and developments in the sector to objective and public scrutiny. In the years since independence, the agricultural research and education establishment has largely failed to serve as a conduit for new concepts and methods of policy analysis into Ukraine. There are no provisions for the reintegration of young, foreign trained Ukrainian professionals who could reinvigorate the research and education.

xiv. Policy reforms and investments could greatly increase the competitiveness of Ukrainian agriculture. In the policy sphere, greater restraint should be exercised in the area of trade, market and price policy. *Ad hoc* intervention on agricultural markets should be reduced. Accession to the WTO is an important and encouraging signal that policy makers are willing to adopt less intrusive and more stable trade, market and price policies. In the investment sphere, priorities include food safety monitoring and certification systems, trade infrastructure and logistic capacity, food chain management, technical advisory and market information systems, streamlined and transparent customs procedures, land markets, and research and education institutions.

I. Agriculture's current and potential role in the Ukrainian economy

Agriculture's role in the Ukrainian economy

1. The agri-food sector is an important part of the Ukrainian economy. Agricultural production accounted for roughly 7% of Ukrainian GDP in 2007, and food processing for roughly 8% (Appendix 2, Table 1). If the industries upstream from agriculture (farm machinery, fertilizer, agricultural chemicals) are added, the agri-food sector's share of GDP in Ukraine approaches 20%. In 2007, 10% of the country's employed worked in agriculture and food processing, and 32% of the country's population lived in rural areas (Appendix 2, Tables 1 and 2).

2. Some Oblasts contribute considerably more than others to agricultural production in Ukraine. Appendix 2 Table 3 presents data on the shares of Ukraine's 25 Oblasts in national production of major crop and livestock products. A group of 'core' Oblasts in Central to Eastern Ukraine (Vinnitsa, Dnipropetrovsk, Donetsk, Kiev, Odessa, Poltava, Kharkiv and Cherkassy) have shares of over 5% in national gross agricultural production, (compared with an average share of 4% for 25 Oblasts). These are joined by Kirovograd (also in Central Ukraine) when only crop production is considered, and Lviv (in Western Ukraine) when only livestock production is considered. With few specific exceptions (e.g. poultry production in Crimea), Southern Oblasts (low precipitation) and the most Northern and Western Oblasts (less suited soils) make below-average contributions to Ukraine's agricultural production.

3. There are two broad types of farm in Ukraine; individual and corporate (Lerman et al., 2006). Corporate farms, of which there were roughly 17700 in 2004, are the large successors of the former collective and state farms. They account for roughly 59% of the 41.7 million hectares of agricultural land in Ukraine, and 30% of the country's gross agricultural output (GAO). Individual farms include the roughly 5.3 million household plots (33% of the agricultural land and 60-65% of the GAO), and roughly 43,000 peasant farms (8% of the agricultural land and 5-10% of GAO). Compared with corporate and peasant farms, the household plots are largely subsistence-oriented. In a survey carried out in 2005, Lerman et al. (2006, p. 88) determined that the average household plot sells 21% of its agricultural output and consumes 48%, with the rest being stored and used as intermediate inputs. Analogous shares for the corporate (peasant) farms are 57% (64%) and 10% (9%), respectively (see Table 1 for farm size distribution).

4. For largely historical reasons, there is a clear East-West gradient in the share of household plots in GAO across Oblasts, with shares ranging from highs of near 90% in the West, to slightly under 50% in the East and South (Appendix 2 Table 3). There is also a statistically significant correlation between an Oblast's share of national agricultural output and average agricultural wages in that Oblast, with wages increasing by roughly 25 Hryvnia/month per one percentage point increase in agricultural production share. However, this relationship is weak (explaining only roughly 23% of the variation in wages between Oblasts), and says nothing about the underlying causalities, which likely involve wage levels in other sectors. Many of the Oblasts that make above average contributions to Ukraine's agricultural production and in which above average agricultural wages are paid (e.g. Dnipropetrovsk and Kiev) are also characterised by above-average overall economic performance.

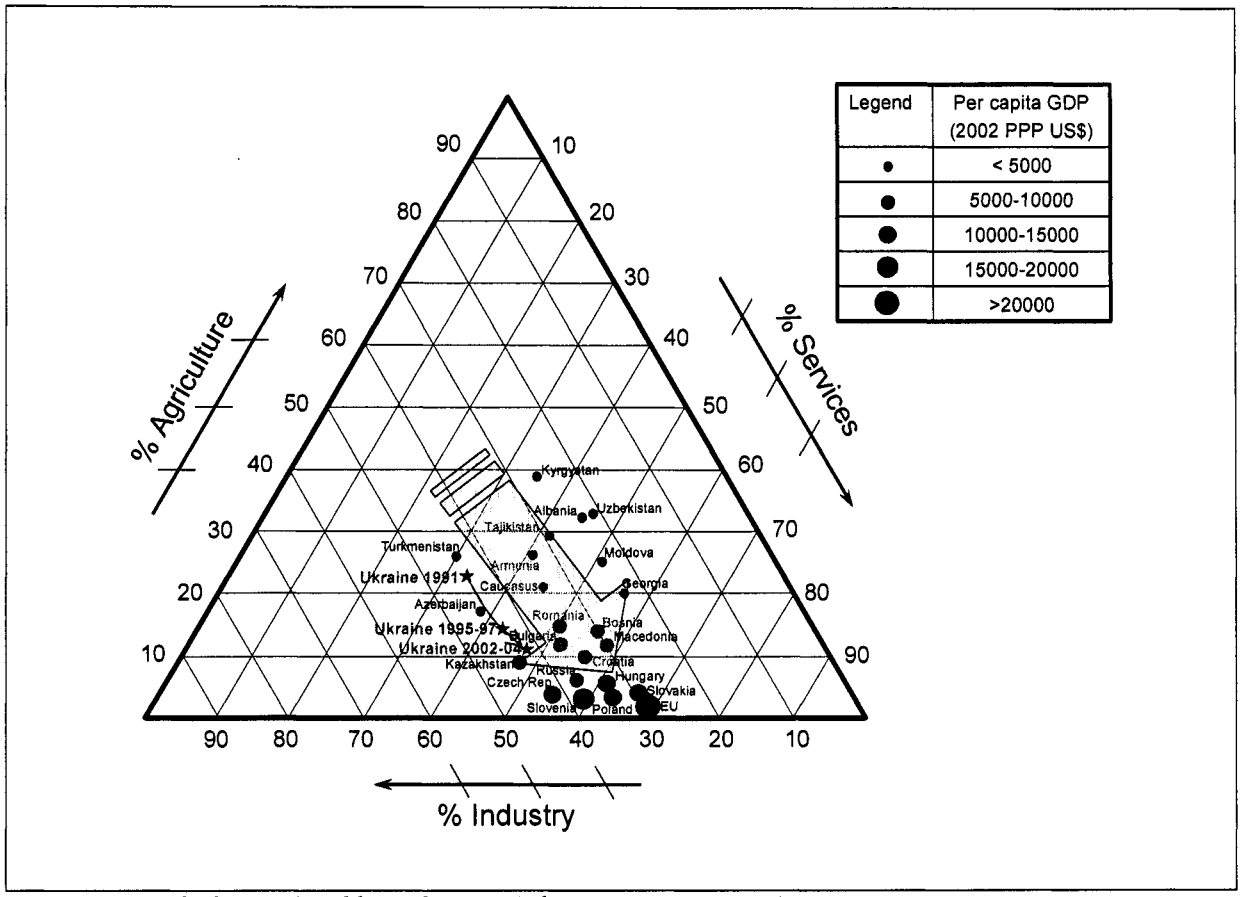
Table 1: Distribution of farms in Ukraine by size (2006)

Size category (hectares)	Individual farms				Corporate farms	
	Peasant farms		Household plots			
	Number	Land use ('000 ha)	Number (million)	Land use ('000 ha)	Number	Land use ('000 ha)
to 0.25	-	-	1.24	484	-	-
0.26–0.5	-	-	1.47	1342	-	-
0.5–1.0			1.66	2808	-	-
< 1	345	0.3	4.37	4634	-	-
1–5	5754	19.3	0.95	4291	-	-
< 5	6099	19.6	5.31	8925	168	0.6
5 – 10	4199	33.2	0.12	1950	104	0.9
> 10	-	-	0.07	4728	-	-
10–20	4934	76.6	-	-	277	4.2
20–50	14117	538.9	-	-	713	25.9
50–100	3947	277.1	-	-	670	50.7
100–500	4514	1026.4	-	-	3042	822.6
500–1000	858	601.8		-	2128	1555.0
1000–2000	519	706.8	-	-	2734	3944.6
2000–3000	116	280.5	-	-	1366	3330.3
3000– 4000	43	146.4	-	-	712	2470.2
> 4000	49	265.5	-	-		
4000 – 5000	-	-		-	313	1354.0
5000 – 7000	-	-	-	-	300	1724.2
7000 – 10000	-	-	-	-	103	847.1
> 10000	-	-	-		52	680.9
Farms w/o agricultural land	3755	-	-	-	2026	
Total	39395	3973	5.5	15602	12682	16811
Average size (hectares)	100.9		2.8		1325.6	

Source: State Statistics Committee of Ukraine.

5. The share of agriculture in production and employment tends to fall in the course of economic development, as the shares of first the industrial sector and later the service sector increase. Figure 1 is a Leamer triangle (Leamer, 1987) in which each vertex represents one of the three aggregate sectors; agriculture, industry and services. Each sector's relative share of total economic activity in the economy is measured by the distance from the side opposite its vertex. By construction, the sum of the three sector shares indicated by any point in the triangle is 100%. Hence, any economy can be characterised by a unique point inside the triangle, the location of which describes that economy's sectoral composition. For a cross-section of Former Soviet Union (FSU) countries and the EU, Figure 1 illustrates the trend of declining agricultural and industrial shares and increasing service share as per capita GDP (represented by the size of a country's point) increases. It also shows that Ukraine has followed this trend in the years since independence (see also Table 2, Appendix 2).

Figure 1: The sectoral composition of the economy in the European Union and Former Soviet Union countries (2002)



Source: Own calculations (World Development Indicators, various issues).

6. However, in the case of Ukraine the trend displayed in Figure 1 is not a result of textbook long-run forces (relative sectoral rates of technical change, Engel's Law, etc.) at work in a full-employment economy. The entire Ukrainian economy, including agriculture, is operating well below its production frontier. Tiffin (2006) presents the results of econometric efficiency estimates that suggest that Ukraine was producing only 22% of the output it could given its factor endowments in 2000, down from 49% in 1990. Hence, shifts in sectoral GDP shares since independence have been primarily driven by the sector-specific depths of the transition crisis up to 2000, and different rates of partial recovery since. Agriculture's GDP share could remain constant or even increase in the medium term in Ukraine if sectoral reforms and restructuring were accelerated. Furthermore, the absolute size of both agriculture and food processing in Ukraine has increased in real terms since 2000, and this trend could continue, even if agriculture's relative contribution continues to fall. Similarly, successful adjustment to increasing domestic and foreign demand for higher-value food products would increase the agri-food sector's ability to generate skilled, high-wage employment.

Ukraine's agricultural potential

7. Ukraine's agro-climatic endowment provides the basis for a large potential in agricultural production. Over 40 million hectares of agricultural land, of which roughly 32.5 million hectares are arable (FAO), provide an excellent basis for the production of temperate crops and livestock products. Over one-half of Ukraine's arable land is covered with humus-rich *chernozem* ('black soil') that is ideally suited for field crop production. The two main belts of this soil in the world are located in i) Ukraine through southern Russia and into Siberia, and ii) the Canadian Prairies. Roughly one-third of the worldwide stock of *chernozem* is located in Ukraine.

8. Due to Ukraine's relatively low population density[1], area-based production potential implies export potential. Although incomes have grown rapidly since 2000 (Appendix 2 Table 2), increasing domestic demand for food, Ukraine has the capacity to produce much greater volumes of temperate grains, oilseeds and livestock products than its (shrinking – see Appendix 2 Table 2) population can 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 FSU, North Africa and the EU.

9. 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 Northwest 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. Drought and/or winter-kill has a significant impact on agricultural production every 3-5 years; examples of this being the poor and very poor harvests recorded in 2000 and 2003, respectively. According to some forecasts, global warming will exacerbate drought problems in the future, with Ukraine becoming hotter and drier on average.

10. Another limitation is, paradoxically, soil fertility. The rolling landscape that characterises much of Ukraine's agricultural heartland is susceptible to erosion. Penkaitis (1994, p. 16) cites Ukrainian sources that refer to over 12 million ha of arable land as being significantly affected by erosion. As a result of distorted incentives, the vaunted *chernozems* have in many locations been stripped of their nutrient and humus content over decades, compounding problems with moisture retention in years of low precipitation (see also Breburda, 1990; Spaar & Schuhmann, 2000; IER, 2006b, p. 2). The Chernobyl nuclear accident created additional limitations in the form of radioactively contaminated farm land. As the prevailing winds were blowing from South to North when this accident occurred, much of this contamination affected regions in what is now Belarus (e.g. Gomel) and Russia (e.g. Bryansk). However, 4 of the 10 most affected regions in the former Soviet Union (Kiev, Zhitomir, Chernigov and Cherkassy in descending order of contamination) are in Ukraine (Penkaitis, 1994, p. 16).

11. Finally, as agricultural competitiveness is increasingly determined by transformations that take place post-harvest in a complex food chain, the importance of natural conditions is declining. Anderson (1993, p. 305) illustrates that at the outset of transition the FSU was endowed with a

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[1] Ukraine's population density was 79 inhabitants/km² in 2003. By comparison: World average–46; India–325; China–134; USA–30; Argentina–14; Russia–8 (United Nations Statistics Division, 2007). If only agricultural land is considered, Ukraine's population density (1.17 inhabitants/agricultural ha) is less than the world average (1.28) (FAO, 2006).

low stock of capital per worker and a high stock of natural resources per worker relative to the rest of the world. As agri-food systems become increasingly capital intensive, the comparative advantage implied by this ample natural resource endowment diminishes. As is outlined in greater detail below, 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 assets with insufficient amounts of complementary inputs such as human capital, marketing systems and policy facilitation. This is largely a result of Ukraine's difficult post-Soviet agricultural legacy. However, with each passing year, reasons for limitations in the sector's competitiveness must increasingly be sought in inadequate agricultural policies leading to insufficient investment in the period since Ukraine's independence.

II. Outlook on future agricultural markets and the positioning of Ukrainian agricultural products

Recent and forecast developments on international agricultural markets

12. The overall outlook for agriculture world-wide is bullish. Prices for major agricultural commodities (grains, oilseeds and livestock products) on world markets are strong and increasing in real terms after almost a century of decline.[2] Of course, claims that the long-run decline in agriculture's terms of trade is coming to an end have often turned out to be premature in the past. However, there are indications of a fundamental shift in the constellation of rapid technical change against a background of more sluggish demand that has driven declining agricultural terms of trade for decades. Constraints on global availability of land and water are increasingly binding. Marginal yield returns to conventional plant breeding programs for the major crops are declining, and genetic engineering has not (yet?) produced major yield increases of its own. While these factors reduce the growth of farm commodity supply, rapid income growth especially in South and East Asia – where populations are large and income elasticities of demand especially for livestock products are high – is accelerating growth in demand for livestock products and in derived demand for the grains and oilseeds needed to produce them. Growing demand for biofuels is adding to this fundamental shift, although so far most of this demand hinges on subsidies and tax exemptions for biofuel production and use in the EU and the US.

13. Figure 2 presents data on the development of price indices for cereals, oilseeds and meat since 1980, and Figure 3 shows representative world market prices for wheat, oilseeds and butter since 2002, together with the OECD's forecasts up to 2018. In Figure 2, the strengthening of prices in recent years is clearly visible. The OECD forecasts in Figure 3 suggest that prices are expected to remain strong in the medium term. FAPRI (2006) and other forecasts are generally similar.

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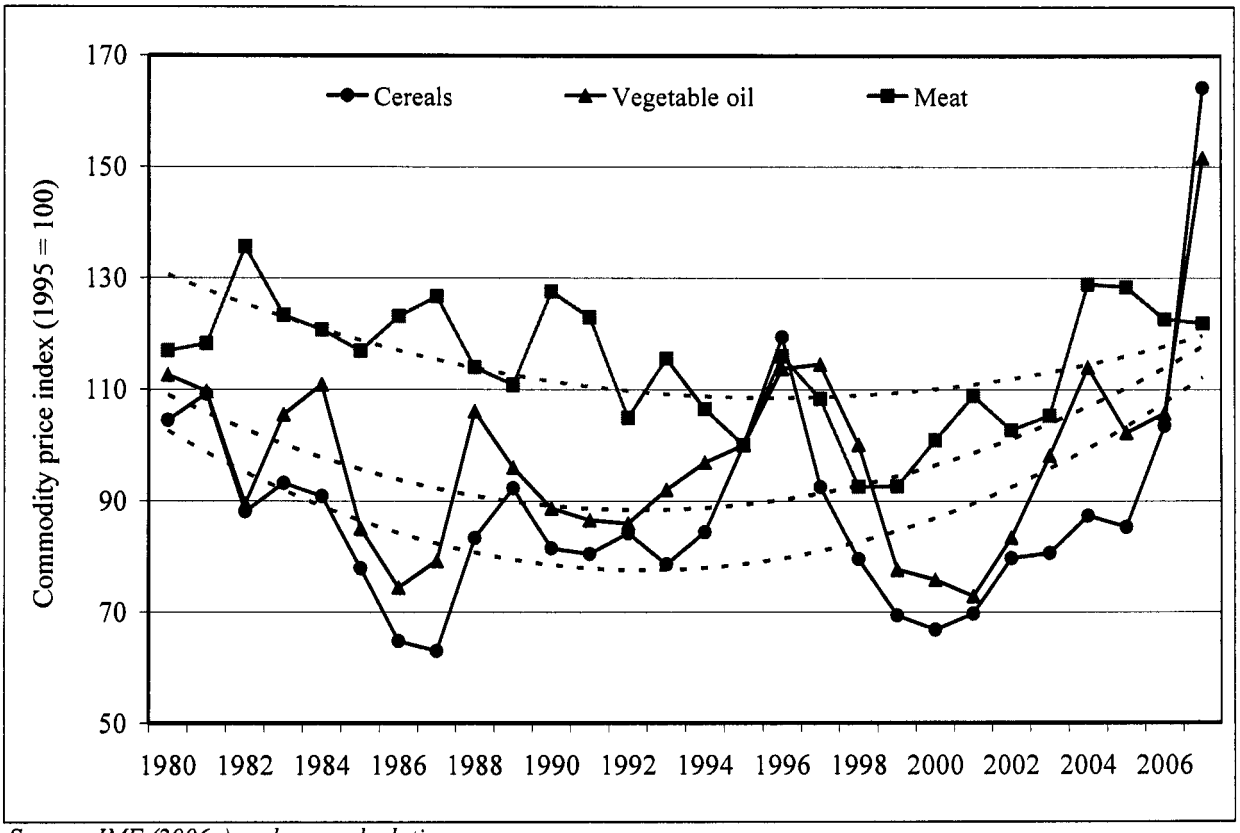
2 At the moment (early 2008), international prices for grains and oilseeds are peaking at levels that are much higher than anything seen in recent history. It is not clear what share of this peak reflects long-run trends, and what share is due to short-run imbalances and speculative forces. Agricultural commodity prices are highly volatile and assembling consistent long run price series is difficult. This complicates attempts to identify and test the statistical significance of long-run trends. For a discussion of the relevant issues see IMF (2006b, Chapter 5).

