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Davidova, Sophia; Fredriksson, Lena; Bailey, Alastair

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School of Economics Discussion Papers

Subsistence and Semi-subsistence Farming in Selected EU New Member States

Sophia Davidova, Lena Fredriksson and Alastair Bailey

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SUBSISTENCE AND SEMI-SUBSISTENCE FARMING IN SELECTED EU NEW MEMBER STATES*

Sophia Davidova, Lena Fredriksson and Alastair Bailey
University of Kent

ABSTRACT:

Factor and cluster analysis are used to analyse the attitudes and perceptions of agricultural households in five EU New Member States towards farming, commercialisation, and barriers to and drivers for an increased integration in agricultural markets. The contribution of unsold output to the total household income is valued. A stepwise linear regression is employed to detect important variables explaining the degree of agricultural market integration of farm households. The analysis indicates that subsistence farming is of utmost importance for the rural poor, and particularly in Bulgaria and Romania. The proportion of consumption from own production, manual cultivation techniques and distance to an urban centre negatively affect output sales. Rural development policies targeted at rural physical and market infrastructure might relieve some of these constraints.

KEYWORDS: Agricultural households, Subsistence, Commercialisation, Incomes, Cluster analysis, Stepwise regression

JEL CLASSIFICATION: Q12, Q13, O18

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Address for correspondence: School of Economics, University of Kent, Keynes College, Canterbury Kent, CT2 7NZ, United Kingdom.
Email: S.M.davidova@kent.ac.uk; lef8@kent.ac.uk and A.Bailey@kent.ac.uk

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1. Introduction

Twenty years after the start of the economic transition in Central and Eastern Europe, small scale subsistence and semi-subsistence farms are still wide-spread. The resilience of these farms has raised a heated debate about their role and future, particularly in relation to the EU membership, as producers in the New Member States (NMS) have to compete in the single EU market.

In the literature, there is no agreement about the role and prospects of subsistence farming. One school of thought treats subsistence and semi-subsistence farms in Europe as an unwanted phenomenon and an impediment to rural growth. Subsistence farming has been associated with a traditional technology, inefficiency, and a use of scarce resources which could have been allocated to a more efficient use (Kostov and Lingard, 2004). Often, subsistence has also been related to poverty (Mathijs and Noev, 2004).

However, subsistence farming could be considered as an important survival strategy, not only in low but also in middle income countries, during periods of drastic economic reform and economic recession. Brüntrup and Heidhues (2002) argue that subsistence farming is a way for people to survive under difficult and risky conditions, and to cope with high transaction costs in fragile economies.

In the economic literature the persistence of subsistence farming has been explained by market failure and particularly high transaction costs. As different farm households face different transaction costs, the evidence is that subsistence and commercial farms co-exist (e.g. Key *et al*., 2000). The general wisdom is that subsistence farms are not market integrated and market based policies cannot be effective. Recently, this isolation from the output markets and non-responsiveness to price signals has been challenged. Dyer *et al.* (2006) argue that subsistence households do adjust their supply to changes in agricultural output prices through multiple factor linkages when there is at least a single commercial producer in the vicinity. In the EU NMS there are commercial producers in most of villages, thus the subsistence/semi-subsistence farms may react to output price changes even if indirectly.

All the arguments mentioned above treat subsistence farming not as a voluntary choice but as a necessity; households are forced into subsistence by economic shocks and/or imperfect markets. As long as there is perpetuation of "selective" market failures, affecting heterogeneous farm households differently (De Janvry *et al*. 1991), subsistence farming will persist. However, subsistence farming might be a strategy selected by choice. Subsistance production could be favoured by households with non-farm income or by retired households in order to satisfy their lifestyle and consumption preferences. This aspect of subsistence farming has been much less explored.

This paper aims to evaluate the role of subsistence farming in five EU NMS where households with small farms are wide-spread: Bulgaria, Hungary, Poland, Romania and Slovenia. It also analyses the attitudes and perceptions of farm households about a range of impediments to their commercialisation and factors that could facilitate their market integration. All data refer to the year 2006. Data were collected through surveys of agricultural households conducted within the EU FP6 SCARLED project. The paper employs multivariate statistics (factor and cluster analysis) and regression analysis to investigate the impediments and facilitators to commercialisation.

The paper is structured as follows. The next section includes a working definition of subsistence farming and a brief description of the existing

subsistence/semi-subsistence farms in the NMS. Section three focuses on the methodology used, and section four describes the data collection and the sample of farm households analysed. Section five presents the results and section six concludes.

2. Background

There is no universally agreed definition of subsistence farming. Most of the definitions stress the objective to satisfy household food needs. Barnett *et al.* (1996) define the following characteristics of subsistence farming: (i) the farming activities form a livelihood strategy; (ii) the output is consumed directly; (iii) only a few purchased inputs enter the production process; and (iv) the proportion of output sold is low (see Kostov and Lingard (2004) for a more extensive review of definitions of subsistence farming).

Mathijs and Noev (2002) argue that one problem in defining subsistence farming lies in the possibility to consider the activity from either a consumption or a production point of view. In this paper, the approach used is to analyse subsistence/semi-subsistence households from a production point of view. The consumption approach is not preferred in this study as any commercial operation, fully integrated in input and output markets, may still cover a great deal of food consumption of a household.

Farms could be placed on a continuum of market integration from zero to 100% depending on the proportion of output sold. At the two extremes are pure subsistence and pure commercial operations with different mixes in-between. In the NMS, farm households normally produce for their own needs but also sell to the market. It is assumed here that farms in NMS are not purely subsistence but *semi-subsistence*. For this reason, in the remaining of this paper the notion of semi-subsistence is used. As a working threshold for classifying farm households as mainly semi-subsistence or mainly commercial 50% of output sold is applied. This threshold is arbitrary but has been widely used since Mosher (1970) defined subsistent farmers as those selling less than 50% of their output.[1]

The analysis of semi-subsistence farming in the NMS is difficult due the lack of adequate data. One of the sources of comparable data (although not catered towards subsistence farming) is the EU Farm Structure Survey (FSS). In compliance with the EU requirements, the most recent FSS in the five countries analysed here were carried out in 2005 and 2007. So far, EUROSTAT has published data for 2007 for Hungary, Poland and Slovenia. For the two countries that joined the EU in the last enlargement, Romania and Bulgaria, data are from 2005.

The FSS surveys focus on commercial farms including all farms of an economic size of at least one ESU.[2] However, EUROSTAT also publishes the number

[1] Another approach to split households into subsistence and commercial is based on household modelling and uses the concept of non-separability of production and consumption (Singh *et al.,* 1986). These authors show that under market failures household production and consumption decisions become non-separable.

