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When Will Ukraine be a Global Player on World Agricultural Markets?

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(When) Will Ukraine be a Global Player on World Agricultural Markets?

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Abstract:

Competitiveness has been a subject of considerable attention in agricultural economics. In this paper we study the development of the international competitiveness of Ukrainian crop production between 1996 and 2001 using the concepts of Domestic Resource Cost and Private Cost Ratio. We distinguish between ‘average’ and ‘best’ farms to get a comprehensive picture of farm competitiveness in Ukraine.

Our main conclusion is that agriculture responds quickly to incentives, and there are indications that Ukrainian agriculture has entered a phase of dynamic development. A shortage of human capital and physical bottlenecks in grain and oilseeds marketing could limit this development in coming years; if policy makers respond to these risks Ukraine could easily be a global player by the end of the current decade.

Key words: Competitiveness, Domestic Resource Cost, Private Cost Ratio, farm heterogeneity, Eastern Europe

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1 Introduction

Ukraine has a considerable physical agricultural potential. It combines a large area (33.3 mill. ha. of cropland and 7.5 mill. ha. of permanent pasture) with fertile soils (roughly 40% of the world's black soils), year-round ice-free ports and proximity to key import markets in the Middle East, Northern Africa and, potentially, the EU. The mention of Ukraine still conjures up visions of boundless fields of grain, of a European breadbasket (VON CRAMON-TAUBADEL and ZORYA, 2001a). But when will Ukraine live up with its potential?

Surely, the expected potential has not been realised in the first 10 years of transition. Between 1991 and 2000, gross agricultural production declined by 39% (in 1996 constant prices). Moreover, the share of agriculture in GDP shrank from 20% in 1990 to only 11% in 2000. Only in 2000 did agricultural output in Ukraine grow by 9% (UEPLAC, 2001). Although this increase in agricultural production continued in 2001, Ukraine is still far from being the bread basket that it once was, and was expected by many to become again. Has the potential of Ukrainian agriculture been overstated? Or is the amount of institutional reform and enterprise restructuring required to tap Ukraine's existing potential much larger than initially anticipated?

To answer this, one must look beyond averages. Farm performance in Ukraine is very heterogeneous due to differences in how farmers attempt to overcome the rigidities of the transition period and in their management skills. Therefore, it is very misleading to treat agriculture in Ukraine as one large 'kolchose' when evaluating competitiveness (STRIEWE *et al.*, 2001, p. 62). As stated by STIGLITZ (1998, p. 109) "it may be less important to know what sector to expand than to find some niche within a particular sector. The success of a project is likely to be highly dependent on finding good managers and providing good incentive structures". By looking beyond the averages, it is possible to find out how efficient the current best practice farms in Ukraine are and how far Ukraine's best practice is from that of major competitors. This will help to determine the true extent of Ukraine's agricultural potential and when it might be realised.

Using Domestic Resource Cost analysis and farm level data, we attempt to cast light on these questions. In section 2 different concepts of farm competitiveness and how competitiveness can be measured are discussed. In section 3 farm competitiveness in crop production in Ukraine is evaluated on the basis of Domestic Resource Costs (DRC) and Private Cost Ratios (PCR). Moreover, differences in competitiveness within the sector are analysed and the use of averages is discussed. In section 4 we discuss possible scenarios of Ukraine's agricultural development and Ukraine's future role on world markets. Section 5 concludes.

2 Farm competitiveness in transition economies

2.1 *The concept of farm competitiveness*

The notion of competitiveness is complex and sometimes controversial. There is no single definition of competitiveness in the economic literature. The difficulties in defining competitiveness are due to the various dimensions of this concept. A widely used definition is provided by FREEBAIRN (1986, p. 2): "Competitiveness is an indicator of the ability to supply goods and services in the location and from and at the time they are sought by buyers, at prices that are as good as or better than those of other potential suppliers, while earning at least the opportunity cost of returns on resources employed." FROHBERG and HARTMANN (1997) also stress the importance not only of output markets, but of factors markets as well. In the same

vein, the OECD combines the issues of external balance and domestic performance, defining competitiveness as “the ability to produce goods and services that meet the test of foreign competition while simultaneously maintaining and expanding of domestic real income” (OECD/TEP, 1992, p. 237 cited in OECD, 1998). Analyses of competitiveness differ with respect to the level of investigation. According to FROBERG and HARTMANN (1997), studies can be carried out at various levels of product aggregation: across the entire economy, for a specific industry, or for a single product. Our analysis is conducted at the farm level.