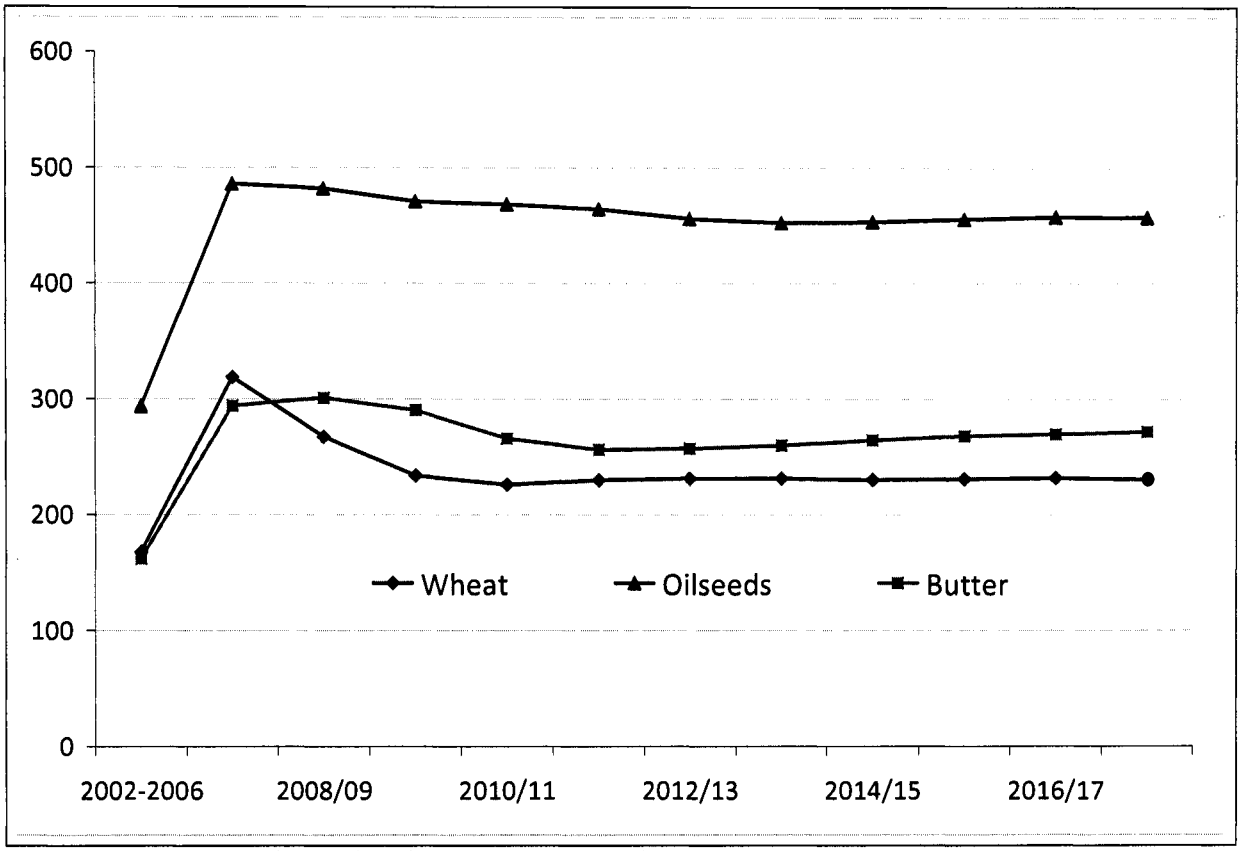
Figure 2: IMF agricultural commodity price indices and corresponding quadratic trends, 1980-2007 (1995 = 100)



Source: IMF (2006a) and own calculations.
Note: Cereals includes wheat, maize, rice and barley. Vegetable oil includes soybean, soybean meal, soybean oil, coconut oil, palm oil, sunflower oil, olive oil, fishmeal and groundnut. Meat includes beef, lamb, pork and poultry. See IMF (2006a) for exact definitions of the component prices and methodology. All linear and quadratic trend terms are significant at the 2% level or better.

14. The prices and price forecasts in Figures 2 and 3 are nominal and largely based on quotations in US Dollars. Hence, how they translate into incentives for producers in Ukraine will depend on the future development of the Hryvnia/US$ exchange rate and inflation in Ukraine. Significant devaluation of the Hryvnia as a result of the financial crisis in 1998/99 corrected severe misalignment (Zorya, 2003) and provided agricultural producers (and other producers of tradable goods and services) in Ukraine with a major boost in competitiveness. Recent years have been characterised by slow real appreciation of the Hryvnia, partially eroding increases in international prices. Future competitiveness will depend on the continuation of stable and sustainable macroeconomic policies and the avoidance of major distortions due to macroeconomic misalignment. Agricultural producers in Ukraine are at an advantage vis-à-vis their competitors in energy-rich Russia and Kazakhstan in that they do not need to fear the effects of possible real exchange rate fluctuations and Dutch Disease phenomena due to energy price volatility.

Figure 3: Past and projected prices for major agricultural commodities (US$/t, 2002-2017/18)



Source: OECD-FAO Agricultural Outlook 2008-2017. Paris/Rome, 2008.

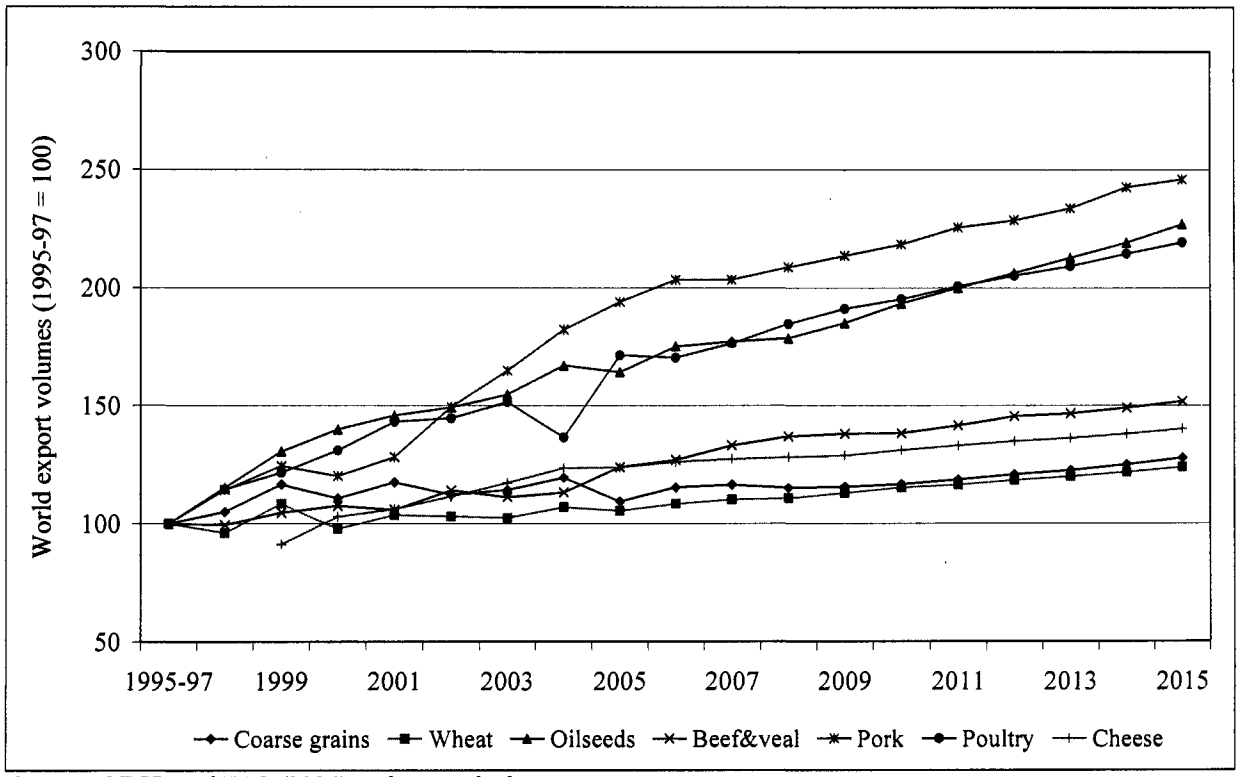
15. Along with prices, the volume of international trade for the major agricultural commodities has also grown in recent years, and is expected to continue to do so in the coming years, as illustrated in Figure 4. Again, OECD and FAO (2006) and FAPRI (2006) paint similar pictures of growing world markets for farm products, with oilseeds, pork and poultry experiencing especially strong growth over the last decade, and expected to continue to do so over the next.

Ukrainian agricultural trade - recent and forecast developments

16. Has Ukraine been able to profit from recent trends on world agricultural markets, and what are the forecasts of its future participation? Turning first to the past, Ukraine's agricultural export performance over the last decade has been mixed. The last decade saw rapid growth in Ukrainian net exports of wheat, barley and maize, and significant contraction in exports of beef, pork and sugar (Appendix 2 Table 4). These trends must be interpreted with caution, however, as they refer to a time span over which Ukraine underwent great economic upheaval, from the depths of the transition crisis in the mid-1990s to first sustained recovery and growth in the first half of the current decade. Some large percentage changes in trade volumes are due to the basis effect of low (actual or recorded) trade in the mid-1990s. Moreover, Ukrainian exports of many products, and especially grain, were highly volatile, with wheat exports for example falling by over 5 million

tons from 1999 to 2000, and over 10 million tons from 2002 to 2003 (Appendix 2 Table 4). Reducing these fluctuations – at least the part that is due to inappropriate agronomic practices and policy-induced volatility – would contribute to Ukraine's international competitiveness by increasing its reliability as a supplier.

Figure 4: World export volumes for major agricultural commodities, 1992-2006 and projections through 2015 (1995-97 = 100)



Source: OECD and FAO (2006) and own calculations.
Note: For definitions of the product aggregates underlying these export volumes, see OECD and FAO (2006). For cheese the base period (= 100) is 1999-2001.

17. Three destinations dominate Ukraine's exports (Appendix 2 Table 5). First, FSU countries, and especially Russia, play a dominant role as destinations for Ukraine's exports of dairy products. That this is a precarious trade structure became apparent in 2006, when Russia banned imports of dairy products from Ukraine for several months. Second and third, the EU and Mediterranean Rim countries of Northern Africa and the Middle East are the main destinations for Ukraine's exports of grains and oilseeds. The fact that Ukraine has succeeded in penetrating the EU market for these products is encouraging, as this market is one of the most demanding in the world as regards quality and safety standards.

18. According to FAPRI (2006) forecasts (Appendix 2 Table 6) Ukraine is not expected to participate fully in the expected expansion of international agricultural trade through 2015. In general, domestic demand for food products is expected to grow relatively quickly with increasing incomes in Ukraine, while forecast growth in domestic supply is comparatively sluggish. Hence, for many agricultural products, Ukraine's export volume is forecast to fall

(Appendix 2 Table 6), and in some cases in which increased export volumes are forecast (e.g. wheat), these increases are less than required to maintain or expand Ukraine's world market share. Only in the cases of sunflower oil and meal, maize, pork, and broilers does Ukraine's world market share increase according to these forecasts. However, for the latter two products this increase actually refers to a reduction in Ukraine's share of world imports. Furthermore, increasing exports of sunflower oil and meal in the past (Appendix 2 Table 5) and future (Appendix 2 Table 6) are a dubious success as they are subsidised by a 17% tax on exports of sunflower seed that ensures domestic crushing mills low-priced raw material at the farmers' expense. Note, however, that these FAPRI forecasts are based ón expectations of continued slow reform and production growth in Ukrainian agriculture.

19. However, there is currently no 'absorption' problem on world agricultural markets. On the contrary, trade has expanded considerably and prices are strong, and no change in these trends is expected in the medium term. Hence, there is significant potential for expansion of Ukrainian agricultural exports if competitiveness constraints are addressed successfully. Of course, forecasts of developments on world agricultural markets are notoriously difficult. Regardless of future developments, Ukraine is not taking full advantage of the window of opportunity offered by current favourable conditions. This – along with the immediate costs it implies – will certainly not make things any easier should world market conditions become less favourable than currently expected.

20. Ukraine's recent WTO accession and the start of negotiations of a free trade agreement with the European Union (EU) offer attractive opportunities but also put additional pressure on Ukraine's agricultural sector to compete in domestic and international markets. On the other hand, the achievement of WTO membership and the start of FTA negotiations with the EU signal a new resolve on the part of policy makers in Ukraine. The resulting international commitments will discipline policy, reduce ad hoc interventions, improve Ukraine's agricultural market access, and expose deficits in agri-food competitiveness, thus heightening demand for policy reform and investment.

Positioning Ukrainian agricultural products

21. The focus above has been on markets for bulk agricultural commodities such as grains and oilseeds. However, as per-capita incomes and urbanization increase in key import markets, dietary changes will follow, leading to increased demand for livestock and processed food products. Will Ukraine satisfy this demand or will it remain primarily a supplier of bulk raw materials that are processed elsewhere? Clearly, the more value that is added in Ukraine, the more growth and employment the country will realise. However, as a product's degree of processing increases, so does the need for exporters to fulfill **food safety requirements and quality expectations** in target markets. This is an area in which agro-climatic advantages do not play a dominant role: establishing and maintaining efficient systems to foster and certify food safety and quality is a question of institutions that no amount of fertile soil or sunshine can replace.

22. As will be discussed below in Section IV under 'factors constraining agricultural competitiveness', Ukraine faces significant challenges in the area of food safety. To the extent that there are economies of scale in the production of safe, high quality agri-food products, the agricultural structure that Ukraine has inherited from Soviet times is advantageous. This structure is characterised by a relatively small number of large farms capable of cultivating large, uniform plots, presenting a relatively limited number of control points, and providing attractive partners

for vertically integrated food chains. Hence, investments in food safety and quality systems can be expected to generate high returns.

23. The analysis below will demonstrate, however, that Ukraine's primary agricultural competitive advantage in the short run lies in its potential as a low cost supplier of raw and lightly processed agricultural commodities – especially grains, oilseeds and vegetable oils and meals. While the safety and quality demands of the international grain and oilseed trade are certainly far from trivial (and growing increasingly complex due to the need to accommodate genetically modified crops), the hurdles here are lower than in the case of most animal and processed food products. As the trade data presented above (Appendix 2 Table 5) illustrates, Ukraine has succeeded in penetrating the demanding EU market for grains and oilseed products in the past. Ukraine is not a net exporter of livestock products; the only exception is dairy products which are mainly destined for FSU countries where standards and certification systems, for historical reasons, resemble those in Ukraine. Tapping Ukraine's potential in the area of grains and oilseeds is a precondition for the competitive production of exportable surpluses of livestock products. Further development of reliable and efficient monitoring and testing systems for Ukraine's grain and oilseed exports is a logical first step that can provide experience and a basis for the development of more complex systems for other export products.

24. A related food quality issue concerns high-end, high-value added **products of designated origin**, products such as "Parma ham" and "Roquefort cheese". Collectivisation and the radical restructuring of agriculture and food processing in Ukraine in the first half of the last century destroyed many artisanal traditions that are the basis for such products, and decades of isolation mean that awareness of remaining Ukrainian specialties in foreign markets is low.[3] With the exception of a few niche products, therefore, exports of such specialties cannot be expected to make a major contribution to the future development of Ukrainian agriculture.

III. The current status of Ukrainian agricultural competitiveness

Indicators of agricultural competitiveness

25. Numerous indicators of competitiveness have been developed and applied by economists. One approach, going back to seminar work by Liesner (1958) and Balassa (1965) is based on the idea that competitiveness will be 'revealed' by a country's actual trade performance compared with other countries, regions or the world. A variety of 'Revealed Comparative Advantage' (RCA) indices have been developed based on this idea. RCA indices are usually justified on the grounds that most policy-induced distortions are on the import side, and that export performance will therefore provide a genuine reflection of competitiveness. However, as is demonstrated below, this is not the case in Ukraine, where there are significant distortions on the export side as well. Furthermore, Banance et. al. (1987) demonstrate that there is a high degree of inconsistency among alternative RCA indices, and that inferences are correspondingly sensitive to the particular index chosen. These concerns, coupled with the facts that Ukrainian trade statistics are often of dubious quality and that trade has been very volatile for many key agricultural products, make us wary of the RCA method in the context of Ukrainian agriculture.

[3] Vodka and Crimean ,champagne' wines are exceptions.

26. A second approach to measuring competitiveness is causal and attempts to measure factors that influence competitiveness, such as the institutional environment, infrastructure, macroeconomic stability and cost structures. At an aggregated level, this has led to indices such as the 'Growth Competitiveness Indicator' (GCI) developed by Sachs and McArthur, and the 'Business Competitiveness Indicator' (BCI) developed by Porter, both of which can be found in the World Economic Forum's Global Competitiveness Report (e.g. WEF, 2006). These 'broad brush' measures are certainly interesting, but our focus here is on individual agricultural products.

27. For these reasons, we employ Domestic Resource Cost (DRC) analysis to cast light on the competitiveness of Ukrainian agriculture. The DRC is one of many indicators that can be calculated using the Policy Analysis Matrix (PAM) framework developed by Monke and Pearson (1989). The PAM is a product of two accounting identities, one defining profitability as the difference between revenues and costs, and the other measuring the effects of divergences (distorting policies and market failures) as the difference between observed private values and social values that would prevail if the divergences were removed. The structure of the PAM is presented in Table 2, and detailed definitions of the terms in it as well as information on the calculation of the DRCs presented below are provided in Appendix 1.

28. The DRC method compares the cost of domestic resources measured at social prices (in the numerator) to value added measured at social prices (in the denominator), calculated as the ratio of G to $(E\text{-}F)$ in Table 2. The use of social prices throughout ensures that the DRC measures whether employing scarce domestic inputs in the production of a good i generates a positive return for the country as a whole. $0<DRC<1$ indicates comparative advantage: the social cost of domestic resources used is smaller than the corresponding social gain (value added). The opposite is true for the $DRC>1$. If the DRC is smaller than 0, then the denominator $(E\text{-}F)$ must be negative, in which case revenue does not even suffice to cover tradable input costs, let alone domestic inputs. In this case, production of the good in question is clearly not competitive.

29. A weakness of the DRC method as it is usually applied is that it is based on average or 'typical' data for a sector or industry. The conclusions that can be drawn on the basis of average or typical indicators become progressively weaker as the heterogeneity of the underlying population grows. Evidence from numerous studies that apply empirical efficiency analysis techniques (data envelopment analysis – DEA; stochastic frontier analysis – SFA) to farm level data in Ukraine and other FSU countries points to a very significant heterogeneity, with many farms operating at a great distance from the frontier defined by the best-practice farms.[4] For example, the results of Lissitsa and Odening's (2005) DEA analysis indicate that the distribution of efficiency among large farms in Ukraine in 1999 was bimodal, with one peak in the 30-40% efficiency range, a mean efficiency of 46%, and a second, smaller peak of "star performers" operating at 90-100% efficiency relative to the best practice frontier. Comparing these 1999 results with results from earlier years, the authors also find that the efficiency distribution has grown more heterogeneous over time, and that the most (in)efficient farms have tended to remain most (in)efficient. This evidence corroborates the observations of farm management specialists who have practical experience with conditions in Ukrainian farming (e.g. Lischka, 2005).

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[4] See, for example, Galushko et al. (2004), Kurkalova and Jensen (2002) and Lissitsa and Odening (2005).

Table 2: The Policy Analysis Matrix (PAM)

	Revenue	Costs		Profits
		Tradable inputs	Domestic factors	
Accounting in Private (Financial) Prices	$A = P_i^P$	$B = \sum_{j=1}^{k} a_{ij} P_j^p$	$C = \sum_{j=k+1}^{n} a_{ij} V_j^p$	$D = A - B - C$
Accounting in Social (Economic) Prices	$E = P_i^s$	$F = \sum_{j=1}^{k} a_{ij} P_j^s$	$G = \sum_{j=k+1}^{n} a_{ij} V_j^s$	$H = E - F - G$
Effects of Policy and Market Failures	$I = A - E$	$J = B - F$	$K = C - G$	$L = D - H = = I - J - K$

Source: Monke and Pearson (1989).

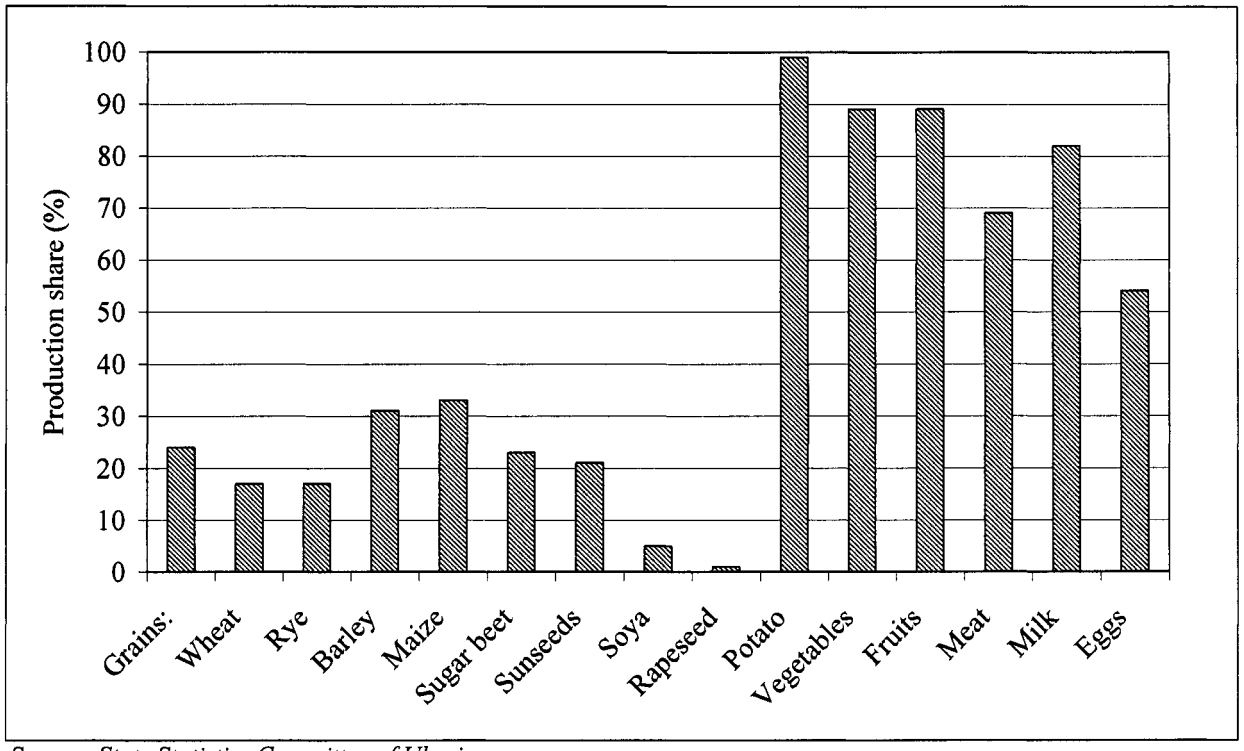
30. For this reason, and as outlined in Appendix 1, farm-level data are used to calculate DRC distributions for major crop and livestock products in Ukraine.[5] This procedure makes it possible to determine for each product what proportions of the farms in Ukraine are characterised by DRCs less than 0, DRCs between 0 and 1, and DRCs greater than 1, and what proportions of Ukraine's total production of these products occurs on the farms in each category. The calculation of DRC distributions is a purely descriptive technique, but its use here is motivated by the hypothesis that Ukraine has the potential to be internationally competitive in most important temperate crop and livestock products if barriers to competitiveness are removed so that many more farms are able to operate at the levels of efficiency that currently only the very best attain.

