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PREFACE

In this issue of Apstract two papers relate to Africa. One paper deals with the effect of urban food crop farming on the food security status of households in Oyo State in Nigeria. The authors concluded that urban farming has a positive effect on household food security.

The second paper is on smallholder food marketing behaviour in which the role of informal credit in stabilization of crop prices is explored. The authors conclude that high transaction costs and limited access to credit are the main barriers limiting competition. Supporting community-based self-help savings and credit associations to raise portfolio can enable more farmers to borrow at the same time. Investing in infrastructure, organising and supporting small scale farmers to bulk their produce might lower transaction costs, promote competition and dampen price fluctuations.

In an explorative study structural breaks or continuous adjustments in grain production and prices are examined for the 1961-2014 period. The main conclusion of the paper is that grain markets generally adjust smoothly and continuously. Prices adjust quickly towards long-run equilibrium, and the results from a series of Chow tests indicate that the changes in relative land allocations have progressed as a relatively smooth process with few structural breaks.

Another interesting papers discusses the role of new production technologies in fostering the sustainable intensification of agriculture. By asking professionals from different fields of agriculture in practice as well as academia in Poland and Germany it was found that technologies that collect or utilize advanced data (sensors, drones) used for knowledge based management are more applicable for use, contrary to nanotechnologies where the costs of development and applications limits its readiness.

This issue of Apstract contains four papers that relate to aspects of agriculture in Hungary. One papers is an empirical investigation of the impact of subsidies on sheep and goat production in the 2010-2016 period. The authors conclude that the effects of farm size and years have considerably modified the subsidies paid under different titles.

The second paper investigates factors influencing market prices of land in Hungary. Land quality value and population density do not significantly impact arable land price, whereas unemployment and distance to railway station do.

A review of the development, characteristics and driving force of modern cooperatives is the topic of the third paper. The focus is on the integrative role of cooperatives in a globalising world.

The last paper is this part of Apstract presents results of an qualitative research among experts of ownership structures of family business. Six ownership structures are distinguished. Succession of generations plays a key role in most family businesses.

There are two papers in this issue that relate to teaching issues.

The last two papers of this issues concern developments in Costa Rica and Mongolia. The impact of free trade on the dairy market in Costa Rica is the topic of a paper that examines this issue. It is concluded that the gap between national milk demand and supply is expected to be filled by milk imported from United States under some assumptions.

The paper on determinants of Mongolian economic growth presents results relating to the 2000-2016 period.. twenty macroeconomic variables were chosen A remarkable result is that FDI did not impact the growth rate.

Wageningen, July 2018

Johan A.C. van Ophem

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SCIENTIFIC PAPER

THE INVESTIGATION OF FACTORS INFLUENCING THE MARKET PRICES OF AGRICULTURAL LAND IN HUNGARY

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Abstract: *The role of land (as the basis and the resource of agricultural production) is the most significant among the resources of production. The ownership of land, its use, the issue of its price and value, they have been key problems of political, social, legal and economic decisions. There were theoretical and practical experts throughout the world, and we intensively have to deal with the issue of land evaluation. In our research using empirical data collection and statistical methods, we examined not only the factors have influenced on land prices, but its effect as well. We have proven that the „golden crown"-based land evaluation system (golden crown is a measurement unit of the quality of agricultural land in Hungary) can show the land quality differences even today, but in spite of this, the results of calculations (and also the practice) increasingly justify and urge the necessity of the introduction of a modern land evaluation system.*
namese professionals graduated in Hungary, the reputation and popularity of Hungarian agricultural products and technologies, the achievements of R&D in the field of agriculture – could not be utilized from Hungarian side. Vietnam, however still preserved its socialist political establishment, but in terms of its economic development strategy and economic policy has gradually been standing on the basis of market orientation. Vietnam, with its population of ninety million shows a rapid and successful development and it means good opportunities even for Hungarian entrepreneurs. It would be a mistake to leave these potentials unused.

Keywords: *agricultural land, market price, land evaluation system, „golden crown"*
(JEL Classification: *Q10, Q24, Q30*)

Introduction

In our days the issue of land evaluation (responsible farming, environmental aspects, and fierce competition) has also gained importance both in developed or transition countries. In Hungary – because of the lack of an operating land market, the emergence of the real market value has been hindered by. That is why the land cannot be used as a collateral security. The research on the economic value of the land has been made by many factors.

The significant importance of land and cost-effective utilization of productivity are important in land evaluating. Land evaluation is important not only on the national economy level, but on the level of individual firms as well.

The transition to a market-oriented economy is a new challenge to the determination of the value of land. The value of land, taxation, credit protections, ownership and leasing are important elements not only in terms of inheritance but also in the agricultural support system as well. In agricultural policy decisions, these factors are necessary to determine the different types of utilization and the efficient allocation. The importance of the topic is also proved by the sustainable strategy of the EU promoting the more responsible utilization of natural resources.

Hungary has one of the lowest prices of arable land in the European Union (Figure 1). The EU can be divided into two groups in respect of agricultural property. The first group comprises the "old" EU countries (e.g. Denmark, Netherlands, Luxembourg, United Kingdom) where average arable prices have remained high for many years. The second group covers the "new" EU Member States, among them Lithuania, Latvia, Estonia, Bulgaria, Romania, Czech Republic, Poland, Croatia, Slovakia and Hungary where the prices of arable land are much lower.

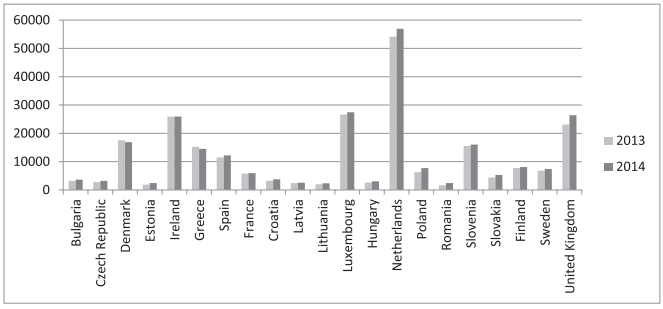

Figure 1: Average prices of arable land in selected European Union countries (EUR per ha) in 2013 and 2014
Source: EUROSTAT (2016), Hungarian data: Hungarian Central Statistical Office (2017)

The average price of arable land approached to € 3,500 per hectare in Hungary in 2015 (Table 1). During the period of 2012 and 2015 the arable land price increased by 13.37% on average per year and its rental rate by 11.15%. The rational decision between land purchase and rent of land is the result of comparing land prices and rents of land. As the land prices are growing more quickly compared to the rent of land in Hungary, the ratio of rent of land to land prices is decreasing in Hungary. The 4.56% ratio as national level equals to 22 years of capitalization. According to STŘELEČEK et al. (2011) the capitalization period in the range of 52–69 years corresponds to the standard of developed European states.

Table 1: Average annual arable land prices and rental rates in Hungary in 2012 and 2015

	Market price for arable land, EUR per ha			Rental price for arable land, EUR per ha		
County (NUTS3)	2012*	2015*	2012-2015** (average annual rate of change, %)	2012*	2015*	2012-2015** (average annual rate of change, %)
Bács-Kiskun	2419	3681	15,02	124	177	12,59
Baranya	2520	3378	10,26	125	183	13,37
Békés	2887	4600	16,80	131	180	11,36
Borsod-Abaúj-Zemplén	1684	2182	9,02	87	114	9,44
Csongrád	2251	3656	17,55	138	166	6,43
Fejér	2872	4289	14,30	125	159	8,14
Győr-Moson-Sopron	2814	4494	16,89	107	165	15,32
Hajdú-Bihar	2827	4479	16,58	130	204	16,14
Heves	1672	2558	15,22	85	127	14,26
Jász-Nagykun-Szolnok	2097	2792	10,02	94	124	9,59
Komárom-Esztergom	2263	3291	13,29	101	142	12,07
Nógrád	1131	2256	25,90	51	74	13,00
Pest	2164	3219	14,16	86	121	12,17
Somogy	2172	3352	15,57	122	173	12,49
Szabolcs-Szatmár-Bereg	1937	3211	18,36	141	190	10,53
Tolna	3007	4048	10,42	166	209	7,95
Vas	2152	3588	18,57	103	140	10,86
Veszprém	2154	2873	10,08	78	105	10,55
Zala	1792	2860	16,86	87	133	15,02
Hungary total	**2379**	**3466**	**13,37**	**115**	**158**	**11,15**

Source: *Hungarian Central Statistical Office (2017), ** author's calculations based on the data from the Hungarian Central Statistical Office (2017)

However, it is important to mention that there are significant differences in prices and price changes, not only between counties, but also within counties as well.

The land prices and rents are influenced by number of factors. The price of a specific arable land is determined by the quality of the soil, the terrain, the size and shape of the board, the properties of the nearby tables, accessibility, distance from the inhabited area and local supply and demand conditions.

An overview of the literature (Latruffe Et Al. 2008, Duvivier Et Al. 2005, Ciaian-D'artis Kancs 2012, Van Herck-Vranken 2013, Swinnen-Vranken 2003) shows that the government support policies have a significant impact on agricultural land prices. MAGDA (2012: 44. p.) notes that „because the supply at a given location is fixed, the price of land depends entirely on the level of demand at that location and governmental subsidies". According to FEKETE-FARKAS et al. (2005) land prices in Central and Eastern European countries have increased at a high rate after the EU Accession because of land market liberalisation and the increasing demand for land for non-agricultural use (transport, industrial green-field investment, urbanisation, increasing demand for recreation areas). Results of meta-regression analysis based on 242 observations from 26 articles reported by FEICHTINGER AND SALHOFER (2013) have shown that, on average, a 10% decrease of agricultural support would decrease land prices by 3.3% to 5%.

According to FEICHTINGER AND SALHOFER (2013) there are two groups of factors determining the prices of agricultural lands: agricultural (internal) factors, which include returns from agricultural production and government payments as well as external factors (variables describing the market, macroeconomic factors and urban pressure indicators).

In this research, we examine the effect of land quality and rent of land on prices of land, and indicators of the demographic (population density) and macroeconomic (unemployment rate, GDP per capita), and as indicators of the input- and output-intensity of arable crop production (organic and fertilizer use, crop yields of major crops) and access conditions (the shortest distance to the county seat, to Budapest, to the railway station, to the highway node). We also analyzed the effect on the price of arable land by analyzing the aggregated data at NUTS3 level.

MATERIAL AND METHOD

Calculations based on the data of the Hungarian Central Statistical Office (2017). Data were aggregated by counties (NUTS3) from the period of 2012-2015.