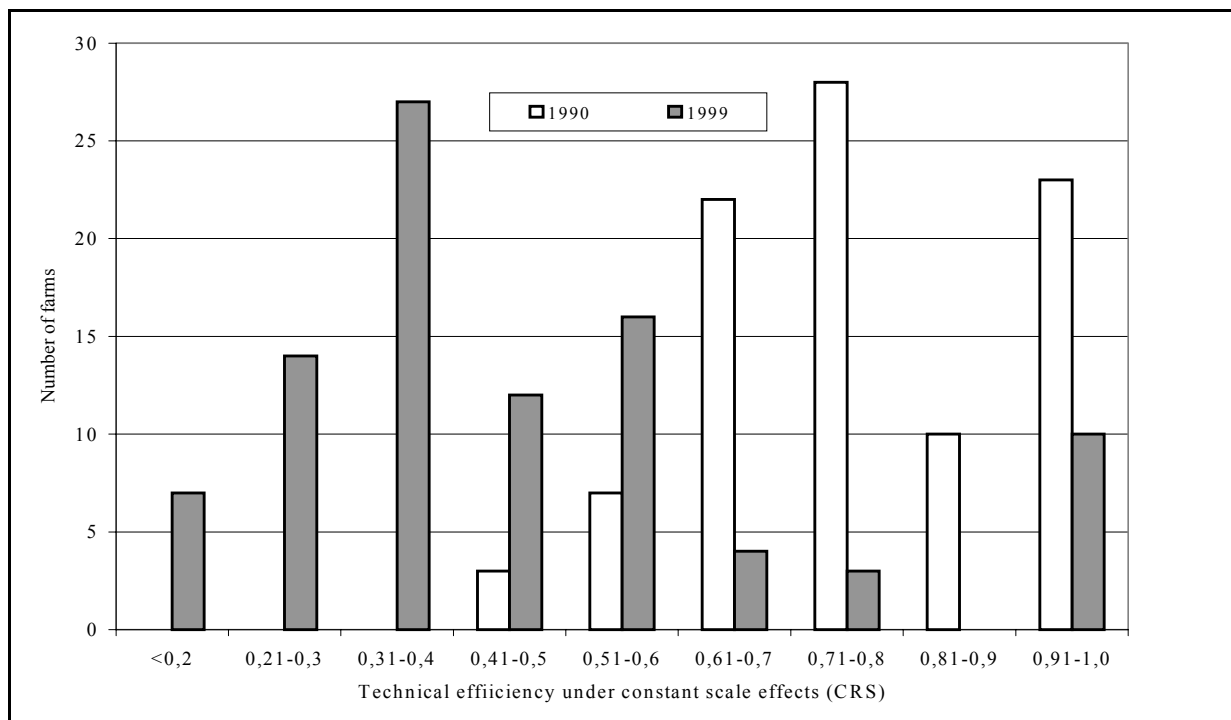
Different indicators can be used to measure competitiveness. Among these indicators, Domestic Resource Cost (DRC) ratio and the related Private Cost Ratio (PCR) are the most widely used in studying farm competitiveness in developing countries (see MONKE and PEARSON, 1989; TSAKOK, 1989). In most studies of farm competitiveness in Central and Eastern Europe, the DRC has been used to measure the international competitiveness of sub-sectors within agriculture, different products and different types of farms. Many of these studies simulate farm competitiveness in the event of EU membership (see HUGHES and HARE, 1992; 1994; MICHAEL *et al.*, 1993; BANSE *et al.*, 1998; BANSE *et al.*, 1999; RATINGER, 1999; BOJNEC, 1999; TILLAC and PIRSCHER, 2000). BANSE *et al.* (1999) present DRC calculations for different types of farm in Hungary. They find that commercial co-operative farms are more internationally competitive in crop production, while individual private farms up to 15 ha perform better in livestock production. However, in most studies the importance of differences between farms is not addressed.

Due to the trials and uncertainties of the transition process, the performance of farms in Central and especially Eastern Europe is very heterogeneous. Ukraine is a good example. In 2000, 52% of the large farms incurred losses (MINISTRY OF AGRICULTURAL POLICY IN UKRAINE, 2000). At the same time well-managed farms reached profitability in winter wheat production of 50%² (YUZKO, 2001). At least until 2000 the technical efficiency of Ukrainian farms decreased on average (KURKALOVA and JENSEN, 1996; MUROVA, 2000). At the same time, LISSITSA and ODENING (2001) find that in terms of technical efficiency, the heterogeneity of former collective farms in Ukraine increased between 1991-1999 (figure 1). Similarly, STRIEWE *et al.* (2001) use data on the profitability of large farms in Ukraine in 1998 and 2000 to demonstrate that the average profitability of all farms (-41.6% in 1998 and 8.4% in 2000) masks a great deal of variability between farms (for example from -92% in the first quintile in 2000 to 69% in the fifth quintile). Recent data from the STATE STATISTICS COMMITTEE OF UKRAINE confirms that the farm profitability varies widely in Ukraine (see figure 2). Clearly, average figures should be used very cautiously when drawing conclusions for the whole sector.

Of course, farm sectors are heterogeneous in most countries. But there is reason to believe that this is especially true in transition economies where market disciplines that lead to exit – such as bankruptcy and competition for scarce resources such as land – do not yet function fully. Consider, for example, that BRÜMMER and LOY (2000) find that in Schleswig-Holstein, Germany, during the period of 1987-1994, only 10% of the dairy farms in a panel sample displayed a substantial degree of inefficiency. We therefore suggest that in order to cast light on the true competitive potential of Ukrainian agriculture, it is important to avoid the pitfalls of data on average performance and focus instead on those farms that have succeeded in performing well in recent years.

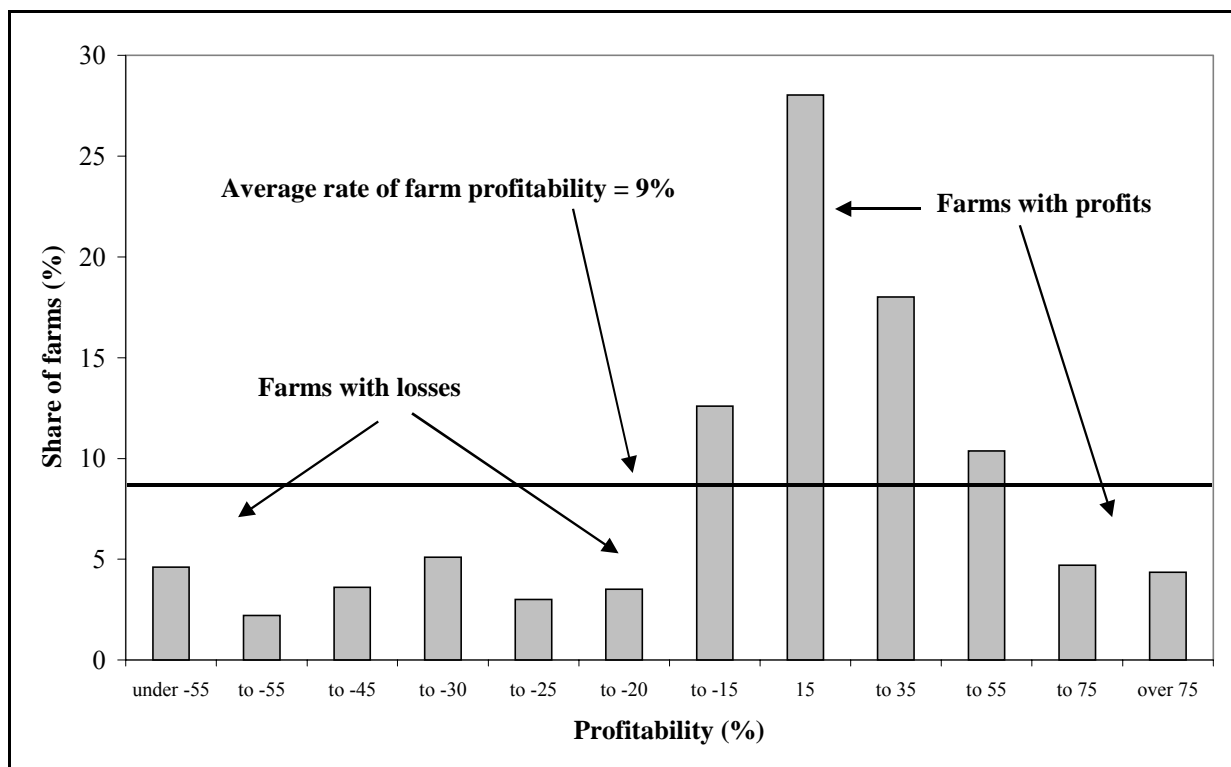
² According to the methodology applied in Ukraine, the rate of profitability is defined as the ratio of gross profit to total costs (production and marketing costs).