31. The data employed are Ukraine-wide farm-level accounting data from 2004 and 2005 provided by the State Statistics Committee of Ukraine. In Ukraine, all corporate farms are required to file standardised reports on their input use, production and sales each year. This is in contrast to most OECD countries, for example, where much more detailed data are collected from representative samples of farms. Data quality is an important issue in analyses of this nature. Farm managers may distort their reports if they believe that this might influence their tax burdens or eligibility for subsidies. There is no information available on such distortions in the data employed here. But clearly Ukraine would be well-advised to implement a modern collection system for farm accountancy data such as that employed in the EU, for example. This would provide policy makers with more detailed, accurate and timely data. Some conditions have changed in Ukrainian agriculture since 2005, but most of the factors that affect competitiveness have not. Hence, the main results presented below, and their interpretation, remain valid. Clearly, the competitiveness of grains and oilseeds production will have benefited from higher world market prices in recent months, although this effect has been mitigated by export restrictions that depress domestic prices for these products. Data for 2006 only recently became available, and ongoing work is studying changes in competitiveness at the farm level using spatial panel econometric techniques.

[5] A separate Policy Note on *The Competitiveness of Bio-Energy in Ukraine* is currently being prepared (an advanced draft is available as of July 2008). That Note illustrates in detail competitiveness aspects along the value chain from agricultural raw products to the biofuel end-products.

32. A limitation of the DRC analysis employed here is that it is based exclusively on the large corporate farms in Ukraine, and does not consider the individual farms (household plots or peasant farms). This is not an important omission for the major cereals and oilseeds, which are primarily produced on large corporate farms (Figure 5). However, household plots are responsible for a much larger share of the potato, fruit, vegetable and livestock production in Ukraine. Unfortunately, detailed data on methods and costs of production for household plots is not available. This may not be such a handicap for competitiveness analysis, however, as it is arguably the large corporate farms that will determine the international competitiveness of Ukrainian agriculture, while the household plots, which market only one-fifth of their output (Lerman et al., 2006) remain largely subsistence-oriented.[6]

Figure 5: The share of households in total production of agricultural products, 2004 (%)



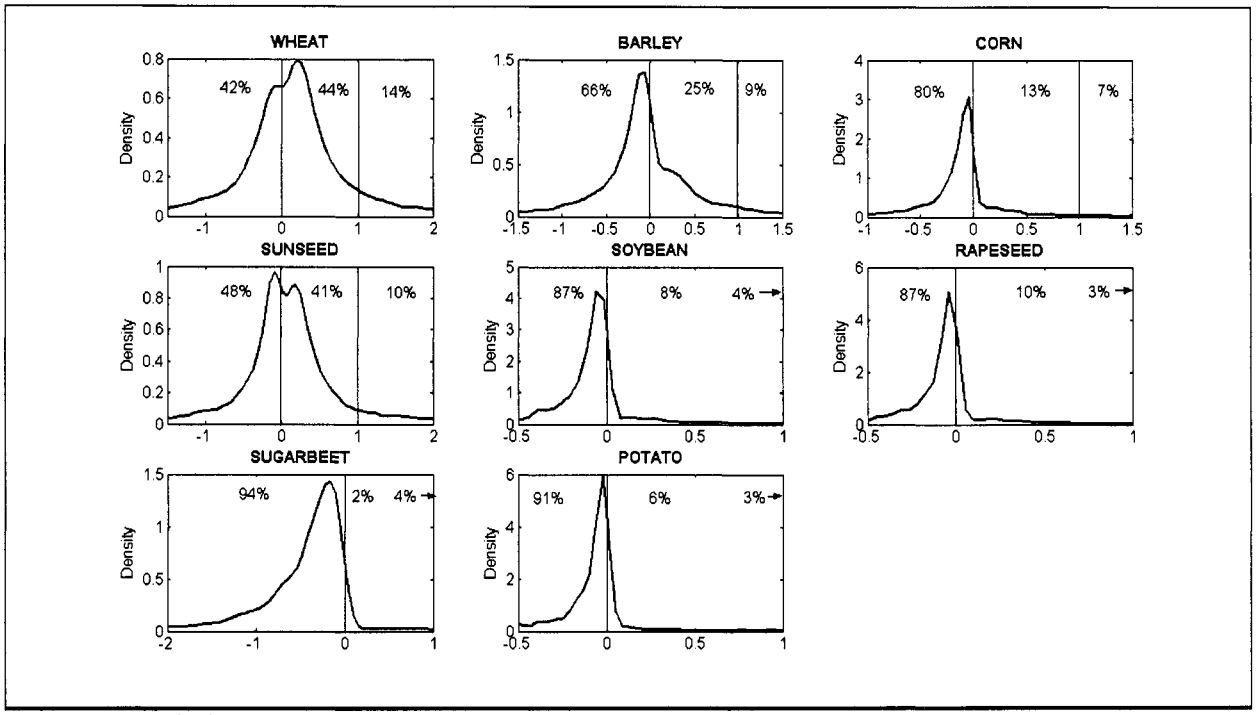
Source: State Statistics Committee of Ukraine.

The current status of Ukrainian agricultural competitiveness

33. Results of the DRC analysis for major crop products in 2005 and 2004 are presented in Figures 6 and 7, and key results are summarised in Table 3. Results for 2005 and 2004 are qualitatively similar, and the following discussion focuses on 2005. The distributions reveal that for wheat (44%), sunseed (41%) and barley (25%), relatively large proportions of the farms in Ukraine produce competitively. For maize (13%), rapeseed (10%), soybean (8%) and potato

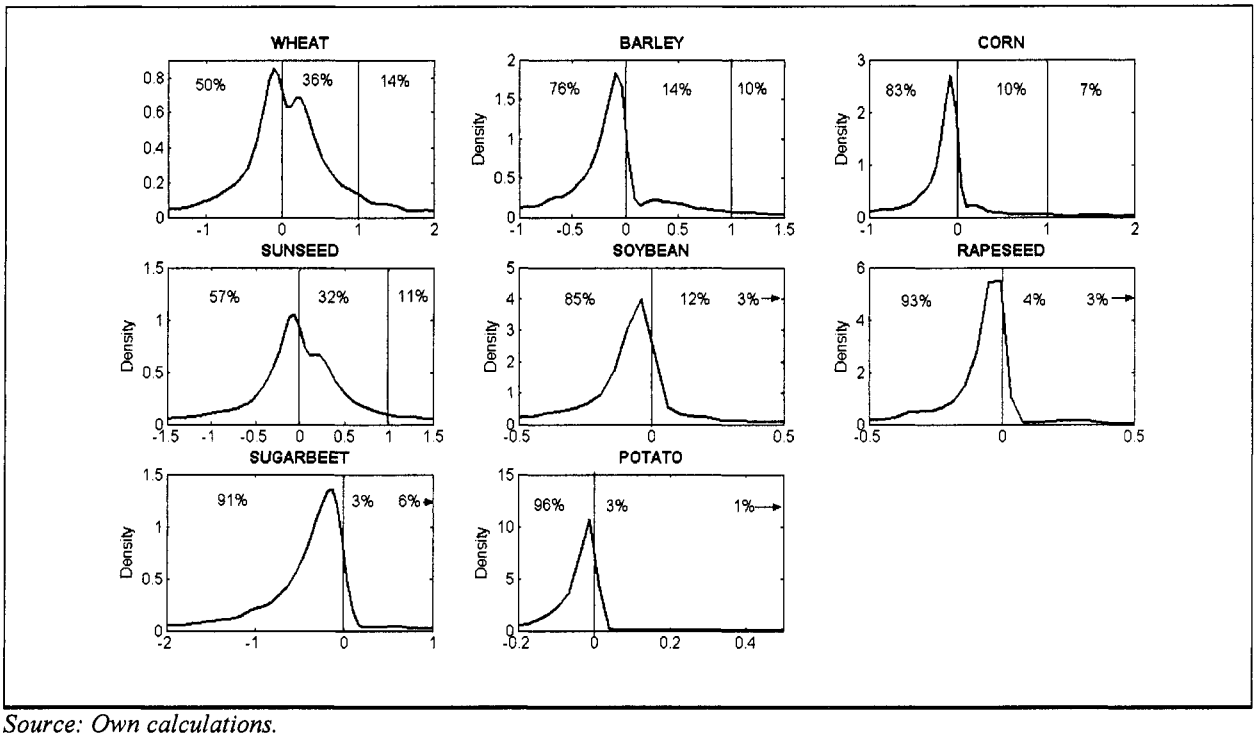
[6] This is not so say that household plots and peasant farms have no role to play in the future of Ukrainian agriculture; some will certainly take advantage of niches and the flexibility that goes along with being small to develop into successful enterprises.

Figure 6: Domestic resource cost distributions for major crop products in Ukraine, 2005



Source: Own calculations.

Figure 7: Domestic resource cost distributions for major crop products in Ukraine, 2004



Source: Own calculations.

(6%), the corresponding proportions are smaller. For all of these products, the competitive farms account for a disproportionately large share of the total production by corporate farms in Ukraine. This effect is especially extreme in the case of potato production. However, since corporate farms account for less than 5% of all potato production in Ukraine (Figure 5), this result – which suggests that a small number of large farms are heavily concentrated in potato production, perhaps for seed and special processing uses – is not representative.

Table 3: Summary of DRC results for major crop products

	2004			2005		
	DRC<0	0<DRC<1	DRC>1	DRC<0	0<DRC<1	DRC>1
Wheat						
Weighted average DRC	-1.10	0.37	2.65	-1.11	0.35	2.95
Share of the group in total production volume	34.7%	49.1%	16.2%	30.6%	55.8%	13.5%
Share of the group in total number of farms	50%	36%	14%	42%	44%	14%
Barley						
Weighted average DRC	-0.91	0.46	2.87	-0.82	0.37	2.73
Share of the group in total production volume	67.2%	20.5%	12.3%	55.8%	34.0%	10.2%
Share of the group in total number of farms	76%	14%	10%	66%	25%	9%
Corn						
Weighted average DRC	-1.18	0.28	5.38	-0.68	0.28	4.36
Share of the group in total production volume	60.1%	27.2%	12.8%	49.4%	34.9%	15.7%
Share of the group in total number of farms	83%	10%	7%	80%	13%	7%
Sunseed						
Weighted average DRC	-1.04	0.33	2.77	-0.91	0.30	2.49
Share of the group in total production volume	34.8%	53.0%	12.2%	32.0%	58.9%	9.1%
Share of the group in total number of farms	57%	32%	11%	48%	41%	10%
Soybean						
Weighted average DRC	-0.57	0.32	3.45	-0.48	0.37	2.96
Share of the group in total production volume	51.3%	45.4%	3.2%	64.2%	27.9%	7.9%
Share of the group in total number of farms	85%	12%	3%	87%	8%	4%
Rapeseed						
Weighted average DRC	-0.57	0.42	3.19	-0.32	0.27	1.91
Share of the group in total production volume	76.8%	15.9%	7.4%	65.8%	28.7%	5.5%
Share of the group in total number of farms	93%	4%	3%	87%	10%	3%
Sugarbeet						
Weighted average DRC	-1.11	0.53	3.41	-0.74	0.52	2.77
Share of the group in total production volume	78.4%	11.6%	10.1%	86.7%	5.9%	7.4%
Share of the group in total number of farms	91%	3%	6%	94%	2%	4%
Potato						
Weighted average DRC	-0.40	0.34	2.52	-1.35	0.26	2.10
Share of the group in total production volume	69.5%	23.2%	7.2%	37.5%	51.0%	11.5%
Share of the group in total number of farms	96%	3%	1%	91%	6%	3%

Source: Own calculations.

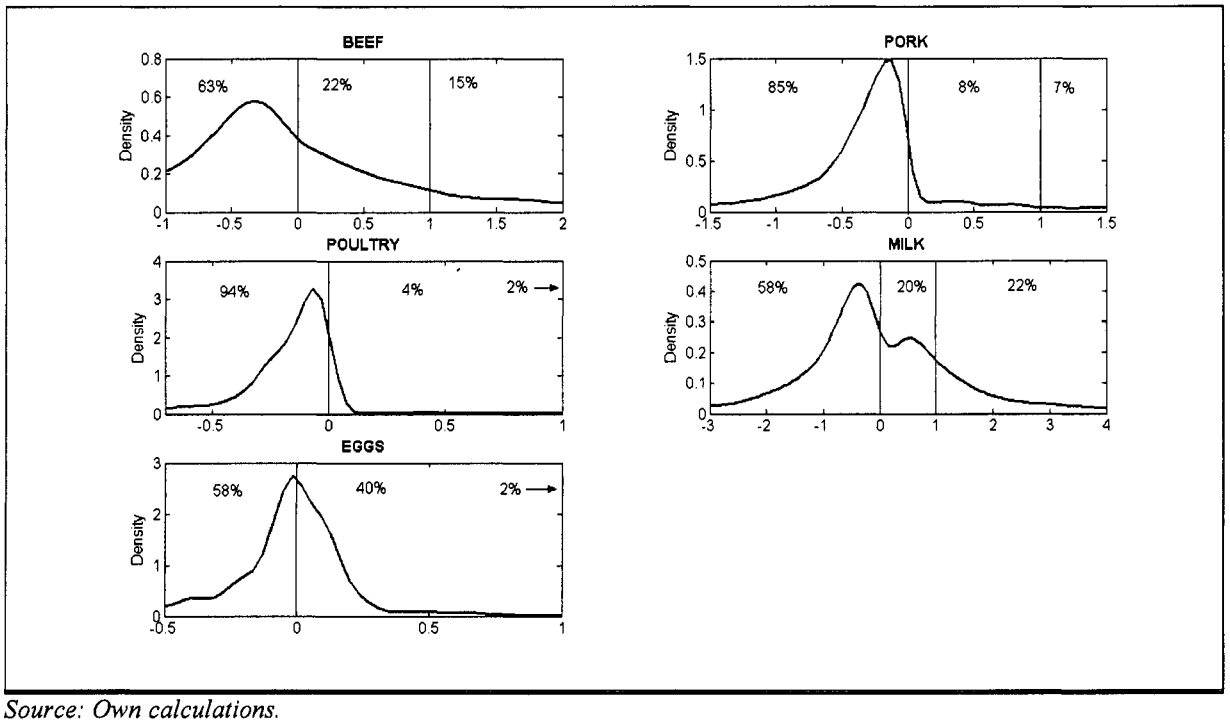
34. Before proceeding with the discussion of these results, we briefly note the contrast between the distributions presented here and average DRCs that would result from the use of aggregated data. For wheat in 2005, for example, it can be shown that the average ton of wheat was produced at a DRC of 1.37. This result, taken at face value, would suggest that there are problems with the

competitiveness of wheat production in Ukraine, obscuring the fact that 44% of all wheat producing farms, and 56% of all the wheat produced in the country, are competitive. This highlights the main advantage of the disaggregated DRC distribution analysis presented here.

35. For sugarbeet, only 2% of the farms in Ukraine are competitive, and these account for only 6% of all sugarbeet production. This confirms the results of earlier analyses (e.g. Strubenhoff and Nivyevskiy, 2006; von Cramon-Taubadel, 1999) that demonstrate that sugarbeet production is only competitive under very limited circumstances in Ukraine.

36. DRCs for major livestock products in 2004 and 2005 are presented in Figures 8 and 9 and Table 4. Across the range of livestock products, the shares of competitive farms are similar to the shares for crop products. 40% of the farms that produce eggs have DRCs between 0 and 1; corresponding shares for beef, milk, pork and poultry are 22, 20, 8 and 4%. These competitive farms again account for a disproportionately large share of the production of these products (eggs 93%; milk 49%; pork 35% and poultry 21%). The only exception is milk, where the 22% of the farms that are competitive account for only 16% of the production by corporate farms in Ukraine. This might be evidence that among the corporate farms that produce milk in Ukraine, those that are relatively small tend to be more competitive than many larger ones.

Figure 8: Domestic resource cost (DRC) distributions for major livestock products in Ukraine, 2005

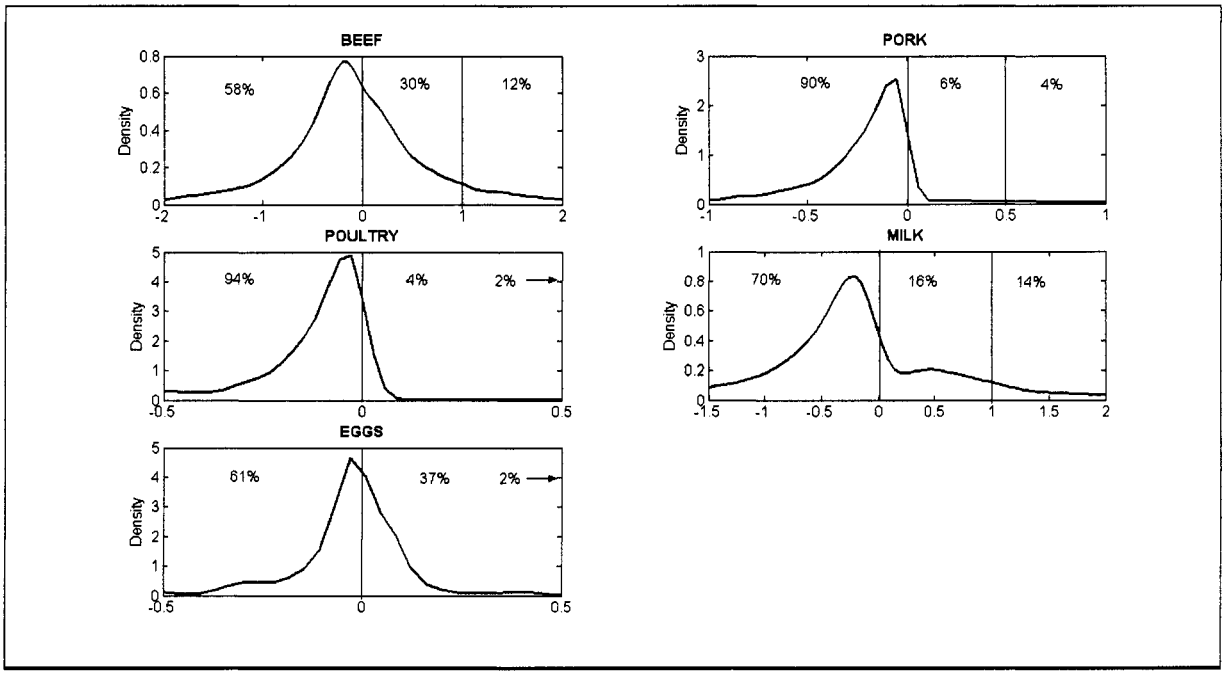


Source: Own calculations.

