The Value of Farmland - Expected Farmland Prices in Ukraine after lifting the Moratorium on Farmland Sales

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Executive Summary

The absence of a fully-fledged farmland market has been considered as a stumbling block in developing of the agricultural sector in Ukraine. The discussion about the moratorium on farmland sales in Ukraine seems to come to an end. The new government in many official statements declared its commitment to lift the moratorium on farmland trade by 2012. This decision would affect the value of farmland that in turn will impact the productivity and future growth prospective in the sector.

Some argue that farmland is undervalued in Ukraine. Given no land market, only normative state methodology is applied to appraise average farm land values. However, the approach and the indicators behind this methodology cast doubts on the accuracy of the normative estimates of farm land values. Proper estimation of the farmland value requires local knowledge of demand and supply factors behind the price formation. Residual income from land that is typically used in relevant calculations has to be coupled with specific local conditions, in particular actual interest rates and productivity growth expectations.

In this paper we apply the income capitalization approach to farmland price estimation. Based on the actual land productivity (gross margins) for Ukrainian farms over the period of 2007-2009, we conclude that a hectare of arable land would be traded from 1500 UAH (Zakarpattia) to 5500 UAH (Kirovohrad). If the sub sample of top-25% performing farms was to be considered, the maximum land value will increase to around 6800 UAH or 860 USD. Of course, in a market economy the bidder with the highest price would get the land. Non-economic considerations are beyond the scope of our analysis but behavioural aspects are usually influencing sellers and buyers of land. Real future farmland prices may therefore deviate from "rational" prices. In some cases lower and in some cases higher than our estimates. Our results are consistent with global farmland prices that we received from a survey covering about 370 farms around the world conducted in December 2010. Our estimates, however, fall in the lower end of the world farmland purchasing prices that vary from 100 USD/ha in Eastern Ghana to over about 105 000 USD/ha in Flevoland (Netherlands).

Such a relatively low level of expected farmland values in Ukraine, however, will remain as long as farming and input and output marketing in Ukraine remains less efficient compared to best global practices. Regardless of the agronomic quality of farmland the most important factors of farmland price growth are current and future expected farm productivity levels as well as capital market conditions (access to capital and interest rates). The expected limited initial competition on the farmland market after lifting of the moratorium and the asymmetry of information of sellers and buyers of land will most likely lead to low initial farmland prices.

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INTRODUCTION

Farmland is a critical asset in the agricultural sector. Capital, knowledge, labor and land are the most important production factors. To ensure optimal allocation of farmland to the most productive use in a sustainable way land policies and land markets have to be harmonized so that producers get the right incentives. In a market economy the purpose of a functioning farmland market is that farmland is used by the most productive farmers. Land should move to the best farmers over time. Absence of a fully-fledged farmland market has been considered as a stumbling block in developing a highly performing agricultural sector in Ukraine. Introduction of private property for land in 1992 was coupled with a ban for agricultural land plots alienation[1]. Formally, from 1998 land owners were allowed to sell their plots until the new Land Code reintroduced the moratorium in 2001. This moratorium has been extended several times and effectively prohibits actual sales agreements in the farmland market. The transition provisions of the Code[2] envisage pre-conditions for lifting the moratorium on agricultural land sale – adoption of the Law on Land Markets and the Law on Land Cadastre – stipulating at the same time that such lifting cannot occur before January 1, 2012[3]. The economic effects of a non-functioning farm land market are reduced structural change as well as reduced finance and investments leading to reduced growth and developing perspectives in the agriculture and food sectors.

The new government in many official statements declared its commitment to lift the moratorium on farmland trade by 2012. Moreover, the voting against the Draft Law #7541 in the Parliament corroborates this intention. The Draft Law #7541, in particular, aimed at extending the moratorium on contributions of the land titles to the statutory funds of business entities and on farm land trade until January 1, 2015.

The political debates and 'revealed attitudes' of the government have generated considerable discussion of the possible levels of farmland values after lifting the moratorium. In this paper we add specific calculations to the existing literature on farmland markets in Ukraine[4] by estimating the purchasing prices of farmland based on the actual performance of agricultural enterprises. However, we do not pretend to predict future farmland values because of many factors that cannot be captured in economic analysis. Markets are driven by many fundamental and speculative factors influenced by hard facts as well as by psychological factors leading to actual market behavior beyond rational thinking. We are discussing the fundamental drivers behind the expected farmland prices as well as some expectations about these drivers.

The paper starts explaining the determinants of farmland values. Then it continues with a discussion of the available economic methods for farmland valuations, followed by the application of relevant methods for assessing Ukrainian farmland prices. The paper ends with conclusions for farm land sellers and buyers as well as for policy and law makers.

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[1] Article 17 of the Land Code No.2196-XII as of March 13, 1992 prohibited any kind of alienation of land plots obtained from Radas apart from bequest for six years, that is, until 1998.
[2] See point 15 of Chapter X of the Land Code of Ukraine No.2768-III as of October 25, 2001
[3] The Draft Law on Land market #2143 is revoked on March 11, 2010, and recent Draft Laws #2141-1 and #2124-2 have bee rejected on March 17, 2011; the Draft Law #8077 on Land Cadastre is registered in Verkhovna Rada for the first reading as of February 15, 2011.
[4] See e.g. von Cramon-Taubadel and Striewe (2001), Kuhn and Demyanenko (2004), Demyanenko (2005), Demyanenko (2009); Fedorchenko and Yanov (2009)

1. THE DETERMINANTS OF FARMLAND VALUE

In a market economy farmland does not have a fixed absolute value but rather a price that varies according to a number of factors. These factors include not only the physical production potential of the land in question. Empirical literature highlights the following factors that determine the farmland values (e.g. see Just and Mironowski, 1993):

1. Returns to land (actual and expected) or rents;

2. Opportunity cost of capital;

3. Inflation;

The most widely accepted determinant of the farmland value is the expected return to land or rent. It is a residual income that accrues to farm land that is left after all relevant costs of farming have been subtracted from the revenue that is generated from the sale of the crops produced on it. Economists refer to this as the price that a farmer would be willing to pay for the use of an additional hectare of land for one year's use of that land. Returns or rents, in their turn, are determined by a complex set of drivers like, e.g. i) stock of capital and labor available, ii) agrochemical characteristics of the plot, iii) location, iv) prices for crops grown, v) managerial skills of the farmer, vi) policy measures etc. The higher the marginal returns the higher should be the willingness to pay for the use of a particular piece of farmland. Obviously, there would be a relationship between this rental price of land and the purchase price that a farmer would be willing to pay for the right to use this hectare of land in perpetuity. Specifically, a rational farmer would be willing to pay no more than the sum of all the expected residual incomes that can be derived from a hectare of land in this and all future years.

