WHERE WILL DEMAND FOR LAND COME FROM? EVIDENCE FROM FARM MODELS

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Abstract

Farmland market in Ukraine is not fully functional due to the farmland sales ban or moratorium that effectively prohibits sales transactions for over 15 years already. Yet under the pressure of economic hardship and badly needed investments in the country and to some extend under the pressure from international donors, the moratorium is expected to be lifted from 2018. One of the important parameters of the future farmland sales market is a potential demand. Its estimate will help to analyse a potential price development over the initial period after lifting moratorium, an extend of needed market restrictions and potential demand for financial resources from the banking sector. In this paper we try to estimate a potential farmland demand from agricultural producers using two approaches: 1) by using recent farm surveys, and 2) farm level performance data for a population of agricultural producers in Ukraine for 2013-2015. Both approaches demonstrate rather close results.

Key Words: Ukraine, farmland market, demand, moratorium, farmers
1. Introduction

Land market in Ukraine is not fully functional. Its ‘rental’ arm has been the main farmland transaction channel for farmers and landowners. Its ‘sales and purchases’ arm, however, is virtually dysfunctional due to the farmland sales ban or moratorium that effectively prohibits sales transactions in the farmland market. The moratorium, however, is expected to be lifted from 2018.

One of the main arguments against lifting the moratorium is that the farmers will not be able to buy the farmland due to lack of financial resources. This will lead to the situation when the demand for farmland will mainly come from speculative demand sources/tycoons, which might disadvantage farming sector and disrupt their operations. Recent farmers’ survey demonstrate, however, that about 11% of farmers and agricultural producers are willing to buy farmland during the first two years after lifting the moratorium, and this translates into almost about 82 000 ha of potential annual farmland demand (see section 2.2 below for details). The survey, however, does not demonstrate a financial capacity of those farms that are willing to buy farmland.

We try to answer this question by exploring the performance of the universe of farmers in Ukraine and tracking down where this financially backed up demand for farmland potentially comes from.

2. Background

2.1 Farmland market in Ukraine

The total area of Ukraine is 60.4 million hectares, 69% of it (or 41.6 million ha) is classified as agricultural land, which includes 32.5 million ha of arable land, 2.4 million ha – meadows and 5.4 million ha – pastures. A half of the arable land is black soil - the highest productive soil type. Ukraine has about one third of the world’s black soil. The area of irrigated farmland is about 2.2 million ha, but only 613 thousand ha were actually irrigated in 2013. Nowadays, from 41.6 million ha of agricultural land, 30.8 million ha is privately owned: about 26 mln ha were privatized by about 7 million former members of collective farms as land shares (pays) and 4.3 mln ha were privatized by about 9.3 owners as household plots or subsistent farms. About 10.7 million ha of farmland is in state ownership.

Agricultural producers in Ukraine operate mainly on leased land. Particularly, in the beginning of 2014 around 20 mln ha out of almost 42 mln ha of agricultural land were leased.
Figure 1 The share of rented agricultural land in 2014, %

Source: authors’ presentation based on the data of Ukrstat

shows a regional distribution of the shares of leased land in the total agricultural land in each rayon of Ukraine. One may notice a higher proportion of leased land in the central, northern and eastern regions of Ukraine. Nearly 84.5% (17.4 mln ha) of agricultural land that are cultivated by agricultural producers (excluding peasant farms) were leased lands. Overall, in 2013 about 68% of all land plots were leased (4.7 mln plots) in Ukraine. However, in practice the percentage of leased plots is significantly higher (see discussion in Nivievskyi et al, 2016). Structurally (see Figure 2), micro and small farm tend to operate mainly on their own land, while medium and large agricultural enterprises mainly cultivate leased land.

Figure 2 Share of owned land in the total amount of cultivated farmland, 2014

Source: authors’ presentation based on the data of Ukrstat

2.2 Revealed Demand for Farmland from Recent Farm Surveys

Results of a 2015 USAID Agroinvest Project survey reveal that 6.65% of peasant farmers and 5.74% of agricultural enterprises are willing to buy farmland during the first two years after lifting a moratorium. Another 3.70% of peasant farmers and 3.15% of agricultural enterprises are willing to buy in 3-10 years’
time after lifting a moratorium. From the above group of agricultural producers, 5.07% have already formally confirmed intentions with farmland owners, while 37.84% have unofficial agreements with farmland owners. Also according to the survey the average size of farmland plot/area that a farmer or agricultural enterprise would be willing to buy is 33 and 125 ha, respectively. Overall this would lead to the potential farmland demand of 164,709 ha during the first two years after lifting a moratorium, or 82,354 ha annually.

