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"Determinants for, and barriers to, exit from subsistence food production: commonalities and differences among NMS"

Lena Fredriksson[1], Sophia Davidova[1] & Alastair Bailey[1]

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[1] Department of Economics, University of Kent, UK S.M.Davidova@kent.ac.uk, lef8@kent.ac.uk and A.Bailey@kent.ac.uk

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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. Food 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.

Executive Summary

This deliverable aims to briefly evaluate the role of subsistence farming in five EU NMS Bulgaria, Hungary, Poland, Romania and Slovenia. The main focus lies on analysing the attitudes and perceptions of farm households about a range of impediments to their commercialisation and factors that could facilitate their market integration.

Data were collected through surveys of agricultural households conducted within SCARLED WP4. Multivariate statistics (factor and cluster analysis) and regression analysis are employed to investigate the impediments and facilitators to commercialisation. All income and production data refer to the year 2006, while statements regarding aims and attitudes refer to the time of the survey.[2]

Subsistence production valued at market prices contributes significantly to household incomes, particularly in Romania, Bulgaria and Poland. Although in Hungary a majority of farms produce mainly for self-consumption (Eurostat, 2009), 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. A similar picture is found in Slovenia, where the contribution of subsistence production to household incomes is higher than in Hungary but lower in comparison to households in Romania, Bulgaria and Poland.

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% in the country. Despite this central importance of subsistence production for the incomes of the Romanian

[2] Autumn 2007 and winter 2008

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.

Concerning the respondents' perceptions about barriers to commercialisation and factors/policies that may facilitate their market integration, the survey 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, their own old age and health problems are other important barriers to commercialisation perceived by respondents.

Cluster analysis based on attitudinal statements generated six clusters: 1) Low-income hobby farmers; 2) Commercially oriented market constrained households; 3) Part-time farmers; 4) Commercially oriented market unconstrained households; 5) Commercially oriented externally constrained households; and 6) Subsistence oriented low-income households.

The analysis concludes that subsistence oriented farming with varying degrees of market participation is still wide-spread across the EU NMS.

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.

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. 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 (Millns and Juhasz, 2006).

In addition, targeted rural development policies addressing underdeveloped and inadequate transport and market infrastructure could help significantly to improve the welfare of the rural poor. This is true notably for clusters 2,3 and 5. At the

country level, Romanian households feel strongly that an improved market and transport infrastructure would contribute towards increasing sales of output.

The analysis 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.

SCARLED Consortium

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Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO) – Coordinator
Theodor-Lieser Str. 2
06120 Halle (Saale)
Germany

Contact person: Judith Möllers
E-mail: scarled@iamo.de

Catholic University Leuven (KU Leuven)
LICOS Centre for Institutions and Economic Performance & Department of Economics
Deberiotstraat 34
3000 Leuven.
Belgium

Contact person: Johan Swinnen
E-mail: jo.swinnen@econ.kuleuven.be

University of National and World Economy (UNWE)
St. Town "Chr. Botev"
1700 Sofia
Bulgaria

Contact person : Plamen Mishev
E-mail: mishevp@intech.bg

Corvinus University Budapest (CUB)
Department of Agricultural Economics and Rural Development
Fövám tér 8
1093 Budapest
Hungary
Contact person: Csaba Csáki
E-mail: csaba.csaki@uni-corvinus.hu

Research Institute for Agricultural Economics (AKI)
Zsil u. 3/5
1093 Budapest
Hungary
Contact person: József Popp
E-mail: poppj@akii.hu

Warsaw University, Department of Economic Sciences (WUDES)
Dluga 44/50
00-241 Warsaw
Poland
Contact person: Dominika Milczarek-Andrzejewska
E-mail: milczarek@wne.uw.edu.pl

Banat's University of Agricultural Sciences and Veterinary Medicine Timisoara (USAMVB)
Calea Aradului 119
300645 Timisoara
Romania
Contact person: Cosmin Salasan
E-mail: cosminsalasan@xnet.ro