[2] According to FSS methodology, a European Size Unit (ESU) is a measure of the economic size of a farm business. For each farm enterprise a standard gross margin is estimated, based on the area or heads of livestock, and a regional coefficient. The sum of these standard gross margins in a farm is its economic size expressed in ESU. One ESU is equal to 1,200 Euros. For example, in England, one ESU roughly corresponds to either 1.3 hectares of cereals, or 1 dairy cow, or 25 ewes, or equivalent combinations of these. https://statistics.defra.gov.uk/esg/asd/fbs/sub/europe_size.htm (2008-10-05)

of holdings that produce mainly for own consumption and splits these holdings by economic size, i.e. smaller or larger than one ESU.

Table 1 indicates that there are nearly 5.3 million of farm holdings which produce mainly for household consumption. In general, they are very small farms. One notable exception is Slovenia where most of the semi-subsistence farms are larger than one ESU.

3. Methodology

The methodology employed here involves two steps necessary to achieve the objective of the study. The first one is the valuation of unsold output and analysis of its importance for the household income of various types of farms households. This step helps answer the following questions: (i) does subsistence farming provide an important contribution to household incomes? (ii) is this contribution more important in the poorest EU Member States (Bulgaria and Romania) than it is in the Central European countries? (iii) what is the role of subsistence farming for poor and vulnerable households? The constructed variable, household income per capita including the value of unsold output (the latter is also referred here to as income-in-kind or subsistence production), is also used at the second step as one of the validation variables for the cluster analysis.

As mentioned earlier, it is important to investigate the importance of subsistence production for poor and vulnerable households (Petrovici and Gorton, 2005). In order to identify poor households, the EUROSTAT definition of at-the-risk-of-poverty is used. This measure refers to individuals living in households where the equivalised income is below the threshold of 60% of the national equivalised median income. Equivalised income is defined as the household total income divided by the equivalent size of the household. The household equivalent size was calculated using the modified OECD equivalence scale.[3]

Vulnerability is a more elusive concept. The World Bank addresses vulnerability from a social risk management perspective and defines vulnerable households as those who are more exposed to uninsured risk and shocks, and are less able to cope with these effectively (Kozel *et al*., 2008). For the purpose of this research, vulnerability refers to households who depend on unearned income (social transfers) and subsistence production, i.e. pensioners and the long-term unemployed. In some instances, the vulnerable households are also poor. As a proxy for vulnerability, the dependency ratio is used which is a ratio of the number of dependent members of the household who are outside working age to the number of economically active household members. It is notated as the *c/w* ratio. In calculating the dependency ratio, the EUROSTAT and European Commission age brackets were used as they reflect better the situation in Europe, particularly the length of education – the economic active persons are between 20 and 64 years old.[4] As a *c/w* ratio cannot be calculated for households for whom there are no members of working age, e.g. pensioner households, these households were assigned a *c/w* ratio of 8 (the highest *c/w* ratio within the sample for households who had economically active members was 7). As vulnerable here were defined households without any economically active member (a *c/w* ratio of 8) and other households with a *c/w* ratio between 3 and 7.

[3] This scale gives a weight of 1.0 to the first adult, 0.5 to any other household member aged 14 years and over, and 0.3 to each child. http://www.oecd.org/dataoecd/61/52/35411111.pdf

[4] See http://ec.europa.eu/health/ph_information/dissemination/echi/echi_1_en.htm.

The second step in the methodology is to create relatively homogeneous groups of farm households, using factor and cluster analysis. The criteria used here depends on the farm households' current aims in farming; their assessment regarding household agricultural production; their perceptions about the impediments they face to commercialisation and those measures they believe can facilitate the increase in their market integration. Within the country surveys, respondents were asked to answer statements related to their aims in farming; their attitude towards their current agricultural activities; their perceptions about barriers to increase output and some measures that might enable them to increase the share of output sold. Households had to state the degree to which they agreed or disagreed with the set of statements, measured on 5-point Likert scales from 'Totally disagree' - 1 to 'Totally agree' - 5. Altogether, 28 statements were included in the questionnaire. They are presented in Table 5. The statements were used as variables in factor and cluster analysis. First, in order to assess the structure of the interrelationships between these variables, and summarise and reduce the data, factor analysis was performed (Hair *et al.,* 1998). Factors presenting an eigenvalue of one or greater were chosen. The cut-off applied here used factor loadings (the correlation coefficients between a variable and a factor) ≥ 0.5 on at least one factor. The application of factor analysis was justified by two tests: the Barlett test of sphericity to test the null hypothesis that the inter-correlation matrix comes from a population with non-collinear variables, and the Kaiser-Meyer-Olkim (KMO) measure of sampling adequacy to define whether the data matrix has sufficient correlation to justify the application of factor analysis.

The factors were subsequently used in a two stage cluster procedure. First, Ward's method, a hierarchical technique, was used to identify outliers and profile the cluster centres. Then, the observations were clustered using a non-hierarchical method with the cluster centres from the hierarchical results used as the initial seed points. Punj and Steward (1983) argue that this procedure maximises the benefits of both the hierarchical and non-hierarchical approaches while it minimises their shortcomings.

The resulting clusters were included as dummies in a linear stepwise regression using as a dependent variable the share of output sold. In addition to the cluster dummies, several other variables have been tested for their predictive power. Continuous variables included: share of food consumption from own production as a proxy for the importance of farming activity for covering household food needs; distance to the nearest urban centre as a proxy for external transaction costs; total cultivated area as a measure of farm size, and a land dispersion index as a proxy for internal transaction costs (this variable was calculated by multiplying the number of household land plots by the distance to the most distant plot). Country dummies were included, as well as dummies for production technologies that could affect productivity rates, output and sales (farming predominantly with machinery; machinery and draft animals; or manually).

4. Data collection and sample description

4.1 Sampling and data collection

A questionnaire was designed in order to collect both quantitative and qualitative information for agricultural households. Information was collected in the following broad areas: (i) household head and household members characteristics; (ii) household income, employment and time allocation; (iii) agricultural land and non-land assets, production, and sales; (iv) household attitudes to their farming activities,

and their perceptions of the importance of drivers for, and impediments to, commercial agricultural activity.

The survey used geographical cluster sampling**.** Regions and villages were selected through a two-stage clustered sampling process. At the first stage, three regions in each of the five surveyed countries were selected according to their degree of relative economic development: (i) poor, (ii) average and (iii) prosperous, corresponding to a GDP per capita below, average and higher than the national average. The survey targeted rural areas, and for this reason the regions of the capital city and other large cities were excluded from the selection. EUROSTAT data at the NUTS3 level was used as a basis for this selection.