A rational farmer or an investor contemplating about purchasing the land, is weighing the flow of expected residual incomes against the opportunity costs of capital or alternative flow of incomes from other real estate or financial investments. The capitalization or discount rate is associated with the opportunity costs of capital. The most important of these alternative investments is the return on nearly risk-free investments in government bonds. In addition, an investor would typically demand a certain risk premium to be included in the discount rate. Higher interest rates, higher risk premiums or lower expected rates of productivity growth would result in lower land values

The purchase of land might also be viewed as a hedge against inflation or even as a tool against excessive spending (Liabson (1997)[5]. Generally speaking, real assets such as commodities, natural resources, and land provide better inflation hedge potential than financial investments. So if these investors perceive that inflation will increase, they are inclined to increase their purchases of real assets including farmland compared to financial assets.

Farmland generally generates a return in the form of capital gains. Taxation of these gains compared to the ordinary income from earnings might push the demand schedule for farmland in both directions.

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[5] The investors aware of the self-control problem may deliberately buy less liquid assets to prevent them from excessive spending. Undesirable undersavings are more likely to occur in case of inflation growth. Higher inflation may lead to higher demand for land thus increasing the price of the latter.

Non-farm sector exerts additional impact on the farmland values. Especially it is felt in the areas close to the urban-industrial areas, were the urban centers need more areas for expansion. The changing demand for land as an investment or government programs for reservation areas or infrastructure may also play a certain role.

2. METHODOLOGIES OF ESTIMATION OF FARMLAND PRICES

There are various financial and economic approaches to assess the value of agricultural production factors. Rural assets are usually valued using three approaches, i.e. i) the market-data (or comparison) approach[6], ii) the costs (or inventory) approach[7], and iii) the income capitalization (or earnings) approach (see e.g. Smith, 1990). The first two methods may be applied in fully functioning farm land markets.

In the literature the most widely accepted explanation of farmland prices is based on expected returns or rents (Just and Miranowski, 1993). This observation is behind the Income-Capitalization approach, where the underlying idea is that a rational farmer would be willing to pay no more than the sum of all the expected residual incomes that can be derived from a hectare of land in this and all future years. Of course, expected income in future years must be discounted to derive its present value, because of one Hryvnia of income in the future is worth less than one Hryvnia today. Formally, the following expression can be used to derive the purchase price of a hectare of land (Pp) from the rental price of land (Pr) [8]:

$$P_p = \frac{P_r}{\text{discount rate } (i) \ - \ \text{growth rate } (r)} \tag{1},$$

where the difference between the discount rate and the growth rate is often referred to as the capitalization rate. Of course, the model simplifies a lot the real life; nonetheless it allows integrating several important drivers of farmland value and sufficiently approximates them to allow informed investment decisions. In the model the gross margin[9] is typically used as a proxy for the rental price of land. Gross margin calculations are simple and known by farmers and experience in many countries shows that investment decisions in land are using this indicator as an upper limit of bidding prices. In a longer-term view fixed costs would have to be considered as well.

The discount rate represents the opportunity cost of invested funds or the rate of return that an investor would require in order to own this asset. Lower discount rates indicate lower opportunity costs and would increase the price that could be paid for an asset. In a country with

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[6] The Market-data approach focuses on analyses and interpretation of circumstances surrounding sales of farmland in the community. Each property is compared with the subject property (the one being appraised) and appropriate price adjustments are made to capture difference in land characteristics. The essence of this approach lies in the choice of the maximum number of similar land plots and actual selling prices. Among the characteristics affecting the appraisal are land use restrictions, peculiarities of land location (climate zones, transportation costs, access to distribution system, timing of sales of similar plots, socio-demographic factors), and quality of the land plots (size and configuration), level of erosion, amelioration, regime of floods, direction of winds, state of soil (yields). This method cannot be fully applied to agricultural land plots in Ukraine due to restrictions of land operations.

[7] In the Cost approach the appraiser analyses the components of the subject property and estimates market costs for replacement with property of like utility and value. Land is broken into market classes, with each class evaluated according to its cost in the market. Improvements are appraised on reconstruction cost new, less depreciation. The value of improved land is defined as the difference between expected return from sales of improved parcels and the costs of such an improvement. Again, the application of such approach is difficult since it requires detailed data on land plots that were subject to any improvements.

[8] For more detailed derivation of the formula see Ross-Westferfield-Jaffe, 2002, page 82.

[9] residual income that accrues to farm land that is left over when variable relevant costs of farming have been subtracted from the revenue that is generated from the sale of the crops produced on it

lower interest rates farmers are therefore willing to pay higher prices for farmland and vice versa. Normally, this rate is thought of as the rate of return on risk-free securities plus an adjustment for the risk associated with the farmland investment. The return on government securities (e.g. bonds) is usually considered to proxy the rate of return on risk-free securities. The discount rate, however, should always be higher than the risk-free return, for farmland returns are risky and one should demand a higher return on it than on government securities. The risk adjustment means that the discount rate would be higher than the interest rate on risk-free securities. In countries with high production, market and policy risks a higher risk adjustment is necessary. In this case offer prices for farmland would be lower.

The growth rate is the percentage rate at which the income associated with farmland is expected to grow. Increasing productivity is one key potential driver of farmland income growth. It is unlikely that the land owner will capture all of the gains associated with this increased productivity – input suppliers are likely able to capture some portion of the farms' incomes due to productivity growth.

There are other possible sources of income growth. Income growth results when output prices increase at a rate at least as fast as input prices. At the moment many observers are convinced that the era of declining real agricultural prices has reached an end, and that a variety of factors such as rapid population and income growth, climate change, and limits on the growth of both yields and agricultural areas will lead to an increasing trend for agricultural prices in the coming decades, subject to short-run fluctuations. This, however, should be weighted against the following factors that will possibly dampen the bullish outlook on agricultural output prices. Input suppliers will likely absorb a certain share of the increased output prices as the same demand and supply factors that are expected to push up agricultural prices are also expected to boost prices for farm inputs (see discussion in more details in von Cramon-Taubadel and Nivievskyi, 2010). Another concern is the government policy in agriculture that has been in place in Ukraine. For example the export grain quotas as well as the recent attempt of the government to monopolize the grain exports is essentially depressing farm-gate prices and is limiting farmers benefits when international agricultural prices go up. Hence, it is an open question whether future price developments may lead to major improvements in farm income in Ukraine.