University of Ljubljana (UL)
Groblje 3
1230 Domzale
Slovenia

Contact person: Luka Juvančič
E-mail: luka.juvancic@bfro.uni-lj.si

The University of Kent, School of Economics (UNIKENT)
Canterbury
Kent CT2 7NP
United Kingdom
Contact person: Sophia Davidova
E-mail: S.M.Davidova@kent.ac.uk

University of Newcastle upon Tyne, Centre for Rural Economy (UNEW)
Newcastle upon Tyne NE1 7RU
United Kingdom

Contact person: Matthew Gorton
E-mail: matthew.gorton@newcastle.ac.uk

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LIST OF ABBREVIATIONS

CAP	Common agricultural policy
CEE	Central and Eastern Europe
ESU	European Size Unit
FADN	Farm Accountancy Data Network
FSS	Farm Structure Survey
NMS	New EU Member States
SCARLED	Structural change in agriculture and rural livelihoods
WP	Workpackage

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1 INTRODUCTION

Twenty years after the start of the transition in Central and Eastern Europe, (CEE) 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 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, 2002). 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. Subsistence 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, but there is some evidence that even if EU accession may lead to a decrease and eventual

disappearance of subsistence farms, hobby farming is likely to persist even in the longer term (Möllers *et al.*, 2009).

In order to understand the barriers to, and facilitators for, commercialisation of subsistence farmers in the EU NMS where households with small farms are widespread, it is key to understand the role of subsistence farming in these countries. The role of subsistence farming in the EU NMS is the focus of SCARLED Deliverable 6.3 "The importance of subsistence farming as a safety net in the NMS", upon which this deliverable relies. This present deliverable aims to briefly evaluate the role of subsistence farming in five EU NMS Bulgaria, Hungary, Poland, Romania and Slovenia. The main focus of this deliverable lies on analysing 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 SCARLED WP4. Multivariate statistics (factor and cluster analysis) and regression analysis are employed to investigate the impediments and facilitators to commercialisation.

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).

Brüntrup and Heidhues (2002) argue that any definition of subsistence farming is always arbitrary since based on thresholds. This is acknowledged by Mathijs and Noev (2002), who argue that another problem of defining subsistence farming lies in the possibility to consider the activity from either a consumption or a production point of view within a spectrum of 0 to 100% of output consumed or sold respectively. In this deliverable, the applied approach is to classify households from a production point of view. The consumption approach is not preferred as any commercial operation, fully integrated in input and output markets, may still cover a great deal of food consumption of a household.

Wharton (1969) addresses the experienced problematic created by an imprecise and non-uniform use of the term subsistence. Focusing on agricultural output markets, he argues that farm households can be placed on a continuum from zero to 100% depending on the proportion of their output sold. At the two extremes are purely subsistence and purely commercial operations with different mixes in-between. With regard to this continuum, he introduced a threshold of 50% of marketed output, classifying farmers selling less than this as subsistence and semi-subsistence while labelling those above the threshold as semi-commercial and commercial. Moreover, he defines "subsistence production" as a situation where the agricultural activities undertaken by the household are directed towards meeting consumption needs, without any or few market transactions (this is how interpreted "without any or few intermediaries or exchange (barter or monetary)"). Several authors (Lerman, 2001; Brüntrup and Heidhues, 2002; Kostov and Lingard, 2004) utilise this approach, which also informs the analyses in this deliverable. Apart from the two extremes mentioned above, the following groups are defined based on this criterion and used in this deliverable:

- Households selling 0 up to 49.99 % of their agricultural output – *subsistence oriented*
- Households selling 50 to 100% of their agricultural output - *commercially oriented*

The analysis of subsistence and 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.

To understand the importance of subsistence farming in the NMS, consider first the farm structure of the NMS which differs from EU-15 (Table 1). While NMS farms are concentrated to the smaller scale of the spectrum, the prevailing farm structure in EU-15 shows a different pattern with a higher concentration of larger farms. Bulgaria, Hungary and Romania differ most from EU-15, while the farm structure of Poland and Slovenia is more similar with the exception of not having as many farms >20 ha.