At the second stage, three villages per NUTS3 region were selected (again with a view to cover the variations within the NUTS3 regions, namely one prosperous, an average and a poor village in comparison to the regional average). Only households who were engaged in agricultural production in 2006 and/or 2003, including production from gardens or yards belonging to the house, were included in the sample.

The survey was implemented by face-to-face interviews using local enumerators. In the five countries, 668 respondents answered the qualitative statements which are the basis for the cluster analysis in this study. Out of 668 respondents 91 (13.6%) were from Bulgaria, 105 (15.7%) from Hungary, 147 (22%) from Poland, 173 (25.9%) from Romania and 152 (22.8%) from Slovenia.

4.2 Data adjustment and descriptive statistics

The objectives of this study require a valuation of the unsold output. It was valued product by product at market prices as a proxy for opportunity costs. If a household has sold a portion of the output in the market, the same price was imputed to the unsold quantity as it was assumed that the price the household had achieved was the best indication about the quality of output. In cases when the household consumed 100% of the output, crops were valued using a weighted average price for the village. In some instances, where there were only a few observations of output sold in a particular village and there was a large difference in reported prices, either regional averages or country averages reported by the national statistics were imputed. The data did not allow computing a weighted average for livestock products, as only the average weight and the average price per head were reported, and not the quantities sold. For this reason, when a village/regional livestock price was calculated it was a simple arithmetic average.

As data from the five countries were merged, all values were converted in Euro using EUROSTAT purchasing power parities (PPP) for 2006, the reference year for the collected data.[5]

Table 2 presents the descriptive statistics of the sample used in the analysis. Table 3 indicates that farmers in the five NMS are relatively old. They spend nearly three quarters of their time on-farm. The mean household is not large, 3.46 members on average. The mean *c/w* ratio does not suggest vulnerability but there are deviations from this mean.

The mean cultivated area is small, 8.7 ha, but the distribution is positively skewed; the size of the largest land plot is well over 100ha.

[5] PPP rates used here can be found in http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/metadata?p_product_code=PRC_PPP_ESMS.

On average, the sample households sell half of their agricultural output, which places them at the margin between semi-subsistence and commercially oriented, based upon the criteria we use here, but pure subsistence households are present in this sample. Home produced food covers a substantial part, nearly 45% on average, of their food consumption. The contribution of subsistence production to household income is just below 18%. However, most of these observations refer to the sample mean. The minimum and maximum indicate extreme cases of full dependence on subsistence farming, or conversely, of a lack of any reliance on subsistence.

The mean household income per capita, with and without the valuation of subsistence production, is less than 10,000 (PPP€) per annum. It should be noted that the standard deviation (SD) of household income is large, and both the mean and SD increases with the valuation of the unsold output and the income distribution is right skewed. At first glance, the location characteristics, represented by the distance to the nearest urban centre, do not suggest remoteness, but in situations where there is poor or inadequate transport infrastructure some households might find that distance acts as an impediment to reach buyers and wholesale markets, or to cultivate their most distant land plots.

5. Results

5.1 Is subsistence farming important for agricultural household incomes?

Table 3 provides a general picture of the contribution of subsistence production to the total household income.

Subsistence production valued at market prices contributes significantly to household incomes, particularly in Romania, Bulgaria and Poland. Although in Hungary there are more than half a million farms, producing mainly for self-consumption (see Table 1), their contributions to household income is modest. It is likely that many of these farms are semi-subsistent by choice and generate much of their incomes from off-farm or non-farm activities.

As expected, the contribution of subsistence farming is higher for households that are below the poverty line (the poverty line is calculated before the valuation of unsold output). Notably, subsistence farming appears to be crucial for the survival of poor agricultural households in Romania. The share of the value of the income-in-kind in the total household income is large at 48% here.

Despite this central importance of subsistence production for the incomes of the Romanian poor, it is in Bulgaria where its valuation has the largest effect, measured by the switch of households from below to above the poverty line (Table 4).

5.2 What are the attitudes and perceptions of farm households to farming and commercialisation?

The attitudes of the majority of respondents towards the aims for their farming activities are both to provide food for the household (49.7% totally agreed) and to generate cash income (40.4% totally agreed). These attitudes place them within the semi-subsistence group. However, the initial assumption in this paper that some households with small farming activities are hobby farmers is qualitatively confirmed by their attitudes. In this regard, 24.1% of respondents totally agreed with the statement that their aim in agriculture was to “Enjoy farming”, 25% totally agreed with the statement “We only produce for the provision of safe food for the household” and 18.7% totally agreed with the statement “We do not produce for pecuniary reasons”.

Concerning the respondents' perceptions about barriers to commercialisation and factors/policies that may facilitate their market integration, the surveys suggest that they are influenced by market prices and policy support, thus they appear not to be purely subsistence farm households. More than half of the respondents perceive that the prices they receive are low and that this is their main barrier to increase production and sales. Consistently, they totally agree that in order to increase the degree of commercialisation "Agricultural prices would need to be higher" and they "Would need (higher) policy payments to agriculture and rural development". The latter presents the respondents as CAP supporters. Insufficient capital, and their own old age and health problems are other important barriers to commercialisation perceived by respondents.

The country differences in the mean scores for Likert scales are statistically significant. Almost all households in the two poorest countries analysed (according to GDP/capita) totally agree that the main objective of farming is to provide food for the household (the mean scores are 4.60 for Bulgaria and 4.83 for Romania, whilst the mean score for the whole sample is 3.38). On the other hand, the attitude to farming as an activity households enjoy is the most pronounced in the richest amongst the five NMS, Slovenia. As barriers to increase production, the perceptions that output prices are low are particularly strong in Poland and Romania. The Romanian households also perceive the existing infrastructure and their own old age/health problems as impediments to increase farm output. The latter were consistent in their responses as they totally agreed (a mean score of 4.22) that an improved market and transport infrastructure could facilitate their commercialisation.

However, these differences in the means cannot help understand the heterogeneity in the attitudes and perception of sample households. For this purpose, factor and cluster analyses were employed. The list of all of the variables considered and those variables extracted for the factor and cluster analysis (those highlighted in bold) are shown in Table 5. The remaining un-emboldened variables had low factor loadings (below the cut-off point of 0.5) and were excluded from further analysis.

In addition, several variables were used to validate the clusters. They included variables characterising the household head (e.g. age, percentage of time spent on-farm); other household characteristics (number of household members, *c/w* ratio; equivalised income per capita (PPP) with and without the valuation of subsistence production; share of subsistence production in total household income; share of own produced food in food consumption); farm characteristics and location (total cultivated area, number of plots; size of the biggest plot; distance to the farthest plot from the residence; share of output sold).