Land prices and rents of land have been reported by Hungarian Central Statistics Office in HUF, which were converted into euros on average with annual exchange rate of HUF 289.42 per EUR 1 issued by MNB (Hungarian National Bank) in 2012. The use of unified exchange rate was necessary to exclude the distorting effect of changing exchange rate.

The golden crown value is a measurement unit of the quality of arable land in Hungary. The golden crown values were calculated based on the data provided by the Enterprise Analysis Department (operator of Test Farm System – FADN) of Hungarian Research Institute of Agricultural Economics.

We used forward multiple regression analysis to determine the impact of increasing direct payments on land rents.

To econometrically quantify the effect of investigated factors on the market prices of arable land, we estimate the following linear regression model (Equation 1.):

$$LP_{i,t} = a + b_1 Rent_{i,t} + b_2 PopDensity_{i,t} + b_3 Unemp_{i,t} + b_4 GDP_{i,t} + b_5 GC_i + b_6 OrgFert_{i,t} + +b_7 ManufFert_{i,t} + b_8 WheatY_{i,t} + b_9 CornY_{i,t} + b_{10} BarleyY_{i,t} + b_{11} DistSeat_{i,t} + b_{12} DistBud_{i,t} + b_{13} DistRail_{i,t} + +b_{14} DistHighw_{i,t} + \varepsilon_{i,t} \quad (1)$$

where:

$LP_{i,t}$= the estimated price of arable land expressed in euros per hectare in case of the i-th county in year t;

t= 2012, 2013, 2014, 2015;

a= the regression constant;

$b_1, b_2, \ldots b_{14}$= the unstandardized regression coefficients;

$Rent_{i,t}$= the rental price of arable land expressed in euros per hectare in case of the i-th county in year t;

$PopDensity_{i,t}$= the value of population density for the i-th county in year t, measured by the number of human inhabitants per square kilometer;

$Unemp_{i,t}$= the value of unemployment rate for the i-th county in year t, %;

$GDP_{i,j}$= the value of GDP per capita expressed in euros for the i-th county in year t;

GC_i= the average value of the quality of arable land in case of the i-th county, measured in golden crown (GC);

$OrgFert_{i,t}$= the level of the organic fertilizer consumption in case of the i-th county in year t, measured as kilograms per hectare of arable land;

$ManufFert_{i,t}$= the level of the manufactured fertilizer consumption in case of the i-th county in year t, expressed in kilograms per hectare of arable land;

$WheatY_{i,t}$= average wheat yield in the i-th county in year t, expressed in kilograms per hectare of arable land;

$CornY_{i,t}$= average corn yield in the i-th county in year t, expressed in kilograms per hectare of arable land;

$BarleyY_{i,t}$= average barley yield in the i-th county in year t, expressed in kilograms per hectare of arable land;

$DistSeat_{i,t}$= averagae distance to the county seat, in case of the i-th county in year t, km;

$DistBud_{i,t}$= averagae distance to Budapest, in case of the i-th county in year t, km;

$DistRail_{i,t}$= averagae distance to the railroad, in case of the i-th county in year t, km;

$DistSeat_{i,t}$= averagae distance to the highway-node, in case of the i-th county in year t, km;

$\varepsilon_{i,t}$ = error term.

The investigations were continued by fitting the modified Cobb-Douglas function with 14 predictor variables according to Equation 2.

$$LP_{i,t} = a \cdot Rent_{i,t}^{b_1} \cdot PopDensity_{i,t}^{b_2} \cdot Unemp_{i,t}^{b_3} \cdot GDP_{i,t}^{b_4} \cdot GC_{i,t}^{b_5} \cdot OrgFert_{i,t}^{b_6} \cdot ManufFert_{i,t}^{b_7} \cdot \cdot WheatY_{i,t}^{b_8} \cdot CornY_{i,t}^{b_9} \cdot Barley_{i,t}^{b_{10}} \cdot DistSeat_{i,t}^{b_{11}} \cdot DistBud_{i,t}^{b_{12}} \cdot DistRail_{i,t}^{b_{13}} \cdot DistHighw_{i,t}^{b_{14}} \quad (2)$$

where the set of variables is the same as in the equation (1). The data processing and statistical analyses were made with the help of IBM SPSS Statistics 23.0 for Windows statistical software package.

RESULTS AND DISCUSSION

The final forward model included 4 explanatory variables (Table 2.).

The land quality value and the population density were not proven to be a significant factor in respect to the arable land price. As regards the other three explanatory variables, the impact of the rental price was the strongest (Beta=0.698). In case of those counties where the rental price is higher by one euro, the market price is higher by 14.8 euro on average.

Explanatory variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	1635,3	252,818			
Rental price for arable land [EUR/h]	14,8	1,052	,698	6,468	,000
Unemployment rate [%]	-87,0	11,314	-,390	14,049	,000
Average Distance to the railroad [km]	-68,5	19,482	-,176	-7,689	,000
Organic fertilizer [kg/ha]	27,5	8,851	,152	-3,518	,001

Dependent Variable: Market price for arable land, EUR/ha; n=76, R2=0.8341, p<0,01

Table 2: Estimation results for Linear Regression Model

Dependent Variable: Market price for arable land, EUR/ha; n=76, R2=0.8341, p<0,01

Source: authors' calculations based on the constructed sample

Unemployment rate is found to have a medium negative impact (the value of the partial correlation coefficient is -0.667) on land prices. One percentage point of growing of unemployment rate on average has led to 87.0 euros decrease of land prices. When the organic fertilizer consumption is higher by one kilogram per hectare it results an average of 27.5 euros higher land price.

There is a negative correlation between land price and the distance to the railroad. If the distance to the railroad is one kilometer longer, it means 68.5 euros lower land price on average.

The correlation analysis showed that at a 95 percent confidence level, there is a weak positive correlation between the Land quality measured in golden crown (GC) and the wheat yield (r=0.228, p=0.048) and barley yield (r=0.313, p=0.006) per hectare. There is no significant relationship between the land quality value (GC) and the corn yield (p=0.225). Land quality (GC) was medium-positively correlated with arable land price (r=0.595, p<0.01).

In addition to a linear model, a following nonlinear model has been elaborated on the basis of the fitting of modified Cobb-Douglas functions (Equation 3).

$$LP_{i,t} = 116.2 \cdot Rent_{i,t}^{0.679} \cdot Unemp_{i,t}^{-0.233} \cdot GCt_{i,t}^{0.220} \cdot DistRail_{i,t}^{-0.151} \quad (3)$$

The coefficient of determination, $R^2 = 0.8380$ and the relative standard error, RSE=10.81% meaning that the Cobb-Douglas model is well fitted to the data.

The function exponents (Equation 3) show how land price reacts in percent to one percent change (increase) in predictor variables. One percent rising of rental rate means 0.679 percent increasing rate of land price. Rising of one percent of golden crown value means 0.220 percent increasing rate of land price, one percent rising rate of the distance from the railroad results in a decrease of 0.151 percent of land price. One percent growth of unemployment rate on average means 0.233 percent decrease in land prices.

CONCLUSIONS

At NUTS3 level, the effects of the unemployment rate and the accessibility (average distance to the railway station) on the prices of arable land have been statistically detectable. Based on the results of research the lower aggregate – micro region (LAU 1) – data derived from 2007 (VINOGRADOV 2009), the unemployment rate and the accessibility conditions did not prove to be significant factors in the development of arable land prices. It means that „global" factors (macroeconomic elements, demographic characteristics, infrastructure factors) on land prices should only be set at higher aggregation levels as leverage variables for model estimation of arable land prices. Significant differences in these factors can only be detected on higher aggregation levels.

The review of the Hungarian land evaluation system definitely proved the necessity for replacing the golden crown system, which is more than 100 years old, but still plays a very significant role in the determination of land price because of the lack of better system. Concerning counties there were only rather weak correlations between the golden crown value and the average yield of wheat and barley. There is no significant correlation between the quality of land expressed by golden crown and the yield of corn. Test results suggest that golden

crown values should not be reliably used to signal fertility differences between arable lands. However, it is important to mention that the development of yields is not only determined by the quality of land, but the applied cultivation technology greatly influences the utilization of natural resources as well. The land quality effect on the price of arable land is proved to be significant only in the Cobb-Douglas model. In linear regression model the effect of it was not significant compared to other explanatory variables.

The results of examination were also confirmed by NAÁRNÉ, who reached the same outcomes during her examinations made by own database. According to her calculations there is no strong relation between „golden crown" and land price on the market (NAÁRNÉ 2006).

This study did not identify all factors that drive the prices of agricultural property, it shed new light on the factors responsible for Polish farmers' changing perceptions of agricultural land after Poland joined the EU.

According to KOCUR-BERA (2016) such analyses should be always performed on a global scale because factors that are directly linked to land value are not always responsible for changes in property prices.

SUMMARY

The results of empirical research based on the land market data for Hungarian counties lead to the conclusion that the price of the arable land is determined mainly by the local supply and demand concerning the land. On the higher aggregation level (NUTS3) the impacts of unemployment and accessibility have been also revealed on the price of arable land. Land quality (GC) was positively correlated with land price as found by KOCUR-BERA (2016), NICKERSON et al. (2012), KAPUSZTA (2011).

The rental rate has a significant effect on land price, although the rate of rent and price of the arable land is decreasing in Hungary.

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SCIENTIFIC PAPER

STRUCTURAL BREAKS OR CONTINUOUS ADJUSTMENTS IN GRAIN PRODUCTION AND PRICES 1961-2014? AN EXPLORATIVE STUDY

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Abstract: *This article analyses grain production and prices 1961-2014. We first describe the development in aggregated and relative allocation of land worldwide for wheat, corn and soybeans, and the growth in production volumes and yields. We then proceed by analyzing long-term price relationships. Finding that grain prices are strongly co-integrated, we estimate an Error Correction Model to see whether deviations from the long-run equilibrium are quickly adjusted. Furthermore, we investigate whether changes in land allocations for these principal field crops are best described as a continuous process or as a series of structural breaks, hypothesizing that events like the introduction of GM technologies and the "energizing" of corn after 2005 caused structural breaks in acreage shares and relative prices. Given the major and sometimes dramatic political events and technological changes during this period, one would expect to find significant structural breaks in grain production, yields and prices. However, our main conclusion is that grain markets generally adjust smoothly and continuously. Prices adjust quickly towards long-run equilibrium, and the results from a series of Chow tests indicate that the changes in relative land allocations have progressed as a relatively smooth process with few structural breaks.*

Keywords: *markets, Global grain production, Structural Breaks*
(JEL Classification: *O13, Q10, N50*)

Introduction

This article is a contribution to the understanding of long-run trends and structural changes in grain production and prices. We discuss global developments for three principal field crops, namely wheat, corn, and soybeans. Analyzing production, prices, yields, and long-term land allocation over more than half a century (1961-2014), we try to capture changes from one harvest to the next, leaving the short-term movements within the marketing year aside. Our focus is fluctuations in production (metric tons, MT hereafter), acreage (hectares, Ha hereafter), prices and yields (MT/Ha).