Table 1. Shares of total number of holdings by farm size (2007)

Farm size (UAA*)	Bulgaria	Hungary	Poland	Romania	Slovenia	EU-15
0	2.3%	9.6%	0.5%	2.0%	0.1%	1.5%
<2	84.6%	72.2%	43.8%	63.2%	24.7%	32.0%
2<5	8.0%	7.6%	24.3%	24.6%	34.3%	21.0%
5<10	2.0%	3.9%	16.3%	7.6%	25.4%	12.9%
10<20	1.1%	2.7%	10.0%	1.8%	11.3%	10.5%
20<30	0.4%	1.0%	2.7%	0.2%	2.5%	5.2%
30<50	0.3%	1.0%	1.5%	0.2%	1.2%	6.0%
50<100	0.4%	0.9%	0.7%	0.1%	0.4%	6.2%
>100	0.9%	1.0%	0.3%	0.2%	0.1%	4.7%
Total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

* Utilised Agricultural Area. The UAA comprises total arable land, permanent pastures and meadows, land used for permanent crops and kitchen gardens. The UAA excludes unutilised agricultural land, woodland and land occupied by buildings, farmyards, tracks, ponds, etc.

Source: Eurostat

As can be seen from table 1, farms larger than 5 ha are rare in both Bulgaria and Hungary, while the other three countries have higher shares of larger farms; <10 ha in Romania and <20 ha in Poland and Slovenia. The shares of farms larger than these thresholds are only marginal. In the EU-15 on the other hand, farms >20 ha represent more than a fifth of farms. This means that what can be considered a large farm in the NMS, is regarded as small in a wider EU context. [3]

Another measure of farm size is the ESU, which measures the economic size of the farm and gives an indication of its production value. [4] Table 2 clearly illustrates the

[3] What constitute small and large farms will not be debated within this deliverable. For a discussion of what could be considered a small farm according to various measures, see for example Hubbard (2009).

[4] 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

dominance of farms <1 ESU in the NMS. Slovenia places itself somewhere in between the NMS and EU-15, with more farms >1 ESU than the other NMS but still with fewer farms >16 ESU compared to EU-15.

Table 2. Shares of total number of holdings by ESU (2007)

Farm size ESU	Bulgaria	Hungary	Poland	Romania	Slovenia	EU-15
<1	76.1%	77.5%	52.8%	78.0%	18.4%	15.6%
1<2	13.0%	8.5%	15.1%	16.0%	24.6%	16.6%
2<4	6.5%	5.7%	12.5%	4.3%	24.6%	16.6%
4<8	2.1%	3.7%	9.3%	1.1%	16.8%	15.7%
8<16	1.0%	2.2%	6.1%	0.3%	9.5%	12.4%
16<40	0.6%	1.5%	3.4%	0.2%	4.9%	12.7%
40<100	0.3%	0.6%	0.6%	0.1%	0.9%	9.0%
100<250	0.2%	0.2%	0.1%	0.0%	0.1%	4.1%
>250	0.1%	0.2%	0.1%	0.0%	0.2%	1.0%
Total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Source: Eurostat

In absolute numbers, there are nearly five million farm holdings in the studied NMS which produce mainly for household consumption (Table 3). In general, they are very small farms. One notable exception is Slovenia where most of these farms are larger than one ESU.