The factor analysis generated 6 factors, explaining 65% of the variance (the rotated component matrix is presented in Annex 1). The KMO measure of sampling adequacy was 0.84, indicating that the data matrix had sufficient correlation to justify the use of factor analysis. Bartlett's test of sphericity was statistically significant at 1% level, rejecting the null hypothesis that the correlation matrix was an identity matrix.

The first factor relates to facilitators to commercialisation, including investment, training, farmers' collaboration, and contracts with buyers. The second one is associated with informational barriers to market integration and a lack of skills. The third factor indicates the perceived facilitators to commercialisation "Agricultural market prices would need to be higher" and "We would need higher payments for agriculture and rural development". The fourth factor is related to two farm objectives, namely cash income and non-pecuniary aims in farming. The fifth factor relates to insufficient capital and low market prices as barriers to increase production. The last

factor could be labelled farming lifestyle and summarises two aims for agricultural activity "To enjoy farming" and "To transfer to the next generation" (see Annex 1).

Using these factors as a basis for clustering and following the clustering procedure presented in the methodology section, a six cluster solution was obtained (Table 6).

Cluster 1 could be labelled '*low income hobby farmers'*. Households within this cluster claim they do not produce for pecuniary reasons. They have the lowest equivalised per capita incomes in the sample, both excluding and including the value of subsistence production, 6,508 and 7,410 PPP€, respectively (Table 7). Members of this cluster are located near an urban centre; the mean distance is only 15.8 km. The proximity of non-farms jobs may explain why this cluster has the highest share of household members in wage employment. Concerning farm endowments, this cluster has the smallest land holdings in comparison to the other five clusters, operates with the lowest level of technology and makes the least use of hired labour (Table 8). The members of this cluster (together with Cluster 6) sell the lowest share of output, 36.5%, and subsistence production is relatively unimportant for the household income (13.7%). The households of this cluster claim to be constrained by the low market prices. Due to low level of the existing technology and market integration, they also state that they would need to invest in machinery, cooperate with other households and establish contracts with buyers in order to become more commercially oriented. Polish households dominate this cluster with 59.0% of the cluster membership (Table 9).

On the surface, **Clusters 2 and 4** have several similarities, notably with respect to the reasons for farming (to generate cash income), their land assets and technology (Tables 7 and 8). Their members have the highest share of output sold. Hence, the members of both clusters can be classified as commercially oriented households. However, the two clusters differ substantially with respect to their perceptions about the barriers to increase sales. While Cluster 2 has the highest Likert-scale scores regarding the statements related to barriers to increase production, Cluster 4 has the lowest. This profiles Cluster 2 as *commercially oriented market constrained households* and Cluster 4 as *commercially oriented market unconstrained households.* The perceptions about facilitators to commercialisation also differ substantially. While the members of Cluster 2 agree relatively strongly with all the statements about what would help them increase their market integration, households in Cluster 4 do not seem to experience the same level of difficulty in accessing markets. In contrast to all other clusters supporting strongly the need for an increase in policy payments, Cluster 4 members disagree with the importance of these policies for their increased commercialisation (a mean score of 1.81 compared to the sample mean of 4.10).

An explanation for the attitudinal differences between these two clusters might be the household circumstances. Members of Cluster 4 have more land and higher incomes than Cluster 2 (Table 7). In addition, greater proportion of Cluster 4 use their own machinery (Table 8).

Finally, Cluster 2 is dominated by Romanian households (35.7% of the cluster members) who are hardly represented in Cluster 4 (2.6%). Bulgarian households account for the largest share of the membership of Cluster 4 (37.2%) and the lowest one of Cluster 2 (10.2%) (Table 9). Hungary and Poland each represent approximately 15% in Cluster 2 and 18% in Cluster 4.

Clusters 3 and 6 incorporate *asset rich* (Cluster 3) and *asset poor* (Cluster 6) *semi-subsistence households.* The share of output sold is 42.1% and 37.0% respectively (Table 7). In contrast to Cluster 1, the members of these two clusters state

that farming is an income generating activity and, therefore, they are not hobby farmers. Considering the cluster validation variables, households in Cluster 3 are substantially asset and income rich when compared to Cluster 6. They have, on average, twice as large a cultivated area, three times the value of agricultural equipment and 60% higher cash incomes (Table 7). For this reason, Cluster 3 is profiled as *asset rich semi-subsistence households* and Cluster 6 as *asset poor semi-subsistence households*. For the households in Cluster 3 the contribution of subsistence production to total income is significantly low. Subsistence production plays an important role for the asset poor Cluster 6 in shifting households from below to above the poverty line. While 21.6% of the Cluster 6 membership fall below the poverty line before the valuation of subsistence production only 13.7% remain below the poverty line after the subsistence production is valued.

Householders in these two clusters, 3 and 6, differ substantially in their perceptions about barriers to increase output and integration. The members of the asset rich cluster claim that they are content with their skills, capital and market information. They are the only cluster who claim to be satisfied with prevailing output market price levels. The asset poor cluster, Cluster 6, members state that all the above factors are barriers to their increase of farm production and integration. With regard to their perceptions about facilitators to commercialisation, both the asset rich Cluster 3 and asset poor Cluster 6 members claim that their market integration would be improved by all of the suggested actions. However, comparing how strongly respondents agree to these statements, the members of the asset rich cluster seem slightly less constrained than the asset poor cluster. Notably, the members of the asset poor cluster feel stronger about the beneficial impact of household external factors such as market prices, policy payments and infrastructure improvement.

Slovenia dominates Cluster 3 (48.1% of the cluster membership), but is also the second most important country in the asset poor Cluster 6 (24.5%). Bulgarian households constitute an important share of the asset rich cluster (25.3%), when Romanian households account for the largest share of the asset poor Cluster 6 (38.2%) (Table 9).

Similarly to Clusters 2 and 4, households in **Cluster 5** appear to be commercially oriented. This cluster differs from the two other commercially oriented clusters with respect to the share of output sold: 53.0% compared to 62.8% in Cluster 2 and 62.1% in Cluster 4 (Table 7). The farm assets (land, technology) and incomes of households in Cluster 5 are similar to those in Cluster 2. In addition, the households aims for current agricultural activity in Cluster 5 do not differ substantially to those of Clusters 2 and 4 - generating cash income, enjoying farming and transferring to the next generation. Considering the perceptions about current agricultural activity and about facilitators to commercialisation, the members of Cluster 5 appear to be fairly unconstrained in their market participation (similarly to Cluster 4). However, the perceptions about the households external constraints to market integration differ in comparison to Cluster 4, thus Cluster 5 is labelled *commercially oriented externally constrained households*. The members of Cluster 5 claim they receive low prices for agricultural output and in order to increase sales they strongly agree that market prices would need to be higher. Policy payments to agriculture are an equally important factor. Finally, households in this cluster claim that infrastructure improvement could also benefit their market integration, although to a lesser extent.