Empirical analyses of commodity markets often deal with relatively short horizons. A few years of monthly (or weekly or daily) observations are used as input in econometric models in order to test out hypotheses related to market behaviour and price dynamics. Such studies are, obviously, highly relevant for decision makers. Still, such short-term horizons should be supplemented with studies that cover the longer run and using observations with lower frequencies in order to capture trends and possible structural breaks. Such breaks may be identified as "a new era". As pointed out by Zulauf (2016) in his study of factors affecting long-term corn and soybean prices, economists often disagree on what constitutes a new era, see e.g. Irwin and Good (2009, 2016) on whether recent years can be defined as the introduction to a new era of higher agricultural prices. Using recent data on e.g. relative prices and volatility may occasionally result in near-sighted conclusions. Psychological myopia is a well-known trait in human judgements, as we often seem to believe that the recent past represents something completely new or different (see e.g. Hsee, Yu et al. (2003) for a survey).

Wheat, corn and soybeans play a central role in societies worldwide in terms of nutritional content (energy, protein). Grains also represent a major commodity in international trade. Wheat was one of the first domesticated food crops, and is a major diet component in the civilizations of Europe, West Asia and North Africa. Historically, no commercial crop has been as widely grown or heavily traded. Corn and soybeans have many uses, including human consumption, but today their primary use is as feedstock in meat production (pork, beef, chicken).

With the introduction of the Renewable Fuel Standard (RFS) through the US Energy Policy Act of 2005, corn has also become a major input in the production of biofuels[1].

Looking back, the previous decades have been characterized by globalization, dramatic political events, and significant technological innovation in the field of agriculture. Our article aims to identify whether events like wars, economic recessions, political reforms, and technological changes influence adjustments to agricultural by causing structural breaks in relative land allocations, prices and risk. Focusing on some of the events that pertain specifically to agriculture, we employ formal tests where the null is in favour of the primer, i.e. continuity. This research question is relevant in two dimensions. First, a large part of the global population relies on grains as the main part of their staple diet, which means that variations in production and prices of these commodities can come at great human cost, especially in poorer nations. Second, virtually all economies trade in food, which means that dramatic changes in grain production and prices may lead to trade bill effects of significant magnitudes.

Concerns about rising food prices and commodity price variability are widely recognized in the literature. Wright (2011) discusses the economics of grain price volatility and the importance of understanding the relationship between consumption, available supplies and stocks. Other relevant studies include Gilbert and Morgan (2010) who examine historical food price volatility; Radetzki (2006) analysing recent commodity booms, and Jacks (2013) who takes evidence on real commodity prices and discusses long-run trends, medium-run cycles, and short-run boom/bust episodes in a very long perspective. There is also a large body of literature on whether the recent influx of index trackers and financial investors have had an adverse effect on the functioning of commodity markets. Haase, Zimmermann et al. (2016) review this literature in a recent survey, and find that the results from analyzing speculation and its impact on commodity futures markets are mixed.

The contribution of this article is a survey of the development in relative allocation of agricultural land worldwide for wheat, corn and soybeans, and the growth in production and yields since 1961. To our knowledge, we are the first to study the dynamics of land allocation, production, and yields for the major grains on a global basis. We further examine long-term price dynamics and risk, and investigate whether changes in land allocations for these principal field crops adjust continuously. Specifically, we perform a series of 1-step ahead Chow tests to see if whether major political events or technological changes manifests themselves as structural breaks in grain production. Through this approach, we seek to present empirical evidence on how producers adjust to external events and changing consumer preferences. We also study the long-run relationship among grain prices.

The remainder of this article is organized as follows. Section 2 gives an overview of important global events which are likely to have influenced price dynamics and land allocation among the main grains, and consequently impacted global grain production. Section 3 presents the data, while section 4 gives some stylized fact on grain production and prices. In section 5, we look at long run equilibriums and short-term price adjustments in the grain markets, while section 6 tests for structural breaks in land use. Section 7 offers some concluding remarks.

MATERIAL AND METHOD

A historical flashback

From 1961 through 2014, a number of important events took place in the world economy and in international trade, events that presumably had significant impacts on the production and trade in agricultural commodities. One such event was the collapse of the Bretton Woods system, which dissolved between 1968 and 1973 (IMF). Virtually all standardized contracts on agricultural commodities are priced in US dollars. While many feared that the collapse of the Bretton Woods system would destabilise the global economy, the transition to floating exchange rates turned out to be a blessing. When oil prices surged in 1973, floating exchange rates to some extent helped alleviate the impact of this external shock for many economies. The oil crisis in 1973 arose when the Arab members of the Organization of Petroleum exporting Countries (OPEC) proclaimed an oil embargo against the United States. The embargo was a response to American involvement in the 1973 Yom Kippur war, and extended to other countries that supported Israel in this conflict, including the Netherlands, Portugal, and South Africa. By the end of the embargo, global oil prices had quadrupled, and US oil prices were even higher. Energy is a major input in agricultural production through channels like farm equipment, fertilizer production and processing, packaging and transportation. One would expect changes in energy prices to have an impact on grain prices, and also on relative land allocation in global grain production. Wheat, and even more so corn, requires substantial amounts of nitrogen fertilizer in order to obtain high yields, while the soybean is a legume and can use the nitrogen in the atmosphere for plant growth. The second oil crisis of 1979, which began with a decrease in oil output due to the Iranian revolution, also resulted in widespread panic and elevated petroleum prices. An outcome of these events was a growing political willingness to reduce protectionist trade barriers like tariffs and subsidies. In particular, several countries came together on this subject through the General Agreement on Tariffs and Trade (GATT), and even though agriculture is still the most heavily protected sector in world trade, these changes in the political climate also affected agricultural trading. Given these political and economic events, one would expect to find structural breaks in global grain production and relative prices during the 1970s.

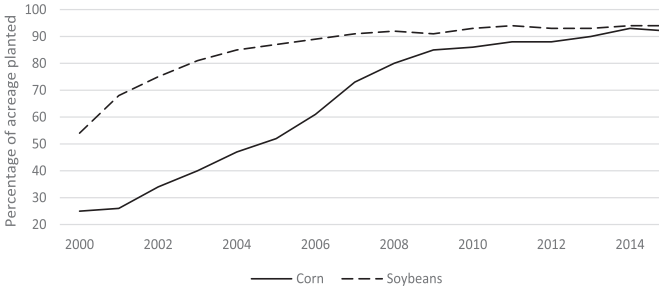
During the 80s and 90s, the global marketplace grew substantially as a number of centrally planned economies opened up towards free trade (or less protection in trade). Most notable in

1 The RFS requires a minimum annual quantity of ethanol content in gasoline, and the bulk of US ethanol is produced from corn. This new source of demand has been claimed to have caused a permanent increase in world corn prices (Carter, C., et al. 2012), and thereby influenced the price and production of other agricultural commodities as producers have reallocated land to corn production and away from other crops.

this context is the collapse of the Soviet Union, which was formally disbanded on December 26, 1991. Agricultural production in the former Soviet Union generally suffered from low productivity due to inefficient rural management, complex socially oriented problems, and cumbersome and confusing agricultural policies. These problems were obviously not solved overnight, but dramatic improvements had taken place by the end of the millennium. By 2014, the Russian Federation had become the 4th biggest exporter of wheat globally, which is reminiscent of the region's golden era prior to the First World War when Russia was the world's largest wheat producer and exporter. In 2016, Russia became the world's biggest exporter of wheat for the first time in modern history, with some 30 million MT.

Parallel to these major events in the global economy and politics there were significant developments that pertain specifically to the grains sector. New varieties and more efficient production methods contributed towards a significant increase in yields. World cereal production doubled in the time period 1960-2000 (Tilman, Cassman et al. 2002), and this growth was predominantly caused by increasing yields due to improved agronomic practices, including more optimal use of fertilizer, water and pesticides, new crop strains, and other technological advances. From 2000 onwards, there has also been rapid growth in the use of genetically modified varieties (GM)[2]. Though controversial in some parts of the world, the use of GM technologies is widespread in corn and soybean production, and has contributed towards more efficient production of these crops. The widespread adoption of GM varieties likely comes from improved profitability over traditional methods. Other factors like producer flexibility, consumer preferences, and farmer attributes and perceptions might also influence adoption (Fernandez-Cornejo and McBride 2002). Looking to the US, GM varieties are now dominating the market for both corn and soybeans; the adoption of GM crops is approaching 100% of planted acreage, see figure 1. As can be seen, GM varieties were introduced around the turn of the century, and their use increased rapidly. For soybeans, the relative GM share grew from about 50 to almost 90% between 2000 and 2006. Likewise, corn GM acreage grew from some 25% in 2000 to more than 80% by 2008. One would expect to see such fundamental technological changes reflected in e.g. relative prices of corn and soybeans versus wheat, where GM technologies has yet to be introduced.

Figure 1: GM corn and soybean varieties as percentage of planted acres of the respective crops, United States, 2000-2015. Source: USDA, National agricultural Statistics Service, June Agricultural Survey for the years 2000-2015.



Another driving factor behind the increase in agricultural production has been expansive government policies and the cultivation of new land, in particular in Brazil. Annual soybean production increased by nearly 2 000% 1968-1997, in part due to the government providing fixed nominal rate loans for equipment and operating expenses, as well as subsidising tractors and fertilizer (Frechette 1997). Furthermore, the Cerrado, a vast savannah that stretches for more than 1 000 miles across central Brazil, has been transformed from infertile land to a prosperous agricultural region by adding appropriate proportions of phosphorus and lime to the soil. Researchers developed tropical varieties of soybeans to make this crop suitable for the Amazonian region, and there has been massive agricultural expansion in Mato Grosso, which is the main production area for soybeans in Brazil. According to Arvor, Meirelles et al. (2012) the net area used for soybean production in Mato Grosso expanded by 275% from 1992 to 2012. Soybean yields in Mato Grosso (3.08 tons per hectare) were estimated to be 17% higher than the Brazilian average (2.63 tons per hectare) in 2009. The increase in yields were largely caused by improved agricultural management practices like double cropping and no till farming, better soil and water management and more efficient use of fertilizer. This region also produces large amounts of corn, and the land allocated to corn crops expanded by a fivefold during the same period. Simultaneously, yields increased by 56 and 117% for soybeans and corn, respectively.