37. In 2004 and 2005, and for all crops and livestock products except wheat in 2005, the modal DRC is less than 0. This indicates that for a large group of farms revenue does not even suffice to cover the costs of tradable inputs, let alone domestic inputs. These farms are subtracting and not adding social value by producing the products in question. Even if the resulting products are

being exported, Ukraine is on balance losing foreign exchange in the process. More detailed analysis – for example using information on the location of individual farms in the dataset, their degrees of specialisation, factor intensities, locations etc. – is required to determine what factors influence whether a farm is competitive.[7] The available evidence suggests, however, that efficient and inefficient farms often exist side-by-side even in the most agriculturally favoured regions of Ukraine. It is a well-known phenomenon in agriculture that unprofitable farms can continue to operate, at least for a while. Especially older owner-operators who see few alternatives outside farming will implicitly accept a low effective compensation for their labour and management inputs or a below-market rate of return on the capital tied up in own equity (buildings and land); the farm's capital stock will be allowed to run down (negative net investment); in extreme cases, plots of land may be sold to provide periodic liquidity injections. There are limits to this under market conditions, however, especially for larger corporate farms that depend on loans and must pay hired labour. In the case of the Ukraine, the fact that large numbers especially of value subtracting corporate farms continue to operate suggests that both positive incentives and market disciplines are needed to ensure that less efficient farms either improve or exit, freeing up resources for more efficient use by others.

Figure 9: Domestic resource cost (DRC) distributions for major livestock products in Ukraine, 2004



Source: Own calculations.

[7] Nivyevskiy and von Cramon-Taubadel (2008) analyze factors that affect the competitiveness and efficiency of milk producing farms in Ukraine using spatial econometric techniques. The results indicated that spillovers between neighboring farms take place, and that proximity to milk processing plants that have invested has a positive impact on competitiveness.

Table 4: Summary of DRC results for major livestock products

	2004			2005		
	DRC<0	0<DRC<1	DRC>1	DRC<0	0<DRC<1	DRC>1
Beef						
Weighted average DRC	-0.92	0.42	2.71	-1.27	0.51	2.94
Share of the group in total production volume	55.1%	30.4%	14.5%	67.2%	15.8%	17.0%
Share of the group in total number of farms	58%	30%	12%	63%	22%	15%
Pork						
Weighted average DRC	-0.70	0.27	2.26	-0.58	0.34	2.16
Share of the group in total production volume	67.5%	21.2%	11.4%	58.8%	34.7%	6.5%
Share of the group in total number of farms	90%	6%	4%	85%	8%	7%
Poultry						
Weighted average DRC	-0.34	0.58	1.94	-0.18	0.46	1.62
Share of the group in total production volume	80.9%	18.8%	0.2%	69.9%	21.0%	9.1%
Share of the group in total number of farms	94%	4%	2%	94%	4%	2%
Milk						
Weighted average DRC	-1.24	0.46	2.48	-1.70	0.49	2.49
Share of the group in total production volume	42.4%	42.0%	15.6%	28.3%	49.1%	22.6%
Share of the group in total number of farms	70%	16%	14%	58%	20%	22%
Eggs						
Weighted average DRC	-0.44	0.07	2.66	-1.79	0.11	1.26
Share of the group in total production volume	3.1%	96.4%	0.5%	6.6%	93.3%	0.2%
Share of the group in total number of farms	61%	37%	2%	58%	40%	2%

Source: Own calculations.

38. The empirical analysis presented here demonstrates that many Ukrainian farms are able to produce wheat, sunflower seed, barley, eggs, beef and milk competitively. The same is true for maize, rapeseed, soybeans, and pork, but for smaller proportions of the producing farms. For all products, the majority of the farms in Ukraine are currently not able to produce sufficient surplus to cover the costs of domestic and tradable inputs. In many cases, the value of production does not even suffice to cover the cost of tradable inputs, indicating that production is subtracting, and not adding value. Overall, the findings here correspond well with Lischka's (2004, p. 110) estimate that roughly one-half of the farms in Ukraine are "... severely threatened ... [e]nterprises of highly questionable viability".

39. The fact that many farms are able to produce competitively bodes well for Ukraine's international competitiveness in major temperate agricultural products and processed foods. Realizing Ukraine's competitive potential (in other words, shifting the distributions presented here) is a matter of (i) increasing the efficiency of production so that the great majority of farms in Ukraine can produce as efficiently tomorrow as the best farms do today, and (ii) developing marketing and processing systems so that Ukraine's ability to produce competitive raw products on the farm is translated into competitiveness on world markets and for high-value added agri-food products.

40. The following chapters IV and V present factors constraining agricultural competitiveness and measures to increase it. The coverage of the sectoral issues and potential remedies presented in these chapters is broader than what the DRC-based analysis of sectoral competitiveness (chapters I – III) alone can support. By drawing on evidence from other recent analyses (von Cramon-Taubadel and Raiser, 2006; von Cramon-Taubadel et al., 2007; World Bank and OECD, 2004; World Bank, 2008b; Zorya, 2006), however, the DRC analysis is integrated into the broader picture of overall sector development.

IV. Factors constraining agricultural competitiveness in Ukraine

41. The factors constraining agricultural competitiveness in Ukraine can be classified in many different ways. Factors overlap and can amplify one another, and factors that are of primary importance for one product or process may be irrelevant for others. The following list begins with general factors and proceeds to more specific ones. A unifying theme throughout is that all the factors discussed below are man-made; they can be changed if they are understood and confronted with sufficient political will. Agricultural competitiveness in Ukraine is mainly constrained by the often glaring **inefficiency of state support systems** at three fundamental levels. The first of these is the macroeconomic level. ***Macroeconomic instability*** throughout the 1990s, beginning with hyperinflation in 1992-1994 and culminating in the financial crisis of 1998/99, severely handicapped Ukrainian agriculture (Zorya, 2003). In the mid- to late 1990s, the *de facto* adoption of a nominal Hryvnia/US$ exchange rate anchor coupled with continued double-digit rates of inflation lead to significant overvaluation of the real exchange rate. This taxed sectors such as agriculture that produce tradable goods. The financial crisis in 1998/99 'corrected' this overvaluation and increased the competitiveness of agriculture. Since then, agriculture in Ukraine has not suffered from similarly blatant macroeconomic imbalances. Nevertheless, a number of measures have had important influences on the development of agriculture. These include:

42. *Taxation.* Frequent *ad hoc* changes to the taxation system and especially the question of VAT refunds on exports have plagued agriculture. Until today, the government failed to implement the expected VAT reform in the agriculture sector in 2008. In general, exporters who face the prospect of an uncertain or unlikely VAT refund respond by adding corresponding risk premia to the margins that they deduct from border prices to determine the prices that they can afford to pay at the farm gate. In the final analysis, therefore, failure to refund export VAT has the same impact as a tax on agricultural exports, lowering the farm gate price and masking some of the competitiveness identified in Section III above.

43. *Regulation.* In the World Bank's *Doing Business* project[8], Ukraine in 2008 ranked 139 out of 178 countries worldwide in the "ease of doing business" overall index which measures the extent to which a country's regulatory environment is conducive to the operation of business. In line with this ranking IER (2006a) provided information on Ukraine's exceedingly complex and costly import regulations for important agricultural inputs such as farm machinery and agro-chemical products, and the amount of discretion that customs authorities wield in implementing these regulations. The regulatory environment in Ukraine increases the costs of doing business and forces economic activity into the 'shadows'. It slows the rate of technology transfer into Ukraine and fosters corruption.

44. At a second level, Ukraine lacks a consistent ***strategy for fostering rural development and combating rural poverty***. There are indications that economic growth since 2000 has reduced the incidence of absolute rural poverty in Ukraine.[9] Nonetheless, disparities between regions have been maintained, disparities within the income distribution have increased, and local pockets of

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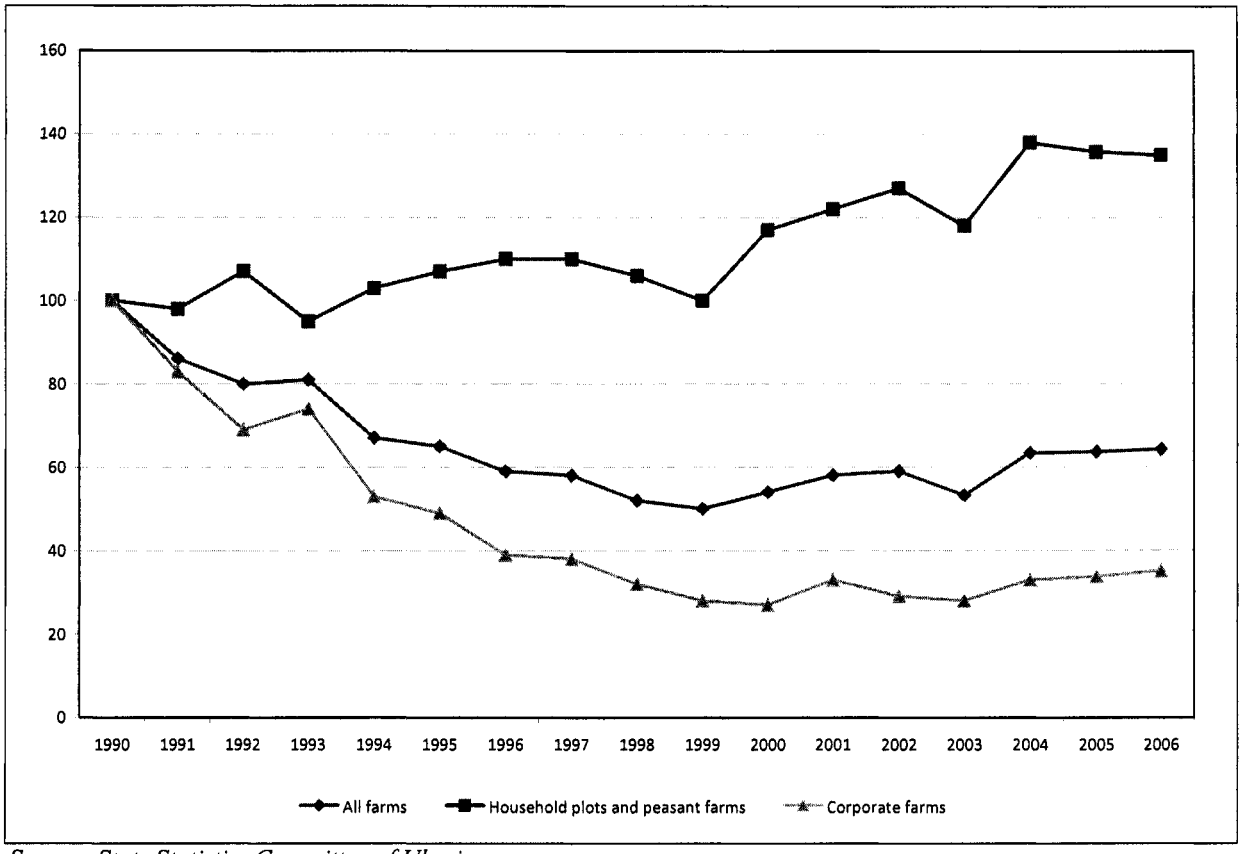
[8] http://www.doingbusiness.org/

[9] Measured against an absolute poverty line, the rate of poverty in Ukraine was 29.5% in 1995 (World Bank, 1996). It increased to 32% in 2001, then fell to 14% in 2004 and 8% in 2005 (World Bank, 2007b). The poverty rate in rural areas is above the national average but has also fallen, from 25.1% in 2003 to 11.3% in 2005 (World Bank, 2007b).

poverty remain. Large parts of the rural population produce for subsistence on their household plots, participating little or not at all in the cash economy. While the household plots represent a valuable social buffer in the transition process, and the success of the household plots in increasing production of livestock and fruit and vegetable products since the onset of transition (see Figures 5 and 10) is rightly acknowledged, the household plots also pose future challenges. Most individual household plots and peasant farms cannot capture economies of scale in production (see Table 1), and their size and number can make it difficult to capture economies of scale up- and -downstream from agriculture (input supply, assembly of appropriately sized lots for processing, food quality control).

Figure 10: Gross agricultural output in Ukraine by type of farm, 1990-2006 (1990 = 100)



Source: State Statistics Committee of Ukraine.

45. Furthermore, much of the increased volume of production on household plots since the onset of transition (see Figure 10) must be attributed to their relationships with large corporate farms. For the operator of a household plot, the link between effort and reward is obvious; for the (often identical) employee of a corporate farm, this link and the incentives it creates are often comparatively tenuous. The often underemployed members of the corporate farms are given or take inputs such as feed, fertiliser or young livestock (e.g. piglets) for use on their household plots. Corporate farms are often obliged to tolerate this leakage in the interests of 'keeping the peace' in the local community, and because stemming it (e.g. guarding fields and barns, monitoring employees) is costly. Corporate farms also provide services such as ploughing to

household plots. Even where these indirect and direct forms of support are being brought under control (according to Lerman et al. (2006), household plots on average now reimburse 76% of the costs of the support that they receive from corporate farms), farms often remain responsible for providing elements of what is referred to as the 'social sphere', which includes schools and child care services, perhaps maintaining the local fire station and repairing local roads. While responsibility for the social sphere is increasingly being transferred to local authorities, Lerman et al. (2006) report that 27% of the farms surveyed in 2005 had not yet undertaken this transfer.

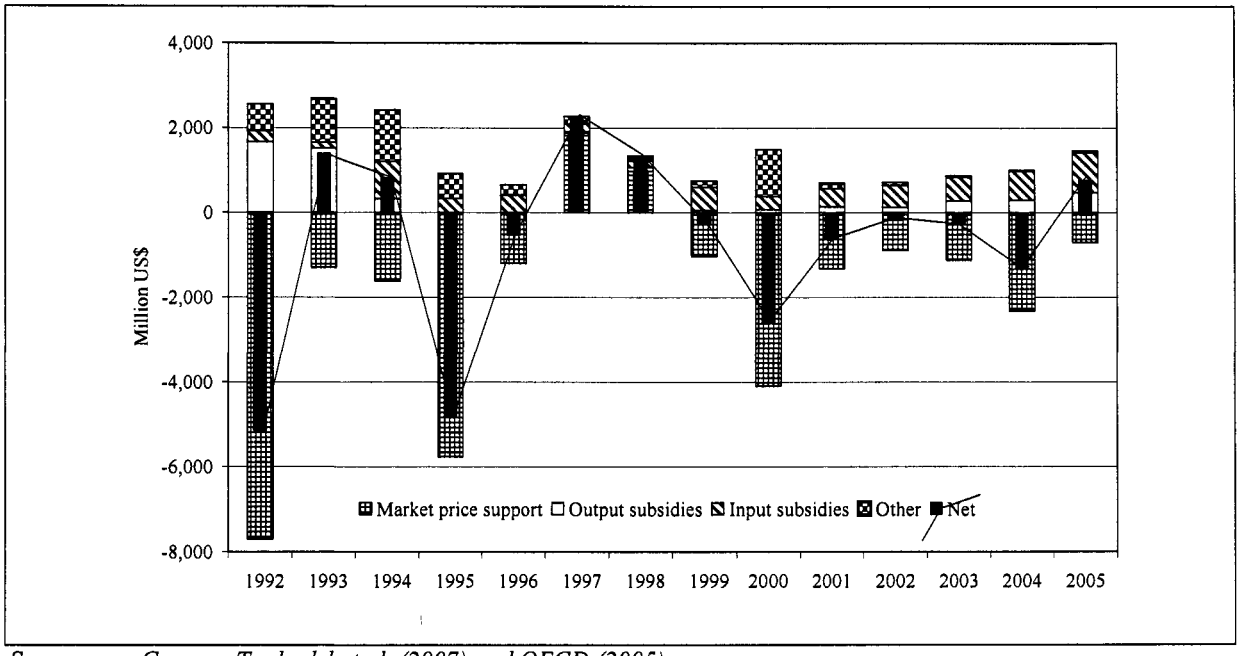
46. In summary, corporate farms are often obliged to assume a variety of important social and infrastructural responsibilities in rural areas, filling a vacuum that is created by a lack of both consistent regional development policy and the fiscal decentralisation needed to permit local authorities to assume these responsibilities. The result is higher production costs and less liquidity for agricultural investments. Perhaps even more damaging is the fact that 'keeping the peace' and managing the social sphere often diverts a great deal of a farm manager's time away from questions of efficient production and marketing.

47. At the third level, Ukraine's ***direct agricultural support policy*** is inefficient and distortive. Appendix 2 Table 7 provides information on fiscal support to agriculture in Ukraine, and Figure 11 presents data on the composition of producer support. As Appendix 2 Table 7 makes clear, the Government of Ukraine has significantly increased the financial support that it provides to agriculture in recent years (Zorya, 2006). In 2006, total fiscal support for agriculture reached 14.4 billion Hryvnia or 2.7% of Ukrainian GDP. This level of support is comparable with that in other middle-income countries (Turkey, Mexico, Brazil, Russia). It represents a significant burden on the Ukrainian economy as a whole, and it allows some of the uncompetitive farms identified in Section III to continue operation.

48. However, Figure 11 (next page) shows that this support has been erratic, fluctuating considerably from year to year in level and composition. In particular the market price component of producer support has been very volatile due to, among other things, exchange rate fluctuations (e.g. strong devaluation in 1997-98), shifts in net trade positions (e.g. net imports of wheat in 2000-01 and 2003-04) and various types of *ad hoc* intervention (e.g. periodic export restrictions).[10] The result has been a destabilisation of agricultural prices in Ukraine that is especially apparent when intra-annual price movements are considered, as is illustrated for the case of wheat in Figure 12. Figure 11 also shows that since 2000 budget expenditure for agriculture has increased but that this increase has been largely negated by negative market price support. This 'stepping on the gas pedal and on the brakes' simultaneously is counter-productive and wastes limited public resources.

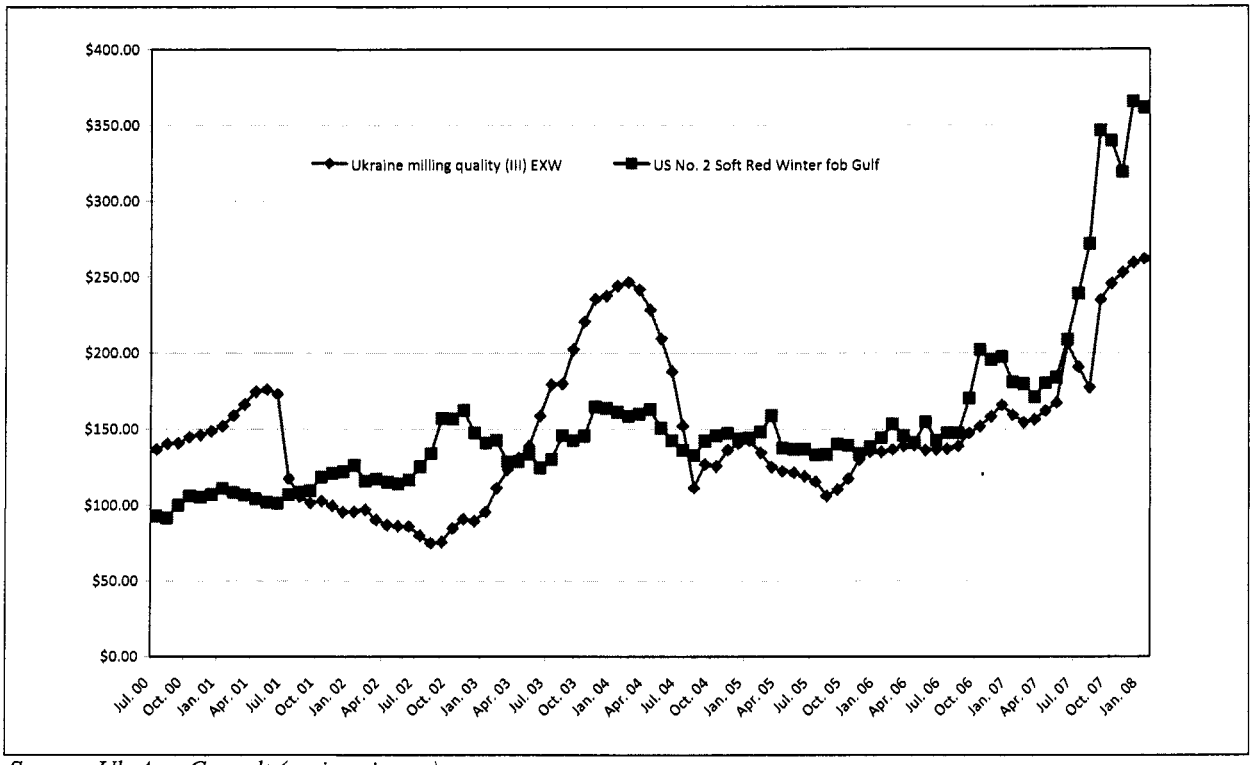
[10] Von Cramon-Taubadel et al. (2007) discusses the evolution of agricultural support policy in Ukraine in detail.

Figure 11: The composition of producer support in Ukrainian agriculture, 1992-2005 (million US dollars)



Source: von Cramon-Taubadel et al. (2007) and OECD (2005).