It is also important to note that the income capitalization model is directly related to the price to earnings ratio (P/E) or cash rent multiple for farmland. The P/E ratio can be found by manipulating equation (1) so that the farmland purchasing price (Pp) divided by rental price of land is equal to $1/(\text{discount rate } (i) - \text{growth rate } (r))$. Hence, the multiple attached to the cash rental rate is the inverse of the capitalization rate. For instance, if the discount rate is 8% and the expected growth rate is 3%, the resulting capitalization rate is 5%, and the cash rent multiple is 20.

Normative farmland valuation methodology in Ukraine

Currently, farmland trade is forbidden in Ukraine, hence farmland has no market price. Instead there is a so-called 'normative valuation of the farmland'. It is applied to determine the volume of land tax, state fee for exchange transactions, inheritance and gifts, as well as establishment of rental rates for state and communal land plots, losses in agriculture and forestry production and development of mechanisms for stimulation of rational land use and land protection. The basic formula for normative land valuation relies on the rental income from grain crops that

further gets corrected to account for location and soil fertility characteristics[10]. For arable land, two main formulas are used:

$$V_N = R*P*T \qquad (2)$$

$$R = (Y*P - C - C*M)/P \qquad (3)$$

V_N - Normative value of arable land, UAH/hectare;

R - Rental income from one hectare of arable land, metric hundredweight;

P - Selling price of one hundredweight of grain, UAH;

T - Capitalization period, equals 33 years;

Y - Yield of grains, hundredweight per hectare

C - Production costs per hectare

M - Normative profitability, $M \in [0,1]$

After some algebra, it is not difficult to see that (2) and (3) are specific formulations of the general income capitalization model described above in (1), i.e. $V_N = (Y \cdot P - C(1+M))*T$. In this simplified expression $(Y \cdot P - C(1+M))$ is a rental income, i.e. inflated production costs are subtracted from the revenue generated from the grain sales. T is a capitalization period or cash rent multiple for farmland and it is equal to $1/(\text{discount rate }(i) - \text{growth rate }(r))$ in (1). Normative land valuation is carried out for 'representative' or model farms. The first time since independence it was carried out in 1995 based on 1986-1990 average figures. Since then the updates were made via indexation (that shall be applied only when the annual inflation rate exceeds 10%) and not through changes of the parameters underlying the land valuation it-self[11].

A brief description of the shortcomings of the normative valuation of farmland reveals several important limitations as to the reliability of the resulting farmland values:

- Normative arable land valuation formula uses the 1986-1990 period as a baseline and up-dates further the resulting farmland values (at least every 5-7 years) using the corresponding indices. Even if these indices are properly calculated and capture the development of the market, the baseline scenario, however, reflects completely other plan or pre-transition settings. For example, in calculations the average (1986-90) grain yield 3.15 t/ha was used. This exceeds current yields. Only in the record 2008 year the average grain yields surpassed this level and achieved 3.45t/ha. This indicates that the resulting rental rates are overestimated.

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[10] See Cabinet of Ministers Decree No. 213 "On methodology for normative land valuation for agricultural land plots" from March 23, 1995 or Joint Order of State Committee for Land Resource, Ministry of Agricultural Policy and Ministry of Construction, Architecture and Housing, and Academy of Agrarian Sciences #18/18/15/21/11 from January 27, 2006.
[11] See Cabinet of Ministers Decree No. 783 "On indexation of normative land valuation" from 12 May, 2000

- A further questionable point in the calculations is the use of grain budgets only and ignoring other important crops. It is difficult to judge, however, how it affects the resulting land values especially in those areas where non-grain crops prevail.

- Another disadvantage of the approach is that it is using data for average or 'typical/representative' farms. However, several representative systems may exist simultaneously for a given location/population of farms, depending on the policy or research question at hand. Sector heterogeneity is especially important for transition economies, with various outperforming farms but at the same time with many poor performing farms. Hence, use of the model or representative farm budgets is overstating performance indicators.

- The assumed capitalization period or cash rent multiple is 33 years, which translates into a 3% capitalization rate. This rate is obviously too low for Ukraine and difficult to justify. For example the rate of return on government bonds has never decreased below 6% since independence in Ukraine. This indicates that the normative farmland values are overestimated at least by a multiple 2.

3. ECONOMIC ASSESSMENT OF FARMLAND VALUES IN UKRAINE

3.1 ESTIMATES OF THE FARMLAND VALUES

In the following we apply the income-capitalization model to assess land prices in Ukraine. The estimation process is summarized below in the following steps:

1) Based on the 2007-2009 Ukraine-wide farm-level accounting data we calculate the 3-year average crop gross margins for 3348 agricultural enterprises (inflation is accounted for). The gross margins were obtained as the difference between sales documented by farms and the variable costs per hectare of arable land (see Figure 1 for the distributions); farms with outlying gross margins were deleted from the sample. We define an observation as an outlier if it lies outside the interval [q0.25-1.5*iqr; q0.75+1.5*iqr], where iqr and q are the intequartile range and corresponding quantile, respectively[12].

2) After this we undertook a regression analysis of the individual farms' gross margins on regional dummies to get the aggregated regional estimates of gross margins with separate estimates for lowest and top-25% performing farms usinq quantile regressions (for the averages across the whole set see Figure 1 and for quantile estimates see Table 1)[13]

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[12] 1st quartile and 3rd quartile (denoted q0.25 and q0.75 in the text) shows the point below which 25% and 75% of the observations lie (also called 25% percentile and 75% percentile) respectively. Interquartile range, iqr, is the range containing all observations between 1st and 3rd quartiles.