Figure 1: Distribution of technical efficiency in Ukraine in 1990 and 1999



Source: LISSITSA and ODENING (2001, p. 16).

Figure 2: The profitability of Ukrainian farms in 2000



Source: STATE STATISTICS COMMITTEE OF UKRAINE (2001).

2.2 Indicators of competitiveness

In the following, competitiveness is judged on the basis of Domestic Resource Cost (DRC) and Private Cost Ratio (PCR) calculations.³ The DRC compares the opportunity cost of domestic production (e.g. the costs of using domestic primary resources – land, labour and capital) to value-added at border prices (TSAKOK, 1990):

$$DRC_i = \frac{\sum_{j=k+1}^n a_{ij} V_j^s}{P_i^s - \sum_{j=1}^k a_{ij} P_j^s} \quad (1)$$

where a_{ij} ($j = k+1$ to n) in the numerator are the technical coefficients for primary domestic resources and non-traded intermediary inputs (i.e. the amount of input j required to produce one unit of output i), and V_j^s are the social prices of these domestic resource and non-traded intermediate inputs. The P^s are the border prices of either output i or input j , while a_{ij} ($j = 1$ to k) in the denominator are the technical coefficients (units of input j per unit of output i) for traded inputs.

Social prices are undistorted border market prices. For exported outputs/inputs, FOB export prices adjusted for marketing costs are used. For imported goods, CIF prices plus import tariffs adjusted for the marketing costs are used. The estimation of social prices of domestic factors is not straightforward. According to theory, primary domestic resources as well as non-traded intermediary inputs are estimated at the ‘second-best’ social price to represent the contribution of the resource at the margin (BOJNEC, 1999).

For DRC calculations the actual nominal exchange rate is used. The DRC is an indicator of the relative efficiency of producing a dollar’s worth of value-added by the producer of a certain product (BOJNEC, 1999). When the DRC is <1 , but still positive⁴, domestic production is efficient and internationally competitive, because the opportunity cost of using domestic resources is smaller than the net foreign exchange gained from export or saved by substituting for imports. The opposite is true when the DRC is >1 .

The PCR is defined as the ratio of the opportunity cost of primary domestic resources and non-traded intermediate inputs to value-added at private (domestic) prices:

$$PCR_i = \frac{\sum_{j=k+1}^n a_{ij} V_j^p}{P_i^p - \sum_{j=1}^k a_{ij} P_j^p} \quad (2)$$

3 Another common indicator of international competitiveness is the *Social Cost-Benefit Ratio*. This indicator treats the costs of tradable and non-tradable inputs equally, which eliminates the possible bias in the DRC if tradable inputs and domestic factors are substantial substitutes among different types of farm (MASTERS and WINTER-NELSON, 2000). This indicator would be useful if we were comparing the competitiveness of large farms and private household plots in Ukraine. As we examine only large commercial farms, the inclusion of this additional measure generates no additional insights.

⁴ The DRC is negative if the activity in question is value subtracting.

where all terms are as in equation (1) and the superscript ‘P’ indicates that private prices are used instead of social ones. Since the PCR is measured at private (or actual) prices which are often distorted by different policy measures such as import tariffs or input subsidies, it can be compared with the DRC to determine the impact of distortions (taxation or subsidisation) on farm competitiveness.

3 The competitiveness of crop production in Ukraine

Extensive data is required to produce the following results, and in some cases important assumptions have to be made. The collection and processing of the data we use is outlined in appendix 1 at the end of this paper.

3.1 Estimation

This study covers six crop products for the period from 1996 to 2001: winter milling wheat, winter feed wheat, winter feed barley, corn, sunflower, and sugar beet. In table 1 the indicators of competitiveness of an ‘average’ Ukrainian farm are presented. Both DRC and PCR indicators show that Ukrainian farms are uncompetitive on average. At both social and private prices, these farms use scarce resources inefficiently as the opportunity cost of using domestic resources is larger than the net foreign exchange gained from export or saved by import substitution.

Table 1: Private Cost Ratio and Domestic Resource Cost for crop production on average Ukrainian farms, 1996-2001

	1996	1997	1998	1999	2000	2001
Private Cost Ratio						
Winter milling wheat	2.19	2.02	2.03	2.78	0.90	1.14
Winter feed wheat	5.98	4.12	5.62	4.78	1.66	3.53
Winter feed barley	3.29	2.47	4.79	3.68	1.03	1.51
Corn	1.22	1.73	3.42	3.00	1.12	1.28
Sunflower seeds	3.38	3.29	4.31	3.05	2.17	1.27
Sugar beet	2.00	2.22	2.93	10.09	2.41	3.01
Domestic Resource Cost						
Winter milling wheat	1.93	2.09	1.83	2.73	1.11	1.74
Winter feed wheat	2.87	3.27	5.04	4.93	6.37	4.10
Winter feed barley	2.62	2.39	3.83	4.02	2.04	1.58
Corn	1.17	1.45	5.14	3.33	1.47	1.39
Sunflower seeds	2.08	1.92	2.24	2.27	1.23	1.80
Sugar beet	2.90	5.45	3.37	11.25	2.67	4.78

Source: Own calculations.