The largest share in Cluster 5 has Romania (35.5%), followed by Hungary (24.3%) (Table 9). Interestingly, the number of members in Clusters 2 and 5 is almost equal. Romanian households dominate both clusters with approximately the same

number of households in each cluster. This may suggest that within Romania there are two groups of commercially oriented households; one which perceives they face both internal and external constraints to commercialisation (Cluster 2) and one which are only constrained by household external factors (Cluster 5).

As explained in the methodology section, the resulting clusters were used in a regression analysis.

5.3 Stepwise regression

The approach taken to model specification reflects that, while there is some theoretical a priori reason to think that a range of variables likely affect the degree of agricultural commodity market integration of farmers in the sample, there is no real idea of which are most important. As a result, the approach makes use of a stepwise variable inclusion procedure. The process begins with the most parsimonious specification and subsequent iterations of the model test for the inclusion of additional parameters, one per iteration. In each subsequent iteration, the excluded independent variable that has the smallest probability of F is entered in an iterative manner as long as the probability of F is sufficiently small, while those independent variables already in the regression equation are removed if their probability of F becomes sufficiently large. Iteration stops when no more variables are eligible for inclusion or removal. Each model is estimated using OLS.

The most general model considered here could include 4 continuous variables, 6 cluster dummies, 3 technology dummies and 5 country dummies. As previously mentioned, the independent variable, used to indicate the degree of agricultural commodity market integration of each farm household, is the share of agricultural output sold. The variables used are listed below:

Continuous variables
Y = Share of agricultural output sold
X1 = Share of food consumption from own production
X2 = Land dispersion index (number of land plots * distance to furthest plot)
X3 = Total cultivated land area (ha)
X4 = Distance to nearest urban centre (km)

Dummy variables
C1= Cluster dummy- Semi-subsistence hobby
C2 = Cluster dummy- Constrained commercial
C3 = Cluster dummy - Semi-subsistence asset rich
C4 = Cluster dummy - Unconstrained commercial
C5 = Cluster dummy - Externally constrained commercial
C6 = Cluster dummy – Semi-subsistence asset poor

T1 = Technology dummy - Mechanical
T2 = Technology dummy - Manually
T3 = Technology dummy - Draft animals

S1 = Country dummy - Slovenia
S2 = Country dummy - Bulgaria
S3 = Country dummy - Romania
S4 = Country dummy - Hungary
S5 = Country dummy - Poland

Summary statistics of the continuous variables considered are presented in Table 2. The dummies for Romania, Cluster 1 (*semi-subsistence, hobby*) and mechanical technology were dropped to avoid singularity.

The estimation procedure began with a model which included a constant and one continuous censored variable: the share of food consumption from own production. Iteration continued through 10 further models during which time no variables included in a previous step were dropped. The final model selected included a constant, 3 continuous variables, 1 technology, 3 clusters and 4 country dummies. The procedure has eliminated 4 variables from the model: Technology – Draft animals, the Land dispersion index, and 2 clusters - C3 and C6. We can conclude that these variables do not help explain farm households' integration into formal markets.

Table 10 presents the parameter estimates in unstandardised and standardised forms along with their respective standard errors, *t*-statistics and probability values. The order in which the independent variables appear in this table indicates the order in which they were included in the model and therefore conveys information about their relative statistical importance in the model itself. As such, and ignoring the rather passive country dummies, the proportion of consumption derived from own production is the most important explanatory variable, while distance from the nearest urban centre is the least important.

As we might expect, the proportion of consumption derived from own production, the reliance on manual technologies, and farming in more remote situations reduces the households degree of integration in agricultural markets. Households with access to more land, and who have been estimated to be members of attitudinal clusters *constrained commercial*, *unconstrained commercial* and *externally constrained commercial* farmers are far more likely to be integrated in agricultural commodity markets.

As for the spatial component of the analysis, it would appear that Romanian agricultural households, the base against which the other countries are measured, are the least integrated into agricultural markets, followed by Slovenian, Polish, Hungarian, and finally Bulgarian households.

6. Conclusions

Subsistence and semi-subsistence farming is still wide-spread across the EU NMS. The analysis in this paper provides several conclusions that might inform policy. The value of income-in-kind is crucial for the rural poor, and particularly in the poorest of the EU NMS, Bulgaria and Romania. Policies strongly in favour of commercialisation might undermine the safety net provided by subsistence production (especially for households who are below the poverty line). Particularly sensitive to such policies might be the farm households in Romania as the regression analysis indicated that Romanian farmers were least market integrated.

Farm households in the NMS claim they respond to market prices, so they appear not be completely isolated from markets and might not base their decision-making on their shadow pricing alone but also on market prices. In addition, farm households in NMS seem to be 'interventionists' wanting more CAP support for agriculture and rural development with the notable exception of households in Cluster 4. This corroborates the work of Gorton *et al.* (2008) who found that, in comparison to EU-15 Member States, farmers in the NMS strongly opposed any idea for agricultural policy liberalisation and did not feel that CAP imposed restrictions on their farm plans.

Those households who sell more than 50% of their output and have been labelled here as '*commercially oriented*' are also not homogeneous (Clusters 2, 4 and 5). Some of them claim to be constrained by factor and human capital endowment while others are more optimistic that they could increase sales under the conditions of higher agricultural prices and policy support.

One of the factors that negatively affects market integration and which could be influenced by policy is technology, and particularly the cases when the main field operations are performed manually. This is consistent with several previous studies which have argued that technological improvements and productivity, and not price support, should be at the centre of policy interest in order to achieve a higher share of market integration (Toquero *et al*., 1975; Rios *et al.*, 2008). Policies to promote the use of machinery co-operatives, the so-called 'machinery rings', can help capital poor farm households to increase production above subsistence levels.

Another factor with a negative relationship to the share of output sold is remoteness (which here is a proxy for external transaction costs), measured by the distance to the nearest urban centre. In fact, the average distances to the urban centres are not large (on average 22.5 km and maximum 78 km). However, the real impediment might not be the distance but the underdeveloped and inadequate transport and market infrastructure. These issues were highlighted, in particularly, by members of Clusters 2 and 6. This is a typical case in which targeted rural development policies could help significantly to improve the welfare of the rural poor.