The turn of this century was characterized by growing demand for a number of key commodities, including agricultural products. Rapidly increasing commodity prices in 2006-08 and 2010-11 can, at least in part, be explained by this (unexpected) growth in demand in conjunction with tightening supplies. Some also suggest that monetary expansion and exchange rate movements following the financial crisis were central explanatory factors of the commodity price boom in 2007-08. A good overview of macroeconomic factors that likely contributed to the price spike in 2008, is given in (Pies, Prehn et al. 2013).

Another important development is the American political aim of promoting energy independency and environmentally friendly technologies through increased ethanol production. The US Energy Independence and Security Act of 2007 stipulated a near doubling of mandated ethanol use. Fortenbery and Park (2008) find that growth in ethanol production is important in explaining corn price determination. According to estimates by Carter, Rausser et al. (2012) the 2007 expansion in the Renewable Fuel Standard caused a 30% increase in world corn prices. Both articles also discuss the considerable expansion in ethanol production capacity that occurred between 2005 and 2007. Abbott (2013) presents figures that document a large and persistent new demand from corn from this industry;

2 GM refers to any organism where the genetic material has been changed through genetic engineering techniques. In agriculture, the DNA of various crops is typically altered to obtain resistance to pest and diseases, to be grown in different climates, or to be resistant to certain chemical treatments (typically some herbicide).

The amount of US corn used in ethanol production increased from 12.4% in crop year 04/05 to over 38.5% in 10/11. The demand from the biofuel industry has remained at this high level. Again, one would expect effects on acreage allocation and relative prices. Summarizing, global grain production has been exposed to major economic, political and technological "shocks" over the past 54 years. It appears reasonable to expect that these shocks would cause dramatic and tangible effects on production, land allocation and relative prices. On the other hand, farming has a long history of adapting rapidly to changing production conditions. The next sections of this paper will elaborate on this issue.

DATA

We focus on wheat, corn and soybeans because these commodities are chiefly grown in the same temperature zones, and thus compete for the same land resources[3]. Beyond being substitutes in production, they are also to some extent substitutes in consumption, in particular when used for animal feed. That corn, wheat and soybeans share a number of common factors becomes evident when we study their price history. We will illustrate and discuss how the three commodities share similar cycles and long-term trends.

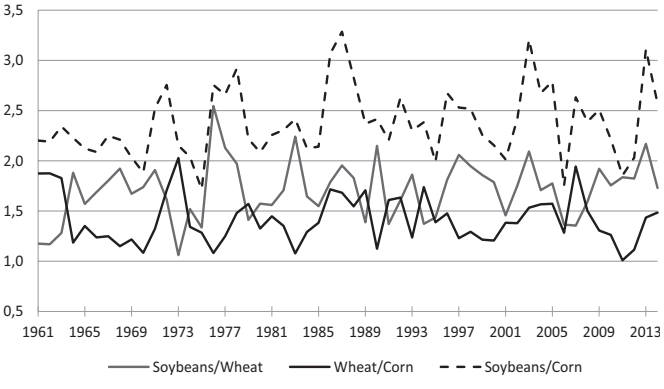
Prices in this article are continuous front month futures prices from the Chicago Mercantile Exchange (CME) Group[4]. We use futures contracts because this market is forward looking by construction, quickly incorporating news and changes in expectations. Our sample covers 1961-2014. We base our analysis on annual data because prices and price expectations are dominated by the annual harvest cycle. Grain prices tend to fluctuate the most within the growing season, as supply expectations can shift significantly due to weather conditions and changes in expectations regarding harvested acreage and growing conditions. For this reason, we use prices observed in the 4th quarter each year (the southern hemisphere has "inverse" seasons compared to the northern, and by measuring prices in December, i.e. between harvests, we average out this effect). At this point, the market should have full information about the size of the current crop year's output for corn and soybeans, and a reasonable basis for forming expectations regarding next years' market conditions based on prevailing price and storage conditions. While it is not ideal to measure wheat prices in the middle of the marketing year, we do so to obtain synchronicity across prices.

Statistics on production (MT), acreage (Ha) and yields (MT/Ha) are obtained from the Statistics Division of the Food and Agricultural Organization of the United Nations (FAOSTAT hereafter). FAOSTAT mainly collects information about agricultural output by the cooperation of governments, which supply information about primary crops through annual questionnaires (FAOSTAT). FAOSTAT also collaborate with various non-governmental agencies, to achieve conformity in the presentation of international statistics. The time reference for reporting on harvested area and crop production is based on the calendar year. More precisely, the statistics for a particular crop are reported under the calendar year in which the entire harvest or the bulk of it took place. The harvest of the crops we analyze in this paper is generally limited to a few weeks in each region. Figures are reported by the countries in various time frames like e.g. calendar year, marketing year, etc., before being allocated to the calendar year in which the entire harvest or the bulk of it took place.

Stylized facts on grain prices and production 1961-2014

Relative prices, rather than absolute prices, are the relevant input parameter in the farmer's decision process. When planning for the upcoming season, a farmer will take into account the relative prices of agricultural inputs like e.g. fertilizer, land and so on. Assuming the farmer is rational in an economic sense, she will then allocate land and other resources to the crop that yields the highest expected revenue (at similar risk levels). Because corn, wheat and soybeans to a large extent are substitutes in consumption, the relative demand for these commodities mainly depend on price. Consequently, the relative price differences between the three commodities are bound due to the consumer's ability to substitute. Short term, and sometimes violent, price variations do occur, mainly because supply is inelastic within season (a farmer cannot reap what he has not sown). However, in the longer term, the relative price differences will move back towards equilibrium. This effect is illustrated in figure 2, which displays relative grain prices 1961-2014. As can be seen, there is no long-term (upward or downward) trend in the price ratios, and peaks do not persist (only last for a couple of years).

Figure 2: Relative front month futures prices (4th quarter) from the Chicago Mercantile Exchange Group, 1961-2014, annual observations.



3 Rice is the staple food in the larger part of Asia, and also widely imported and consumed in the Caribbean and Central and West Africa. When we chose to exclude this commodity from our analysis, it is due to fundamental differences from the other grains. Rice is mainly consumed in different geographical regions than wheat, corn and soybeans. Furthermore, rice production requires different temperatures and different types of agricultural land to be successful, which implies that this crop does not compete with the other grains when land is allocated to food crops. We also chose not to include grains like rye, barley and oats etc., as these grains represent only a marginal part of total grain production. In 2013, global production of e.g. barley was roughly 30 million MT, or 4% of global wheat production that year.

4 All price series are downloaded through Quandl, a search engine for numerical data that offers access to a multitude of financial, economic and social datasets. See www.quandl.com for more information.

Acreage of harvested wheat, corn and soybeans increased from 334 million Ha in 1961 to 523 million Ha in 2014 (see figure 3). In other words, the total acreage allocated to produce these grains increased by roughly 50% over half a century, which corresponds to an annual trend growth of 0.7%. Growth was particularly strong 1970-81 and 1999-2014, at a rate of 1.5% annually in each period. From 1970 to 1981, the total harvested acreage of corn, wheat and soybeans increased by 67 million Ha, i.e. an area that is roughly the total size of France. From 1999 to 2014, the increase was even larger, at some 94 million Ha.

Figure 3: Total grain area harvested (wheat, corn, soybeans) in million Ha, annual data 1961-2014. Source: FAOSTAT.

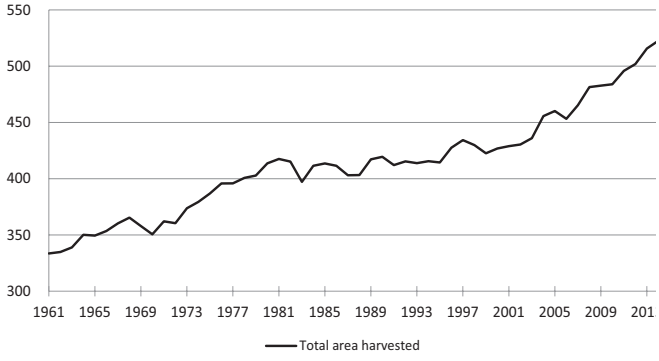
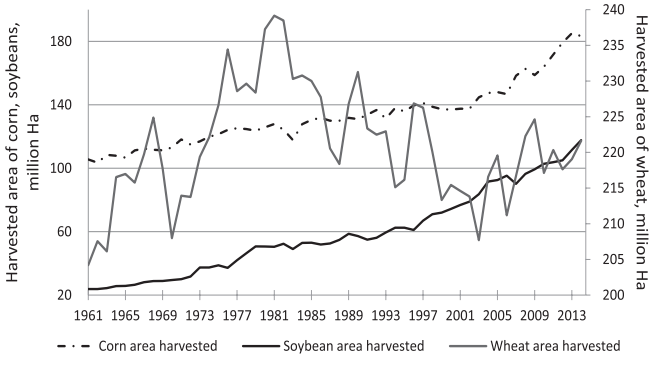


Figure 4 displays the evolution of harvested acreage for each grain individually. From 1961 to 1968, the amount of harvested wheat acreage increased by approximately 21 million Ha, i.e. roughly 2/3 of the total increase in harvested grain acreage during that period. After two years of declining acreage, growth picked up again and increased by 31 million Ha 1970-1981. This area corresponds to about half of the total agricultural land in Canada today. From 1982 onwards, there has been a downward trend in the area allocated to wheat production. This trend is reversing in 2004. The areas allocated to corn and soybean production have increased steadily throughout the last five decades. Corn area harvested has experienced a trend growth of 0.9% annually from 1970 to 2014. The growth has been even stronger for soybeans, where area harvested has increased by more than a fivefold from some 24 to 118 million Ha 1961-1970, see figure 4. This implies an annual trend growth of 2.4%.

Figure 4: Harvested areas of wheat, corn, soybeans (million Ha), annual data 1970-2013. Source: FAOSTAT.



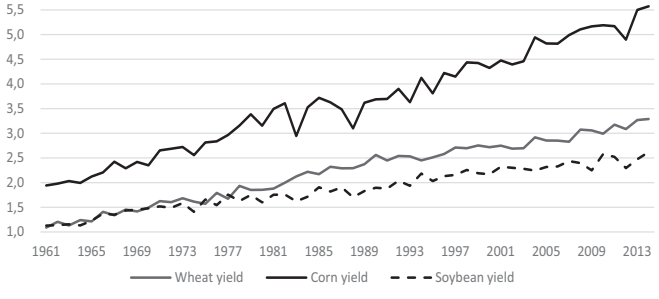
Considering the distribution of land towards production of the three main grains, wheat has been losing acreage shares. Wheat area harvested decreased from 61% of total in 1961 to 42% in 2014. The area allocated to corn production remains relatively constant throughout the period we examine (up from 32 to 35% of total), while the acreage share of soybeans has increased dramatically from 7 to 23%.