The differences between the PCR and DRC values in table 1 are explained by effective protection rates (table 2). Before 1999, grain producers were effectively taxed. Ukraine exports grain (except milling wheat in 2000) and Ukraine does not use any price support schemes or export subsidies. Due to high marketing costs and various administrative barriers, domestic prices were lower than world market prices. In 2000, domestic grain prices increased substantially due to a poor harvest and the need to import milling wheat. In 2001 Ukraine returned to an export situation for grain.

Domestic value-added in sunflower production was depressed by direct (export tax and high marketing costs) and indirect administrative measures. In 2001 domestic value-added sharply increased due to an increase in domestic seed prices over the world market level

following a low sunflower seed harvest and strong demand from domestic crushers under expectation of increased export opportunities.

As Ukraine is in import situation with sugar, prices for sugar beet exceed corresponding world market prices. In 1999 a production quota system was introduced in Ukraine. Together with constant sugar shortages it inflates domestic sugar beet prices and thus, the value-added.

But note that these coefficients should be treated with caution. First of all, Ukraine is a large country with poorly integrated markets. Furthermore, different prices obtain in different marketing channels. This is especially important for the years 1996-1999 when barter was intensively used and price dispersion was huge. Finally, recall that the period from August to December – as the period of the highest output sales – is used to calculate average prices. If one compares these calculations with those for calendar or marketing years, the results could be quite different.

Table 2: Effective rates of protection for crop products in Ukraine, 1996-2001

	1996	1997	1998	1999	2000	2001
Winter milling wheat	-0.12	0.04	-0.11	-0.05	0.14	0.26
Winter feed wheat	-0.52	-0.21	-0.11	0.00	2.56	0.05
Winter feed barley	-0.20	-0.03	-0.21	-0.07	0.68	-0.03
Corn	-0.07	-0.16	0.49	0.08	0.24	0.04
Sunflower seeds	-0.35	-0.38	-0.45	-0.24	-0.45	0.40
Sugar beet	0.62	2.08	0.34	0.36	0.17	0.68

Note: Effective rate of protection is defined as ((value added at private prices - value added at social prices/ value added at social prices) - 1). A positive (negative) value indicates effective protection (taxation).

Source: Own calculations.

3.2 *The international competitiveness of best practice farms in Ukraine*

Based on table 1, one might conclude that Ukrainian agriculture as a whole is highly uncompetitive. However, the sector does include some farms which perform very well and may provide a better indication of true potential. According to DUAP (2001), the managers of large farms in different oblasts, NEDOBOROVSKYY (2001), YUZKO (2001) and several input suppliers, the share of profitable farms in Ukraine during the observed period was around 10-20%. Due to substantial reform efforts in 2000 and 2001, this figure has grown to perhaps 20-30%. The best farms in Cherkassy oblast harvest 60 dt/ha of wheat, while the oblast average is 25-30 dt/ha. In Zhytomyr oblast in 1999 the best farms harvested 305 dt/ha of sugar beet, while the regional average was only 126 dt/ha (NEDOBOROVSKYY, 2001). Finally, the distribution of farms according to their technical efficiency and profitability (figures 1 and 2) clearly shows that not all farm are unprofitable and uncompetitive in Ukraine.

Best practice farms use their inputs more efficiently. And the internal reserves to increase efficiency on the large post-soviet farms are substantial. For example, seeding densities could be reduced at least by 30% (see BENECKE, 2000; STRIEWE *et al.*, 2001), simultaneously increasing yields and reducing seed costs.⁵ The best farms also purchase hybrid sorts with higher yield potential. According to PIONEER HI-BRED (2001), the yield

⁵ In Germany some farms use no more than 150 to 250 kernels/m² and still reach yields of 100 dt/ha, while in Ukraine the typical seeding norm is 600 kernels/m².

potential of company corn hybrid varieties is 14t/ha under standard humidity conditions, compared to only 5 t/ha for the best Ukrainian varieties. The potential yields of Pioneer sunflower seeds are 5 t/ha with oil content 55-59%, while Ukrainian varieties give maximum 2 t/ha with much lower oil content.

Best practice farms in Ukraine apply much more fertiliser and chemicals than the average farms. In 1999 farms on average applied only 18 kg/ha of fertilisers in Ukraine (INSTITUTE FOR AGRICULTURAL ECONOMICS, 2000). Most farms substitute chemicals with cheap labour, but the best farms apply around US\$ 50-60/ha. ZASTAVNYIY (2001) argues that under-application of chemicals decreases wheat quality (farmers loose US\$ 100/ha) and 30% of the yield (US\$ 85/ha). Hence, he states in 2001 the farmers lost around US\$ 660 mill. due to unbalanced and inadequate chemical use in grain production.

Best practice farms not only use more inputs, they use them more efficiently, employing better management practices. DREWS and MEIER (2000) study different technologies of sugar beet production in Ukraine and find significant untapped potential. More balanced fertilisation alone can increase revenues by as much as US\$ 840/ha. Ukrainian farm managers often argue that they are “too poor to experiment”, but those who do experiment and manage their businesses efficiently are able to identify and tap reserves of this type. LISSITSA and ODENING (2001) find that roughly 60% of the variation in farm efficiency in Ukraine can be explained by management skills.

It is interesting that a recent study of the Ukrainian dairy sector produces similar results as we have for crop products. According to VENEMA (2002), around 20% of the milk producers in Ukraine are highly competitive in terms of generating profits and maintaining low production costs. The rate of profitability of the best Ukrainian milk farms is 26%, while the rate of profitability of a typical German milk farms varies from 13 to 26%⁶. Moreover, milk production costs in Ukraine are very low compared with major international competitors (see figure 3).