Figure 12: Milling wheat prices in Ukraine and a comparable world market price for wheat, January 2000 – January 2008 (US$/ton)

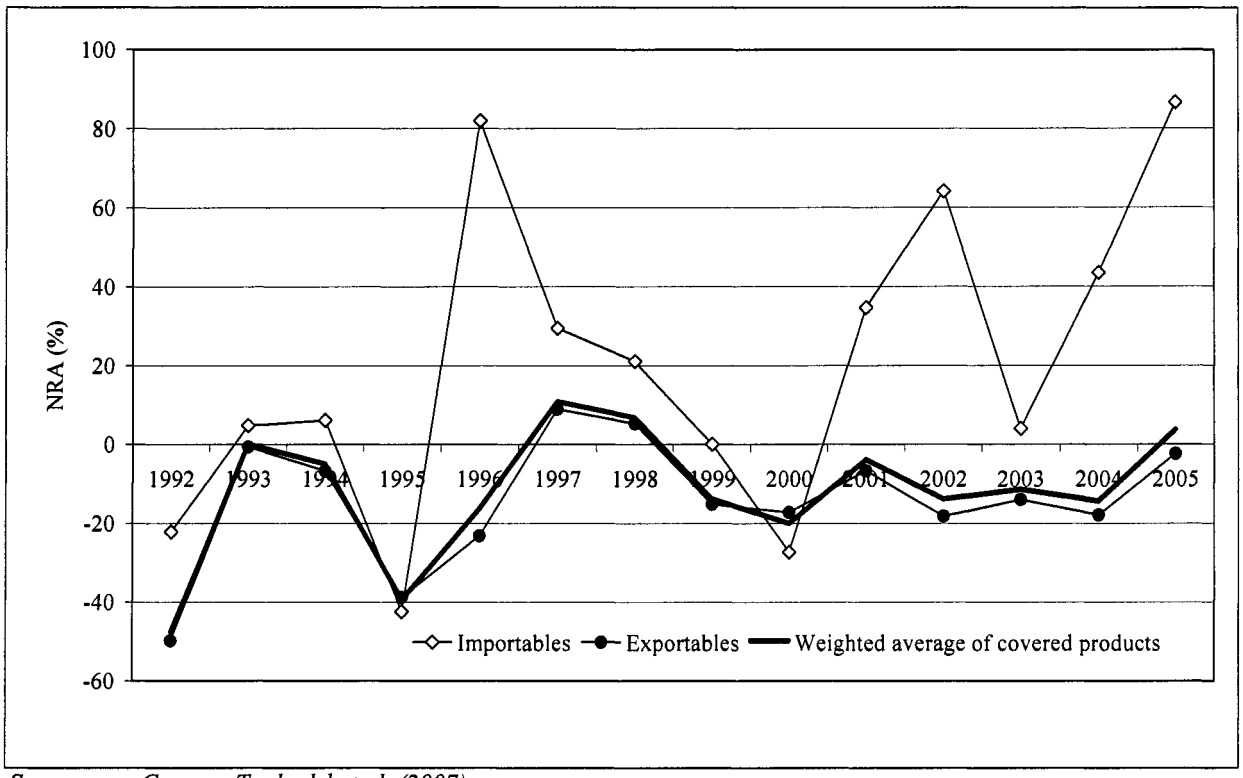


Source: UkrAgroConsult (various issues).

Note: The EXW price is an average price at grain elevators inland in Ukraine; the US price is for an export position free on board at the Gulf of Mexico. A US price that is comparable in levels with the Ukrainian price would be somewhat lower (to account for the cost of moving grain from elevators to an export position). This adjusted US price would be less volatile than that depicted in the figure and therefore even less volatile than the Ukrainian price, unless there is a negative correlation between inland prices and the cost of moving grain to port, which is unlikely.

49. Support is also highly variable across products (Figure 13 and Appendix 2 Table 8). Indeed, it is a striking irony of Ukrainian agricultural policy that it taxes the products that are, according to the DRC analysis above, most competitive (e.g. export products such as oilseeds via the export tax, and grains most recently via export quotas, now abolished) and protects those that are least competitive (e.g. import products such as sugar). To tax exports and protect imports is to follow a common policy recipe for which there are obvious political economic explanations (e.g. Kruger, Valdez and Schiff, 1986). But it is scarcely a recipe for fostering competitiveness. On the contrary, making the production of uncompetitive import products such as sugarbeet artificially profitable draws resources away from other crops where they would add, rather than subtract, social value.

Figure 13: Nominal rates of assistance to agriculture in Ukraine, 1992-2005 (%)



Source: von Cramon-Taubadel et al. (2007).

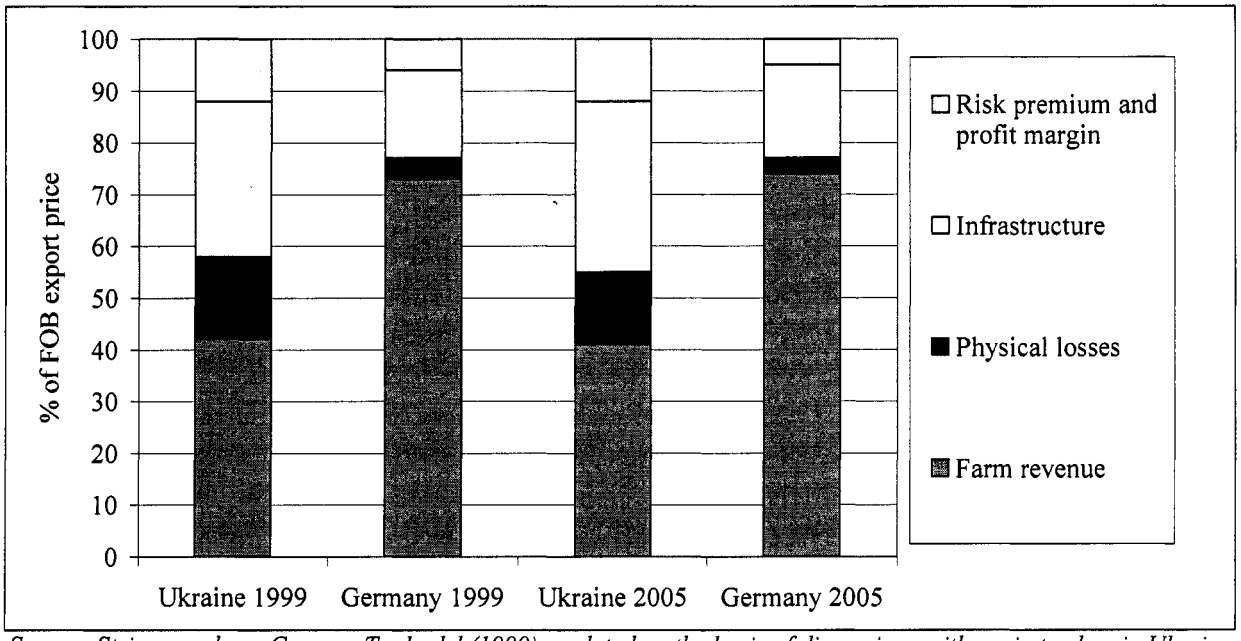
50. Support is also very unevenly distributed across farms. For example, roughly 7% of the subsidised farms received almost 75% of all budget support to livestock producers in 2004 (Borodina, 2006), and 14.7% of the dairy farms in Ukraine, accounting for 56.2% of the country's milk production, received 64.7% of the subsidies provided to milk producers in 2005 (Nivyevskiy and von Cramon-Taubadel, 2007, p. 6). All three dimensions of instability – erratic

over time, variable across products and uneven across farms – are evidence of an unfocused policy that lacks strategic goals.

51. The variability referred to above is what can be observed *ex post*. *Ex ante* this already muddled picture is further complicated by unpredictability. The grain export quota introduced in September 2006 and only recently abolished in May 2008 is a case in point. In the first months of 2006 there was no indication that this measure was being prepared. The justifications provided for it are highly questionable, and the damage it has done to Ukraine's reputation as a reliable supplier of grain and a dependable place to invest in agriculture is immense[11]. In the 2007/08 marketing year alone, the World Bank estimated that the export quota cost wheat and barley producers a total of about US$ 1.9 billion in foregone farm revenues. Lack of transparency and the government's *ad hoc* interference in agricultural markets reduce farm income and increase uncertainty and risk.

52. Policy makers have taken too few steps to improve **inefficient marketing and supply chains**. For example, the information in Figure 14 (compiled from comparison of price quotations at various locations, and discussions with grain traders in Ukraine and Germany) illustrates that Ukrainian farmers get a much lower share of the export value of their wheat than farmers in Germany for example.

Figure 14: Grain marketing costs in Ukraine and Germany, 1999 and 2005



Source: Striewe and von Cramon-Taubadel (1999), updated on the basis of discussions with grain traders in Ukraine and Germany in 2005.

[11] Also see separate Policy Note on "Competitive agriculture or state control: Ukraine's response to the global food crisis", May 2008.

53. Important components of the difference between Ukraine and Germany are physical losses (due to poor harvesting and storage technology on the farm), inefficient and expensive infrastructure between the farm gate and export positions, and inflated margins due in large part to the uncertainties discussed above. Policy has actively contributed to perpetuating all of these problems. By taxing grain and oilseed production, policy has reduced the ability of farms to invest in technology that can increase production and reduce losses. By limiting competition in key areas of transport and marketing infrastructure (for example, the railroad system) and upholding highly inefficient state agents such as *Khlib Ukrainy* (Bread of Ukraine), policy has slowed improvements in marketing infrastructure and reductions in marketing margins. Government intervention on grain markets – export quotas in 2006 being the most recent example – has repeatedly punished grain trading enterprises that have invested in improving marketing systems, especially at major inland elevators and at key Black Sea ports. The result has been significantly less investment than could have been the case, a reduced inflow of the international expertise needed to develop the high-speed, high-turnover logistic systems expected of a major player on world markets, and inflated risk margins as traders are forced to assume that whatever can go wrong probably will.

54. Policy makers often justify their intervention on grain markets by referring to the need to protect consumers from excessive prices and to curb rapacious traders who would otherwise export 'too much', forcing Ukraine to import later in the marketing year. Even if these justifications are taken at face value (and possible rent seeking motives are discounted), the chosen policy response is highly inefficient. Lowering grain prices for all does not target assistance to needy consumers (von Cramon-Taubadel and Raiser, 2006)[12]. Transparency and market information systems that reduce ***information asymmetries*** are a much more effective way to preclude inefficient trade that destabilises domestic markets. If better information about trade flows and stock volumes was available, prices would respond as soon as it became apparent that 'excessive' exports were threatening to put the country into a net import position. As a result, the exports in question would no longer be profitable and markets could not be manipulated in the alleged manner. The appropriate mix of public and private agricultural market information provision varies across products, countries and market structures. On Ukrainian grain markets, however, the problem to date has not been an inappropriate mix of public and private provision but rather the government's withholding of important market information (for example regarding the size of the grain stocks it holds). Uncertainty and information asymmetries put producers at a disadvantage vis-à-vis traders who are generally better connected and informed. This limits producers' marketing options, lowering farm-gate prices and hence creating disincentives for investments in production. Information asymmetries can also lead to problems of adverse selection and 'hold up' in the marketing chain, reducing incentives to invest in the production of the quality required to penetrate international markets. This is especially true where production is more fragmented and quality is complex and difficult to produce, i.e. for many livestock, fruit and vegetable products.

55. Effective national **food safety and quality assurance systems** are essential to protect the health and safety of domestic consumers. They are also critical in enabling countries to assure the safety and quality of their foods entering international trade and to ensure that imported foods

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[12] A separate Policy Note on *Competitive agriculture or state control: Ukraine's response to the global food crisis* was published by the World Bank in May 2005 (http://siteresources.worldbank.org/INTUKRAINE/Resources/WorldFoodCrisisandRoleofUkraine.pdf).

conform to national requirements. The new global environment for food trade places considerable obligations on both importing and exporting countries to strengthen their food control systems and to implement and enforce risk-based food control strategies. In Ukraine, effective food control is undermined by the existence of fragmented legislation, multiple jurisdiction, and weaknesses in surveillance, monitoring and enforcement. Moreover, access to food export markets will continue to depend on Ukraine's capacity to meet the regulatory requirements in importing countries, both public and private. Creating and sustaining demand for Ukrainian products in world markets relies on building the trust and confidence of importers and consumers in the integrity of their food systems. Ukraine has pursued continuously a path of international integration and partnerships, resulting in both opportunities and obligations with implications for its food safety system. Ukraine's WTO membership and its aspiration to engage in a closer partnership with the EU including a free trade agreement require that Ukraine approximate its legislation on Sanitary and Phytosanitary (SPS) measures with relevant EU legislation in the agri-food sector while ensuring compliance with the WTO SPS and TBT Agreements, and generally modernize its food safety related quality assurance system. As trade intensifies and quality requirements in markets increase world-wide, food safety control and quality assurance systems need to be strengthened. Domestically, rising incomes will lead to increased demand for higher quality food, especially for fresh fruits, vegetables, dairy and meat, and farmers and agro-processors – increasingly finding themselves in competition with high-quality producers on domestic markets (imports) and on export markets – need to comply, and certify their compliance, with higher standards and stricter regulations.

56. Policy makers in Ukraine have not yet established a complete set of **land markets** and conditions for the **enforcement of bankruptcy** proceedings in agriculture. Agricultural land lease has been possible since late 1998, and an active land lease market has developed in the interim.[13] However, a moratorium on the sale and purchase of land has been renewed twice, most recently in January 2007. Much anecdotal evidence suggests that farm land is being 'bought' and 'sold' despite the moratorium, via a variety of shady arrangements that will be formalised whenever the moratorium is finally lifted.

57. Land lease is a sufficient condition for land to 'move' from less to more efficient managers. However, a transparent, formal market for land sale is an integral element of the development of rural finance markets. Hence, the lack of a market for the sale and purchase of farm land has contributed to the underdevelopment of agricultural credit markets in Ukraine (Striewe et al., 2001). Land purchase and sale would not lead to rapid, dramatic changes, but it would set in motion a virtuous circle whereby the availability of collateral increases investment and productivity in agriculture, which in turn leads to increased land values, which make yet more collateral available, etc. The ongoing moratorium on the enforcement of bankruptcy proceedings in agriculture has a similar impact on the development of agricultural finance. It also hinders the movement of scarce agricultural assets from less to more efficient farm managers by allowing the former to continue operations longer than would otherwise be the case, thus slowing shifts in the competitiveness distributions presented in Section III.

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[13] IER (2006b, Table 2) provides detailed information on the agricultural land lease market in Ukraine as of January 1, 2006. 88% of the agricultural land in Ukraine is leased, and the average annual payment amounts to roughly 115 Hryvnia/ha, of which 80% is paid in kind.

58. By limiting the development of agricultural credit markets, missing markets for land purchase and sale and the lack of bankruptcy enforcement have reduced especially medium- and long-term investments for example in farm machinery, on-farm storage, cooling (milk) and drying (grain) equipment, etc. Missing or outdated machinery and equipment in crop production results in sub-optimal input application (e.g. seeding density and depth, the timing and precision of fertiliser and agro-chemical applications, incorporation of crop residues and use of moisture-saving no- or low-till technologies), higher costs of production, lower yields, and greater harvest and post-harvest losses (volume and quality). In livestock production it results in sub-optimal feed preparation and storage (e.g. silage quality), animal health problems (e.g. respiratory diseases due to poor climate in barns) and an inability to invest in superior genetic material. Outdated milking equipment can also lead to animal health problems and lower the quality of the milk produced, especially in conjunction with inadequate cooling facilities. At the intersection of animal and crop production, missing investments mean that very few farms are able to make the best possible use of manure to fertilise crops, ameliorate soils and avoid the environmental problems associated with inadequate manure disposal.

59. **Underlying and accentuating all the barriers to competitiveness listed above is a shortage of human capital**. Farm managers in Ukraine often adhere to sub-optimal agronomic practices. The result is low productivity and low quality output, waste and environmental damage. When asked, farm managers generally claim that a lack of capital for investments in modern technology is their biggest problem. However, the same managers rarely make the best possible use of the – admittedly scarce – capital that is at their disposal. Lischka (2004, p. 117) provides two examples:

> "Even taking into account the fact that soil preparation for the seeding of winter grains takes place with old and outdated machinery, insufficient care and diligence when ploughing has led to many fields becoming more and more uneven as time goes by. This makes the ensuing seedbed preparation difficult and expensive. On top of this, managers insist on excessive seeding densities of up to 500 seeds/m², which increase costs further. Seeding does not take place at an even depth, and this increases the risk of winter kill. The resulting problems become apparent when the crops re-emerge after the winter. Either extremely dense, sod-like stands of grain emerge that cannot be raised to generate anything close to the economic optimum. Or a severe winter has wreaked havoc on the unevenly sown seed, leading to significant yield losses and in some cases necessitating complete re-seeding. In this way, poor management exacerbates the prevailing shortage of capital.
>
> Feed production for dairy cows on Ukrainian farms generally takes place on a very extensive basis, ostensibly due to shortage of capital. As a result of this extensive production, land requirements of 0.8 to 1.0 ha per animal equivalent are common. Since optimising feed production for dairy cows could reduce the corresponding land requirements by 30 to over 50%, and since the land unnecessarily bound in this manner is taken out of potential cash crop production, the opportunity costs of this poor management in feed production are high. The result, again, is to exacerbate the shortage of capital."

60. Poor management also contributes to a lack of capital, because creditors will be very hesitant to lend money to a farm that has consistently underperformed and is manifestly poorly managed. But the shortage of human capital does not only detract from competitiveness at the farm level. Producers and agri-food businesses lack knowledge of markets and marketing, including quality requirements in target markets and how to work towards fulfilling these requirements on the farm and in the food chain. And public institutions, such as the ministries responsible for identifying policy needs and formulating and implementing appropriate responses,

suffer from a lack of the necessary analytical capacity and in particular the ability to distinguish between private and social costs and benefits.

61. The root of this shortage of human capital is an outdated and closed agri-food education and research establishment. An example of the degree to which Ukraine is isolated from international exchange and impulses in ***agricultural research and education*** is its almost complete lack of presence in international agricultural economics. The International Association of Agricultural Economists (IAAE) has over 1000 members worldwide; however only one member from Ukraine was registered for the 2005-2007 membership period. At the 2006 triennial IAAE conference in Brisbane, Australia, over 800 agricultural economists gathered for one week to present, discuss and debate, but not a single member from Ukraine was present (with the exception of a few young Ukrainians pursuing PhD studies in the EU and North America). Young Ukrainians who complete PhDs abroad have very few options to return home to teach and establish research programs; the difficulties begin with the fact that their foreign PhDs are not recognised in Ukraine. Within the agricultural education system in Ukraine, corruption is rampant, with admissions, grades and degrees often being purchased rather than earned (Schoreit, 2004).

62. These are all indications that the sizeable agricultural research and education establishment in Ukraine is unwilling or unable to open up and serve as a conduit for new ideas and methods. In the years since Independence, the system has demonstrated that it is monolithic and hierarchical – with advancement more a function of seniority than scientific creativity and output – and quite resistant to change. It does not produce the trained young individuals that Ukrainian agriculture requires, and it does not serve as an independent voice that informs policy makers and other stakeholders by subjecting policy proposals and developments in the sector to objective and public scrutiny.

V. Measures to increase Ukraine's agricultural competitiveness

63. All of the barriers to competitiveness listed in Section IV are man-made. All can be reduced or eliminated with political leadership, the courage to set new priorities and break with past patterns of misallocation and neglect, and the will to work with partners (domestic and foreign private investors, international institutions) who can provide know-how and funding. The following list of measures picks up many strands of the discussion of barriers to competitiveness in Section IV.

64. We broadly distinguish between **trade, market and price support policies** on the one hand (equivalent to "amber box" measures in WTO terminology) and **investment measures** ("green

box,"[14] to the extent that they are public investments) on the other. In the former category we advocate restraint and a reduction of the government intervention which, on balance, has greatly hindered the development of agricultural competitiveness in Ukraine. Domestic policy makers may feel that this restraint would unduly limit their ability to serve the interests of their constituents in agriculture and rural areas. However, this would be to take an overly pessimistic view. Even without traditional trade, market and price support measures, a broad range of profitable, competitiveness-enhancing investment measures remains available to agricultural policy makers. Furthermore, there is compelling empirical evidence that a government's choice between providing subsidies to private goods (such as market and price support) and providing subsidies to public goods (such as investments in research, education, and rural social services) has a major (positive) influence on agricultural growth and rural incomes (López and Galinato, 2007). Countries that spend less on the former and more on the latter perform significantly better in international comparison. Hence, adjusting the policy mix away from market and price support and towards public investment measures would make Ukrainian agricultural policy more and not less effective.

Trade, market and price support policies

65. On May 16, 2008, Ukraine became a member of the WTO. This important success took many years to achieve, as accession negotiations began in 1993 and sometimes appeared to falter due, among other things, to agricultural issues. But it is a success that has major implications for Ukrainian agricultural policy and participation in international agricultural trade, and that signals Ukraine's fundamental commitment to market-oriented development of its agri-food potential.