A large part of the increase in soybean acreage is located in the region of Mato Grosso, which is the main production area for soybeans in Brazil, accounting for 31.3% of national production as of 2009 (Arvor, Meirelles et al. 2012). Here, agricultural expansion has played an important part in increasing agricultural production, as previously mentioned the net area used for soybean production expanded by 275% from 1992 to 2012. Further, large areas of savannah in central Brazil have been transformed from infertile land to a rich agricultural region through new technologies.

Production and yields

Agricultural development has led to large increases in food supply feeding a growing world population. From 1961 to 2014, world population increased from some 3.000 billion people to more than 7.000 billion and a large part of this population have grains as main source of daily caloric intake. As previously mentioned, some of the growth in world grain production came about due to cultivation of new land, and more cropland has been oriented towards grain production. Nevertheless, increasing yields have been the major driving force behind the growth in grain and oilseed production from the 1960s onwards. Figure 5 shows that this increase has been largest for corn and wheat. Wheat yields have increased from 1.1 to 3.3 tons per hectare in 54 years, while corn yields are up from 1.9 to 5.6 tons per hectare. In both cases, this is equivalent to an annual trend growth of 1.9%. The trend growth in soybean yields was 1.4% during the same period, and in absolute terms, soybean yields increased from 1.1 to 2.6 tons per hectare from 1961 to 2014. Masuda and Goldsmith (2009) projects a 2.2% annual growth in soybean production up to 2030, but also highlight a need for significant investments in yield improving research by agribusiness policy makers and managers.

Figure 5: Global grain yields; wheat, corn, soybeans (tons per hectare), annual data 1961-2014. Source: FAOSTAT.



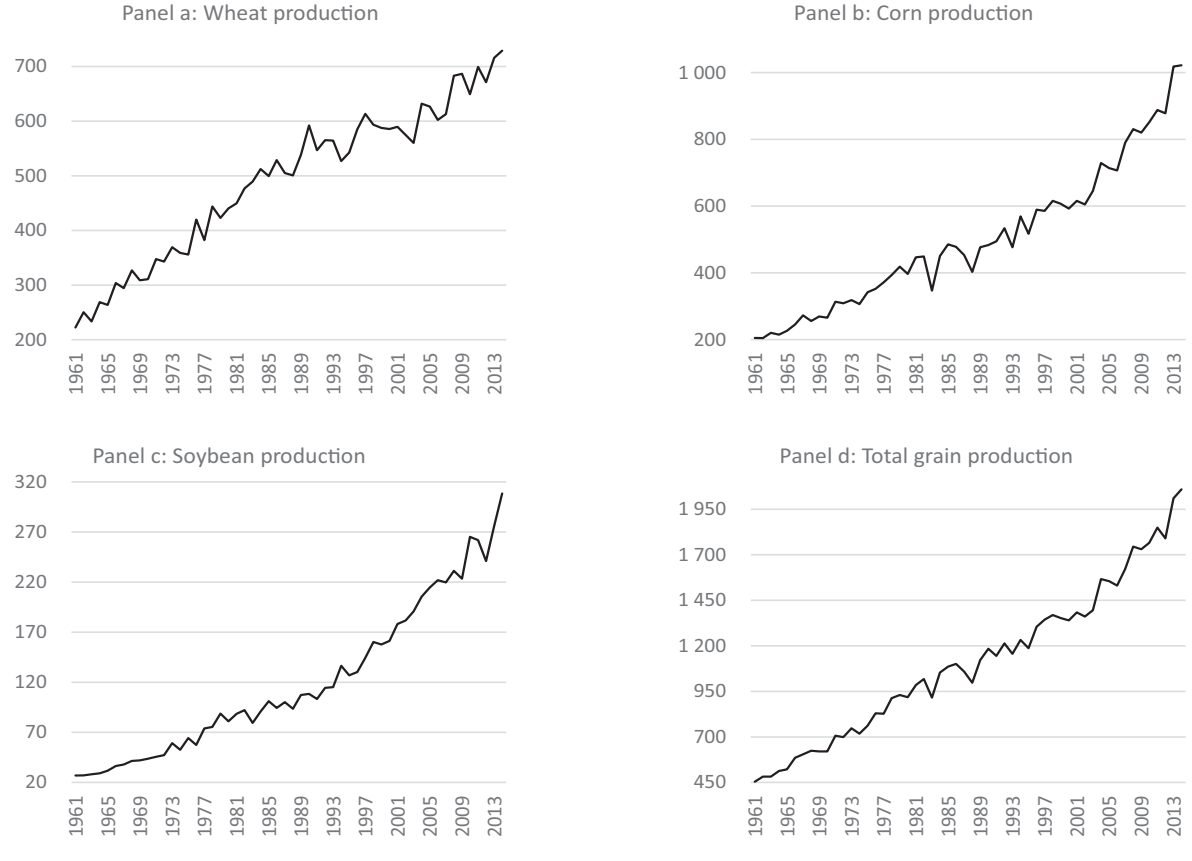
Wheat, corn and soybeans all experienced significant increase in yields at the global level from the 60s onwards.

However, behind the average yields reported in figure 5 there are large regional differences, and there is still room for yield growth and more efficient grain production in important agricultural regions. Large areas in Africa would benefit from better water management and modern agronomic practices, including greater inputs of fertilizer, herbicides and pesticides. Considering the African continent's climatic and soil conditions, tropical soybean varieties can be cultivated in about half of Africa's land (Kolapo 2011). This implies that the technologies employed in Brazil could possibly be imported to countries in Africa, like e.g. Mozambique or Zambia. There is also a greater potential for improved soybean yields in certain regions with the introduction of newly developed GM drought tolerant soybean strains.

Further, there are still parts of the former Soviet Union were agricultural production suffer from low productivity and inefficient agricultural management. To put this potential into context, we note that in 2012, the agricultural land in the Russian Federation, Ukraine and Kazakhstan combined amounted to approximately 465 million Ha (source: The World Bank). A large part of this area is allocated to wheat production, and increasing yields in this region would have a significant impact on the world supply of wheat. To illustrate the changes that have occurred in this region, we use the year 2000 as our baseline. This year, the Russian Federation exported 696 million tons of wheat, while the total exports from the Russian Federation, Ukraine and Kazakhstan combined were 4 746 million tons. These are marginal magnitudes on a global basis. By 2014, the Russian Federation had become the 4th biggest exporter of wheat globally. Total exports from the Russian Federation, Ukraine and Kazakhstan combined amounted to 37.5 million tons, which made this region the biggest exporter of wheat worldwide that year (source: USDA). In 2016, Russia was expected to be (and became) the world's biggest exporter of wheat for the first time in modern history tons (Financial Times, August 18, 2016). In other words, we have seen huge efficiency gains in this region through the last decade, but there are still opportunities for improving agricultural management and technologies in the former SU.

Based on our discussion of the development in harvested acreage and yields, we know there has been a significant growth in grain production from 1961 to 2014. This growth is illustrated in figure 6. The annual trend growth of wheat, corn and soybean production was 1.9%, 2.8% and 4.4%, respectively. Harvested acreage of wheat actually declined during the time period we study, which implies that the increase in production came from increasing yields alone. The increase in corn production was a combination of increasing yields and harvested acreage, as were the increase in soybean production. In terms of soybeans, a large part of this increase was caused by cultivation of new land in Brazil. Looking at grains as a whole, production has increased from 450 million MT to 2 059 million MT from 1961 to 2014, equivalent to a trend growth of 2.5%. Annual trend growth was even higher from 2000 to 2013, at 3.0%. For comparison, world population growth has been roughly 1.1% during the same period, which implies that grain production is now growing faster than world population.

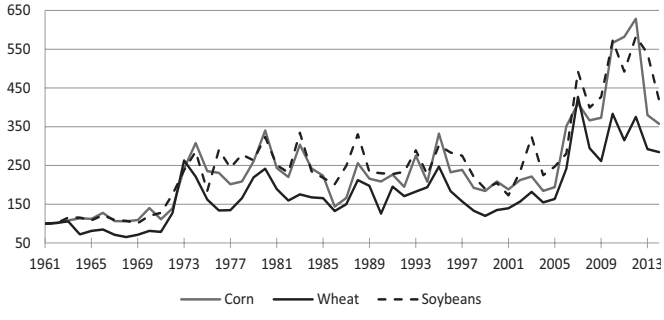
Figure 6: Grain production, wheat, corn, soybeans, total (million tons), annual data 1961-2014. Source: FAOSTAT.



PRICES AND RISK

Despite massive increases in production and yields, concerns regarding land use and food security remain central on the international agenda. In particular, there was much talk about a global food crisis proceeding the summer of 2008, when the prices of several important agricultural commodities had nearly doubled from the beginning of 2007. The peak in grain prices (and most other commodities) were short-lived, and in the autumn of 2008 prices fell almost as fast as they had increased just a few months earlier. However, food commodity prices rose sharply again between June 2010 and February 2011, even surpassing the record 2008 peak that had worried policymakers and non-governmental organizations across the world.

Figure 5: Global grain yields; wheat, corn, soybeans (tons per hectare), annual data 1961-2014. Source: FAOSTAT.



Both 2007–08 and 2010–11 were characterized by adversely affected crops in several important regions for agricultural production (Trostle, Rosen et al. 2011). Typically, agricultural price booms and periods of high volatility are caused by shocks on the supply side. In the short run, price changes are driven by inflow of information to the market place, forming expectations and speculation regarding future supply and demand dynamics. In the long run, agricultural commodity prices are determined by fundamental drivers, namely supply, demand and available inventory (Geman 2015). Factors like demographic changes and income variations influence demand, while weather patterns and adverse events like droughts or pests are key drivers on the supply side. Table 1 presents summary statistics for corn, wheat and soybeans.