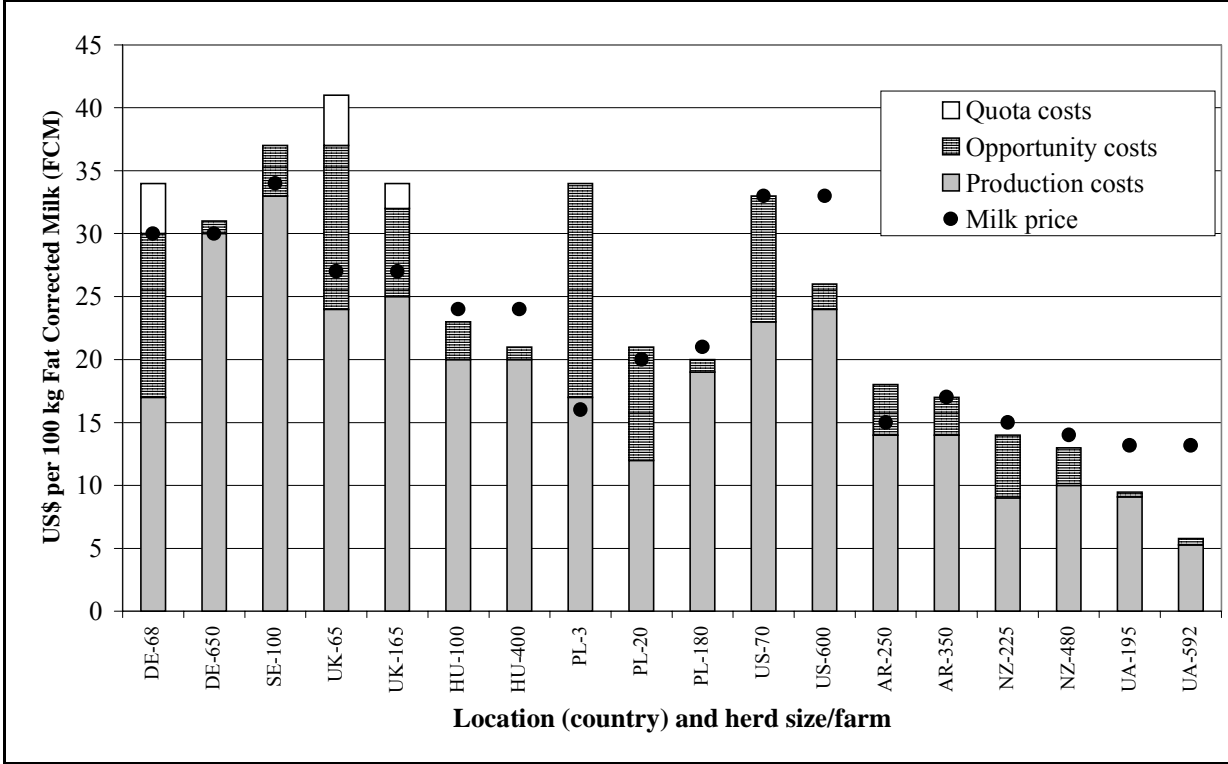
PCR and DRC estimates for the best practice crop farms are presented in table 3. The best practice farms show much better results than average farms, although until 2000 the production of most crop products was uncompetitive at both private and social prices. Beginning in 2000, the best Ukrainian farms competitively produce winter food wheat, barley, corn and sunflower seeds. Sugar beet remains uncompetitive, which confirms the results of a detailed analysis of sugar beet production in Ukraine carried out by BENECKE (2000).

The year 2000 represents a turn-around because, as mentioned above, substantial reforms were implemented in late 1999 and early 2000. These include, most importantly, the withdrawal of the state from farm input supply (which in the past inevitably involved the state in output marketing), and the distribution of land shares to farm members and associated restructuring of many large farms. These reforms greatly increased the scope for good managers to respond to market price signals and improve the efficiency of their operations (see VON CRAMON-TAUBADEL *et al.*, 2001 on recent changes in Ukrainian agriculture). Moreover, among the ‘large’ CIS countries, Ukraine has made the most progress in liberalising the market for farm land. A Land Code that will permit land sale as of January 1, 2005 was signed into law in October 2001, and land lease was legalised in 1998. Despite the temporary moratorium on land sales, the Land Code represents substantial progress from a

⁶ Here, the rate of profitability rate is calculated as a ratio of profit to revenue (German methodology), instead of the rate of profit to production costs (Ukrainian).

psychological point of view in that it represents a major defeat for the left wing forces that continue to advocate collective farming and intensive state intervention.

Figure 3: Milk prices and costs in major milk producing countries in 1999



Note: DE-Germany, SE-Sweden, UK-the United Kingdom, HU-Hungary, PL-Poland, US- the USA, AR – Argentina, NZ – New Zealand, and UA – Ukraine. Numbers following abbreviations list the herd size, based on the FAL International Farm Comparison Network’s (IFCN) ‘typical’ competitor farms in the country in question.

Source: ISERMEYER (2001) and VENEMA (2002).

These changes were accompanied by (indeed also contributed to) strong overall economic growth (in 2000 the real GDP grew by 5.8%) and improved macroeconomic conditions (for example, the real interest rate fell by 13.2% to 24% in 2000 in comparison to 1999). In 2001 economic growth even accelerated, reaching 7.3% (GDP, year on year, see IER, 2002). The food processing industry has been an engine of this recent economic growth in Ukraine. Food processors are beginning to compete for the clients (i.e. raw commodity suppliers) rather than ‘capturing’ these clients with the help of administrative interference (e.g. barriers to inter-regional trade). The result is increased farm-gate price and a reduction in the hold-up problems characterised by excessively long payment delays for delivered products (GOW and SWINNEN, 1998).

As a result of all these factors, agricultural gross output grew by 9% in 2000 and further growth of roughly 10% is expected in 2001 (AGRIUKRAINE, 2001). We conclude that, on average, Ukrainian farms were and remain uncompetitive. But some farms perform substantially better than the average, and since 2000 these farms are internationally competitive. Although the share of these farms is small, it is growing rapidly, supported by recent reforms and improvements in the economic environment.