The above revealed interest or potential demand for a farmland, however, does not show financial capacity of farmers to undertake it. Moreover, a great majority of agricultural producers (74.67% of peasant farmers and 67.29% of agricultural enterprises) did not give an answer at all. This circumstance might lead to significant underestimation of the revealed demand for farmland from agricultural producers. In the following we will try to estimate this demand using a population of peasant farms and agricultural producers in Ukraine for 2013-2015 period.

3. Methodology and Data Description

In the paper, we look at individual farms gross margins and calculate whether farms are able to finance farmland loans out of gross margins. One of the key elements in the estimation approach is a determination of a farmland value.

3.1 The determinants of farmland value

Farmland value is determined by a number of factors, they are (e.g. see Just and Mironowski, 1993):

1. Returns to land (actual and expected) or rents;
2. Opportunity cost of capital;
3. Inflation;

The [expected] return to land or rent is the most widely accepted determinant of the farmland value. It is a [residual] income that accrues to farmland that is left after all relevant [variable] costs of farming have been subtracted from the revenue that is generated from the sale of the crops produced on it. This a price that a farmer will be willing to pay for the use of an additional hectare of land. Returns or rents, in their turn, are determined by a complex 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 a farmer, vi) policy measures etc. The higher returns should translate into increasing willingness to pay for the use of that farmland. Clearly, there will be a relationship between the rental price of land and the purchase price that a farmer will be willing to pay for the right to use this hectare of land in perpetuity. Specifically, a rational farmer will 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.

Opportunity costs of capital comes into the picture, for a farmer contemplating about purchasing the land, usually weights the flow of expected residual incomes against the opportunity costs of capital or alternative flow of incomes from other real estate or financial investments. Capitalization or discount rate is associated with 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 (investment in capital may be considered more risky than other investment options). On the other hand, the risk premium might be counterweighted by
the expected growth of incomes. Higher interest rates, higher risk premiums or lower expected rates of growth in income will 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)). 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.

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 role here.

### 3.2 Methodologies of estimation of farmland prices

There are various financial and economic approaches to assess the value of agricultural production factors. The rural assets are usually valued using three approaches, i.e. i) the market-data (or comparison) approach, ii) the costs (or inventory) approach, 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 empirical 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 will 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 \((P_p)\) from the rental price of land \((P_r)\):

\[
P_p = \frac{R}{(1 + r)^n}
\]

1. 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.

2. 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 applicable to agricultural land plots in Ukraine due to restrictions of land operations.

3. 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 (RCN), 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.

4. For more detailed derivation of the formula see Ross-Westferfield-Jaffe, 2002, page 82.
\[ P_p = \frac{P_r}{\text{discount rate} (i) - \text{growth rate} (r)} \]  

(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\(^5\) 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 a lower opportunity cost and will increase the price that can be paid for an asset. In a country with 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 will 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 to absorb 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. As with the productivity growth, inputs suppliers will likely to 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 essentially depresses the farm-gate prices and does not allow the farmers benefiting from the upward trend in international agricultural prices.

A final comment to the income capitalization model is that it 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

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\(^5\) 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.
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 capitalization rate is 5%, and the cash rent multiple is 20.

4. Economic Assessment of Potential Farmland Demand in Ukraine

3.1 Approach for estimating a potential farmland demand

In the following, we estimate the potential farmland demand in Ukraine by using the individual farm specific estimated farmland prices and look whether farm gross margins are sufficient to finance commercial farmland loans, subject to other credit and farmland market conditions. We also perform sensitivity analysis to see the variability in results. The estimation process is summarized below in the following steps:

1) Based on the 2013-2015 Ukraine-wide farm-level of accounting data we calculated the 3-year average crop gross margins for a population of agricultural enterprises (inflation is accounted for). In total we analyzed 98593 agricultural enterprises (peasant farms and corporate agricultural enterprises). For 2015, however, we could analyze only a population of corporate agricultural enterprises.

Gross margins were obtained as the difference between sales revenues documented by farms and variable costs per hectare of agricultural land; farms with outlying gross margins, costs or revenues 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 interquartile range and corresponding quantile, respectively\(^6\). After this we estimated 3 to 2 years farm-level average gross margins per hectare of agricultural land (see Figure 3a for the distributions of average gross margins);

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\(^6\) 1\(^{st}\) quartile and 3\(^{rd}\) 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 1\(^{st}\) and 3\(^{rd}\) quartiles.
2) In the second step we estimated a potential farmland value based on the actual rental payments. The discount rate in (1) we approximate by a return on medium term Ukrainian government bonds. In December 2016 the average return was registered at 15.33% in UAH while 6.04% in USD; hence, we consider 6.04% as a reasonable approximation to the discount rate in our application.