66. The benefits of WTO membership are manifold. As demonstrated in a recent paper by Melitz (2003) on the impact of international trade in the presence of intra-industry heterogeneity (such as the heterogeneity in Ukrainian agriculture documented in the DRC analysis in Section III above), increased exposure to international competition can generate benefits in the form of intra-industry resource reallocations that lead to increases in aggregate industry productivity. WTO membership will also ensure that Ukraine benefits from Most Favoured Nation status in its trade with other WTO members, and from access to the Dispute Settlement Mechanism in the event of conflict. Finally, WTO membership will impose disciplines on Ukraine's agricultural policy, reducing distortions and intervention on agricultural markets. In particular, the conditions of Ukraine's accession to the WTO include the commitment that Ukraine will not make use of export subsidies. This effectively precludes any form of price support for products that Ukraine exports. Other important disciplines will limit the use of the export restrictions (export taxes and quotas) which policy makers in Ukraine have resorted to (for oilseeds and grains) in recent years.

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[14] "Green Box" measures as defined under the WTO Agreement on Agriculture are measures of domestic support to agriculture that have no, or at most minimal, trade-distorting effects or effects on production. Support needs to be provided through a publicly-funded government program (including government revenue foregone), not involving transfers from consumers, and the support in question must not provide price support to producers. Green box measures are exempt from reduction commitments and include (i) governmental services including research, extension advisory services, market information, pest control, inspection services, infrastructure; (ii) public stockholding for food security purposes; (iii) domestic food aid; (iv) direct payments to producers and decoupled income support; (v) government contribution to income insurance and income safety net programs; (vi) natural disaster relief including government contributions to crop insurance schemes; (vii) structural adjustment assistance through producer or resource retirement programs and investment aids; (viii) environmental programs; and (ix) regional assistance programs.

67. A durable solution must be found for the export VAT refund problem. Outstanding refunds must be repaid and an accountable and transparent mechanism put in place to ensure that there is no further accumulation of unpaid refunds. Failure to do so will subject agricultural exporters to unjustified costs and risks, and these will continue to be passed on to farmers in the form of lower farm gate prices.

68. Anything that makes imports such as seed, agricultural machinery or agri-chemicals more expensive reduces Ukraine's agricultural competitiveness. Therefore, import barriers for such inputs should be reduced. Three sets of measures would contribute to such a reduction. First, import tariffs should be reduced. In recent years, steps in this direction have been taken as a result of Ukraine's negotiations and preparations for WTO membership. Second, recognition of EU product safety standards and certification would reduce non-tariff barriers to imports. Third, reform of customs procedures would reduce additional non-tariff barriers in the form of delay and cost at Ukraine's borders. This third component is related to the second because complex, arbitrary and intransparent standards and certification requirements can provide customs officials with a pretext for extracting bribes in return for more expeditious processing of imports. Reform of customs procedures would also reduce the costs of exporting, thus further increasing competitiveness. Since standards and certification, and reform of customs procedures are essentially 'investment' measures, we return to them below.

69. Intervention on individual agricultural markets should be reduced. As demonstrated above, intervention taxes Ukraine's most competitive agricultural products, and subsidises especially sugar, which is the least competitive. This self-destructive policy has cost Ukrainian agriculture billions of Hryvnia in revenue. Hence, measures such as export taxes and quotas should be abolished[15]. The subsidisation of sugar beet production should be phased out. Subsidies to livestock producers in the form of VAT expenditures, which are poorly targeted and distort incentives, should be eliminated. The agricultural support measures that remain (Ukraine has negotiated an aggregate measure of support allowance of 0.613 billion US$ as one condition of its accession to the WTO) should be as non-distortive as possible. Targeted, direct income support and income stabilisation measures should be emphasised. To reduce policy uncertainty, market and price measures should be simple and transparent (simple price wedges, no quantitative restrictions) and measures that call for state spending (e.g. intervention purchases) should be sufficiently financed in order to ensure effective implementation.

Public and private investments in the competitiveness of Ukrainian agriculture

70. Further efforts are required to separate the so-called social sphere from the farms in Ukraine. As part of a broader reform of fiscal federalism in Ukraine, the responsibilities of central, oblast and local governments for social services, health care, infrastructure maintenance and schooling must be brought into balance with the financial capacities of these different levels of government to fulfil their responsibilities. Progress in this direction would reduce the excess burden on farms in Ukraine, freeing management capacity and resources for core tasks in farming and marketing. It would also contribute to combating the perception that rural areas are backward and unattractive places to live, thus making it easier to attract and bind the qualified young workers and managers that a modern agri-food sector requires.

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[15] While export quotas for cereals were dropped in May 2008, the risk of their re-introduction remains until the instrument of export quotas as such is abolished.

71. If farmers in Ukraine had received roughly the same share of fob grain prices as their counterparts in Germany, the 2006 harvest of roughly 35 million tons would have generated an additional 1 billion US$ of farm revenue, equivalent to about one-half of total government spending in support of agriculture in that year. To reduce marketing margins and increase farm gate prices there is a pressing need to continue upgrading local storage facilities and inland transportation infrastructure for agricultural products. If the steps outlined above to improve the trade, market and price policy environment were taken, many such investments in local, private assets such as grain storage and harbour facilities would be undertaken by private investors. However, other investments (e.g. in the intra-regional road and rail networks, and in the development of waterways) have public good characteristics that justify public and joint public-private investment. Public investment in feasibility studies and impact analyses (for example of a project to develop the Dnjepr into a major waterway for transporting bulk commodities) could focus attention and generate interest in some key projects. Another step towards improving grain and oilseed marketing infrastructure would be the privatisation of the state-owned *Khlib Ukrainy*, which continues to own choice grain marketing assets (elevators, terminals) but is not subject to hard budget constraints.

72. Physical marketing infrastructure can only be used to its full advantage if combined with the necessary expertise. Public investment to improve management along the food chain – especially training in the areas of logistics, the monitoring of food safety, and the implementation of traceability systems – would enhance Ukraine's agricultural competitiveness. Again, in a more stable and transparent market and price policy environment, large firms in particular could be expected to increase private investment in the necessary human capital. However, from a social perspective these private firms would probably under-invest as they train primarily for their own needs and not those of public institutions (e.g. ministries, monitoring bodies) and smaller firms that also require expertise. Hence, public investment in improved training facilities (e.g. introducing modern logistics and quality management courses into curricula at Ukrainian universities and management schools, establishing a corresponding research institute), perhaps in cooperation with private partners, would generate significant returns.

73. Ukraine should further harmonise its domestic legislation with EC food and feed law, codex alimentarius standards and WTO SPS standards. It should seek bilateral and multilateral assistance to upgrade its food safety and quality assurance systems, strengthening certification mechanisms and institutions for quality assurance and accreditation, establishing reference laboratories, and implementing GAP- and HACCP-compliant production and processing. Failure to address these steps will lock Ukraine into the low-quality, bulk commodities segment of international agricultural trade and delay its expansion into high-value added segments, thus reducing export prices and opportunities for diversification of rural economies and employment. In some cases (e.g. a large supermarket chain that maintains additional private quality and certification standards and sources products in Ukraine), private firms will undertake their own investments in food safety. Nevertheless, Ukraine needs to develop and maintain a positive 'brand image' for Ukrainian agri-food products in general. Quality problems in a single shipment can lead to border closings for an entire industry and tarnish this image. This highlights the very important role that public investment must play.

74. The need to modernize and streamline customs procedures was mentioned above. On the import side, this would contribute to reducing the cost of key agricultural imports such as seed and machinery. On the export side it would make Ukrainian agricultural products more

competitive on world markets. Dependable and rapid customs processing can be especially critical for exports and imports of perishable agricultural products. In recent years, many countries have adopted software systems that automate customs procedures and reduce the discretion that can be exercised by customs officials. When Cameroon adopted such a system at one of its main ports at the beginning of 2007, customs revenues increased by roughly 3 million Euros (6%) in the first month of operation (BMZ, 2007, p. 4). Even if customs revenues increase, importers as a rule incur less costs at the border under such automated systems than before because they are no longer subject to chicanery, delays and arbitrary decisions. Together with the recognition of EU product safety standards and certification, investment in automated, transparent customs procedures could generate significant returns in Ukraine.

75. Ukraine needs to invest in developing modern agricultural market information systems. If more timely and objective market information were available, the ostensible justification for many episodes of damaging state intervention on agricultural markets would be greatly weakened. Improved market information would improve the marketing options open to producers and reduce the problems associated with information asymmetries such as hold-up problems that can discourage investments in the production of quality.

76. The absence of futures markets is often cited as a major weakness of agricultural commodities markets in Ukraine. A functioning futures market would increase the efficiency and transparency of price discovery in Ukraine, and provide hedging instruments that reduce (or redistribute) risk. Public investment in feasibility studies and the design of a Ukrainian futures market for agricultural commodities could therefore contribute to improving competitiveness. Public financing could even contribute to the capital stock required to establish a functioning futures market. However, it should be stressed that such investment would be in vain as long as government interventions in grain and oilseed markets prevail. The ever-present likelihood that grain export quotas and regional bans on movements of grain will be imposed generates basis risk that would make corresponding futures contracts useless to a potential hedger. Any indication that policy makers are attempting to influence the futures market in any way would sound its death knell. Instead of establishing a new futures market in Ukraine it might be more effective and considerably less costly to invest in establishing futures contracts with Ukrainian specifications on an established exchange elsewhere. In this manner, the credibility and liquidity of an existing exchange could be tapped. Modern electronic trading technology has greatly reduced the importance of the physical location of an exchange.

77. Agricultural credit markets need to be developed further. In the medium term, the current policy of partial subsidisation of interest on credits to agriculture is a comparatively efficient measure, provided the individual credits that benefit from interest rate subsidies are granted on an impartial, commercial basis. However, such subsidies can satisfy only a fraction of the demand for agricultural credit in Ukraine. Moreover, many of the steps above, by improving the competitiveness and earnings of Ukrainian agriculture, would further increase the demand for credit. Legalising the purchase and sale of agricultural land and allowing creditors to enforce bankruptcy would expand supply. Although this has proven to be a very difficult and contentious area, international donors and their Ukrainian partners should persevere in their efforts to establish the institutions needed to ensure transparent and secure land transactions.

78. Much more investment and effort must go into revitalising agricultural research and education in Ukraine. While investments in agricultural research and development (R&D) take time to bear fruit, there is overwhelming evidence that they generate significant payoffs.

According an analysis of 1673 published estimates (cited in World Bank, 2008a, p. 166), returns on investment in agricultural R&D average over 40%. Besides increased investment in agricultural R&D, priority should be given to restructuring the agricultural research and education system so as to create alternatives to the existing hierarchies that stifle debate and block both the inflow of new ideas and the retention/reintegration of high-potential young Ukrainians. Internationally recognized accreditation procedures for universities (e.g. under the auspices of the EU's 'Bologna Process') should be used to establish benchmarks and expose inadequacies. Mandatory and early retirement schemes for older colleagues, and the use of independent, international hiring committees, would create more opportunities for merit-based advancement and incentives for highly trained young Ukrainians to return home. If old institutions (the leading Universities and the Academy of Science) continue to resist reform, then new parallel institutions should be established to compete with them on the basis of output and performance. These steps are desperately needed to ensure that Ukraine produces the highly trained individuals needed to run a modern agri-food sector.

Measuring improved competitiveness

79. It was argued above that realising Ukraine's competitive potential in agriculture is a matter of i) shifting DRC distributions so that the great majority of farms in Ukraine can produce as efficiently tomorrow as the best farms do today, and ii) developing marketing and processing systems so that Ukraine's ability to produce competitive raw products on the farm is translated into competitiveness on world markets and for high-value added agri-food products. ***Monitoring the impact of policy reform*** and investment on these goals is difficult because of the need for a counterfactual (what would have happened in the absence of the reforms and investments in question). Despite this difficulty, there are obvious and straightforward criteria for the evaluation of some individual measures. For example, investments in automated customs procedures should lead to an increase in customs revenues, a reduction in average delays due to customs processing at the border, and an increased availability of timely, accurate trade statistics.

80. The impact of reforms and investments on competitiveness for individual products can be monitored by extending the DRC distribution analysis introduced here as new years of detailed farm level data become available. To provide a sounder basis for the interpretation of future developments, the DRC analysis could also be extended back to earlier years to generate a longer baseline period and information on year to year fluctuations. More detailed analysis could further disaggregate DRC distributions by region, by farm size and degree of specialisation. Successful reforms and investments should be reflected in pronounced shifts of the DRC distributions, with the mid-range ($0<DRC<1$) gaining at the expense of the tails ($DRC<0$, and $DRC>1$).

81. Improvements in competitiveness on world markets and for high-value added agri-food products can be monitored in several ways. More detailed, systematic analysis of prices and margins and farmers' shares in the food chain over time (along the lines of that provided for grains in Figure 14 above) and in comparison with other exporting countries would cast light on the efficiency of the food chain. Indicators based on trade performance (e.g. RCA – revealed comparative advantage) could be used to trace Ukraine's ability to compete on international markets for agri-food products. Such monitoring and evaluation would also provide a necessary ingredient for cost-benefit analyses of public spending measures for agriculture in Ukraine.

APPENDIX 1: THE DOMESTIC RESOURCE COSTS METHOD AND THE CALCULATION OF DRC DISTRIBUTIONS

1. The DRC method

To measure the competitiveness of Ukrainian agriculture, Domestic Resource Costs (DRC) are calculated for major crop and livestock products. The DRC is one of many indicators that can be calculated using the Policy Analysis Matrix (PAM) framework developed by Monke and Pearson (1989). The PAM is a product of two accounting identities, one defining profitability as the difference between revenues and costs and the other measuring the effects of divergences (distorting policies and market failures) as the difference between observed private values and social values that would exist if the divergences were removed. The structure of the PAM is presented in Appendix 1 Table 1.

Appendix 1 Table 1: The Policy Analysis Matrix (PAM)

	Revenue	Costs		Profits
		Tradable inputs	Domestic factors	
Accounting in Private (Financial) Prices	$A = P_i^P$	$B = \sum_{j=1}^{k} a_{ij} P_j^P$	$C = \sum_{j=k+1}^{n} a_{ij} V_j^P$	$D = A - B - C$
Accounting in Social (Economic) Prices	$E = P_i^s$	$F = \sum_{j=1}^{k} a_{ij} P_j^s$	$G = \sum_{j=k+1}^{n} a_{ij} V_j^s$	$H = E - F - G$
Effects of Policy and Market Failures	$I = A - E$	$J = B - F$	$K = C - G$	$L = D - H = I - J - K$

Source: Monke and Pearson (1989)

In Appendix 1 Table 1:

the subscript i refers to outputs and the subscript j to inputs;

a_{ij} for ($j = 1$ to k) are technical coefficients for traded inputs in the production of i;

a_{ij} for ($j = k+1$ to n) are technical coefficients for domestic inputs in the production of i;

P_i^* is the price of output i, evaluated privately ($* = p$) or socially ($* = s$);

P_j^* is the price of traded input j, evaluated privately ($* = p$) or socially ($* = s$);

V_j^* is the price of domestic input j, evaluated privately ($* = p$) or socially ($* = s$);

I measures output transfers;

J measures input transfers;

K measures factor transfers;

D (= A-B-C) measures net private profits;

H (= E-F-G) measures net social profits; and

L measures net transfers.

DRC is calculated as the ratio of *G* to (*E-F*) in the table above. Hence, it compares the cost of domestic resources measured at social prices (in the numerator) to value added measured in social prices (in the denominator). The use of social prices throughout ensures that DRC measures whether employing scarce domestic inputs in the production of good *i* is really resulting in a positive return to the country in question. DRC<1 indicates comparative advantage - the social opportunity costs in terms of domestic resources used are smaller that the corresponding social gain in terms of value added generated. The opposite is true for the DRC>1. DRC = 1 indicates that the economy neither gains nor loses from employment of resources in the production of *i*.

The DRC method has the advantage of being intuitively clear, reasonably easy to use and well established in applied economics. It also has several weaknesses. In particular, it is based on the assumption of fixed technical coefficients. Hence, it ignores possible factor substitution and cross price effects that could be expected to result from shifting production away from the observed point of production characterised by private prices, to the hypothetical point characterised by social prices. Depending on the strength of these effects, the DRC will be biased. The DRC may also be biased against activities that rely heavily on domestic inputs such as land and labour, and it is sensitive to the classification of inputs into domestic and tradable (Masters and Winter-Nelson, 1995).

2. Calculating DRC distributions

As discussed in Section III, there is ample evidence that the farms in Ukraine are highly heterogeneous. Calculating average or typical DRCs would therefore be of dubious value. For this reason, detailed farm level data is used to calculated DRC distributions for major crop and livestock products. For each farm in the dataset employed (see below), DRCs are calculated for each of its major crop and livestock products. For each product, an estimate of the resulting univariate density function of DRCs across all relevant farms is calculated using the kernel-based estimate proposed by Rosenblatt (1956).

Note, however, that there is an inherent discontinuity in the DRC distribution at 0, with values slightly greater than 0 reflecting very competitive farms, and values slightly below reflecting very uncompetitive farms. The kernel-based algorithm used to estimate the DRC distributions presented in this paper smoothes this discontinuity and, hence, creates the false impression of a relatively high frequency of observations close to and equal to 0.

For this reason, social cost benefit ratio (SCB: Masters and Winter-Nelson, 1995) distributions are also calculated and presented in Appendix 1 Figures 1 through 4 below. The SCB is based on the same PAM components as the DRC. It equals the ratio of the sum of tradable and domestic input costs to the price of the good in question, or (*F* + *G*) divided by *E* in Appendix 1 Table 1 above. The SCB is always greater than 0, and a SCB less than (greater than) 1 indicates that total input costs are less than (greater than) revenue and that production is (is not) competitive. The SCB is not sensitive to the classification of inputs into domestic and tradable, and it is not subject to the discontinuity that affects the DRC distribution. However, unlike the DRC, it does not distinguish between uncompetitive production that is merely unable to cover the opportunity costs of domestic factors (DRC>1) and uncompetitive production that is not even able to cover the costs of tradable inputs (DRC<0). As the results presented in this paper make clear, this distinction is relevant in the case of Ukrainian agriculture.

3. Data and assumptions

The empirical analysis described above is carried out using Ukraine-wide farm-level accounting data provided by the State Statistics Committee of Ukraine. This dataset is an unbalanced panel of 17,906 observations over the period 2004-2005. For each observation in the dataset (representing a farm in one of the two years), information on total input costs for each farm product is available, as is information on the breakdown of input costs for each of the output aggregates 'crop' and 'livestock' products. In order to generate disaggregated input use data for each individual farm product, the share of each individual product in total farm costs is used. In other words, if the data show that wheat accounted for 25% of total input costs in crop production for a specific farm, then 25% of the labour allocated to crop production on that farm is assumed to have been spent on wheat, 25% of the fertiliser, etc. An alternative would be to allocate inputs according to acreage shares, but this would i) probably be less accurate as more profitable crops (such as sunflower and sugarbeet, for example) tend to be produced more intensively than others, and ii) not be helpful for acreage-independent livestock products. Appendix 1 Table 2 provides an overview of the resulting data structure and numbers of observations, and Appendix 1 Table 3 provides information on average input cost shares for crop and livestock production in the sample of farms employed in the DRC analysis.

Appendix 1 Table 2: Data description

	Wheat	Barley	Corn	Sunseed	Soybean	Rapeseed	Sugarbeet	Potato	Beef	Pork	Poultry	Milk	Eggs
Number of farms producing													
2004	8282	7725	4067	4772	876	697	2445	671	6596	5498	490	6018	357
2005	7631	6865	2942	4319	1057	1004	2546	461	5523	4810	472	5113	363
Inputs used													
Seeds	+	+	+	+	+	+	+	+	-	-	-	-	-
Fertilizers	+	+	+	+	+	+	+	+	-	-	-	-	-
Diesel and gasoline	+	+	+	+	+	+	+	+	+	+	+	+	+
Gas	+	+	+	+	+	+	+	+	+	+	+	+	+
Electricity	+	+	+	+	+	+	+	+	+	+	+	+	+
Spare parts, renovation costs	+	+	+	+	+	+	+	+	+	+	+	+	+
Labour	+	+	+	+	+	+	+	+	+	+	+	+	+
Other inputs (manure, litter etc)	+	+	+	+	+	+	+	+	+	+	+	+	+
Land	+	+	+	+	+	+	+	+	-	-	-	-	-
Capital	+	+	+	+	+	+	+	+	+	+	+	+	+
Fodder	-	-	-	-	-	-	-	-	+	+	+	+	+

Source: Own presentation.