Table 3. Subsistence oriented farms in the studied NMS (2007)

	Bulgaria	Hungary	Poland	Romania	Slovenia	Total
Total number of farms (thousands)	493.13	626.32	2,390.96	3,931.35	75.34	7,517.10
Share of farms producing mainly for own consumption (%)	69.7	83.4	38.0	80.7	60.5	66.4
Share of farms <1ESU (%)	76.1	77.5	52.8	78.0	18.4	69.2
Share of farms <1ESU producing mainly for own consumption (%)	81.8	91.8	54.3	85.6	88.8	78.3

Source: Eurostat

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)

3 METHODOLOGY

The methodology employed here involves two steps necessary to achieve the objective of this deliverable. 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.[5] 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.[6]

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). In this research, vulnerability is based on household demographics. Note that 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.[7] 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 4 (the highest *c/w* ratio within the sample for households who had economically active members was 4). As vulnerable here

[5] The Eurostat at-the-risk of poverty thresholds were in 2006: Bulgaria €1022, Hungary €2308, Poland €1867, Romania €828 and Slovenia €5589.

[6] 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

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

were defined households without any economically active member (a *c/w* ratio of 4) and other households with a *c/w* ratio between 3 and 4.

The second step in the methodology is to create relatively homogeneous groups of farm households, using factor and cluster analysis. The criteria used here depend 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.

In the final step, the resulting clusters were included as dummies in a linear stepwise regression using share of output sold as the dependent variable. The rationale of this approach is to investigate the group (cluster) effect on the degree of commercialisation. In addition to the cluster dummies, several other variables were 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 within the scope of SCARLED WP4. 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 deliverable. 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 deliverable 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.[8]

Table 4 presents the descriptive statistics of the sample used in the analysis.

Table 4. 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 sales in output (%)	52.89	0	100	32.61537	-0.064	0.095
Share of food consumption from own production %)	45.26	0	100	26.97347	-0.065	0.098
Equivalised income per capita (PPP€)						
• excl. subsistence production	8304	254	52264	7137.38	2.684	0.095
• incl. subsistence production	10245	451	68627	7817.869	2.807	0.095
Value of agricultural equipment (PPP€)	17773	0	680343	41616.52	10.261	0.117

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.

[8] 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 10,250 (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 Importance of subsistence farming for agricultural household incomes

Table 5 provides a general picture of the contribution of subsistence production to the total household income.[9]

Table 5. Contribution of subsistence farming to total household income per capita, by country.

	Bulgaria	Hungary	Poland	Romania	Slovenia
Equivalised income per capita excluding subsistence production (PPP€)	8902	9957	6744	5280	11805
Value of subsistence production per capita (PPP€)*	2864	507	2146	2365	1601
Share of the value of the unsold output in income per capita (%)**					
– All households	28.29	5.99	23.53	32.68	12.54
– Poor households	39.49	19.07	40.44	50.82	23.29
– Vulnerable households	39.27	6.28	26.66	39.73	13.52

* Based on equivalised household size

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

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 3), 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% in the country.

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 6).

Table 6. Contribution of subsistence farming to the poor households, by country

[9] Refer to SCARLED Deliverable 6.3 "The importance of subsistence farming as a safety net in the NMS", for a detailed analysis of the role of subsistence farming for rural households in the NMS.

Country	Below poverty line excl. subsistence production		Below poverty line incl. subsistence production		Pushed above poverty line when incl. the value of unsold output	
	Number	Share (%)	Number	Share (%)	Number	Share (%)
Bulgaria	19	20.9	8	8.8	11	12.1
Hungary	14	13.3	9	8.6	5	4.8
Poland	14	9.5	3	2.0	11	7.5
Romania	6	3.5	2	1.2	4	2.3
Slovenia	39	25.7	26	17.1	13	8.6
Total	*92*	*13.8*	*48*	*7.2*	*44*	*6.6*

Surprisingly, Slovenia, which on average is the richest amongst the five studied NMS measured by GDP/capita, has the highest share of poor households. It has to be borne in mind that the poverty lines are relative and country-specific. What the above table indicates, is that in relation to the average incomes in the country, Slovenia and Bulgaria have the highest proportions of rural poor.

5.2 Aims and perceptions of farm households to farming and commercialisation

The aims of the majority of respondents regarding their farming activities are both to provide food for the household (49.7% totally agreed) and to generate cash income (40.4% totally agreed) (Table 7). These attitudes reflect both subsistence objectives (providing food for the household) as well as commercially oriented intents (generating cash income). However, the initial assumption in this deliverable that some households with small farming activities are hobby farmers is qualitatively confirmed by the attitudinal statements. 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".