This study does not find that our measure of household land fragmentation, the farm dispersion index, acts as a barrier to commercialisation. This may suggest that policies for land consolidation, itself a very expensive and slow process, may not provide such a strong boost towards market integration, at least for the small farm sector itself, as had been hoped. However, caution is necessary as it is difficult to generalise based on one survey per country.

In summary, agricultural households are heterogeneous. While some households are already well integrated into formal markets, others are not. The factors that limit the integration of the willing households into markets are many but significant patterns appear from the analysis of this work. Furthermore, there appears to be some prospect of designing coherent policies to aid the integration of these groups of households. However, for others, semi-subsistence agriculture is a choice rather than a necessity. These households enjoy their lifestyle, produce for non-pecuniary reasons and insist on producing their own safe food. Such households will rarely respond to market based policy signals designed to provide incentives for market integration, and if these values and attitudes do not change (and changes in these areas could only be expected in the long run), semi-subsistence farming in the NMS is likely to persist despite policies facilitating structural change.

References

Barnett A., Blas E., Whiteside A. (eds.) AIDS Brief. Subsistence Agriculture. GPA/UNAIDS, 1996:4-5.

Brüntrup, M., Heidhues, F. (2002) Subsistence Agriculture in Development: Its Role in the Processes of Structural Change. *Discussion Paper.* Discussion Paper No. 1/2002, Institute of Agricultural Economics and Social Sciences in the Tropics and Subtropics, University of Hohenheim.

De Janvry, A., Fafchamps, M., Sadoulet, E. (1991) Peasant Household Behaviour with Missing Markets: Some Paradoxes Explained. *The Economic Journal*, 101**,** 1400-1417.

Dyer, G., Boucher, S., Taylor, J. (2006) Subsistence Response to Market Shocks. *American Journal of Agricultural Economics*, 88(2), 279-291.

EUROSTAT (2007a) Farm structure in Bulgaria - 2005. Statistics in focus, Agriculture and Fisheries, 43/2007.

EUROSTAT (2007b) Farm structure in Romania - 2005. Statistics in focus, Agriculture and Fisheries, 60/2007.

EUROSTAT (2008a) Farm structure in Poland - 2007. Statistics in focus, Agriculture and Fisheries, 50/2008.

EUROSTAT (2008b) Farm structure in Slovenia - 2007. Statistics in focus, Agriculture and Fisheries, 87/2008.

EUROSTAT (2009) Farm structure in Hungary - 2007. Statistics in focus, Agriculture and Fisheries, 7/2009.

Gorton, M., Douarin, E., Davidova, S., Latruffe, L. (2008) Attitudes to Agricultural Policy and Farming Futures in the Context of the 2003 CAP Reform: a comparison of farmers in selected established and new Member States. *Journal of Rural Studies*, 28(3), 322-336.

Hair, J., Anderson, R., Tatham, R., Black, W. (1998) *Multivariate Data Analysis* (Fifth Edition). Upper Saddle River, NJ: Prentice Hall International.

Key, N., Sadoulet, E., De Janvry, A. (2000) Transactions Costs and Agricultural Household Supply Response. *American Journal of Agricultural Economics*, 82(2)**,** 245-259.

Kostov, P., Lingard, J. (2004) Subsistence agriculture in transition economies: its roles and determinants. *Journal of Agricultural Economics*, 55(3)**,** 565-579.

Kozel, V., Fallavier, P., Badiani, R. (2008) Risk and Vulnerability Analysis in World Bank Analytic Work: FY2000—FY2007. *SP Discussion Paper* No 0812 World Bank.

Mathijs, E., Noev, N. (2004) Subsistence Farming in Central and Eastern Europe: Empirical Evidence from Albania, Bulgaria, Hungary and Romania. *Eastern European Economics*, 42(6), 72-89.

Mosher, A. (1970) The Development of Subsistence Farmers: A Preliminary Review. *Subsistence Agriculture: Concepts and Scope*, Aldine, Chicago.

Petrovici, D., Gorton, M. (2005) An evaluation of the importance of subsistence food production for assessments of poverty and policy targeting: Evidence from Romania. *Food Policy*, 30(2)**,** 205-223.

Punj, G., Stewart, D. (1983) Cluster analysis in marketing research: review and suggestions for application. *Journal of marketing research, 20*, 134-148.

Rios, A. R., W. A. Masters and G. E. Shively (2008). *Linkages between Market Participation and Productivity: Results from a Multi-Country Farm Household Sample*. Selected Paper 461840. American Agricultural Economics Association, 2008 Annual Meeting, July 27-29, 2008, Orlando, Florida.

Singh, I., Squire, L., Strauss, J. (1986) *Agricultural household models: extensions, applications, and policy*, Baltimore: Johns Hopkins University Press.

Toquero, Z., *et al.* (1975). Marketable Surplus Functions for a Subsistence Crop: Rice in the Philippines. *American Journal of Agricultural Economics*, 57(4), 705-709.

Table 1: Semi-subsistence farms in the studied NMS*

	Bulgaria	Hungary	Poland	Romania	Slovenia
Number of holdings producing mainly for own consumption (in thousand)	367.9	522.6	908.2	3444.8	45.6
Share of holdings producing mainly for own consumption of size less than 1 ESU (%)**	88.4	85.3	75.5	75.2	26.9

* Hungary, Poland and Slovenia data for 2007; Bulgaria and Romania data for 2005.
Source: EUROSTAT (2007a, 2007b, 2008a, 2008b, 2009)
** According to FSS methodology, a European Size Unit (ESU) is a measure of the economic size of a farm business. For each farm enterprise a standard gross margin is estimated, based on the area or heads of livestock, and a regional coefficient. The sum of these standard gross margins in a farm is its economic size expressed in ESU. One ESU is equal to 1,200 Euros. For example, in England, one ESU roughly corresponds to either 1.3 hectares of cereals, or 1 dairy cow, or 25 ewes, or equivalent combinations of these.
https://statistics.defra.gov.uk/esg/asd/fbs/sub/europe_size.htm (2008-10-05)

Table 2: Descriptive statistics of the sample analysed

	Mean	Min	Max	Std. Deviation	Skewness	
					Statistic	Std. Error
Number of observations	668					
Age of household head	54.34	22	89	12.9114	0.013	0.095
Time spent on-farm by household head (%)	72.38	0	100	36.6507	-0.765	0.095
Number of household members	3.46	1	9	1.62244	0.726	0.095
c/w ratio	1.35	0	8	2.38028	2.261	0.095
Total cultivated area (ha)	8.67	0.005	132	14.2779	4.656	0.095
Size of the biggest plot (ha)	2.89	0	67	5.16438	7.032	0.096
Distance to the most distant plot (km)	3.68	0	45	4.67885	3.939	0.095
Distance to the nearest urban centre (km)	22.49	4	78	18.9999	1.611	0.095
Share of output sold (%)	50.15	0	100	33.8542	-0.026	0.095
Share of food consumption from own production (%)	43.57	0	100	27.8633	-0.017	0.095
Equivalised income per capita excluding subsistence production (PPP€)	8323	254	52264	7110.98	2.67	0.095
Equivalised income per capita including subsistence production(PPP€)	9910	316	60387	7673.18	2.632	0.095
Subsistence production as share of total household income (%)	17.9	0	81.17	16.9881	1.015	0.095