Table 3: Private Cost Ratio and Domestic Resource Costs for crop production on best practice farms in Ukraine, 1996-2001

	1996	1997	1998	1999	2000	2001
Private Cost Ratio						
Winter milling wheat	1.14	1.37	1.29	1.34	0.38	0.61
Winter feed wheat	2.79	3.00	3.87	2.17	0.65	1.55
Winter feed barley	1.59	1.82	3.52	2.32	0.62	1.46
Corn	0.65	1.14	1.74	1.49	0.68	0.69
Sunflower seeds	1.97	2.47	2.36	1.78	2.05	0.71
Sugar beet	0.92	0.88	1.15	1.96	1.31	1.27
Domestic Resource Cost						
Winter milling wheat	1.01	1.42	1.15	1.30	0.45	0.86
Winter feed wheat	1.44	2.26	3.23	2.12	1.66	1.66
Winter feed barley	1.00	1.07	1.34	1.45	0.86	0.86
Corn	0.63	0.95	2.42	1.54	0.87	0.72
Sunflower seeds	1.13	1.24	1.10	1.19	0.95	0.94
Sugar beet	1.20	1.78	1.31	2.00	1.42	1.67

Source: Own calculations.

4 The future of Ukraine on world agricultural markets

Will Ukraine ever become a global player on world agricultural markets? We begin by sketching two scenarios. Under the pessimistic scenario Ukraine does not become a global player. Advocates of this view would refer to the results in table 1. And from the static point of view they are right. Currently Ukraine's agriculture is dominated by uncompetitive farms. Moreover, the emergence of a competitive agriculture is hindered by Ukraine's poor general economic development (ZORYA, 2001a), illiberal trade policies (VON CRAMON-TAUBADEL and ZORYA, 2001a and 2001b), rigidities and inefficiencies upstream and downstream from agriculture (VALDES, 1997; VON CRAMON-TAUBADEL and STRIEWE, 1999a; ZORYA, 2001b), the crowding out of private investments in agriculture (SEDIK *et al.*, 2000; STRIEWE *et al.*, 2001), and institution weaknesses in the formulation and implementation of agricultural policy (BOSTYN and BOYTSUN, 2001; VON CRAMON-TAUBADEL and ZORYA, 2001a). Given these weaknesses and distortions of agricultural development in Ukraine, it is possible to conclude that Ukrainian agriculture will remain uncompetitive for the foreseeable future.

The optimistic scenario is based on the evidence of competitive best practice farms presented in table 3. If recent positive developments in agriculture and the economy as a whole continue, a critical threshold could be crossed, leading to rapid improvements in the responsiveness and efficiency of the Ukrainian farm sector.

Two recent developments are instructive in this respect. The first concerns grain production. As a result of very distortive agricultural policy in 1994-1999, Ukraine's grain output decreased from 34 mill. tons in 1995 to 24.4 mill. tons in 2000. After only one year of the above mentioned reforms and in response to high grain prices in 2000, in 2001 Ukraine harvested 40 mill. tons of grain, 63% more than in the previous year. As a result, Ukraine is expected to export 6-7 mill. tons of grain in the current marketing year, and farmers and traders in the EU are talking about pressure from 'Baltic' grain on the market.

The second development concerns sunflower seeds. The sunflower seed market benefited from a relatively low level of government interference in the mid-1990s and as a result, sunflower was the most profitable major crop in Ukraine (VON CRAMON-TAUBADEL and STRIEWE, 1999b). Exports accounted for 50% of total sunflower output and Ukraine

accounted for around 10% of the world sunflower seed market. In 2000 the producers responded to these positive conditions by increasing sunflower production by 25%. In 2001 implemented a 17% export tax and a policy of not refunding value-added tax to sunflower exporters. As a result, sunflower producers switched their resources to the grain production and gross output promptly fell 38%.

The conclusion is that the farmers in Ukraine are increasingly responding to incentives and disincentives as farm managers 'learn the ropes' on the one hand, and are given increasing freedom to respond and decide on the other. The key question is how quickly might the current distribution of Ukrainian farms 'shift to the right' in terms of performance and competitiveness? In other words, how quickly will less efficient farm structures and managers be forced to exit, freeing resources for use by others?

There is reason to believe that, once initiated, this process can take place quite rapidly. The experience of other former centrally planned economies suggests that farms can quickly restructure and become competitive when free to respond to incentives. The fast growing Central European countries such as Hungary, Czech Republic and Poland recovered from their initial agricultural output declines in 1992-94, stabilised and gradually increased their yields (ZMP) and labour productivity (SWINNEN, 2001). ISEMEYER (1995), THIELE and BRODERSEN (1997), and BRODERSEN and THIELE (1999) discuss various aspects of the restructuring of agriculture in East Germany, pointing out, *inter alia*, that many former collective farms in East Germany are highly competitive and that, by many measures of productivity and efficiency, the East German farming sector as a whole, in less than one decade, had surpassed its West German counterpart.

We would be guardedly optimistic, at least arguing that the experience of the last 10 years should by no means be interpreted as evidence that Ukraine's basic agricultural potential has been overestimated. Instead, after a 'wasted' decade of stagnation, there are indications that the transition of agriculture is entering a dynamic phase. If this phase continues, the second decade of transition could very well see Ukraine tapping its physical potential and joining the major exporters of grains and oilseeds as a major player on world markets.

Two main bottlenecks could prove critical in this respect. One concerns human capital and the need to draw from a large pool of capable farm managers with the required technical, economic and motivational skills. The required skills are not taught in a systematic fashion by the educational and training systems in Ukraine and the decade of stagnation has driven many suitable candidates out of agriculture. The other bottleneck is physical and concerns marketing infrastructure, in particular the transportation, storage and harbour facilities required to move large quantities of grains and oilseeds on to world markets dependably and at low cost. Ukraine's marketing infrastructure is old and dilapidated, and much of it was built with a view to supplying Soviet partners to the North rather than world markets via the Baltic Sea. This year's export surplus of 6-7 mill. tons of grain is already exposing severe weaknesses in the grain marketing system, delaying exports and putting considerable pressure on domestic farm gate prices (VON CRAMON-TAUBADEL, 2001). It remains to be seen whether policy makers will be willing to relinquish control of this 'strategic' area to permit market driven investment and modernisation.