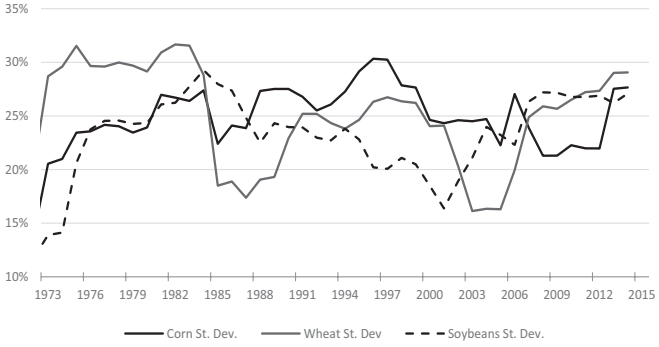
Table 1: Descriptive statistics, 1961-2014, percent changes

	Wheat	Corn	Soybean
Average	2%	2%	3%
St. Dev.	24%	24%	22%
Kurtosis	0.49	0.09	-0.35
Skewness	0.61	0.26	0.08
Min	-45%	-50%	-40%
Max	72%	59%	56%
N=	54	54	54

Annual observations, front month futures prices from the Chicago Mercantile Exchange Group, 1961-2014

The price changes of all three grain varieties are positive on average during the time period we consider. We note that as our data consist of nominal prices, the positive price changes in table 1 likely represent inflation rather than actual positive returns. The annual standard deviation of corn and wheat are identical at 24%. These commodities display similar return distribution characteristics, although the statistics on wheat suggests that this distribution has slightly fatter tails compared to corn, and also moderately more positive skewness. The statistics for soybean indicates less price variability, with a standard deviation of 22% and a platykurtic distribution. To get a more dynamic impression of variability and risk, figure 8 displays the evolution in standard deviations based on a rolling window of 12 observations, 1973-2014.

Figure 8: Standard deviations for wheat, corn and soybean price changes, 12 year rolling window, 1961-2014, annual observations.



In the recent debate on food prices, many have claimed that price risk has increased significantly since 2005 (see e.g . Haile, Kalkuhl et al. (2016)). Whether or not price volatility has increased does however depend on the window we are looking through. This is demonstrated in figure 8, where the standard deviations of the three grains based a 12-year moving window show no increasing trend in volatility. Comparing commodity risk, we see that annual volatility fluctuates within the range of 15-30% for all three grain varieties. There are individual differences in the trajectories, but the three rolling samples share common cycles. The figure shows that soybeans have lower annual volatility compared to corn and wheat.

RESULTS AND DISCUSSION

Price Dynamics: Long-run equilibrium and short term adjustments

Considering how grain prices share common trends and cycles, it is reasonable to expect some form of long-run relationship between the three price series. A series of Augmented Dickey-Fuller (ADF) tests reveal that grain prices observed annually 1961-2014 are non-stationary. We further find that all series are stationary when differenced once.

Following the Engle-Granger (1987) two-step procedure, we begin by performing the first step in establishing a co-integration relationship:

$$p_{(i,t)} = \alpha + \beta p_{j,t} + u_t^{(i,j)}$$

for all the pairs (i,j), i.e. corn-wheat, corn-soybeans and wheat-soybeans. Testing the residuals from these regressions for stationarity clearly demonstrates that grain prices are co-integrated, i.e. tied together in a long-run equilibrium (table 2).

Having found that all three grain prices are co-integrated,

Table 2: Step 1 - ADF-tests for stationarity of $\hat{u}_t^{(i,j)}$

	t-values	Number of lags#
Corn-wheat	-5.05**	0
Corn-soybeans	-3.53*	4
Wheat-soybeans	-5.27**	2

 # number of lags determined by minimizing AIC
Critical values from Engle and Yoo (1987): * 5% = -3.29; ** 1% = -4.14

we proceed by estimating Error Correction Models (ECMs). Since the OLS estimate of β is superconsistent (Stock 1987) , the sampling error from estimating it through a co-integrating equation is less important than the sampling error of the error correction model estimates asymptotically. This justifies the two-step approach, and we estimate an ECM specified as:

$$\Delta p_{(i,t)} = \alpha + \sum_{i,j=1}^{2} \rho_{i,j}(p_{i,t-1} - \hat{\beta} p_{j,t-1}) + \varepsilon_t$$

where Δ is the first-difference operator, the variable $\rho_{i,t}$ represents the log-price of commodity i at time t, and $\rho_{j,t-1}$ is the log-price of commodity j at time t – 1. The expression inside the brackets is the error correction term from the cointegration regression of $\rho_{i,t}$ on $\rho_{j,t}$. Since the two variables are cointegrated with cointegrating coefficient β, all variables in (2) are stationary. (2) describes the short-run relationship between deviations from the long-run equilibrium and changes in ρ_i. ρ is an estimate of the speed at which ρ_i returns to a long-run equilibrium after a change, or "shock". As such, the ECM recognizes that previous time periods' deviations from the equilibrium influence short-run dynamics.

Table 3: ECM model estimation results, 1961-2014

	α	$\rho_{c,s}$	$\rho_{w,s}$	$\rho_{c,w}$
Wheat	0.02 (0.59)		-0.62 (-2.59)	-0.29 (-1.16)
Corn	0.02 (0.80)	-0.33 (-1.39)		-0.50 (-2.30)
Soybeans	0.03 (0.90)	0.00 (0.01)	0.39 (1.91)	

T-*Values in brackets,*
values significant at the 5% level is marked in bold

From table 3 we see that deviations from the long-run equilibrium between wheat and soybean prices have a significant effect on changes in wheat prices the subsequent period. The coefficient representing speed of adjustment implies that 62% of the short-run disturbance is corrected the following year. Similarly, the price of corn is "pulled back" towards the long-run equilibrium after a shock in the price of wheat. Once more, the correction is relatively swift; the estimated coefficient suggests half of the disturbance is corrected the subsequent period. The error correction mechanism between soybean prices and the other grains are not as distinct, but we see that the coefficient representing the relationship between wheat and soybeans is significant at the 10% level. The speed of adjustment is 39%. As regards the topic of this article, namely whether grain prices adjust continuously, these results support the notion of prices that move rapidly back into equilibrium after an initial disturbance or shock.

Testing for structural breaks in land use

There are several studies on the acreage effects from agriculture price changes. These at least date back to the classic articles by Mark Nerlove, e.g Nerlove (1956) , and a number of studies in the 1970s (e.g. Houck and Ryan (1972)). In their recent study, Haile, Kalkuhl et al. (2016) find significant and positive price elasticities on acreage using a panel data approach.

Taking a time series approach, we examine whether relative prices have a significant effect on land allocation among the main grains. Performing regressions with harvested acreage (Ha) as dependent variable we study changes in acreage caused by changes in grain prices, adjusted for area growth.

$$dlHa_{j,t} = \alpha_0 + \alpha_1 dlHa_{j,t-1} + \sum_{i=1}^{3} \beta_i dlp_{i,t-1} + \varepsilon_t \qquad (3)$$

where the variable *dlHa* represents the logged difference of harvested acreage, the superscript *j* indicates commodity, and the variable $\rho_{j,t-1}$ is the logged difference of the price of commodity i at time t – 1. The lagged value of *dlHa* controls for short-term adjustments in acreage.

Using logged difference variables on both sides of the econometric specification is convenient because all variables are now stationary, and it allows for a straightforward interpretation of the regression coefficients. All parameter estimates have a natural interpretation as percentage changes, and information about the effect of relative price differences is given by the quotient rule which states that *lnx* - *lny*=ln ($^x/_y$). We expect $\beta \neq 0$, i.e. that changes in prices lead to short-term (annual) adjustments in harvested acreage. Table 4 presents the results.

Table 4: the relationship between harvested acreage and last years' prices, 1961-2014

	α_0	α_1	β_w	β_c	β_s	R^2
Wheat	0.00 (0.18)	0.10 (0.68)	0.04 (1.84)	0.02 (0.80)	-0.02 (-0.97)	15%
Corn	0.01 (2.74)	-0.01 (-0.09)	0.00 (0.23)	0.07 (2.91)	-0.00 (-0.13)	37%
Soybeans	0.02 (3.28)	0.27 (2.22)	0.02 (0.57)	-0.14 (-4.61)	0.20 (6.01)	42%

T-values in brackets, values significant at the 5% level is marked in bold
w = wheat, c = corn, s = soybeans

Table 4 shows that a substantial part of the variation in harvested acreage of wheat, corn and soybeans, respectively, is explained by a combination of last year's harvested acreage and relative prices. From (3) we expect high R-squared values, as farmers are likely to carry their planting patterns over from one year to the next.

Our results indicates that last year's prices of corn and soybeans have no significant effect on harvested acreage of wheat. Wheat acreage is however sensitive to changes in wheat prices (statistically significant at the 10% level), and tend to increase with 4% in response to a 1% increase in last years' wheat prices. Moving the discussion to harvested corn acreage we find similar results, harvested acreage of corn respond to last years' price of corn, and also last years' harvested corn acreage. Statistically, corn acreage increases with 0.07% in response to a 1% increase in the price of corn the previous year. Soybeans are the only field crop where we find a statistically significant relationship between harvested acreage and last years' prices of another grain variety. Harvested soybean acreage tend to decrease with 0.14% in response to a 1% increase in the price of corn the previous year. Acreage is also sensitive to changes in last years' prices, increasing by 0.20% in response to a 1% increase in lagged soybean prices. Using the quotient rule, this implies that the response towards a change in the ratio of corn vs soybean prices is -0.34, i.e. that a 1% increase in last year's price of corn relative to the price of soybeans leads to a 0.34% decrease in harvested soybean acreage.

Overall, these results are not surprising; one expects to find the closest lead-lag relationship between corn and soybeans. These commodities are to some extent substitutes in both consumption and production, they share a similar 5-month growth cycle and require similar climatic conditions. Using the US as an example, the bulk of corn and soybeans are produced in the Midwest region, where planting starts in the beginning of April and last through June. The main harvest begins in September and is finished by the end of November at the latest. The largest exporters of corn and soybeans globally are the US, Brazil and Argentina. From 2000 onwards, Ukraine has also become a major exporter of corn, increasing their exports from some 400 000 MT in 2000, to 15 500 000 MT in 2015.

While it is relatively easy to switch between planting corn or soybeans, wheat stands out with its own unique growth cycle and harvest time frames. In the US, winter wheat is planted from mid-August through October, and the harvest run from mid-May to July. Further, wheat is a sturdier crop compared with corn and soybeans, and can be grown commercially in harsher climates. It follows that wheat production benefits from taking place in a number of regions, and the largest exporters of wheat are the European Union, the Russian Federation, the US, Canada, Australia and Ukraine. Kazakhstan and Argentina are also noteworthy wheat exporters.