Table 7. Aims regarding farming activities (%)

	Totally disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Totally agree	Total
To provide food for the household	7.2	5.5	6.7	30.8	49.7	100
To provide work for household members	18.7	13.9	17.1	31.7	18.6	100
To transfer to the next generation	15.0	10.3	25.6	24.6	24.6	100
To enjoy farming	8.5	8.4	25.3	33.7	24.1	100
To generate cash income	10.2	7.0	12.3	30.1	40.4	100
We only produce for the provision of safe food for the household	15.3	17.7	15.1	26.9	25.0	100
We do not produce for pecuniary reasons	24.9	24.1	18.6	13.8	18.7	100

Concerning the respondents' perceptions about barriers to commercialisation and factors/policies that may facilitate their market integration, the survey 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, 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 (Appendix 1). 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, where the score for the objective to generate cash income is lower than the sample average. However, the relationships between farm household perceptions and country level of economic development need to be interpreted with caution as it may reflect cultural rather than economic differences. 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 8. The remaining un-emboldened variables had low factor loadings (below the cut-off point of 0.5) and were excluded from further analysis.

Table 8. 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

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 Appendix 2). 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 Appendix 2).

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 9). The clusters were validated with a set of continuous variables (Table 10) and the analysis further informed through a range of binary validation variables (Table 11). The geographical distribution of clusters was also considered (Table 12).

Cluster 1 could be labelled '*low income part-time 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, 6,368 and 7,675 PPP€, respectively (Table 9). 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 9). The members of this cluster (together with Cluster 6) sell the lowest share of output, 37.5%, and subsistence production is relatively unimportant for the household income (13.7%). The households of this cluster claim to be constrained by 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 10). Considering the low incomes of the households in the sample, it is likely that some households in this

cluster are pushed to keep farming to secure household food consumption needs (the share of food consumption from own production is 47.8% and it is higher than the sample mean of 45.3%, Table 10). It is also possible that part of the cluster are hobby farmers, whose agricultural activities are a lifestyle choice although they contribute little to household incomes.

On the surface, **Clusters 2 and 4** have several similarities. Generating cash income as an objective for farming is most pronounced for these two clusters, and their members also sell the highest shares of output, 61.3 and 61.2% respectively. With that they represent the most commercially oriented clusters in the sample, and the commitment to commercial agricultural activity is also reflected by the time allocation of household heads, which spend the highest shares of time on-farm (77.6 and 83.3% respectively) in comparison with the other clusters. The two clusters also share similar characteristics with respect farming technology. 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 the two clusters 2 and 4 might be the household circumstances. Members of Cluster 4 have more land and higher incomes than Cluster 2 (Table 10). In addition, a greater proportion of Cluster 4 uses own machinery (Table 11).

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 12). Hungary and Poland each represent approximately 15% in Cluster 2 and 18% in Cluster 4.

Table 9. Cluster profiling variables

Attitudinal statement	Cluster mean 1	2	3	4	5	6	Sample mean	6-cluster *F*-test	Sig	
N =	100	157	79	78	152	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	***
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 10. 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 N=668	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)	15.8	21.5	25.3	34.5	21.3	20.9	22.5	9.982	0.000	***
Share of sales in output (%)	37.5	61.3	55.6	61.2	53.3	45.6	52.9	9.121	0.000	***
Share of food consumption from own production (%)	47.8	42.9	41.8	47.9	45.3	47.0	45.3	0.857	0.510	
Equivalised income per capita (PPP€)										
– Excl. subsistence production	6368	8226	10396	10635	8572	6481	8304	6.016	0.000	***
– Incl. subsistence production	7675	10398	11754	13301	11005	7874	10245	7.541	0.000	***
Subsistence prod. contribution to total income (%)	18.96	21.34	13.35	24.44	24.68	23.13	21.42	5.290	0.000	***
Value of agricultural equipment (PPP€)	8167	22150	25656	20887	18787	8955	17773	1.999	0.078	*