[13] Regional dummies are variables that take the value 1 whenever a farm comes from that particular region (oblast) and 0 otherwise. A researcher leaves all but one regional dummies as explanatory variables and run the regression of the following type $y_i = b_0 + \sum_i^n b_i x_i + u_i$, where y_i — individual farms' gross margins and $x_i = \{1, 0\}$ — regional dummies, n — total number of regions in the set. Constant term b_0 would then denote the average gross margin for the left-aside region (all x_s would equal zero in this case), slopes b_i are differences between left-aside region and the region at hand, the average gross margin for each particular region is then $b_0 + b_i$.

Figure 1 Gross margins distributions (2007-2009 average), UAH/t
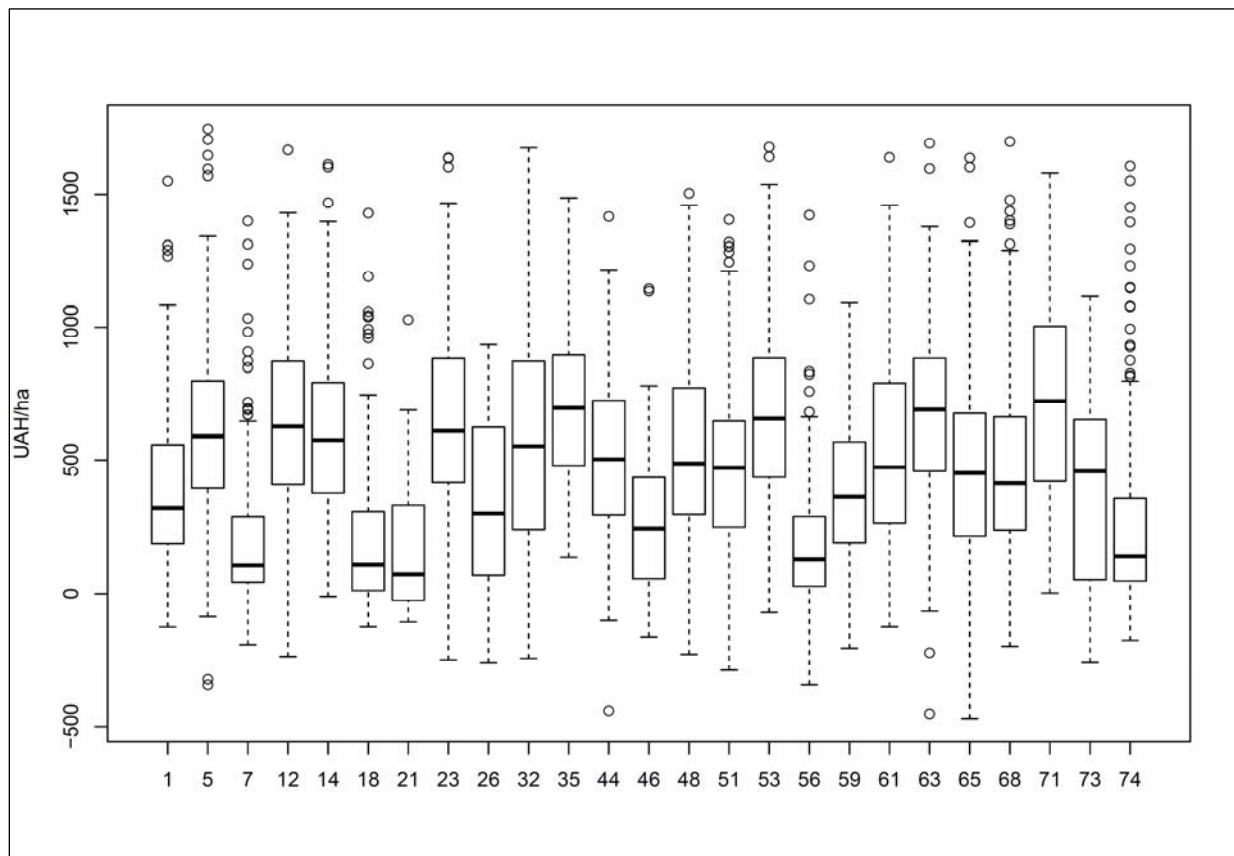
Source: Own calculations; Codes of the regions: Crimea-1; Vinnytsia-5; Volyn-7; Dnipropetrovsk-12; Donetsk-14; Zhytomyr-18 ;Zakarpattia-21; Zaporizhia-23; Ivano-Frankivsk-26; Kyiv-32; Kirovograd-35; Lugansk-44; Lviv-46; Mykolayiv-48; Odesa-51; Poltava-53; Rivne-56; Sumy-59; Ternopil-61; Kharkiv-63; Kherson-65; Khmelnytskyi-68; Cherkasy-71; Chernivtsi-73; Chernihiv-74.

3) The discount rate in (1) we approximate by a return on more than 5-year Ukrainian government bonds. In 2009 the average return was registered at 15.6% while it has gone down to about 9.5% in 2010; hence, we consider 15.6% as a reasonable approximation to the discount rate in our application. This would correspond to a cash rent multiple of 6.4. (See Annex A for the sensitivity of the estimates to changes in discount rates).

4) We expect that income growth in agriculture will be mainly attributed to productivity growth. Since 1992, Ukrainian agriculture has experienced annual total factor productivity (TFP) growth of 4.1% (see von Cramon-Taubadel and Nivievskyi, 2010). This is strong growth, and it is higher than the global average rate of 3% over the same period. This TPF growth in Ukraine has decelerated considerably since 2000; from 1992 to 2000 the annual rate of TFP growth in the country was 5.5%, but between 2001 and 2007 it equalled only 2.5%; this would be our assumption regarding annual farm's income growth. Combined with the 15.6% discount rate, we use a 13.1% capitalization rate. (See Annex A for the sensitivity of the estimates to changes in productivity growth rates).

5) Finally, the region-wise purchasing prices of arable land are received by applying the income capitalization formula with 13.1% capitalization rate and the aggregated regional estimates of gross margins from the regression analysis (see Table 1).

Table 1 Regionally aggregated crop gross margins and the corresponding purchasing prices of arable land.