To examine whether there have been structural breaks in the relationship between harvested acreage and last year's grain prices, we run Recursive Least Squares *(RLS)* estimations with specifications as outlined above. Recursive estimations start with a minimal number of observations, and statistics are recalculated adding one new observation at a time. The coefficients of the regression are thus estimated sequentially, and studying these estimates provides information about parameter consistency and structural breaks. We employ the classical test for structural breaks, namely the 1-step-ahead Chow test, which uses an F-test to determine whether a single regression is more efficient than two separate regressions splitting the data into two sub-samples (Chow 1960). Formally, the 1-step-ahead Chow test statistic follows an F-distribution with $F(1, t-k-1)$ under the null of constant parameters, for $t=M,\ldots,T$. The test statistic is calculated by comparing the residual sum of squares across sub-periods:

$$\frac{(RSS_t - RSS_{t-1})(t-k-1)}{RSS_{t-1}} = \frac{v_t^2/w_t}{\hat{\sigma}_{t-1}^2}$$

where *RSS* represents Residual Sum of Squares for each *t*, *t* denotes sample size, *k* is the number of parameters, and v_t and w_t represents the standardized innovations (standardized recursive residuals). Normality is required for the statistic to be F-distributed.

Table 5: 1-step-ahead Chow tests, 1961-2014

	Years	df	F-values
Wheat	1976	1,8	6.70
	2004	1,36	4.82
Corn	1983	1,15	10.82
Soybeans	1974	1,6	15.64
	1978	1,10	6.92
	1983	1,15	7.94

T-values in brackets, values significant at the 5% level is marked in bold
w = wheat, c = corn, s = soybeans

Table 5 presents the outcome of a series of 1-step-ahead Chow test performed on the model outlined in (3). Regressing the logged difference of harvested wheat acreage on changes in relative grain prices, adjusting for short-term area adjustments we find support for the hypothesis of a structural break in 1976 and 2004. Even though these years are statistically significant, it is hard to think of historical events that might have caused these instabilities. Both years were characterized by moderate price levels, stocks were however much lower in 04 compared to 76. Referring back to figure 4, we believe that these breaks merely represents the beginning and end to a downward trend in the land allocated to wheat production, rather than changes of a structural character.

The 1-step Chow test on corn acreage identifies a structural break in 1983. While it is hard to identify the exact cause of this break, some reasonable conjectures can be made. In the US, it is common to speak of 1973-80 as an agricultural boom period, while the 80s was a bust decade with poor performance and low farm income. This view is supported by a 35% increase in US farm export volume from 1973-1980, an increase that was sustained by production shortfalls in other countries, a fall in the dollar's real exchange value after the collapse of the Bretton Woods system, rapid growth in foreign real income and strong support from domestic commodity programs (Belongia 1986). By the beginning of the 80s, farm fundamentals such as real income and relative prices were generally bearish – and even though farm productivity was increasing farmers continued to leave the sector. Turning to the Federal Reserve Bank of St. Louis' February forecasts for agriculture, 1983 was expected to be the fourth consecutive year of low farm income in the US (Belongia 1983). A record harvest in 1981, declining exports, and large carryover stocks had all contributed to depressed grain prices. Ideal weather conditions and record yields in 1982 did nothing to alleviate the situation, and the US at now held about 76% of global corn stocks and 39% of world wheat stocks (Belongia 1983). Policy actions had been taken to encourage wheat and corn producers to reduce their planted acreage and thus reduce grain output[6], but with little success – at least in terms of supporting grain prices. What ultimately made grain prices recover in 1983 was a drought induced production shortfall, when intense heat affected crops across numerous states in the Midwest and the Great Plains. This yield related disturbance had major effect on grain prices, especially for corn and soybeans. That we find no evidence of this shift in wheat prices lends support to this supposition, as wheat benefits from being produced in a number of regions, while the world relied heavily on US corn and soybean exports during the 80s. We believe that the political incentives towards reducing grain acreage in the US and the drought induced price spike were important contributors towards the structural instability detected in 1983.

Moving to soybeans in figure 11, we find indications of structural breaks in 1974, 1978 and 1983. We are not able to identify an obvious cause for the breaks in 74 and 78, but the evidence of a structural break in 83 lends further support to our conjecture that instability was caused by US agricultural policies and adverse conditions in the US Corn Belt.

CONCLUDING REMARKS

In this article, we have described grain acreage, yields and aggregate production, as well as price relationships for wheat, corn and soybeans in an historical setting 1961-2016. During this period, agriculture has been exposed to a number of dramatic changes related to input prices, agricultural technology, geopolitical events and rapid changes in consumers' income and preferences. Oil price shocks, the collapse of the Soviet Union, the introduction of GM-technology and new demand for corn as input for biofuels are examples of events that have added to the uncertainties normally faced by farmers. One would expect such dramatic events to be reflected in grain production and prices as erratic changes or structural breaks. However, the analysis of acreage allocation, prices, production and yields tells a story of gradual adjustments and continuity – with some exceptions. Grain farmers seem to have been able to adjust successfully to both positive and adverse external events. Production, yields and grain acreage have grown at a steady rate, and the changes in land allocation towards the different crops have been relatively smooth. Likewise, price risk as measured by standard deviations have been fairly stable over the long-run, as have fluctuations in relative prices.

Considering how wheat, corn and soybeans are substitutes in production, and to some extent substitutes in consumption, it is reasonable to expect a long-run relationship between grain prices. This link is confirmed through a co-integration analysis. Estimates from ECMs shows that grain prices are cointegrated, with rapid adjustments of deviations from the long-run equilibrium. In sum, we find that despite massive international events like wars, technological changes, and so on, adjustments in agriculture are continuous and relatively smooth. Some of this continuity should be attributed to global markets that allow producers and consumers to share risk, information, and forming expectations.

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6 The 1981 US Farm Bill encouraged grain farmers to participate in a new acreage reduction program by offering deficiciency payments and price support loans in return for ideling a crop-specific percentage of their base acreage. This was an essential alteration from the former set-aside program; prior to 1981 acreage reductions were based upon current year plantings, and most importantly, the reductions were not crop-specific.

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SCIENTIFIC PAPER

URBAN FOOD CROP FARMING AND FARM HOUSEHOLDS' FOOD SECURITY STATUS IN OYO STATE, NIGERIA

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Abstract: *Food production and supply has been on the decline in Nigeria with a consequent impact on household food security. This study examined the influence of urban farming on household food security in Oyo State, Nigeria. Multi-stage sampling procedure was used to select 159 farm households in a cross-sectional survey. Structured questionnaire was used to obtain data on socio-economic characteristics, determine the food security status of urban crop farming households in the study area, and examine the effects of urban crop production on households' food security status. Data were analysed using descriptive statistics while the statistical tools were Food Security Index (FSI) and Probit Regression Model (PRM). Results revealed that 84.9% of the respondents was male, 81.2% married. The average age, household size, and farm size were 49.6 years, 6 persons, 1.1 hectares respectively. Most (75.5%) of the respondents did not have access to consumption credit and 62.3% did not belong to any farmers association. Based on minimum daily energy requirement per adult equivalent of N230.8, 90.6% of the farm households was food secure. The PRM showed that age ($\beta = -0.1$, $p<0.05$), household size ($\beta= -0.4$, $p<0.01$) and economic efficiency ($\beta = -61.6$, $p<0.05$) reduced the probability of household food security while access to consumption credit ($\beta= 1.7$, $p<0.05$) and allocative efficiency ($\beta = 67.9$, $p<0.05$) increased the probability of household food security. The study concluded that urban farming significantly influence household food security.*

Keywords: *Food Security, Urban Food Crop, Food Security Index, Probit Regression Model*
(JEL Classification: *Q11*)

Introduction

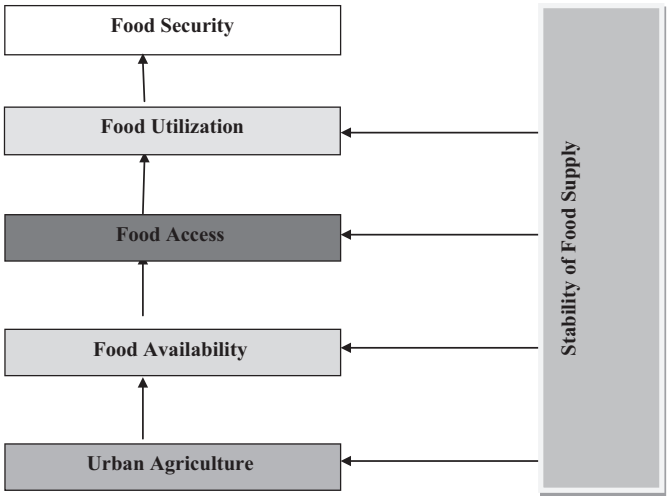
Urban agriculture practice is a major strategy towards improving food security in many cities throughout the world (Chaminuka and Dube, 2017). The challenge of feeding cities lies in enhancing consumer access to food by ensuring increased local food production, processing and distribution as well as reversing dependence on distant production sites, thus enabling cities to become more autonomous in food production (JONGWE, 2014).Urban food insecurity is a growing challenge emanating from rapid urbanization and rising poverty. Urbanization increases resource competition, costs of supplying, distributing and accessing food, thus negatively impacting on urban household food security (Rabinowicz, 2002).

Among the developmental problems Nigeria is faced with, food insecurity ranks topmost (Babatunde et al., 2007a). The level of food insecurity has continued to rise steadily since the early 1980s. It rose from 18% in 1986 to about 41% in 2004 (SANUSI et al., 2006).A large proportion of urban households and dwellers in Nigeria merely eat for survival despite their involvement in urban agriculture, just like many rural households whose occupation is predominantly agriculture (Obayelu, 2012). This implies the existence of some disjoint relationship between household food security and urban food production. This study sought to provide answers to the irregular relationship by the following research questions: i. What are the socio-economic characteristics of the urban farming households in the study area? ii. What is the food security status of urban farming households in the study area? iii. What are the effects of urban food crop production on households' food security status?

Food security can be elaborated into four dimensions which are: food availability, food accessibility, food utilization and stability of food supply (Jrad et al. 2010). Food availability has to do with physical presence of food which may come from own production, purchases from internal market or import from overseas for consumption (Gregory et al. 2005). Household food access deals with the ability to obtain sufficient food of guaranteed quality and quantity to meet nutritional requirements

of all household members. Food utilization entails ingestion and digestion of adequate and quality food for maintenance of good health (Jrad et al., 2010). Stability of food supply is achieved when there is a continuous supply of adequate food all year round without shortages (Jrad et al., 2010).

Figure 1: Conceptual Framework Showing Relationship between Urban Agriculture and Food Security (2017)



MATERIAL AND METHOD

Study Area

Oyo State covers an area of 28,454 square kilometres and has a population of 5,591,589 people according to the 2006 population census. It lies between latitudes 7o 31N and 9o121N and longitudes 2o 471E and 4o 231E (NPC, 2006). Oyo State has the largest arable urban farmland among other South-Western states in Nigeria with about 27,107.5 square kilometres which can be used to cultivate food crops like: cereals (rice, maize and guinea corn), legumes (cowpea, and soybeans), root and tuber (sweet potato, cassava and yam) (Goudie, 2002).