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

Table 11. Binary cluster validation variables (share of cluster membership in %)

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	20.3	21.8	8.6	21.6	13.8
Below poverty line including subsistence production	10.0	2.5	12.7	9.0	3.9	10.8	7.2
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 12. Cluster membership by country (%)

Country	Cluster Number						Total sample
	1	2	3	4	5	6	
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%

Clusters 3 and 5 have similar degrees of market integration with 55.6 and 53.3% of output sold. They are therefore defined as commercially oriented, even though to a lesser extent than clusters 2 and 4. The two clusters share similar demographic characteristics, size of holdings and household head time allocation to work on-farm. While both clusters agree with enjoying farming, generating cash income is a strong objective for cluster 5 but less so for cluster 3. There are two plausible explanations for this. One the one hand, households in cluster 3 are slightly larger and have a higher share of members engaged in waged employment in comparison with cluster 5, who has got the lowest degree of income diversification of all clusters. This could explain the high average incomes of cluster 3 and its low share of subsistence production in total household income. On the other hand, there is a

high degree of poor households in this cluster and subsistence production plays an important role in shifting these households above the poverty line. Providing food for the household could hence be a stronger objective than producing for pecuniary reasons. Nevertheless, the higher involvement in off-farm employment and lower degree of commercialisation relative to clusters 2 and 4, and the higher incomes than cluster 1 best define cluster 3 as *high income part-time farmers*.

The high income part-time farmers of cluster 3 appear relatively unconstrained in increasing output, but seem to be facing constraints with respect to increasing sales where they lean towards agreeing with all the proposed statements about facilitators to increase commercialisation. It should be borne in mind that these farmers are mainly farming part-time, are integrated in off-farm labour markets to a high extent and already enjoy high incomes. It is likely that for them to increase sales, it would be necessary to allocate more time to on-farm work, thus requiring a higher pay-off than current income activities would generate. Policy payments to agriculture and rural development together with increased market prices and improved infrastructure are the external factors that would have the highest impact. On the farm household level, investing in new machinery and accessing credit are the two factors that would matter the most. Training in marketing and how to meet quality standards are other factors that could be important, as well as establishing contracts with buyers. Specialising production and collaborating in marketing output seem to matter only to a lesser extent.

In contrast, the low degree of involvement in off-farm employment of household members in Cluster 5 gives the impression of this cluster as more oriented towards agriculture and as such more similar to clusters 2 and 4. Comparing the attitudes towards perceived barriers and facilitators for commercialisation, cluster 5 is very similar in its opinions to cluster 4 (commercially oriented unconstrained households). However, the perceptions about 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. Infrastructure improvement could also benefit their market integration, although to a lesser extent. A final point to make with respect to this cluster is the indications of a high proportion of households in this cluster being pensioners; high share of vulnerable households and high average age of household heads. It is therefore likely that a large proportion of households in this cluster would not respond to policy measures aimed at increasing commercialisation, even if through increased policy payments.

Slovenia dominates Cluster 3 (48.1% of the cluster membership), followed by Bulgaria (25.3%). This distribution of households within the cluster may explain why there is a large share of households below the poverty line, despite average incomes being high. As indicated in Table 6 Bulgaria and Slovenia have high shares of rural households below the poverty line, and at the same time Slovenia has the highest GDP/capita amongst the NMS in the sample. Both Slovenia and Bulgaria only

represent smaller shares of cluster 5, where Romania has the largest share (35.5%) and Hungary and Poland make up 24.3 and 20.4% of the cluster, respectively.