Region	Estimated gross margins, UAH/ha			Purchasing price, UAH/ha		
	lowest 25%	average	top-25%	lowest 25%	average	top-25%
Crimea	185.4	390.5	557.5	1415.2	2980.6	4255.6
Vinnytsia	393.0	614.2	799.4	3000.1	4688.8	6102.4
Volyn	43.3	214.0	289.1	330.4	1633.3	2207.2
Dnipropetrovsk	406.9	642.0	871.0	3105.9	4901.0	6648.5
Donetsk	374.9	610.9	792.6	2861.9	4663.3	6050.0
Zhytomyr	12.4	200.0	309.1	95.0	1526.8	2359.3
Zakarpattia	-29.5	217.0	366.4	-224.9	1656.6	2796.7
Zaporizhia	414.1	674.2	882.5	3161.3	5146.3	6736.9
Ivano-Frankivsk	70.6	326.2	611.8	538.7	2490.4	4670.2
Kyiv	240.3	584.8	872.2	1834.3	4464.1	6657.8
Kirovograd	476.0	722.6	896.8	3633.3	5516.4	6845.7
Lugansk	287.8	512.3	728.9	2197.3	3910.5	5564.4
Lviv	56.3	276.4	434.3	430.1	2109.8	3314.9
Mykolayiv	297.4	536.7	772.9	2270.4	4096.8	5900.1
Odesa	248.5	478.7	648.6	1896.6	3654.4	4950.8
Poltava	434.8	683.2	883.8	3319.1	5215.5	6746.5
Rivne	28.1	212.7	289.3	214.2	1623.6	2208.7
Sumy	190.5	391.2	568.6	1453.9	2986.4	4340.7
Ternopil	264.9	557.3	790.7	2021.8	4254.1	6036.1
Kharkiv	457.5	667.5	883.2	3492.6	5095.4	6741.6
Kherson	213.7	472.8	676.9	1631.2	3609.1	5167.4
Khmelnytskyi	238.2	484.5	663.3	1818.0	3698.8	5063.1
Cherkasy	419.8	718.0	1003.6	3205.0	5481.0	7661.3
Chernivtsi	60.3	391.4	600.4	460.4	2988.2	4583.4
Chernihiv	48.0	259.3	357.5	366.5	1979.5	2728.9

Source: Own calculations

The estimated average farmland prices vary from around 1526 UAH per hectare in Zhytomyrska oblast to more than 5500 UAH per hectare in Kirovogradska oblast. The range between the estimated average farmland price for the least and top-25% performing farms is even more significant: from 95 UAH to more than 6800 UAH in the same regions[14]. In USD the above mentioned intervals range from 192 USD to 693 USD and from 12 USD to 860 USD respectively. As Table 2 demonstrates, our estimates of the purchasing price of the arable farmland are consistent with earlier estimates in Ukraine. However, our estimates stand out from the rest as we provide a greater variation of the estimates. Taking into account a significant heterogeneity of farms, soils and climatic conditions in Ukraine, our broader estimation intervals likely better reflect this underlying heterogeneity. In a market economy the upper bound of well-performing farms are dominating the farmland market. Their bidding price is based on higher individual gross margins. The demand curve for farmland usually reflects the best per-

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[14] Note, that for some regions the lowest 25% of farms exhibit negative profitability resulting in negative land values. If better farms dominate after lifting the moratorium, one may expect the reduction of the ratio of low performing farms by increased productivity and accelerated structural change)

forming farms. A potential investor is also usually optimistic about his own capacity to boost yields and productivity. It is also important to note that non-economic considerations, e.g. accumulation of assets for future generations or individual preferences for land ownership instead of land leasing for psychological reasons. Bidding prices would reflect these additional considerations.

Table 2 Farmland values in Ukraine in various studies, USD per ha

IER estimates (2007-2009) (income capitalization model, 13.1% capitalization rate)	Ukrainian Agribusiness Club, (2010) (top 15% agricultural producers, 12% capitalization rate, 7 years time horizon)	AAA agency (2007) (unknown methodology)
12-840	600-900	700-800

Source: Own calculations, UCAB and AAA

Compared to the normative state values of arable land (see Annex C Table) , our corresponding estimates look drastically low. The normative values for the best land exceed our estimated purchasing prices by 2.2 times. It comes as no surprise. The main reasons for such a discrepancy are i) grain yields used in the normative valuation lag behind the current yield levels, and ii) the normative capitalization rate (3%) is critically low difficult to justify under current capital market conditions in Ukraine. The regional normative values, however, show a significant correlation with our estimates, the correlation coefficient is about 62%.

Our estimates of the arable land purchasing price are also consistent with the global farmland prices that we received from our global survey (see Appendix B for more details on the survey). The survey covered around 370 farms around the world and its primary interest was to find out the farmland prices in the world from 'first hand' practitioners and investors. The survey was conducted electronically (via emails) in December 2010. Our estimates, however, fall in the lower end of the world farmland purchasing prices that vary from 100 USD/ha in Eastern Ghana to over about 105 000 USD/ha in Flevoland (Netherlands). It is no surprise that the soil quality is only weakly correlated with farmland prices. Farm land prices do reflect the relative scarcity or abundance of farm land compared to other production factors. Land-man rations or capital-land ratios are decisive drivers on farmland markets. It is also interesting to note that the level of farmland prices in Russia after lifting of the moratorium on farm land sales remains lower than the level of farmland prices in Ukraine before the lifting of the moratorium although interest rates are higher in Ukraine. So, actual farm productivity matters obviously a lot.

3.2 DISCUSSION OF THE RESULTS

A comparison of the estimated farmland prices in Ukraine and in the world is probably discouraging, since according to the estimates the farmland would likely sell at relatively low prices. For many proponents of the moratorium including many Ukrainian academics this has been an often repeated argument in favor of continuing the moratorium. Since independence Ukrainian academics have been prescribing an 'objective' price of land based on soil quality. It is rather common to hear that the farmland quality in Ukraine compares to that in some parts of the United States. As Annex D shows, the performance of the black soil belt in Ukraine compares to that in the central parts of the USA, for example in Iowa. In our worldwide survey the farmers from Iowa reported that the purchasing price of the farmland in their region may reach a

value of 15,000 USD/ha. Should we conclude that similar land in Ukraine does have the same value? The answer is neither "No" nor "Yes". These considerations just make little sense. The value of land is not a constant function of its agronomic quality alone, but rather a highly complex function of agronomic, economic and farm managerial factors. von Cramon-Taubadel and Striewe (2001), for example, shortly but clearly explain why farmland prices are so high in Germany, although the quality of the farmland in Germany lags far behind the Ukrainian ones.