Table 3: Contribution of subsistence farming to total household income per capita by country

	Bulgaria	Hungary	Poland	Romania	Slovenia
Value of unsold output/capita (PPP€)*	2,321	684	1,892	1,906	1,112
Share of the value of the unsold output in income per capita (%)**					
– All households	23.6	6.1	19.5	28.4	9.0
– Poor households	30.1	17.7	29.2	48.2	16.8
– Vulnerable households	32.6	4.5	20.3	36.0	7.8

* Based on equivalised household size

** Calculated as equivalised value of unsold output per capita/equivalised income per capita including the value of unsold quantities

Table 4: Contribution of subsistence farming to the poor households, by country

Country	Below poverty line excl. unsold output		Below poverty line incl. unsold output		Pushed above poverty line when incl. the value of unsold output	
	Number	Share (%)	Number	Share (%)	Number	Share (%)
Bulgaria	19	20.9	11	12.1	8	8.8
Hungary	15	14.3	10	9.5	5	4.8
Poland	14	9.5	6	4.1	8	5.4
Romania	6	3.5	2	1.2	4	2.3
Slovenia	40	26.3	31	20.4	9	5.9
Total	94	14.1	60	9.0	34	5.1

Table 5: Statements included in the questionnaire and cluster profiling variables (in bold)

Current aims for agricultural activity
To provide food for the household
To provide work for household members
To transfer to the next generation
To enjoy farming
To generate cash income
Perceptions about current agricultural activity
We have good profitability
We fully employ household members
We only produce for the provision of safe food for the household
We do not produce for pecuniary reasons
We get satisfactory income from current sales
Perceptions about barriers to increase production
We lack capital
We receive low prices for agricultural output
We lack necessary skills and education
We lack information and advice on market prices
We cannot meet standards of buyers or public regulations
Market and transport infrastructure prevent us from selling our products
Age/health prevent us from producing more than we currently do
Perceptions about facilitators to commercialisation
Agricultural market prices would need to be higher
We would need more land
We would need to specialise production into fewer products
We would need to invest in new machinery
We would need credit
We would need to collaborate with other households or farms to collectively market output
Market and transport infrastructure would need to be improved
We would need advice on how to meet buyers' quality standards and how to comply with public regulations
We would need training in marketing
We would need contracts with buyers
We would need (higher) policy payments to agriculture and rural development

Table 6: Cluster profiling variables

Attitudinal statement	Cluster mean						Sample mean	6-cluster *F*-test	Sig	
	1	**2**	**3**	**4**	**5**	**6**				
	No 100	No 157	No 79	No 78	No 152	No 102				
Current aims for agricultural activity										
To transfer to the next generation	3.13	3.62	3.25	3.27	3.57	2.84	3.33	5.856	0.000	***
To enjoy farming	3.27	3.64	3.95	3.46	3.76	3.23	3.56	5.807	0.000	***
To generate cash income	2.55	4.44	3.2	4.17	4.47	3.46	3.84	56.155	0.000	***
Perceptions about current agricultural activity										
We do not produce for pecuniary reasons	4.52	1.97	2.99	2.13	2.45	3.11	2.77	67.929	0.000	***
Perceptions about barriers to increase production										
We lack capital	4.32	4.24	2.1	4.03	3.06	3.97	3.66	66.8	0.000	***
We receive low prices for agricultural output	4.64	4.75	2.11	4.21	4.3	4.02	4.14	96.248	0.000	***
We lack necessary skills and education	2.08	1.82	1.71	2.29	2.6	3.6	2.35	49.973	0.000	***
We lack information and advice on market prices	2.17	2.6	1.94	2.76	2.87	3.8	2.72	34.846	0.000	***
We cannot meet standards of buyers or public regulations	2.2	2.33	1.54	2.28	2.49	3.62	2.44	45.837	0.000	***

* Significant at 10% level; ** Significant at 5% level; *** Significant at 1% level

Table continues on the next page.

Table 6 ctd.

Attitudinal statement	Cluster mean						Sample mean	6-cluster *F*-test	Sig	
	1 No 100	**2** No 157	**3** No 79	**4** No 78	**5** No 152	**6** No 102				
Perceptions about facilitators to commercialisation										
We would need to specialise production into fewer products	2.93	3.71	3.34	1.45	2.57	3.3	2.96	44.275	0.000	***
We would need to invest in new machinery	3.46	4.41	4.13	1.74	2.59	4.11	3.46	88.094	0.000	***
We would need credit	3.07	4.02	3.61	1.77	1.78	3.68	3	89.579	0.000	***
We would need to collaborate with other households or farms to collectively market output	3.14	3.88	3.22	1.65	2.45	3.5	3.05	48.919	0.000	***
Market and transport infrastructure would need to be improved	2.92	4.1	3.86	1.62	3.22	4	3.39	61.456	0.000	***
We would need advice on how to meet buyers' quality standards and how to comply with public regulations	2.4	3.96	3.53	1.45	2.65	3.7	3.04	69.129	0.000	***
We would need training in marketing	2.43	3.9	3.67	1.69	2.18	3.45	2.94	67.82	0.000	***
We would need contracts with buyers	3.46	4.01	3.53	1.67	2.89	3.91	3.33	52.181	0.000	***
Agricultural market prices would need to be higher	4.55	4.68	3.89	2.26	4.63	4.51	4.25	99.091	0.000	***
We would need (higher) policy payments to agriculture and rural development	4.22	4.59	4.03	1.81	4.61	4.3	4.1	110.048	0.000	***

* Significant at 10% level; ** Significant at 5% level; *** Significant at 1% level