3) We expect that income growth in agriculture will mainly be attributed to productivity growth. Since 1996, Ukrainian agriculture has experienced average annual total factor productivity (TFP) growth at 0.97% (see Nivievskyi and Nizalov, 2017). Combined with the 6.04% discount rate, we came up with 5.07% capitalization rate. see Figure 3b above demonstrates the distribution of the expected farmland values based on the actual farm level rental payments data and assumed capitalization
rate. The figure shows the modal value would be around USD 1000/ha. (in the following we also perform sensitivity analysis of the estimates to changes in capitalization rate).

4) Next we construct a condition that would allow us to select farms that would be able to finance a farmland loans out of their gross margins:
   a. First, we select the farms with positive gross margins.
   b. Second, we have to consider the level of a down payment that would be applied to a farmer in a case he/she applies for a farmland mortgage loan to a bank. A bank will not finance or extend a credit for the entire value of a farmland; this will depend on the credit risk attached to farmland or liquidity of an asset. Now, according to the National Bank of Ukraine requirements, land is valued only at 35% (only land) to 60% (land + productive buildings on it) of its value for the purposes of crediting. Liquidity of a future farmland sales market will be quite low in the first period after lifting the moratorium, so our assumption about the liquidity of the farmland as a collateral should approach a lower bound of the above range, i.e. 0.35, or even less. Due to moratorium, now NBU attaches zero liquidity to farmland. The above conditions will require at least about 65% of a down payment from farmers.
   c. Third, we select farmers, which gross margins would cover at least 65% of a down payment of a farmland loan (‘bankable’ farms in the following). The amount of down payment is estimated based on the estimated farmland value above. The calculations show that only 4.9% of peasant farms and agricultural enterprises comply with this condition. Note, that this figure is very close to the one we showed above when we discussed the results of the farm surveys. To repeat, results of the recent Agroinvest survey reveal that 6.65% of peasant farmers and 5.74% of agricultural enterprises (or almost 11% in two years or 5.5% in one year) are willing to buy farmland during the first two years after lifting a moratorium. In the next section, we describe a profile of those complying farms.

5) After selecting farms that would potentially make up a demand, we continue with quantifying how much would individual farmer buy of additional land. In this exercise we simply stick to some of the parameters of the currently discusses draft Law On Land Circulation. One of the parameters limits the amount of individual ownership of farmland to 200 ha. Building upon this parameter we assume, that as long as the farm size is below 200 ha, ‘bankable’ farmers are able to buy as much as their current farmland holdings. Given this assumption, our estimate for a potential demand is 258,040 ha of farmland. If we, however, relax the assumption of 200 ha ceiling, our estimate for farmland demand reaches 1,681,307 ha of farmland.

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7 Farmer and agricultural enterprises potentially can overcome this restriction by making their trustful workers/employers to buy the farmland for them.
Figure 4 below shows a geographical distribution of the potential farmland demand. One may notice that southern regions of Ukraine (Odesa, Mykolayiv and Kherson) dominate the distribution.

**Figure 4 Geographical distribution of the Potential Farmland Demand**

3.2 Sensitivity analysis

Table 1 and Table 2 below show results of the sensitivity analysis for various capitalization rates and levels of down payments. Quite expectably is that at lower capitalization rates and heavier down payments, a % of bankable farmers is decreasing. Interestingly, however, to note that at 5% capitalization rate (the one we assumed above) and at 100% down payment (essentially, farms do not have to recourse to mortgage loans in this cases), about 2.7% of farms are financially capable to buy the farmland. Under our assumptions, this demand is estimated at 132 856 ha.

3.2 Where will the demand for farmland come from?

Figure 3 c) and d) demonstrate a distribution of farm sizes of bankable farms we identified above using 5.07% capitalization rate and 65% down payment assumption. Figure 3d) is just a zoomed in version of Figure 3c). As the Figure 3c) shows, bankable farms range from very small peasant farms of 0.5 ha to very large farms of 142 000 ha. Small and medium farms, however, are expected to dominate. See below the distribution of farmland demand from various farm sizes groups. Small and medium farms share in the expected farmland demand is about 80%.

- < 60 ha: 6.35% (or 16 397 ha)
- 60÷260 ha: 24.68% (or 63 680 ha)
- 260÷667 ha: 25.31% (or 65 322 ha)
• 667÷1581 ha: 21.71% (or 56 041 ha)
• > 1581 ha: 21.93% (or 56 600 ha)

Table 1 % of bankable farms at different capitalization rates and down payments

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Table 2 bankable farmland demand at different capitalization rates and down payments, mln ha

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<td>0.54</td>
<td>0.61</td>
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</table>