Cluster 6 incorporates subsistence oriented households. Output sold is 45.6% and incomes are together with cluster 1 the lowest in the sample. Generating cash income is not a strong objective for farming. Considering that 21.6% of households fall below the poverty line before subsistence production is valued, satisfying household food consumption needs is likely to be a stronger objective. After valuation of subsistence production, this figure falls to 10.8%. Income diversification of this cluster is high, with a high share of household members working off-farm and household head time allocation to on-farm work being slightly lower than average. Land assets are small and ownership of agricultural machinery is low. All these factors taken into account, this cluster is labelled *subsistence oriented low-income households*. It is not expected that these households will shift away from part-time subsistence oriented farming to commercially oriented agricultural activities since this would require major adjustments. This is reflected in the perceptions about barriers to increase production and facilitators for increasing commercialisation, where households highly agree with all proposed statements. Naturally, increased policy payments and increased market prices could impact on this decision as could infrastructure improvements but most importantly, the answers of this cluster indicate that at present, these subsistence oriented farmers do not possess the necessary assets, skills and contacts to commercialise. It appears that what would benefit the households in this cluster the most, are not policies aimed at commercialisation of agricultural activities as much as policies in favour of developing rural labour markets. Such measures would allow the small land assets of these farmers to be put to more efficient use by larger commercially oriented holdings.

Geographically, Romania occupies the largest share of this cluster (38.2%) followed by Slovenia (24.5%). The other countries only make up smaller shares of the cluster (Bulgaria 8.8%, Hungary 12.7% and Poland 15.7%).

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 - Low income part-time
C2 = Cluster dummy - Constrained commercial
C3 = Cluster dummy – High income part-time
C4 = Cluster dummy - Unconstrained commercial
C5 = Cluster dummy - Externally constrained commercial
C6 = Cluster dummy – Subsistence oriented low-income
S1 = Country dummy - Slovenia
S2 = Country dummy - Bulgaria
S3 = Country dummy - Romania
S4 = Country dummy – Hungary
S5 = Country dummy - Poland

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

Summary statistics of the continuous variables considered are presented in Table 4. The dummies for Romania, Cluster 1 (*low income part-time farmers*) 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 9 further models during which time no variables included in a previous step were dropped. The final model selected included a constant, 2 continuous variables, 1 technology, 2 cluster and 4 country dummies. The procedure has eliminated 6 variables from the model: Technology – Draft animals, the Land dispersion index, and 3 clusters - C3, C5 and C6. We can conclude that these variables do not help explain farm households' integration into formal markets.

Table 13. Preferred specification. Predictors of farm market integration.

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	B	Std. Error
(Constant)	43.411	3.354		12.943	0.000
Share of food consumption from own production (2006)	-0.224	0.043	-0.187	-5.224	0.000
Total cultivated land area 2006 (ha)	0.416	0.082	0.173	5.055	0.000
Manually	-28.547	3.796	-0.275	-7.520	0.000
Hungary	33.611	3.746	0.364	8.972	0.000
Slovenia	23.692	3.124	0.309	7.585	0.000
Bulgaria	14.561	4.005	0.157	3.636	0.000
Poland	14.475	3.258	0.181	4.443	0.000
Cluster 2	10.616	2.580	0.139	4.115	0.000
Cluster 4	8.332	3.533	0.083	2.358	0.019

Table 13 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, the share of food consumption from own production and total cultivated land area are the most important explanatory variables, while the cluster memberships are the least important.

As we might expect, the proportion of consumption derived from own production and the reliance on manual technologies 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* and *unconstrained commercial* 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 Bulgarian, Polish, Slovenian and finally Hungarian households.

6 CONCLUSIONS

Subsistence oriented farming with varying degrees of market participation is still wide-spread across the EU NMS. The analysis in this deliverable 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 where subsistence production hence constitutes an important safety net. Policies strongly in favour of commercialisation through incentives encouraging structural change might undermine the safety net provided by subsistence production (especially for households who are below the poverty line). Possible threats of such policies might be pressure to sell off land to expanding farm businesses due to disappearance of market outlets for semi-subsistence farmers surplus production in favour of larger supermarkets dealing with contract suppliers. 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, 3, 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.