Table 7: Continuous cluster validation variables

Variables	Cluster Mean 1 n= 100	2 n=157	3 n=79	4 n=78	5 n=152	6 n=102	Sample mean	6-cluster *F*-test	Sig.	
Age of household head	55.87	55.21	54.00	51.63	54.34	53.85	54.34	1.153	0.331	
Time spent on-farm by household head (%)	70.5	77.6	66.2	83.3	67.6	69.9	72.4	3.174	0.008	***
Number of household members	3.59	3.57	3.89	3.58	3.11	3.25	3.46	3.246	0.007	***
c/w ratio	1.14	1.02	1.67	1.28	1.82	1.16	1.35	2.371	0.038	**
Total cultivated area (ha)	3.69	9.98	9.90	12.19	10.95	4.56	8.67	6.480	0.000	***
Size of the biggest plot (ha)	1.98	3.41	3.01	3.37	3.38	1.82	2.89	2.239	0.049	**
Distance to most distant plot (km)	2.59	3.99	3.23	5.11	4.00	3.02	3.68	3.376	0.005	***
Distance to nearest urban centre (km)	15.81	21.54	25.33	34.46	21.32	20.91	22.49	9.982	0.000	***
Share of output sold (%)	36.5	62.8	42.1	62.1	53.0	37.0	50.1	15.160	0.000	***
Share of food consumption from own production (%)	46.6	41.2	39.8%	47.7	43.0	45.0	43.6	1.153	0.331	
Equivalised income per capita excl. subsistence production (PPP€)	6506	8226	10325	10635	8612	6508	8323	5.793	0.000	***
Equivalised income per capita incl. subsistence production (PPP€)	7410	9940	11195	12999	10715	7758	9910	7.370	0.000	***
Subsistence production as share of total income	13.7%	17.8%	9.4%	22.0%	21.8%	19.9%	17.9%	8.386	0.000	***
Value of agricultural equipment (PPP€)	8003	22150	25656	20593	18701	8847	17618	2.083	0.066	*

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level

Table 8: Binary cluster validation variables (share of cluster membership, %)

Variables	Cluster Number						Total sample
	1	2	3	4	5	6	
Vulnerable households	11.0	10.2	16.5	10.3	23.7	16.7	15.1
Below poverty line excluding subsistence production	13.0	7.0	21.5	21.8	9.2	21.6	14.1
Below poverty line including subsistence production	11.0	3.2	17.7	11.5	4.6	13.7	9.0
No household member self-employed	95.0	94.3	96.2	89.7	92.8	91.2	93.3
No household member in wage employment	25.0	37.6	31.6	39.7	48.0	35.3	37.3
Farming with household labour only	91.0	84.7	89.9	75.6	80.9	87.3	84.7
Formal credit used for production and marketing	3.0	7.6	5.1	14.1	8.6	3.9	7.0
Technical assistance used	6.0	17.2	11.4	17.9	15.8	8.8	13.3
Main farming technology							
Own agricultural machinery	42.0	48.4	55.7	56.4	46.1	35.3	46.7
Other peoples' agricultural machinery	30.0	39.5	16.5	26.9	38.8	48.0	35.0
Own draft animals and agricultural machinery	3.0	0.0	1.3	2.6	4.6	2.0	2.2
Other peoples' draft animals and agricultural machinery	7.0	3.2	1.3	1.3	2.0	2.9	3.0
Manually	15.0	8.3	24.1	9.0	6.6	11.8	11.4

Table 9: Cluster membership by country (%)

Country	Cluster Number						
	1	2	3	4	5	6	Total sample
Bulgaria	7.0%	10.2%	25.3%	37.2%	6.6%	8.8%	13.6%
Hungary	6.0%	14.6%	15.2%	17.9%	24.3%	12.7%	15.7%
Poland	59.0%	15.3%	3.8%	17.9%	20.4%	15.7%	22.0%
Romania	16.0%	35.7%	7.6%	2.6%	35.5%	38.2%	25.9%
Slovenia	12.0%	24.2%	48.1%	24.4%	13.2%	24.5%	22.8%
Cluster total	100	100	100	100	100	100	100

Table 10: Preferred specification. Predictors of farm market integration.

Share of agricultural output sold Independent Variables:	Unstandardised Coefficients		Standardised Coefficients		
	B	Std. Error	Beta	T	Sig.
(Constant)	38.893	4.157		9.597	.000
Share of food consumption from own production	-.199	.046	-.164	-4.366	.000
Technology dummy - Manually	-24.598	4.057	-.228	-6.064	.000
Cluster dummy - constrained commercial	23.406	2.982	.296	7.850	.000
Cluster dummy - unconstrained commercial	18.129	3.942	.173	4.598	.000
Total cultivated land area	.281	.083	.119	3.369	.001
Country dummy - Hungary	23.226	4.026	.245	5.769	.000
Country dummy - Poland	19.378	3.535	.236	5.482	.000
Country dummy - Bulgaria	26.402	5.806	.270	4.548	.000
Cluster dummy – externally constrained commercial	12.133	3.086	.151	3.932	.000
Country dummy - Slovenia	7.876	3.441	.098	2.289	.022
Distance to nearest urban centre (km)	-.195	.095	-.110	-2.067	.039

Annex 1 - Rotated Component Matrix

	Component					
	Facilitators to market integration	Information and skills constraints	Market and policy facilitators	Pecuniary farming objectives	Financial constraints	Farming lifestyle
We would need to invest in new machinery	**.799**	.000	.077	-.089	.028	-.003
We would need credit	**.797**	-.039	-.061	-.122	.079	.025
We would need training in marketing	**.767**	.016	.045	.107	-.062	.091
We would need advice on how to meet buyers' quality standards and how to comply with public regulations	**.727**	.103	.213	.166	-.105	.048
We would need to collaborate with other households or farms to collectively market output	**.681**	-.032	.189	-.062	.157	.054
Market and transport infrastructure would need to be improved	**.662**	.139	.327	.139	-.110	.008
We would need to specialise production into fewer products	**.633**	-.036	.181	-.055	-.029	.090
We would need contracts with buyers	**.603**	.030	.355	-.069	.062	-.029
We lack necessary skills and education	-.061	**.806**	.029	-.083	.004	.069
We cannot meet standards of buyers or public regulations	.058	**.779**	.092	-.040	.132	-.006
We lack information and advice on market prices	.055	**.771**	-.057	.121	.119	.026
We would need (higher) policy payments to agriculture and rural development	.377	-.002	**.767**	.055	-.020	.013
Agricultural market prices would need to be higher	.315	.052	**.749**	-.045	.081	.048
We do not produce for pecuniary reasons	-.003	.067	.093	**-.867**	.049	.031
To generate cash income	-.045	.069	.119	**.765**	.157	.287
We lack capital	.103	.202	-.147	-.082	**.817**	-.019
We receive low prices for agricultural output	-.088	.077	.223	.176	**.805**	.084
To enjoy farming	.101	.032	.028	.016	-.117	**.849**
To transfer to the next generation	.072	.051	.016	.166	.183	**.764**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 6 iterations.