5 Conclusions and policy implications

This study considers the development of the international competitiveness of Ukrainian crop production between 1996 and 2001 using the concepts of Domestic Resource Cost and Private Cost Ratio. Current observations suggest that the farms on average are a long way from using domestic resources efficiently. They are not competitive either at private or social prices. But existing heterogeneity within the farm sector makes it necessary to look beyond averages. Best practice Ukrainian farms are internationally competitive in food wheat, barley, corn and sunflower seed production. These farms account for perhaps 20% of the farm sector in Ukraine, and there are indications that this share is growing.

Based on average farm performance, one might conclude that Ukraine's agricultural potential has been overstated in the past and that Ukraine is unlikely to play a significant role on world agricultural markets even in the long run. However, given recent economic reforms in Ukraine and the rapid manner in which many farms have responded to these reforms in recent years, we would argue that this conclusion is premature. Agriculture can respond quickly to incentive, and there are indications that Ukrainian agriculture has entered a phase of dynamic development. A shortage of human capital and physical bottlenecks in grain and oilseeds marketing could limit this development in coming years; if policy makers respond to these risks Ukraine could easily be a global player by the end of the current decade.

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Appendix 1: Data collection and processing

To compute the farm competitiveness indicators, microeconomic (farm level) and macroeconomic data are required. Macroeconomic data such as nominal exchange rates and real interest rates are available from official statistics and are relatively reliable in Ukraine. However, farm data are often unavailable or unreliable. Ukraine's farm accountancy data network produces only average data, and much technological and price information for different types of farm is not available. Moreover, standard gross and net margin calculations are not common. This makes it necessary to explain the farm data collection in detail.

This study covers six crop products for the period from 1996 to 2001: winter milling wheat, winter feed wheat, winter feed barley, corn, sunflower, and sugar beet. To gather data at the farm level, field work was done in Lviv, Ternopil, Zhytomyr, Vinnitsa and Cherkassy oblasts.⁷ These oblasts represent almost all agro-climatic zones in Ukraine (Lviv and Ternopil – west, Zhytomyr – middle-north, Cherkassy and Vinnitsa – middle-east). The input-output matrix was built based on collected farm data, data from inputs suppliers, and suggested production technologies from Ukrainian agricultural institutions (PANKIV *et al.*, 2000; SPYCHAK, 2000; KHARKIV STATE TECHNICAL UNIVERSITY FOR AGRICULTURE, 2001). While technical coefficients change over time, the coefficients used here are up-to-date.

Private and social output prices are unweighted average prices for August-December, e.g. the months in which large output sales and sometimes exports are used to finance the autumn-seeding campaign.⁸ Moreover, as credit repayment to the state and the private banks is due in November-December for most farms, most sales occur in these months.

Tradable inputs include fertilisers, chemicals, seeds and fuel. Domestic private prices for tradable inputs are taken from the price lists of input suppliers and official statistics.⁹ We assume that the social prices of agricultural chemicals and fuel are equal to the domestic private prices. Most agricultural chemicals are imported free of import duties as they are not produced domestically, and according to BENECKE (2000), agricultural chemical prices in Ukraine correspond closely to prices in Germany. Concerning fuel, import duties and excise taxes have been officially applied in some years. However, most fuel has been imported into Ukraine from Russia through joint-ventures which were exempted from paying any import taxes.¹⁰ As Russia is the main fuel supplier to Ukraine, the Russian import prices are considered to be the world reference prices for Ukraine.

Seed prices greatly depend on the quality of seeding material and, thus, uniform price information is not available. Seed varieties may quickly appear on the market and disappear just as quickly after showing worse results than other varieties. The import regime for seeds is

⁷ Farm data for Lviv and Ternopil oblasts were collected in October 2001. Data on Zhytomyr oblast was taken from NEDOBOROVSKYY (2001) and YUZKO (2001). Data on Vinnitsa and Cherkassy oblasts are based on the meetings with DUAP staff and BENECKE (2000).

⁸ The sources for data on output prices are STATE STATISTICS COMMITTEE OF UKRAINE, STATE CUSTOMS COMMITTEE OF UKRAINE, UKRAGROCONSULT, and OLIMPEX LTD.

⁹ The sources for data on input prices are the price lists of ZHYTOMYRAGROKHM, DUAP data base, BASF UKRAINE, PIONEER HI-BRED, STATE STATISTICS COMMITTEE OF UKRAINE, and UKRAGROCONSULT.

¹⁰ In 2001 all exemptions were cancelled and a uniform import duty of 10 Euro/t applied. However, for the 2001 seeding and harvesting campaigns, fuel was imported without import taxes *via* earlier exemptions and an article in the Law of Ukraine "On Stimulation of Agricultural Development in 2001-2004" dated January 18, 2001, which allowed tariff free seasonal import of diesel for the agricultural sector.

complicated due to long and expensive certification and testing procedures. Import tariffs are zero, except for barley (20 Euro/t) and sugar beet (70% *ad valorem*) since 1999. As there is no single (or reference) seed price and non-tariff barriers are difficult to measure, we assume that the social prices for seeds in Ukraine are equal to the private prices, except for barley and sugar beet since 1999.

Fertilisers are the only tradable inputs exported by Ukraine. We assume that the world market prices for fertilisers are 10% lower than the corresponding domestic prices. Ukraine is subject to a number of anti-dumping investigations as Ukrainian producers allegedly sell fertilisers for less than the production costs. Thus, the undistorted social prices for fertilisers are lower than the actual private prices. In reality this rate is not constant over time and this deviation may be even larger.

The calculation of social prices for *domestic resources* (land, labour and capital) is not straightforward. The following technique was used. For *land* we assume that the opportunity cost of land is equal to its average rental value. Land lease in Ukraine was legalised only in 1998.¹¹ Prior to this time, agricultural land belonged to the members of the collective farms and leasing was not permitted. We assume, therefore, no rental payments before 1998, and typical rental payments in Ukraine of UAH¹² 28/ha in 1998, UAH 30/ha in 1999 (STARIKOV, 2000), UAH 70/ha in 2000 and UAH 120/ ha in 2001 (DUAP, 2001).