Regardless of its agronomic quality, as long as farming as well as input and output marketing in Ukraine remains less efficient or generates less rent compared to agriculture in Iowa, the farmland in Ukraine will be worth less than farmland in Iowa. Many empirical studies showed that both farming as well as input and output marketing in Ukraine are far from best global practices. Even if farmland trade were legal in Ukraine, the Ukrainian land market would most likely have some specific Ukrainian characteristics with a grave asymmetry of information flows. Farmers' losses through grain export restrictions, unpredictable agriculture policy and limited competition in the up and downstream sectors of agricultural value chains are considerable and may explain why Ukrainian farmers receive less for the same product as their American, Australian or European counterparts.

A further aspect concerns the access to the farmland market. According to the terms of Ukraine's accession to WTO, foreign subjects will not be permitted to own farmland in Ukraine. This means that the demand side of the land market will be limited to a relatively small number of wealthy Ukrainians, thus limiting growth of farmland prices.

On the supply side, most land owners in Ukraine are poorly informed about their rights and responsibilities as land owners. Often, farm managers serve as a source of information about these rights and responsibilities, often tempting to abuse this opportunity in their own interests.

4. CONCLUSIONS

Political debates in Ukraine and 'revealed attitudes' of the new government to lift the moratorium on farmland trade by January 2012 have generated considerable discussion of the possible levels of farmland prices after lifting the moratorium. In this paper we estimate the purchasing prices of farmland based on performance indicators (crop gross margins) of the agricultural enterprises, current productivity growth and interest rates.

Comparing our method and results with the normative farmland valuation model and its parameters that is officially used in Ukraine, we reach the conclusion that the model significantly overestimates farmland values. Hence, the official normative farmland values serve as a very poor indicator of 'fair' farmland values.

Based on the 2007-2009 Ukraine-wide farm-level accounting panel data for 3348 agricultural enterprises we calculate the 3-year average crop gross margins. Applying 13.1% capitalization rate, we estimate that the arable land prices range from 63 USD to 740 USD/ha. The interval broadens if low and top performing farms are considered separately. Compared to the normative state values for arable land, our corresponding estimates look drastically low. This is mainly due to low productivity levels and high interest rates.

Our estimates of the arable land purchasing price are consistent with the global farmland prices received from a survey of 370 farms around the world conducted by Hubertus Nesselrode. The survey results range from 100 USD/ha in Eastern Ghana to over about 105 000 USD/ha purchasing price in Flevoland (Netherlands).

Policy makers and the broader public should not harbor an illusion that Ukraine's farmland should be worth as much as the land of similar quality in, for example, USA. A low level of farmland values in Ukraine will remain as long as farming and input and output marketing in Ukraine remain less efficient compare to best practices regardless of the agronomic quality of land. The expected limited competition on the land market and the grave asymmetry of information will also limit growth perspectives of farmland prices. However, top-performing firms will dominate the market, and one should expect slowly increasing land prices. In this view farmland would move over time to those farms with the highest productivity level. The lifting of the moratorium of land sales will contribute to increased structural change in the agriculture and food sectors in Ukraine. It will strengthen finance, investment and growth perspectives.

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ANNEX A. FARMLAND PRICES UNDER DIFFERENT CAPITALIZATION RATES

The following tables show how the estimated farmland price changes in response to variation in productivity growth rate r and discount rate i [15]. In table 4 we show average farmland estimate of 4002 UAH per ha that is calculated from weighted average gross margins from table 1 (arable land area in oblasts in 2010 was taken as weights). Table 5 shows the same changes in average farmland value for top-25% farms.

Table 4 Average farmland estimates in Ukraine, UAH per ha (7%<i<30%; 1.0%<r<6%)

	r=1.0 %	r=2.0 %	**r=2.5 %**	r=3.0 %	r=4.0 %	r=5.0 %	r=6.0 %
i=7%	8737	10485	11650	13106	17475	26212	52424
i=10%	5825	6553	6990	7489	8737	10485	13106
i=13%	4369	4766	4993	5242	5825	6553	7489
i=15.6 %	3591	3855	**4002**	4161	4519	4946	5461
i=19%	2912	3084	3177	3277	3495	3745	4033
i=22%	2496	2621	2688	2759	2912	3084	3277
i=25%	2184	2279	2330	2383	2496	2621	2759

Source: Own calculation; i= interest rate; r = productivity growth

Table 5 Average farmland estimates in Ukraine, top-25% farms, UAH per ha (7%<i<30%; 1.0%<r<6%)

	r=1.0 %	r=2.0 %	**r=2.5 %**	r=3.0 %	r=4.0 %	r=5.0 %	r=6.0 %
i=7%	11808	14170	15744	17712	23617	35425	70850
i=10%	7872	8856	9447	10121	11808	14170	17712
i=13%	5904	6441	6748	7085	7872	8856	10121
i=15.6 %	4853	5210	5408	5623	6108	6684	7380
i=19%	3936	4168	4294	4428	4723	5061	5450
i=22%	3374	3542	3633	3729	3936	4168	4428
i=25%	2952	3080	3149	3220	3374	3542	3729

Source: Own calculation; i= interest rate; r= productivity growth

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[15] From formula (1): $P_p = \dfrac{P_r}{\text{discount rate } (i) - \text{growth rate } (r)}$ we could derive how changes in discount rate and productivity growth rate would affect the farmland prices estimates. For small changes around initial point with i=15.6% and r=2.5%, the following schedule (total differential) may be applied $DP_p = \dfrac{DP_p}{di}\,di + \dfrac{DP_p}{dr}\,dr$ or $DP_p = P_r \dfrac{1}{(i-r)^2}(dr - di)$ According to (2), if productivity growth rate (discount rate) increases (decreases) by (for example) 0.01 from 2.5% to 2.6%, the increase in average farmland price varies from 11.65 UAH in Zhytomyrska to as much as 42 UAH in Kirovohradksa oblasts. Note, that if productivity growth rate increases (decreases) by the same amount as discount rate decreases (increases) (regardless how large it is) one expects no changes in the farmland prices.