Remoteness as measured by the distance to nearest urban centre was not statistically significant in the regression analysis. While the average distances to the urban centres are not large (on average 22.5 km and maximum 78 km), 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, 3 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 deliverable 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), subsistence oriented farming in the NMS is likely to persist despite policies facilitating structural change.

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APPENDIX 1: MERGED SAMPLE STATEMENTS ANOVA, BY COUNTRY

Attitudinal statement	BG	HU	PL	RO	SI	Tot.	5-country F-value	Sig.	
N =	91	105	147	173	152	668			
Current aims of agricultural activity									
To provide food for the household	4.60	3.38	3.57	4.83	3.99	4.10	47.495	0.000	***
To provide work for household members	3.08	3.10	3.14	3.36	3.11	3.18	1.114	0.349	
To transfer to the next generation	2.77	3.01	3.02	3.76	3.72	3.33	16.150	0.000	***
To enjoy farming	3.21	3.31	3.16	3.84	4.02	3.56	16.850	0.000	***
To generate cash income	3.73	4.30	3.28	4.39	3.48	3.84	23.869	0.000	***
Assessment of current agricultural activity									
We have good profitability	2.33	2.99	1.88	2.73	2.36	2.45	17.594	0.000	***
We fully employ household members	2.75	3.17	3.02	3.07	4.13	3.27	20.637	0.000	***
We only produce for the provision of safe food for the household	3.65	2.53	2.62	3.90	3.55	3.29	31.652	0.000	***
We do not produce for pecuniary reasons	2.41	2.18	3.23	2.94	2.78	2.77	10.790	0.000	***
We get satisfactory income from current sales	2.02	2.36	1.54	2.50	2.52	2.21	18.782	0.000	***
Perceived barriers to increase production									
We lack capital	3.59	3.61	3.64	3.92	3.48	3.66	2.677	0.031	**
We receive low prices for agricultural output	3.53	3.90	4.55	4.57	3.80	4.14	21.838	0.000	***
We lack necessary skills and education	1.88	2.10	2.20	2.79	2.45	2.35	12.532	0.000	***
We lack information and advice on market prices	2.53	2.78	2.33	3.18	2.64	2.72	11.395	0.000	***
We cannot meet standards of buyers or public regulations	1.95	2.17	2.44	3.19	2.09	2.44	35.055	0.000	***
Market and transport infrastructure prevent us from selling our products	2.25	2.50	2.38	4.03	2.64	2.87	65.004	0.000	***
Age/health prevent us from producing more than we currently do	2.69	2.95	2.65	4.02	2.84	3.10	24.469	0.000	***

Table continues on next page

Attitudinal statement	BG	HU	PL	RO	SI	Tot.	5-country F-value	Sig.	
N =	91	105	147	173	152	668			
Perceived facilitators to increase commercialisation									
We would need more land	2.90	2.81	3.69	3.88	3.45	3.44	13.720	0.000	***
We would need to specialise production into fewer products	2.40	2.57	2.95	3.28	3.23	2.96	10.291	0.000	***
We would need to invest in new machinery	3.03	3.07	3.26	3.84	3.76	3.46	9.535	0.000	***
We would need credit	2.78	2.37	2.80	3.29	3.44	3.00	11.826	0.000	***
We would need to collaborate with other households or farms to collectively market output	2.65	2.64	3.08	3.45	3.08	3.05	8.284	0.000	***
Market and transport infrastructure would need to be improved	2.91	3.25	2.67	4.22	3.53	3.39	34.571	0.000	***
We would need advice on how to meet buyers' quality standards and how to comply with public regulations	2.51	2.79	2.50	3.84	3.16	3.04	27.528	0.000	***
We would need training in marketing	2.69	2.50	2.39	3.40	3.39	2.94	19.367	0.000	***
We would need (higher) policy payments to agriculture and rural development	3.34	4.17	4.08	4.76	3.79	4.10	25.023	0.000	***
We would need contracts with buyers	2.88	3.08	3.48	3.62	3.30	3.33	5.828	0.000	***

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

APPENDIX 2: 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.