The opportunity cost of *labour* is equal to its marginal product in the next best alternative. Labour in the rural areas of Ukraine usually has very few alternatives. Due to the high unemployment in urban areas and low capacity utilisation by industrial enterprises, household production remains the best job alternative for most rural workers. If the labour market functions properly, farm members will equalise the return from the last hour spent on the farm and on their household plots, respectively. However these returns are difficult to quantify. For example, farm members receive not only wages from their farms, but also different social payments and other incentives. The opportunity cost of labour is assumed to be equal to the wages in the crop production of the large farms.

To compute the opportunity cost of *capital*, the approach of BANSE ET AL. (1998) and BOJNEC (1999) is used. Information on the marginal productivity of capital in its next best alternative use is unavailable in Ukraine. However, information on the real interest rates on commercial loans and on estimated depreciation and repair costs is available. Data on real interest rates on commercial bank loans is reported by UEPLAC (2001). Depreciation and repair cost data for agricultural machinery and equipment in Ukraine is reported in KHARKIV STATE TECHNICAL UNIVERSITY FOR AGRICULTURE (2001).¹³ All machines and equipment underlying our calculations are produced in Ukraine with the exception of harvesters (data on used Claas grain harvesters and Holmers sugar beet harvesters were used), which have not been produced in Ukraine until recently. Old Soviet or Russian combines incur large harvest losses (around 30%), while Western combines often lose no more than 2-3%. Thus, old Soviet/Russian combines are clearly uncompetitive (PIONEER HI-BRED UKRAINE, 2001).

¹¹ Law of Ukraine “On land Leasing“ dated October 6, 1998 allowed the leasing of the agricultural land.

¹² UAH is the abbreviation of Ukrainian currency Hryvnia. The average official exchange rate in 2000 was UAH 5.44 per US\$ 1.

¹³ Only agricultural machinery and equipment is used to calculate capital costs. Ukrainian farms possess fixed assets as well, but the data on these assets are not available or highly unreliable (the value of these assets is often overestimated in farm balance sheets).

The official nominal UAH/US\$ exchange rate (annual average) is used for all export-import transactions. Black or shadow market rates have not deviated considerably from official rates over the time period considered here. It is assumed that the nominal exchange rate is in equilibrium, although prior to 1999 this may not have been the case, as demonstrated by the rapid devaluation of the Hryvnia *vis a vis* most other currencies following the financial crisis in late 1998.

Appendix tables 1 and 2 show gross and net margin calculations based on our data. Additional information on the data and assumptions underlying these calculations and our DRC and PCR results are available on request.

Appendix table 1: Gross and net margin calculations for Ukrainian farms on average in 2000

Item	Units	Winter milling wheat	Winter feed wheat	Winter feed barley	Corn	Sunflower seeds	Sugar beet
Yield	t/ha	2.1	2.1	2.3	3.0	1.3	20.7
Price	US\$/t	135	56.7	67.3	77.1	172.3	19.3
Revenue	US\$/ha	278.1	116.7	152.6	232.3	227.4	400.1
Seed	kg/ha or units/ha	240	240	240	60	60	2.7
	US\$/ha	22.1	22.1	9.5	21.0	23.2	6.8
Fertiliser	kg/ha	50	50	20	20	20	320
	US\$/ha	7.4	7.4	3.3	3.3	2.9	49.7
Crop Protection	kg/ha	1.4	1.4	1.2	1.2	1.2	3.0
	US\$/ha	35.5	35.5	11.1	11.1	17.3	92.4
Fuel	kg/ha	65	65	60	65	40	295
	US\$/ha	17.7	17.7	16.3	17.1	10.9	80.3
Sum Tradable Inputs	US\$/ha	82.6	82.6	40.3	53.1	54.3	229.3
Gross Margin	US\$/ha	195.5	34.1	112.3	179.1	173.1	170.9
Labour	Hour/ha	45	45	40	100	44	440
	US\$/ha	10.3	10.3	9.1	22.8	10.1	100.5
Land	US\$/ha	28.6	28.6	28.6	28.6	28.6	28.6
Capital	US\$/ha	178.3	178.3	173.5	211.4	173.5	366.6
Sum of Domestic Factors and Non-Tradable Inputs	US\$/ha	217.1	217.1	211.2	262.8	212.1	495.7
Net Margin	US\$/ha	-21.7	-183.1	-98.8	-83.7	-39.0	-324.8

Source: Own calculations.

Appendix table 2: Gross and net margin calculations for best Ukrainian farms in 2000

Item	Units	Winter milling wheat	Winter feed wheat	Winter feed barley	Corn	Sunflower seeds	Sugar beet
Yield	t/ha	6.0	6.0	6.0	6.5	2.5	45
Price	US\$/t	135	56.7	67.3	77.1	172.3	19.3
Revenue	US\$/ha	810	339.9	403.7	501.3	430.7	869.9
Seed	kg/ha or units/ha	180	180	180	50	60	2.4
	US\$/ha	16.5	16.5	7.1	17.5	23.2	6.1
Fertiliser	kg/ha	400	400	180	350	470	910
	US\$/ha	56.0	56.0	28.9	47.1	66.0	133.4
Crop Protection	kg/ha	2.4	2.4	1.7	1.7	2.1	4.5
	US\$/ha	71.4	71.4	13.7	13.7	31.9	152.4
Fuel	kg/ha	75	75	70	75	44	350
	US\$/ha	20.4	20.4	19.1	20.4	12.0	95.3
Sum Tradable Inputs	US\$/ha	164.4	164.4	68.8	98.7	133.1	387.2
Gross Margin	US\$/ha	645.6	175.5	334.9	402.6	297.6	487.2
Labour	Hour/ha	35	35	30	80	22	200
	US\$/ha	8.0	8.0	6.9	18.3	5.0	45.7
Land	US\$/ha	28.6	28.6	28.6	28.6	28.6	28.6
Capital	US\$/ha	254.7	254.7	247.9	301.9	247.9	366.6
Sum of Domestic Factors and Non-Tradable Inputs	US\$/ha	291.3	291.3	283.3	348.3	281.5	685.2
Net Margin	US\$/ha	354.4	-115.7	51.6	53.8	16.1	-202.5

Source: Own calculations.