In terms of the farm models, in the Error! Reference source not found. we distributed farms equally into 10 farm sizes groups (into 10 quantiles groups). For each group we calculated then individual crop shares in total farms’ agricultural area and total crop revenue share as a percentage of total farms’ revenues. Table 3 shows no drastic differences among various farm sizes, except a couple of interesting features, namely: i) grains (and crops overall) play less important role for small farms, while 2) vegetables and fruits are more important for small farms.
Table 3 Farm models of ‘bankable’ farms, individual crop area as a % of total farmland for various farm sizes

<table>
<thead>
<tr>
<th>Ha</th>
<th>Wheat</th>
<th>Corn</th>
<th>Barley</th>
<th>Sunflower</th>
<th>Soybean</th>
<th>Sugar Beet</th>
<th>Veggies</th>
<th>Fruits</th>
<th>Berries</th>
<th>% in total agricultural area</th>
<th>Crop share in total farm revenue</th>
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</thead>
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<tr>
<td>&lt;31</td>
<td>16.35</td>
<td>7.51</td>
<td>9.96</td>
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<tr>
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<td>20.02</td>
<td>8.42</td>
<td>10.48</td>
<td>17.97</td>
<td>10.60</td>
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<td>3.44</td>
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<td>9.61</td>
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<td>20.27</td>
<td>10.12</td>
<td>0.44</td>
<td>37.03</td>
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<td>225 ÷ 394</td>
<td>19.74</td>
<td>9.95</td>
<td>9.25</td>
<td>21.87</td>
<td>11.83</td>
<td>0.25</td>
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<tr>
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<td>10.89</td>
<td>9.26</td>
<td>21.83</td>
<td>9.18</td>
<td>0.19</td>
<td>0.23</td>
<td>0.74</td>
<td>0.01</td>
<td>94.40</td>
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<tr>
<td>946 ÷ 1356</td>
<td>23.64</td>
<td>12.98</td>
<td>8.31</td>
<td>24.56</td>
<td>7.40</td>
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Conclusions and Implications

Farmland market in Ukraine is not fully functional due to the farmland sales ban or moratorium that effectively prohibits sales transactions for over 15 years already. Yet under the pressure of economic hardship and badly needed investments in the country and to some extend under the pressure from international donors, the moratorium is expected to be lifted from 2018. One of the important parameters of the future farmland sales market is a potential demand. Its estimate will help to analyse a potential price development over the initial period after lifting moratorium, and the extend of needed market restrictions and potential demand for financial resources from the banking sector. In this paper we try to estimate a potential farmland demand from agricultural producers using two approaches: 1) by using recent farm surveys, and 2) farm level performance data for a population of agricultural producers in Ukraine for 2013-2015. Both approaches demonstrate rather close results.

Results of a 2015 USAID Agroinvest Project survey reveal that 6.65% of peasant farmers and 5.74% of agricultural enterprises are willing to buy farmland during the first two years after lifting a moratorium. Also according to the survey the average size of farmland plot/area that a farmer or agricultural enterprise would be willing to buy is 33 and 125 ha, respectively. Overall this would lead to the potential farmland demand of 164 709 ha during the first two years after lifting a moratorium, or 82 354 ha annually. The above revealed interest or potential demand for a farmland, however, does not show financial capacity of farmers to undertake it.

In the second approach we estimate a potential using a population of peasant farms and agricultural producers in Ukraine for 2013-2015 period. We look at individual farms gross margins and calculate whether farms are able to finance farmland loans out of gross margins. One of the key elements in the estimation approach is a determination of a farmland value. Since there is no farmland sales market in Ukraine we estimated a potential farmland value using income capitalization approach using actual rental payments of farms. Capitalization rate was assumed at 5.07% (combined from 6.04% return on 5 years...
government bonds in USD and 0.97% annual productivity growth). We also assumed 0.35 liquidity coefficient for farmland as a collateral asset, which means farmers will require to pay 65% of down payment on farmland loans. Another selection criteria (based on currently discussed parameters of the expected farmland sales market regulations) is that we assume, that as long as the farm size is below 200 ha, ‘bankable’ farmers are able to buy as much as their current farmland holdings. Given this assumption, our estimate for a potential demand is 258 040 ha of farmland. If we, however, relax the assumption of 200 ha ceiling, our estimate for farmland demand reaches 1 681 307 ha of farmland. Interesting to note, however, that about 2.7% of farms are financially capable to buy the farmland without a recourse to farmland loans, which makes up 132 856 ha.

In terms of the farm sizes, we show that a potential farmland demand will come very small peasant farms of 0.5 ha to very large farms of 142 000 ha. But in relative terms, about 80% of the farmland demand is expected from small and medium farms.

In terms of the farm models, we noticed no drastic differences among various farm sizes, except a couple of interesting features, namely: i) grains (and crops overall) play less important role for small farms, while 2) vegetables and fruits are more important for small farms.
References