Conversion from private to social prices and costs is based on a variety of assumptions and sources of data:

- Factors for converting revenue from the sale of **agricultural output** from a private to a social price basis are calculated using information from the World Bank Agricultural Distortions Project Ukraine Case Study undertaken by von Cramon-Taubadel et al. (2007), which draws heavily on the OECD's PSE tables (OECD, 2005). Border reference prices (border prices

corrected for marketing costs) are compared with farm-gate prices to calculate conversion factors (Appendix 1 Table 4) that are multiplied with actual reported revenues to estimate hypothetical social revenues. The case of sugar is somewhat more complicated because farmers sell sugarbeet while world trade is in raw or white sugar. Technical extraction coefficients are used to convert the border price for white sugar into a sugarbeet price, and comparison with the corresponding farm gate price results in a conversion factor of 0.73 (0.57) for 2004 (2005).

Appendix 1 Table 3: Cost shares for inputs in crop and livestock production in Ukraine, 2004 and 2005 (%)

Input	Crop		Livestock	
	2004	2005	2004	2005
Labour	13.6	15.3	16.1	17.4
Seeds and grafts	13.6	11.7	-	-
Other inputs (manure, litter, eggs for incubation etc)	1.3	1.1	3.5	4.0
Fertilizers	10.6	12.3	-	-
Fuel: diesel and gasoline	16.2	17.6	4.9	4.9
Electricity	1.3	1.2	3.4	3.2
Fuel: gas	1.1	1.2	0.6	0.8
Spare parts, renovation	7.5	7.4	3.6	3.5
Outside services employed	11.3	10.8	4.5	6.9
Depreciation	5.1	5.4	3.9	4.1
Other costs: including	18.4	16.0	3.7	3.5
Land rent (as % of other costs)	12.5	11.2	-	-
property costs (as % of other costs)	0.4	0.4	0.2	0.2
Fodder	-	-	55.9	51.9

Source: Own calculations.

Appendix 1 Table 4: Calculation of conversion factors for revenues

Product	2004			2005		
	Farm gate price (UAH/t)	Reference border price (UAH/t)	Conversion factor	Farm gate price (UAH/t)	Reference border price (UAH/t)	Conversion factor
Crops						
Wheat	493	620	1.26	414	502	1.21
Barley	387	429	1.11	489	561	1.15
Corn	438	573	1.31	371	389	1.05
Sunseed	1151	1247	1.08	981	1213	1.24
Soybean	778	1093	1.40	989	981	0.99
Rapeseed	1163	1228	1.06	1135.7	1207	1.06
Potato	530	596	1.12	684	820	1.20
Livestock						
Beef	4359	5588	1.28	5882	5402	0.92
Pork	7196	5722	0.80	10198	7688	0.75
Poultry	4974	3217	0.65	6495	3746	0.58
Milk	835	988	1.18	1120	1138	1.02
Eggs	4225	6417	1.52	4486	5575	1.24

Source: Own calculations with von Cramon-Taubadel et al. (2007).

- Social costs for **seeds, fertilisers and fodder** are based on private costs corrected for the impact of tariff and non-tariff barriers (NTBs). Tariffs are taken from official tariff schedules, and NTBs are assumed to be equivalent to 2% *ad valorem* tariffs based on IER (2006a). For fertiliser, conversion factors of 0.93 and 0.95 are used in 2004 and 2005, respectively. For all seeds except barley, sugarbeet and potato, a conversion factor of 0.98 is used in both years (in other words, only the assumed 2% NTB is corrected). For barley and sugarbeet, 0.95 and 0.33 are used in both years. For potato, the conversion factors used in 2004 is 0.53, and in 2005 0.78. For fodder and eggs for incubation, conversions factors of 0.95 are used in both years.

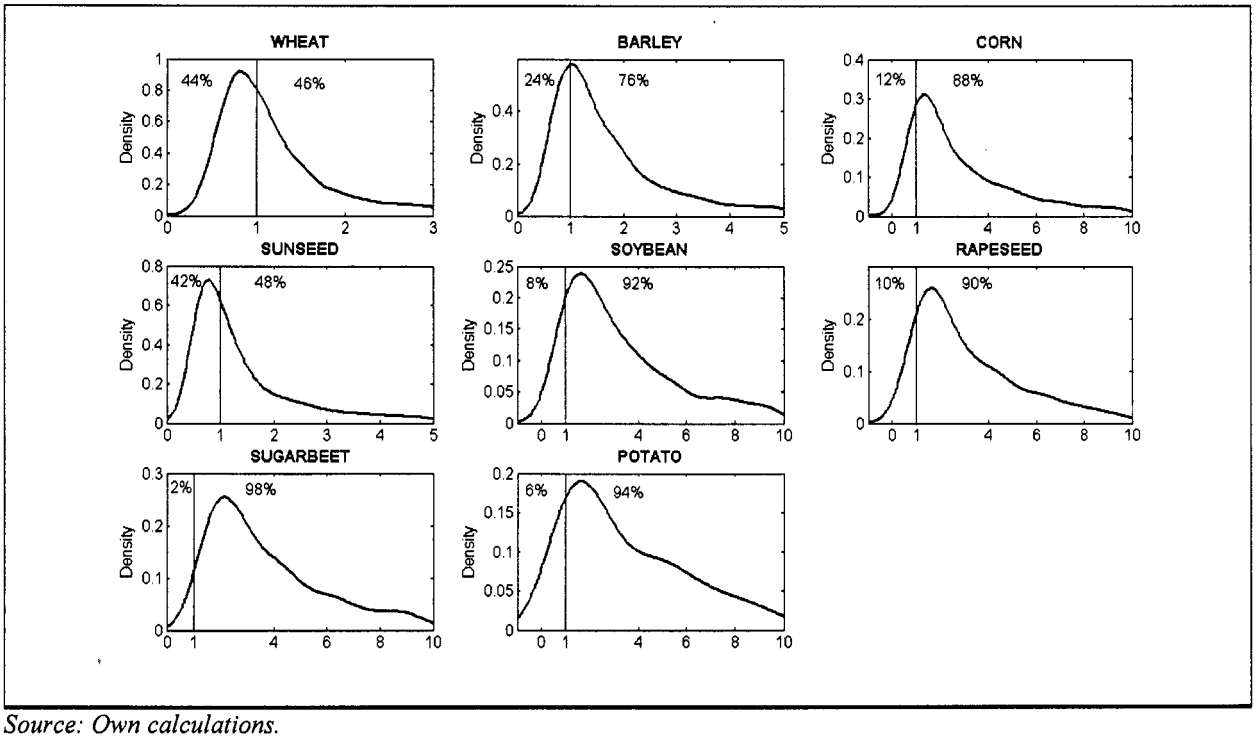
- Capital input is measured as the sum of depreciation (i.e. the reduction in the value of assets arising from wear and tear), and the forgone return on financial capital tied up in the value of assets. A conversion factor for **capital** costs is calculated as the product of a conversion factor for capital assets value and a conversion factor for capital recovery (see Guba (2000) for details). The factor for capital assets value is assumed to equal 0.95 based on information in IER (2006a) about tariffs and NTBs applied to agricultural machinery and equipment imports. The conversion factor for capital recovery is estimated using the relationship between private and social interest rates. The private real interest rate is calculated using nominal interest rates and the rate of inflation. The social interest rate is estimated using macroeconomic data (GDP and factor income shares) based on the assumption that under competitive conditions the ratio of a factor's marginal to average value product should equal its share of total income (Monke and Pearson, 1989). The result of these calculations is a conversion factor for capital recovery of 0.52 in 2004 and 0.64 in 2005. Hence, the conversion factor for capital costs is 0.50 in 2004, and 0.61 in 2005.

- Private **fuel** costs are corrected for two types of distortion to arrive at a social valuation. The first distortion is due to the fact that Ukraine has paid considerably less than world market prices for gas as a result of special arrangements with Russia (which have been the subject of much recent controversy). Pavel and Chukhai (2006) argue that an economically justifiable gas price for Ukraine can be calculated as the EU market price minus the cost of gas transit from Ukraine to the EU. According to this calculation, the price in Ukraine in mid-2006 should have been 277 US$/tm^3 rather than the actual 95 US$/tm^3. On this basis, private-to-social cost conversion factors for gas use are determined to be 2 and 2.5 in 2004 and 2005, respectively. The second distortion is the result of memoranda signed between the Government of Ukraine and the fuel industry according to which the latter supplied 360,000 and 600,000 tons of fuel (diesel and gasoline) at a discount to farmers in 2004 and 2005, respectively. Based on information about the discount rates and prices for fuel in other countries, conversion factors of 1.11 and 1.09 for diesel and gasoline inputs are determined for 2004 and 2005.

- For **electricity**, social costs are assumed to equal private costs based on a description of the Ukrainian electricity market in Pavel and Poltavets (2006). Ukraine generates its own electricity and even exports it, and there is no differentiation between electricity prices in agriculture and in other sectors of economy, with the exception of a partial electricity cost refund program that concerns only rice producers and some other minor products not considered here.

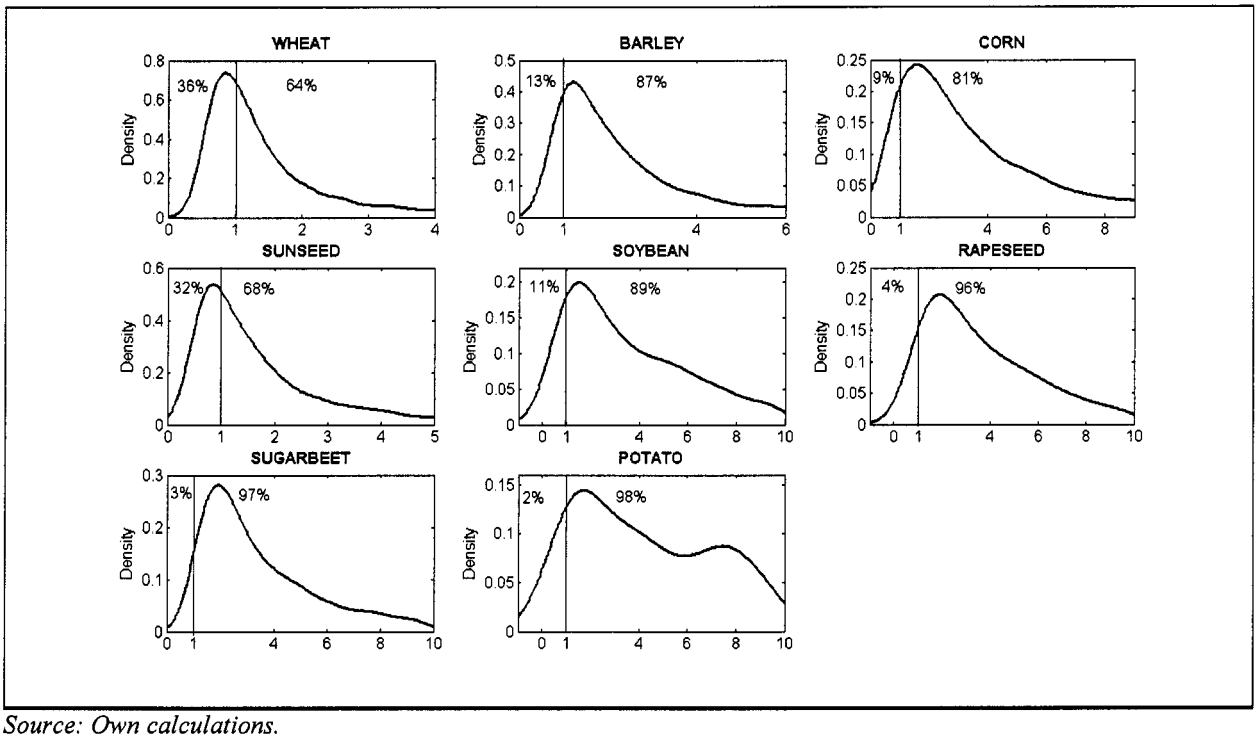
- Social valuation of **land** is estimated as in Monke and Pearson (1989) by comparing profits before land costs for as many crops as possible on each farm, and setting farm-specific social land costs equal to the highest profits before land costs observed. An alternative would be to use land lease prices, as there is an active land lease market in Ukraine. However, this market is not strictly cash-basis (land owners are often partly paid in kind or in the form of services), and regional average lease rates will not account for farm-specific conditions (e.g. irrigation, particular soil qualities, etc.). The assumption made here is biased in that it implicitly assumes that 100% of a farm's land could be allocated to the production of the most profitable crop in any given year, which ignores crop rotation restrictions. Hence, it may tend to over-value land and underestimate competitiveness as a result. This effect is likely limited, however, as the share of land in total factor costs is low (see Appendix 1, Table 3).
- Social costs are assumed to equal private costs for **labour**. Wages have been increasing with economic growth since 2000 and will likely continue to increase in the future. While we are aware of no major distortions on labour markets in Ukraine, market wages could be subject to some distortions. For example, if protection of labour-intensive products does inflate market wage rates in Ukraine, the assumed equality of social and private labour costs will bias the magnitude of the calculated DRCs upward and correspondingly reduce the shares of competitive farms and production, especially for labour-intensive agricultural products.
- Finally, social costs are also assumed to equal private costs for **other inputs** such as manure and litter.

Appendix 1 Figure 1: Social cost benefit (SCB) distributions for major crop products in Ukraine, 2005



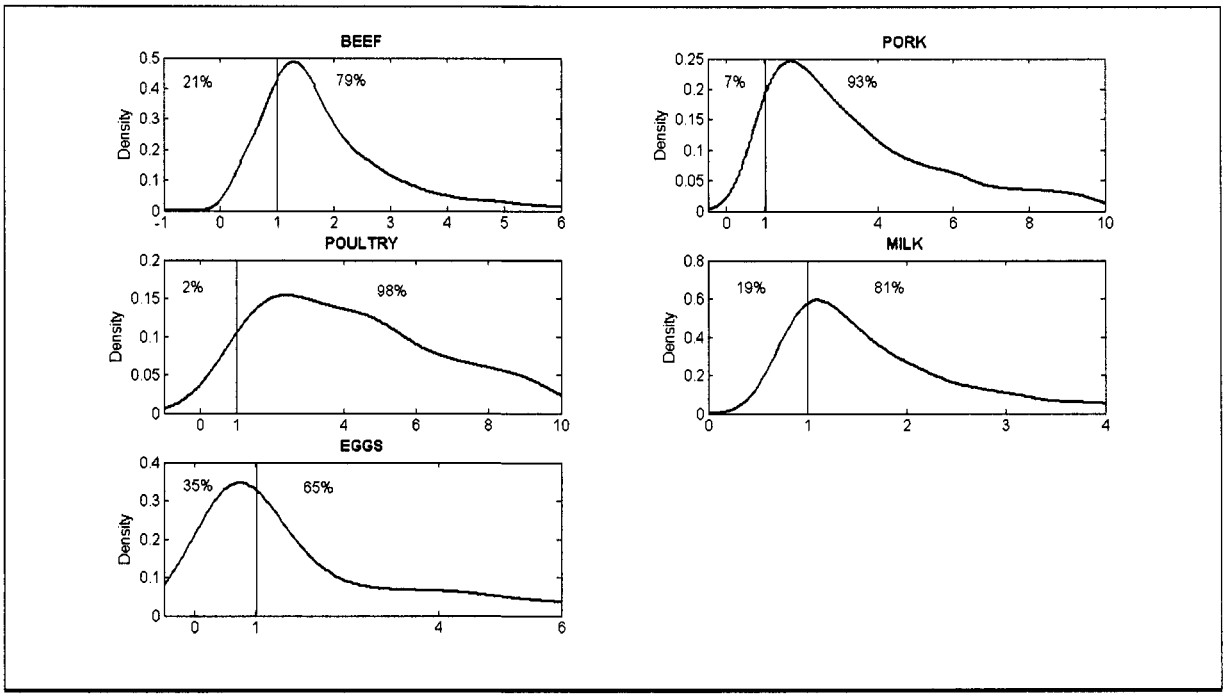
Source: Own calculations.

Appendix 1 Figure 2: Social cost benefit (SCB) distributions for major crops products in Ukraine, 2004



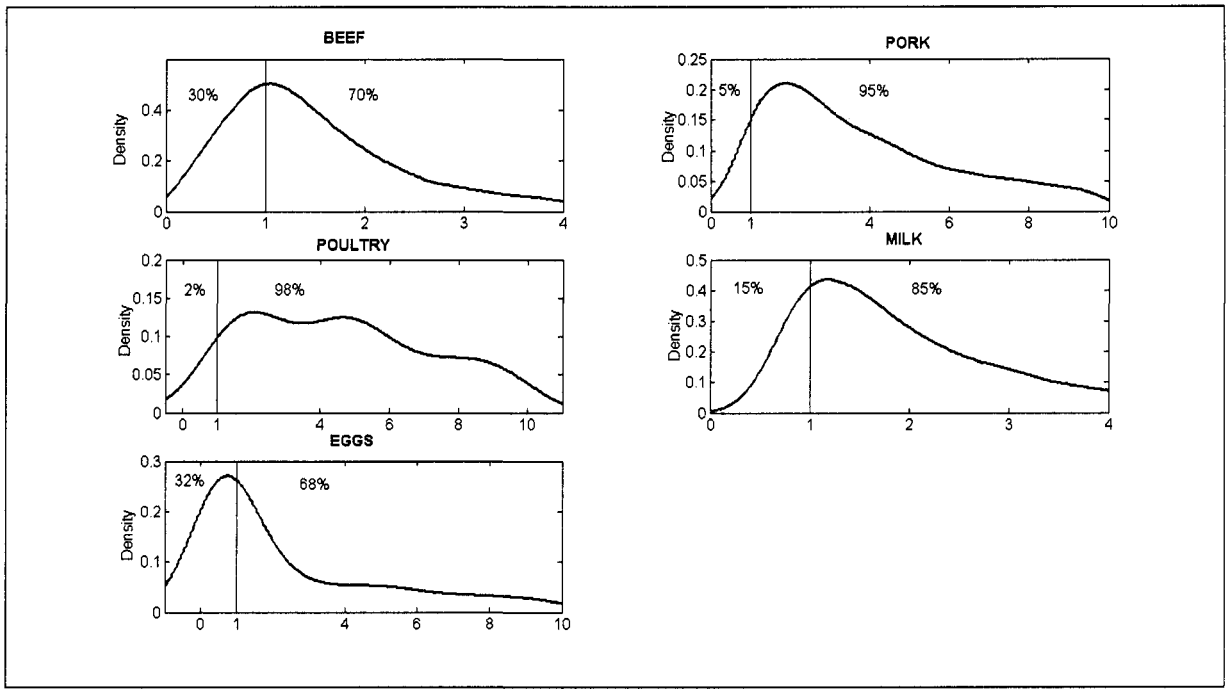
Source: Own calculations.

Appendix 1 Figure 3: Social cost benefit (SCB) distributions for major livestock products in Ukraine, 2005



Source: Own calculations.

Appendix 1 Figure 4: Social cost benefit (SCB) distributions for major livestock products in Ukraine, 2004



Source: Own calculations.