ANNEX B FARMLAND PRICES: GLOBAL SURVEY RESULTS

In this section we present the result of a global survey on farmland prices covering around 370 representatives of agricultural farms around the world. The survey was conducted electronically (via emails) in December 2010. In the questionnaire we asked the respondents to inform us about paid rents and purchasing prices for farmland:

> "This questionnaire is a part of a study which examines Ukraine's agricultural markets in a post-moratorium scenario. The *Institute for Economic Research and Policy Consulting* in Kiev is scheduled to publish the paper in early 2011, and we hope that many of you will contribute to it by answering the questionnaire below. For further information please consult our websites www.ier.kiev.ua and www.agribusiness.kiev.ua. Upon completion the results will be emailed to all participants. Feel free to forward to anyone who might be interested.
>
> 1.   Where are you located?
>
> *(City, Province and Country)*
>
> 2. On average how much gross rent is currently being paid for arable farmland in your area? *(Currency and Units)*
>
> 3. On average what is the gross purchasing price of arable farmland in your area? *(Currency and Units)*
>
> 4. If you were to raise a loan in order to buy arable farmland how much interest would popular banks typically charge you at the moment? *(Currency, Percent)*"

The survey yielded 374 responds in 174 provinces of 30 countries. On average for every province/state we collected 2 records. In order to keep things simple we did not ask to specify the impact of subsidies, irrigation, livestock, root crops, vegetables, density of population etc. We simply adopted at face value figures that were submitted to us. The resulting pattern of the farmland prices is, perhaps, not representative for the world, as the survey does not cover Asia, the Near East, almost all of Africa and Central America. English speaking countries dominate; however, Europe, Brazil and Argentina are reflected in the survey. Taking into account that these countries are the major producers and exporters of wheat, barley, corn and soybeans, this might not be a critical omission in our case.

The results of survey show a great variability of the purchasing price of farmland all over the world. It varies from 100 USD/ha in Eastern Ghana to over 105.000 USD/ha in Flevoland (Netherlands). The rent multiples (purchasing price to rent ratio) also show a great variability, i.e. from 7.9 in Altai (Russia) to 250 in Luxemburg.

Figure 2 Farmland purchasing price distributions in the world
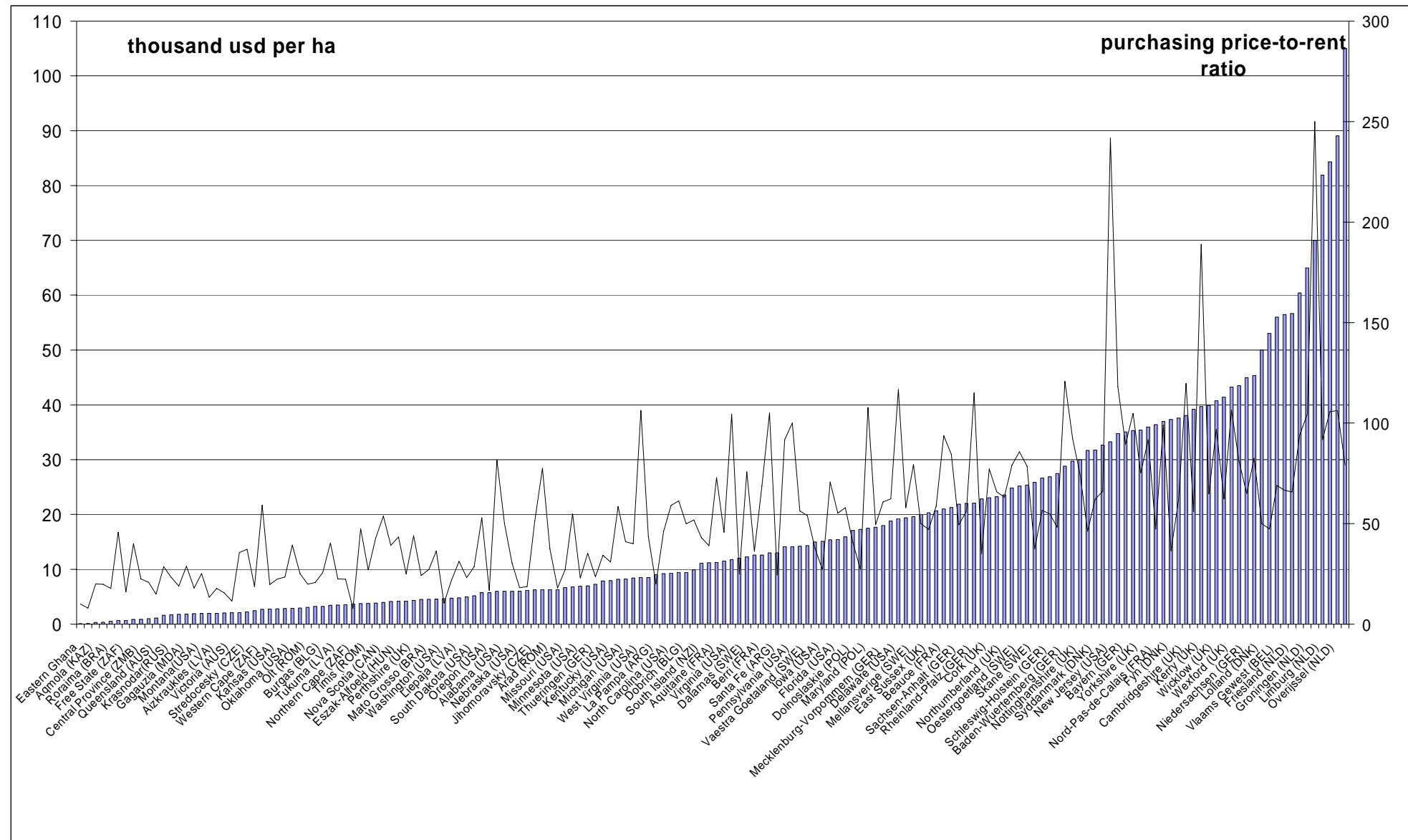
Note * Farmland prices in bars (LHS), purchasing price to rent ratio in line (RHS)

Source: IER SURVEY RESULTS.

ANNEX C. REGIONAL NORMATIVE LAND VALUES IN UKRAINE

Table 4 Normative farmland value by types of land in 2007 and 2010, UAH/ha

Oblast	Arable land		Pastures		Perennials		Hayland		Farmland	
	2007	**2010**	**2007**	**2010**	**2007**	**2010**	**2007**	**2010**	**2007**	**2010**
Crimea	11193	14038	2324	2915	48121	60350	2405	3016	12363	15505
Vinnytska	10018	12564	2357	2956	53680	67322	2640	3311	10563	13247
Volynksa	9070	11375	6071	7614	14768	18521	7565	9488	8254	10352
Dnipropetrovska	9854	12358	2455	3078	17299	21695	2416	3030	8967	11246
Donetska	10559	13243	3032	3802	37162	46606	3066	3845	9818	12313
Zhytomyrska	6235	7820	4392	5508	50384	63188	5736	7194	6464	8106
Zakarpatska	7947	9967	3685	4621	20075	25177	4793	6012	7240	9080
Zaporizka	10252	12858	2343	2938	21930	27503	2579	3234	9449	11850
Ivano-Frankivska	8655	10854	2671	3350	10530	13206	2678	3358	7958	9980
Kyivska	9685	12146	3596	4509	51052	64026	5748	7208	9595	12034
Kirovohradksa	9726	12197	2456	3080	11313	14188	2867	3596	8979	11260
Luhanska	8034	10075	2298	2882	45240	56737	4585	5750	7011	8793
Lvivska	8065	10115	3122	3915	10497	13164	3377	4235	9653	12106
Mykolaivska	7987	10017	2066	2591	28036	35160	2104	2639	7607	9540
Odeska	8516	10681	2168	2719	32751	41074	3136	3933	8410	10547
Poltavksa	10515	13187	2805	3518	31794	39874	3997	5013	9860	12365
Rivnenska	9513	11931	4650	5832	15533	19481	7030	8816	8615	10804
Sumska	8916	11181	3020	3787	17868	22409	4628	5804	7975	10002
Ternopilska	9613	12056	3095	3881	15329	19225	4212	5282	9048	11347
Kharkivska	9849	12352	2304	2889	36859	46225	2834	3554	8857	11108
Khersonska	10482	13146	1709	2144	31470	39467	1855	2326	10192	12782
Khmelnytska	10452	13108	2908	3647	36652	45966	3331	4178	10158	12739
Cherkaska	12062	15127	2335	2929	32564	40840	5603	7027	11694	14665
Chernivetska	10302	12919	2378	2983	42278	53022	3205	4019	10237	12839
Chernihivska	7399	9279	4156	5213	12426	15583	5349	6708	6802	8530
Kyiv	6613	8293	3680	4615	69063	86614	5269	6608	13293	16671
Sevastopol	12038	15097	2500	3136	66430	83312	0	0	34180	42866
Ukraine	**9528**	**11949**	**3039**	**3811**	**35534**	**44565**	**4699**	**5893**	**9040**	**11337**

Source: State Agency for Land Resources

Inherent Land Quality Assessment
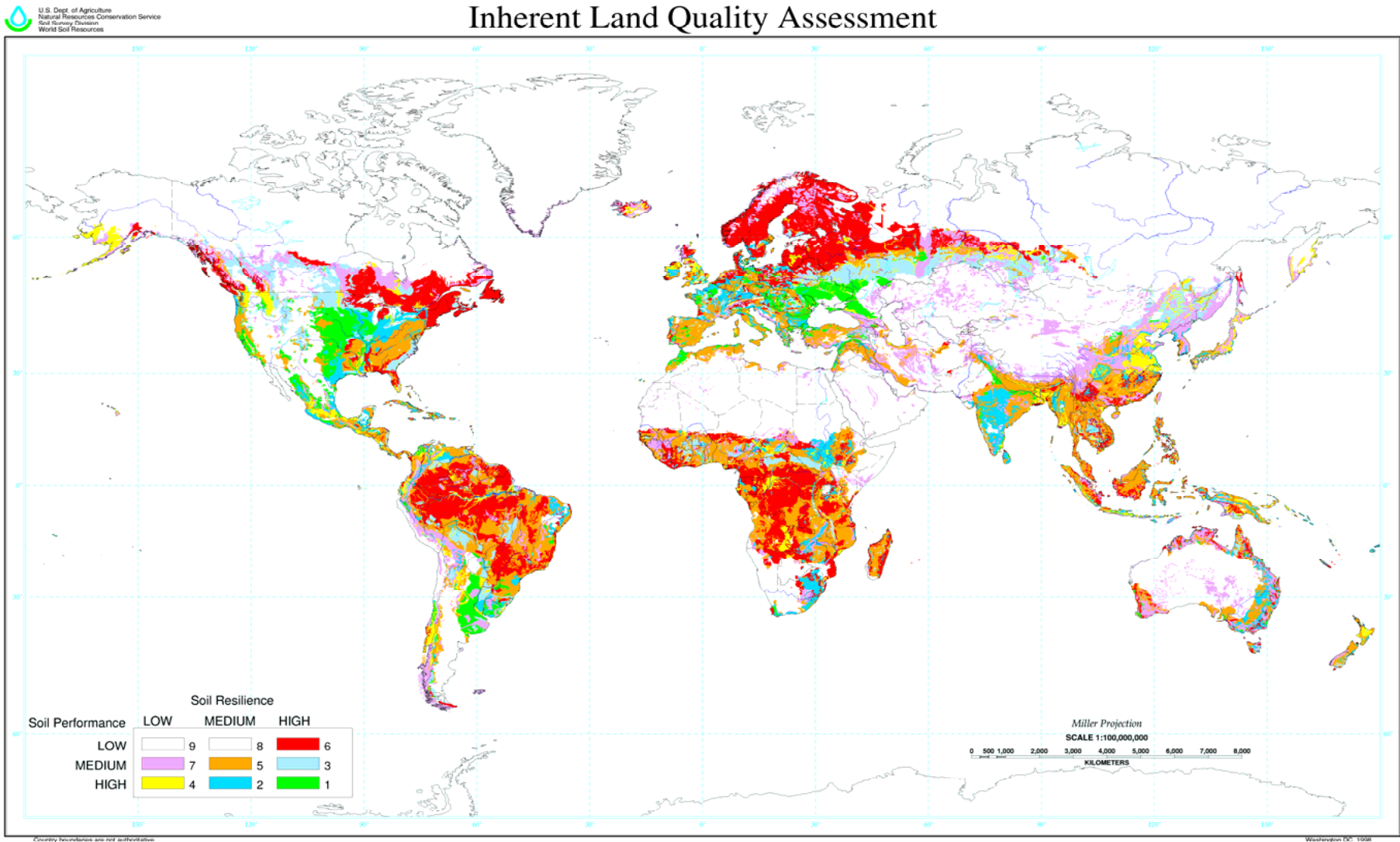
Source: Natural Resource Conservation Service, USDA