APPENDIX 2: STATISTICAL DATA

Appendix 2 Table 1: Economic indicators of agriculture and the food processing industry in Ukraine, 2000-2007

		2000	2001	2002	2003	2004	2005	2006	2007*
Agriculture									
Gross agricultural output	UAH m	58,475	69,690	70,049	71,151	92,543	94801	98410	113246
	% total output	13.5	13.3	12.2	10.3	10.1	9.6	7.6	7.0
Value added	% GDP	14.4	14.4	13	10.9	10.8	9.2	7.5	6.7
Value added / output	%	42.7	43.3	42	41.4	40.4	40.1	41.7	41.9
Structure of value added:									
Compensation to employees	% sector value added	18.2	19.8	17.4	16.8	16.2	16.9	20.6	19.8
Profit, mixed income	% sector value added	75.4	80.1	81.9	83.6	85.6	85.1	83.6	84.7
Net taxes on production & imports	% sector value added	Na	0.1	0.8	-0.5	-1.9	-2.1	-4.2	-4.4
Employment	thousand people	2,549	2,206	1,877	1,537	1,174	1,038	1,005	680
	% total employed	18.6	17.1	15.3	0.2036	10.4	9.1	8.7	6
Average wage	UAH	114	154	183	219	295	415	518	733
Exports	UAH m	4,963	5,758	7,361	4,052	8,262	9,441	10493	Na
	% total exports	4.7	5.1	5.9	2.6	3.9	4.1	4.2	Na
	% sector output	8.5	8.3	10.5	5.7	8.9	8.9	10.7	Na
Imports	UAH m	921	862	801	5,024	3,338	3,804	4410	Na
	% total imports	0.9	0.8	0.7	3.4	1.8	1.7	1.6	Na
	% sector output	1.6	1.2	1.1	7.1	3.6	3.6	4.5	Na
Exports/imports	Index	5.4	6.7	9.2	0.8	2.5	2.5	2.4	Na
Food processing industry									
Gross output	UAH m	48,892	64,810	68,973	84,470	103,221	116,639	139850	179371
	% total output	11.3	12.4	12	12.3	11.3	10.5	10.8	11.1
Value added	% GDP	7.8	7.7	7.9	8.2	4.2	7.8	Na	Na
Value added / output	%	27.3	24.2	25.8	25.8	24.1	26	Na	Na
Structure of value added:									
Compensation to employees	% sector value added	30.9	26.3	24.7	25.5	34.1	39.5	Na	Na
Profit, mixed income	% sector value added	15	24.8	27.6	28.6	15.6	17.7	Na	Na
Net taxes on production & imports	% sector value added	54.1	48.9	47.6	45.9	50.4	42.8	Na	Na
Employment	thousand people	518	485	464	445	452	465	453	441
	% total employed	3.8	3.8	3.8	3.8	3.9	4	4	4
Average wage	UAH	281	364	423	496	597	779	986	1223
Exports	UAH m	7,775	7,780	8,961	12,246	16,725	16,135	Na	Na
	% total exports	7.3	6.9	7.2	7.9	7.9	7.1	Na	Na
	% sector output	15.9	12	13	14.5	16.2	12.1	Na	Na
Imports	UAH m	3,456	5,005	4,903	6,701	6,648	9,700	Na	Na
	% total imports	3.5	4.6	4.3	4.5	3.6	4.3	Na	Na
	% sector output	7.1	7.7	7.1	7.9	6.4	7.3	Na	Na
Exports/imports	Index	2.2	1.6	1.8	1.8	3.9	1.7	Na	Na

Source: State Statistic Committee of Ukraine; own calculations.. Preliminary.*

Appendix 2 Table 2: Major economic indicators and production of major agricultural products in Ukraine, 1990-2007

	1990-92*	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007***
Major economic indicators																
Population (million)	52.1	52.1	51.7	51.3	50.8	50.4	49.9	49.4	48.9	48.5	48.0	47.6	47.3	46.9	46.6	46.4
Rural population (mill.)	16.8	16.7	16.6	16.5	16.4	16.3	16.2	16.1	16.0	15.9	15.7	15.5	15.3	15.1	14.9	14.7
Nominal GDP (bnUS$)	77.6	65.6	52.2	48.2	44.6	50.2	41.9	31.6	31.2	37.8	42.6	49.5	65.1	83.1	106.5	140.5
GDP/capita (nom. US$)	1491	1259	1010	940	878	996	840	640	638	779	888	1040	1376	1772	2285	3028
Real GDP growth (%)	-8.2	-14.2	-22.9	-12.2	-10.0	-3.0	-1.9	-0.4	6.0	9.2	5.2	9.6	12.1	2.7	7.1	7.3
Inflation**	na	4735	891.2	376.7	80.3	15.9	10.6	22.7	28.2	12	0.8	5.2	9	13.5	9.1	16.6
GDP shares (%):																
Agriculture	22.7	21.5	16.2	14.5	11.8	11.8	11.9	11.7	14.4	14.4	13	10.9	10.8	9.2	8.6	6.7
Industry	na	na	na	30.9	29.4	24.7	25.2	26.5	26.6	26.1	27.4	27.2	28.3	29.6	29.3	27.9
Construction	na	na	na	7.3	5.5	5.4	4.8	4.1	3.6	3.6	3.4	3.9	4.3	3.9	5	4.5
Trade & transport	na	na	na	14.5	19.6	20.4	20.6	19.7	21.3	23	23.1	25	24.7	26.8	27.7	22.5
Other services	na	na	na	25.5	26.8	25.8	23.3	21.2	19.9	21.2	23.6	24.6	22.6	28.9	29.2	29.4
Crop production (million tons)																
Grains and pulses	42.7	45.6	35.5	33.9	24.6	35.5	26.5	24.6	24.4	39.7	38.8	20.2	41.8	38.0	34.3	29.3
of which:																
Wheat	23.7	21.8	13.9	16.3	13.5	18.4	14.9	13.6	10.2	21.3	20.6	3.6	17.5	17.9	14.0	13.9
Corn	4.1	3.8	1.5	3.4	1.8	5.3	2.3	1.7	3.8	3.6	4.2	6.9	8.9	6.6	6.4	7.4
Rye	1.2	1.2	0.9	1.2	1.1	1.3	1.1	0.9	1.0	1.8	1.5	0.6	1.6	1.3	0.6	0.6
Oats	1.1	1.5	1.4	1.1	0.7	1.1	0.8	0.8	0.9	1.1	0.9	0.9	1.0	0.8	0.7	0.6
Barley	9.1	13.6	14.5	9.6	5.7	7.4	5.9	6.4	6.9	10.2	10.4	6.8	11.1	8.8	11.4	6.0
Sugarbeet	36.4	33.7	28.1	29.7	23.0	17.7	15.5	14.1	13.2	15.6	14.5	13.4	16.6	15.6	22.4	17.0
Sunflower	2.3	2.1	1.6	2.9	2.1	2.3	2.3	2.8	3.5	2.3	3.3	4.3	3.1	4.3	5.3	4.2
Potatoes	17.5	21.0	16.1	14.7	18.4	16.7	15.3	12.7	20.2	17.3	16.6	18.5	20.8	19.5	19.5	19.1
Vegetables	6.0	6.1	5.1	5.9	5.0	5.2	5.5	5.3	5.7	5.9	5.8	6.5	7.0	7.3	8.1	6.8
Fruits and Berries	2.2	2.8	1.2	1.9	1.9	2.8	1.1	0.8	1.5	1.1	1.2	1.7	1.6	1.7	1.1	1.4
Animal production (million tons, except eggs)																
Meat	3.9	2.8	2.7	2.3	2.1	1.9	1.7	1.7	1.7	1.5	1.6	1.7	1.6	1.7	1.7	1.9
of which:																
Beef and veal	1.4	1.1	1.1	0.9	0.8	0.8	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.5	0.5	0.4
Pork	1.1	0.8	0.7	0.7	0.7	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5
Poultry	0.6	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.5	0.5
Milk	22.0	18.4	18.1	17.3	15.8	13.8	13.8	13.4	12.7	13.4	14.1	13.7	13.8	13.8	13.4	12.2
Eggs (billion)	15.0	11.8	10.2	9.4	8.8	8.2	8.3	8.7	8.7	9.7	11.3	11.5	12.0	13.0	14.2	14.0

*Notes: * Three-year average. ** % change in CPI, average over period.* *** Preliminary.*
Source: State Statistics Committee of Ukraine; IMF (various issues).

Appendix 2 Table 3: Characteristics of agricultural production in Ukraine by Oblast, averages for 2002-2005

Oblast	Share of Oblast in production of crops (%)					... of livestock products (%)					Share of Oblast in ... (%)			House-hold share of GAO(%)	Average monthly ag. wage (UAH)
	Wheat	Barley	Sugar-beet	Sunfl.-seed	Potato	Milk	Eggs	Beef	Pork	Poul-try	Gross agric. output	Gross crop output	Gross animal output		
Crimea	4.2	3.2	0.0	0.6	0.9	2.8	4.7	3.3	4.1	11.2	3.3	2.4	4.6	46.9	335
Vinnitsa	5.2	5.4	13.9	2.0	7.5	5.7	3.8	5.2	4.6	3.3	5.6	6.1	4.9	59.7	240
Volin	2.6	1.0	4.3	0.0	5.5	3.8	1.8	3.0	4.2	2.5	3.1	2.9	3.4	79.8	177
Dnipropetrovsk	6.8	8.0	2.5	13.6	3.0	3.7	6.3	2.6	5.5	10.3	6.0	6.5	5.4	51.9	351
Donetsk	5.2	5.8	0.3	11.2	3.5	3.9	10.2	4.0	5.7	6.2	5.5	5.3	5.7	59.5	421
Zhytomyr	1.7	1.8	3.8	0.1	5.7	5.1	3.4	3.8	3.3	2.1	3.4	3.1	3.9	70.0	193
Zakkarpattia	0.7	0.3	0.0	0.1	2.9	2.9	2.4	3.1	3.7	1.5	2.2	1.9	2.8	93.7	256
Zaporizhzhia	5.4	5.3	0.2	13.9	1.5	2.7	4.4	3.3	4.2	2.9	3.6	3.8	3.4	50.4	341
Ivano-Frankivsk	0.9	0.6	1.0	0.0	4.4	4.1	2.4	4.3	3.0	2.5	2.7	2.1	3.5	91.5	242
Kyiv	5.3	4.8	11.0	0.9	6.2	5.2	10.9	5.3	8.1	14.1	6.3	5.5	7.6	45.8	365
Kirovohrad	5.7	7.7	5.0	10.7	2.6	2.9	2.2	3.3	3.9	1.8	4.2	5.0	3.0	54.1	260
Luhansk	3.8	2.3	0.2	6.6	2.3	2.8	4.8	3.2	2.0	2.9	2.8	2.7	3.0	53.8	310
L'viv	2.5	0.9	3.0	0.0	7.7	7.1	4.4	6.5	3.9	4.2	4.5	3.9	5.5	89.8	205
Mikolaiv	6.2	7.4	1.4	8.7	1.0	3.1	2.1	2.2	1.5	1.3	3.2	3.6	2.5	48.1	298
Odessa	7.7	7.9	1.4	8.3	1.4	4.9	5.8	3.6	5.2	3.3	5.2	5.6	4.6	53.9	238
Poltava	5.5	7.0	8.6	5.9	4.2	5.0	4.5	3.6	3.0	2.1	5.1	5.9	3.9	49.5	275
Rivne	1.7	1.4	3.4	0.0	5.1	3.6	2.6	3.6	4.8	1.3	2.9	2.7	3.3	80.5	195
Sumy	3.0	3.8	5.0	0.7	4.7	3.6	2.8	4.6	4.0	2.6	3.4	3.3	3.6	57.7	255
Ternopil	3.1	2.8	8.4	0.0	4.1	3.6	2.4	4.3	1.9	1.9	3.0	3.1	3.0	74.6	194
Kharkiv	6.9	6.7	7.9	7.6	5.2	4.4	5.7	5.3	5.7	7.2	5.8	6.1	5.3	54.8	345
Kherson	5.1	4.0	0.3	5.1	1.2	2.6	2.1	3.2	3.0	1.6	3.3	3.7	2.7	61.4	301
Khmelnytsk	3.7	3.7	6.2	0.1	5.5	5.4	1.5	6.0	4.1	2.1	4.1	4.1	4.1	67.5	178
Cherkasy	4.1	5.5	7.1	3.5	4.5	3.8	3.9	4.9	5.5	7.3	5.0	5.1	4.7	49.9	288
Chernivtsi	0.7	0.6	1.4	0.2	2.2	2.6	2.0	2.7	1.9	0.8	2.0	1.8	2.3	85.5	201
Chernihiv	2.3	2.1	3.7	0.2	7.3	4.6	3.0	5.2	3.1	2.1	4.1	4.3	3.8	63.4	212
Ukraine	100	100	100	100	100	100	100	100	100	100	100	100	100	61.3	275

Source: State Statistics Committee of Ukraine, own calculations.

Appendix 2 Table 4: Ukrainian net exports of major agricultural commodities, 1995-2005 (thousand tons) and change 1995/97-2003/05 (%) – update

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Change 1995-97 to 2003-05 (%)
Wheat	25.8	963.6	809.0	2766.3	4524.4	-472.2	2670.2	8299.4	-2175.1	1960.7	6000.9	222
Rye	-28.6	185.4	21.5	0.8	271.8	3.1	13.3	467.7	-169.6	49.9	80.5	-122
Barley	451.5	1104.4	460.7	581.7	1065.1	841.8	2184.4	2818.1	1862.0	3686.7	3504.5	349
Oats	6.9	86.7	1.4	0.0	55.0	24.1	42.9	29.4	-0.2	22.6	4.3	-72
Maize	-2.5	141.4	56.9	581.5	282.6	71.2	364.9	492.1	921.6	1219.9	2787.4	2417
Sunseed	19.2	853.1	1072.1	906.6	432.7	833.0	582.5	67.3	866.3	349.5	32.5	-36
Sunoil	83.7	267.2	181.1	178.3	166.5	582.4	473.2	566.1	922.9	867.9	851.0	397
Sugar	987.5	813.1	693.7	-31.4	-252.2	-305.2	-442.4	-266.5	-1064.3	-244.3	-178.3	-160
Beef & veal	4.1	3.8	1.3	1.0	0.3	0.0	0.0	0.6	0.2	0.2	0.0	-96
Pork	-0.3	7.2	5.6	-2.4	2.5	9.1	-1.7	-0.2	2.7	-41.4	-45.8	-776
Milk & dairy	1362	790	103	264	310	1050	1800	866	1071	2046	n.a.	107

Source: State Statistics Committee of Ukraine and own calculations.

Appendix 2 Table 5: Ukrainian exports of agricultural commodities, total and by destination* (tons)

Product	Total exports	Top 4 destinations			
		1st	2nd	3rd	4th
Cheese	116210	Russia (112213)	Kazakhstan (1519)	Moldova (1406)	Romania (851)
Butter	24369	Russia (20512)	Armenia (930)	Azerbaijan (733)	Kazakhstan (729)
Non-fat dry milk powder	56542	Russia (18506)	Algeria (18479)	Japan (5002)	Bulgaria (2116)
Whole dry milk powder	19875	Algeria (7400)	Russia (6215)	Turkey (1430)	Georgia (740)
Sunflower seed	11561	EU-25 (4249)	Turkey (141)	Bulgaria (48)	Georgia (40)
Sunflower seed meal	861598	EU-25 (388488)	Belarus (200965)	Israel (102046)	Morocco (81925)
Sunflower seed oil	641760	EU-25 (196378)	Switzerland (90989)	Russia (90423)	Turkey (34695)
Rapeseed	81054	EU-25 (48789)	Turkey (2930)	USA (2772)	India (1043)
Sugar	50416	Moldova (32874)	EU-25 (9446)	Afghanistan (3607)	Uzbekistan (2704)
Wheat	3788942	EU-25 (1609478)	Israel (459952)	Tunesia (367990)	Indonesia (233813)
Barley	4144043	Saudi Arab. (1660355)	Jordan (505296)	Iran (433367)	Syria (419105)
Maize	1686429	Iran (369915)	Israel (286244)	EU-25 (251246)	Belarus (187506)
Peas	201177	EU-25 (140614)	India (37685)	Belarus (4103)	Russia (887)

Source: State Statistics Committee of Ukraine and own calculations.
*Note: * Dairy export data are for the 2005 calendar year, all other data for the 2004/05 marketing year.*

Appendix 2 Table 6: Forecasted development of world trade in selected agricultural products, and Ukraine's share in this trade, 2004-06 to 2015

Product	World (exports in '000 tons)			Ukraine (exports in '000 tons)			Ukraine's share of world exports (%)*		
	Average 2004-06	Forecast 2015	Change	Average 2004-06	Forecast 2015	Change	Average 2004-06	Forecast 2015	Change** (%-points)
Butter	649	719	70	34	25	-9	5.2	3.5	-1.7
Cheese	1186	1610	423	108	131	23	9.1	8.1	-1.0
Non-fat dry milk	1127	1468	342	64	49	-15	5.7	3.4	-2.3
Whole milk powder	1661	2065	404	19	16	-3	1.1	0.8	-0.4
Beef and veal	5617	6973	1355	62	-52	-114	1.1	-0.7	-1.8
Pork	4035	5018	984	-61	-69	-9	-1.5	-1.4	(0.1)
Broilers	5851	7582	1730	-162	-79	83	-2.8	-1.0	(1.7)
Sunflower seed***	1359	1459	101	486	315	-171	35.8	21.6	-14.2
Sunflower oil***	2241	3016	776	929	1436	507	41.5	47.6	6.2
Sunflower meal***	2492	3152	660	1304	1705	401	52.3	54.1	1.8
Barley	18115	20496	2380	4138	3744	-394	22.8	18.3	-4.6
Maize	74435	88760	14325	2463	2996	533	3.3	3.4	0.1
Wheat	90003	105733	15730	5148	5853	705	5.7	5.5	-0.2

Source: Own calculations with FAPRI (2006).

*Note: * A negative share of world exports (shaded cells) indicates that Ukraine is a net importer. ** Values in brackets indicate that the increase in question results from a reduction in Ukraine's share of world imports. ***For sunflower products, FAPRI (2006) data and forecasts refer to the CIS as a whole. It is assumed that Ukraine will participate proportionately in the increases depicted here.*

Appendix 2 Table 7: Total fiscal support to agriculture in Ukraine, 1992-2006 (million UAH)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Budget expenditures	5.4	81.4	1086.5	8999.7	1269.1	872.5	943.2	935.1	1035.7	1741.5	1,473.1	2,827.8	3,250.5	5,592.1	8,648.1
Tax expenditures	0.01	0.06	232.6	696.5	501.6	774.3	1261.8	2768.0	1771.0	1941.0	3,349.7	3,424.6	3,563.7	5,677.7	5,769.9
Other fiscal support***	na	na	na	na	na	na	na	na	na	na	13.1	318.0	184.8	214.5	Na
Total fiscal support to agriculture (TAFS)	5.4	81.5	1319.2	1596.3	1770.0	1646.8	2205.0	3703.1	2806.7	3682.5	4,835.9	6,570.3	6,999.0	11,484.3	12,448.4
Share of TAFS in GDP	10.7%	5.5%	11.0%	2.9%	2.2%	1.8%	2.1%	2.8%	1.6%	1.8%	2.1%	2.5%	2.0%	2.6%	2.7%
Ratio of tax proceeds from agriculture to TAFS	na	na	na	na	na	na	na	na	na	na	34.6%	19.6%	23.6%	na	na
Ratio of tax proceeds from agro-food sector to TAFS	na	na	na	na	na	na	na	na	na	na	120.5%	87.6%	87.9%	na	na

**** Includes expenditure on intervention measures (mainly grain) as well as expenditure on the agricultural machinery leasing program by the state enterprise Ukragroleasing.*
Source: 1992-2001 – World Bank & OECD (2004, Table 3.6); 2002-2006 – own calculations using Ministry of Finance of Ukraine and Laws on Budget.

Appendix 2 Table 8: Nominal rates of assistance to agricultural industries and fiscal support for agriculture in Ukraine, 1992-2005 (%)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
NRAs for individual importables														
Sugar	11.5	4.3	3.4	-48.5	181.4	21.0	-0.9	-0.1	14.9	27.7	42.8	63.2	28.6	73.9
Poultry	-48.4	6.0	14.6	-14.9	-1.4	45.4	69.9	0.2	53.1	43.9	93.8	66.2	58.9	95.3
NRAs for individual exportables														
Wheat	-68.3	-34.1	75.2	-34.0	-45.2	103.8	16.1	-16.4	-43.1	-1.7	-9.3	-38.1	-21.4	-17.3
Maize	-19.4	76.0	44.6	-23.6	-8.6	-23.3	-15.8	9.1	-20.2	-5.6	-5.9	14.4	-25.0	-2.9
Rye	-40.0	8.5	161.3	49.3	30.4	8.4	17.7	40.8	11.5	37.2	-4.1	16.9	2.3	23.4
Barley	-59.3	27.9	16.7	-26.6	-8.2	-5.2	13.9	-21.4	-14.3	-18.0	-20.4	9.1	-9.9	-13.2
Oats	-61.1	-6.3	415.6	154.5	34.0	27.2	-23.2	43.1	39.8	11.6	3.1	83.9	11.9	69.4
Oilseeds	-46.7	15.4	12.7	-27.9	-21.4	-22.3	-31.5	-32.7	-28.9	4.8	-34.0	-24.6	-9.5	-19.4
Milk	-48.8	8.5	-33.8	-47.9	-35.9	-7.2	-3.5	-30.0	-35.1	-30.4	-31.8	-19.1	-17.2	3.5
Beef and Veal	-18.9	40.8	-18.6	-48.8	-15.3	11.2	-14.4	-13.4	6.8	6.3	-7.5	10.1	-16.6	20.7
Pigmeat	-63.4	-42.5	-36.0	-50.9	1.1	-9.4	36.9	16.5	1.0	38.7	12.8	-29.7	-5.6	48.2
Eggs	-40.1	-9.0	11.7	9.3	92.0	75.2	88.4	42.1	-8.7	-7.1	-30.2	-47.2	-38.0	-20.9
Importables	**-22.1**	**4.8**	**6.1**	**-42.4**	**81.9**	**29.4**	**21.1**	**0.1**	**-27.3**	**34.6**	**64.1**	**4.0**	**43.4**	**86.6**
Exportables	**-49.8**	**-0.7**	**-6.7**	**-38.8**	**-23.1**	**8.9**	**5.3**	**-15.1**	**-17.2**	**-6.7**	**-18.2**	**-13.9**	**-17.9**	**-2.4**

Source: von Cramon-Taubadel et al. (2007).

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