Sampling Procedure and Sample Size

Multistage sampling procedure was employed in the selection of 159 households from the study area. Oyo State is divided into four agricultural zones which are: Saki/Oke-ogun, Ibadan/Ibarapa, Oyo, and Ogbomoso zones. In the first stage, all the four agricultural zones of the state were used for proper representation of urban food crop farmers in the study area. The second stage was a purposive selection of blocks in each zone where urban food crop farmers were identified.

Estimation of food security status of urban crop farming households

The cost of calorie (COC) intake proposed by Foster, Greer and Thorbecke, (1986) was adopted to determine a threshold food security line. This method has been applied to several studies with main focus on food security (Asogwa and Umeh, 2012; Olagunju *et al.*, 2012; Ahmed And Abah, 2014). The COC yields a threshold value which is close to the minimum calorie requirement for human survival. Following the approach of earlier studies, the food insecurity line is given as:

$$\ln h = a + bC \quad \text{..... (1)}$$

Where h = daily adult equivalent food expenditure in naira
C = actual calorie consumption per adult equivalent in a household (kcal)
a = model intercept
b = model slope
FAO's recommended minimum daily calorie requirement per adult equivalent is 2260kcal; this was used to determine the food insecurity line using the equation:

$$Z = e^{(a+bL)} \quad \text{..... (2)}$$

Where Z = food security status
L = recommended minimum daily calorie intake level per adult equivalent of 2260 Kcal.The daily calorie consumption was estimated using the calorie content conversion factor (Table 4) of the consumed food item in each household as used by Babatunde et al., (2007b) and Ayantoye et al., (2011). The daily household calorie intake was then divided by the adult equivalent conversion factor (Table 5) to obtain the daily calorie intake per adult equivalent as used by Babatunde et al., (2007b).

Effects of urban crop production on households' food security status

The probit regression model was used to analyze the effect of urban food crops farming on households' food security status of urban farm households. The food security status of households which is bivariate, taking the value of 1 for food secure households and 0 for food insecure households was used as the dependent variable. The choice of probit model is because it assumes there is a latent, unobserved continuous variable Z* that determines the value of Z and includes observable error term distribution as well as realistic probabilities (Adepoju and Adejare, 2013; Yusuf et al., 2015).

$$\text{Log}\frac{Pi}{1-Pi} = Z_i = \alpha + \beta_i W_i \quad \text{..... (3)}$$

$$Z_i = \alpha + \beta_1 W_1 + \beta_2 W_2 + \ldots\ldots\ldots + \beta_n W_n \quad \text{..... (4)}$$

Where:
Z_i = Food security status (1 = Food secure, 0 = Food insecure)
α and β_i are the parameters to be estimated.
W_1 = age (Years)
W_2 = years of formal education (Years)
W_3 = household size (head count)

W_4 = cultivated farmland (Hectares)

W_5 = urban farming experience (years)

W_6 = output of urban food crops farm (in grain equivalent using the conversion factor of Table 6)

W_7 = access to consumption credit (1 = Yes, 0 = No)

W_8 = membership to farmers' association (1 = Yes, 0 = No)

W_9 = ownership of cultivated land (1= own the land, 0 = rent/lease the land)

W_{10} = proportion of food consumed from production

W_{11} = technical efficiency of respondents

W_{12} = allocative efficiency of respondents

W_{13} = economic efficiency of respondents

W_{14} = respondents' income from urban food crop farming (in naira)

RESULTS AND DISCUSSION

Individual households' socio-economic characteristics and resources were identified as basic factors influencing the food security status of households (SANUSI et al., 2006). Demographic and socio-economic characteristics of urban food crop farmers in the study area are presented in Table 1. These characteristics include: age, sex, household size, farm size, marital status, access to consumption credit, and membership of farmers' association.

Result from the study area revealed that 32.80% of the respondents have their ages between 51 and 60 years; this is consistent with previous work by Ogunniyi et al., (2017). The mean age of 49.58 years indicated that many of the respondents were adults. In the study area, 84.90% of the households were male headed while 15.10% were female headed households; this finding was similar to Ogunniyi et al., (2017). Many (46.60%) of the respondents had a household size of between 4 and 6 in the study area. This average household pattern is consistent with previous study by Ahmed and Abah, (2014). The demographic characteristics of the respondents as observed from the field as shown in Table 1 revealed that approximately 81.8% of the respondents were married just as it was noted in findings by Ogunniyi et al., (2017). Majority (70.4%) of the respondents cultivated their crops on a farmland of less than 1hectare; and the mean farm size was 1.1 hectares. This suggests that the respondents were primarily small holder farmers. Findings from the field survey revealed that a good percentage (75.5%) of the respondents did not have access to consumption credit. Many (62.3%) of the respondents are not members of any farmers association, just a few (37.7%) of the respondents are members.

FOOD SECURITY STATUS OF URBAN FARM HOUSEHOLDS IN THE STUDY AREA

Presented in Table 2 is the result of the food security status of the urban farm households using the cost of calorie approach in Oyo State, Nigeria as was used in previous studies by Ahmed and Abah, 2014; ASOGWA and UMEH, 2012; OLAGUNJU et al., 2012. The result showed that majority (90.57%) of the respondents were food secure. This implies that 9.43% of the urban farm households were below the food security line of N230.78 per adult equivalent per day on per capita food consumption to attain the FAO recommended daily energy requirement per adult equivalent of 2260kcal.

This suggests that the food secure respondents were experiencing stability in food security which is one of the

Table 1: Socio-economic and Demographic Characteristics of the Respondents

Social factor	Frequency	Percentage
Age (Years)		
21–30	12	7.5
31–40	31	19.5
41–50	35	22
51–60	52	32.8
61–70	26	16.3
71–80	3	1.9
SEX		
male	135	84.9
female	24	15.1
household size		
1 – 3	36	22.6
4 – 6	74	46.6
7 – 9	36	22.6
10 – 12	9	5.7
13 – 15	4	2.5
marital status		
married	130	81.8
single	29	18.2
farm size (hectares)		
≤ 3.0	145	91.2
3.1 - 6.0	11	6.9
6.1 - 9.0	1	0.6
9.1 - 12.0	2	1.3
access to consumption credit		
have no access	120	75.5
have access	39	24.5
member of farmers' association		
non-members	99	62.3
members	60	37.7

Source: Data Analysis Result, 2017

four dimensional elements of food security as noted by OKUNEYE, 2002

EFFECTS OF URBAN FOOD CROP FARMING ON HOUSEHOLDS' FOOD SECURITY STATUS

Table 2: Food Security Status of the Respondents

Variable	
Cost of calorie equation	LNH = A+BC
Intercept	5.182031(104.11)
Slope	0.0001148(11.30)
FAO Recommended daily energy requirement per adult equivalent	2260kcal/day
Recommended cost of minimum energy requirement per adult equivalent	₦230.78/day
	₦1,615.46/week
	₦6,923.40/month
	₦84,234.70/year
Number of food secure respondents	144
Number of food insecure respondents	15
Percentage of food secure respondent	90.57%
Percentage of food insecure respondent	9.43%

Source: Field Survey, (2017)

Table 3 revealed the result of the Probit regression model which was used to determine the effects of urban food crop farming on food security status of urban farm households in Oyo State, Nigeria. Out of 14 explanatory variables included in the model, 5 were found to significantly influence the probability of households to be food secure. These are age, household size, access to consumption credit, allocative efficiency and economic efficiency. Age of urban farm households significantly ($p<0.05$) affect food security. Being old tended to reduce the probability of food security of urban farm households by 0.05% while respondents' household size had the probability of reducing food security by 0.36%. This is in line with previous findings by Ahmed and Abah, (2014); Babatunde et al., (2007a); (2007b).This result is consistent with theoretical a priori because the elderly are less productive and are unlikely to diversify their income source to be food secure; in addition, large household size will require greater calorie intake to consume and at greater cost of calorie otherwise they would most likely remain food insecure. Food security was discovered to be significantly ($p<0.05$) affected by respondents' access to consumption credit. This implies that the probability of food security tend to increase with increase in access to consumption credit. This is in agreement with finding by Otunaiya and Ibridunni, (2014). Respondents' allocative efficiency was discovered to significantly ($p<0.05$) affect food security positively. The implication of this is that the probability of food security tended to increase with increase in the respondents' allocative efficiency. The respondents' economic efficiency significantly ($p<0.05$) affected their food security negatively. In other words, increase in the economic efficiency of urban farm households reduced the probability of their food security. By implication while the respondents were attempting to have the maximum ratio of their actual production total cost to expected production total cost at a given frontier of output, their probability of being food secure falls. This could be as a result of poor and inefficient allocation of production resources.

The results showed that the pseudo R2 was 0.3676. This implies that 36.76% of the variation in food security status of the respondents is jointly explained by the 14 explanatory variables in the model. The log-likelihood of -31.4202 implies that the explanatory variables in the Probit regression model significantly explained the factors that had effect on food security of the urban farm households in the study area. Chi-square value of 36.52 associated with the log-likelihood was statistically significant ($p<0.01$) suggesting a strong explanatory power and goodness of fit of the model.

This research work recommends that consumption credit should be made available to urban food crop farmers timely as this facilitates their food security. This study further recommends that urban food crop farmers should be supported with inputs that promote greater output which enhances food security

Table 3: Probit Regression Estimate Showing the Effects of Urban Farming on Food Security

variable	Coefficient	Z	Marginal effect
Age	-0.057573**	-2.34	-0.000593
Education level	-0.042075	-0.83	-0.000434
Household size	-0.351634***	-3.26	-0.003624
Farm size	0.601644	1.32	0.006201
Urban farming experience	0.020549	0.95	0.000212
Output of urban farming	0.000022	0.13	0.0000002
Access to consumption credit	1.713267**	2.3	0.011159
Membership to farmers association	0.144994	0.32	0.001432
Land ownership	0.672808	1.33	0.009604
Proportion of consumed output	1.193283	1.43	0.012299
Technical efficiency	12.76854	1.27	0.131606
Allocative efficiency	67.91355**	2.08	0.699987
Economic efficiency	-61.629500**	-2	-0.635217
Income	0.000004	0.92	0.0000
Constant	-15.3147	-1.46	
Log-likelihood	-31.4202		
Pseudo R2	0.3676		
Prob>chi2	0.0009		
LR chi2(14)	36.52		
Number of observations	159		

** Significance at 10%, **Significance at 5%, *** Significance at 1% Source: Data Analysis Result, 2017*

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SCIENTIFIC PAPER

FRESH PRODUCE RETAIL PRICE COMPARISONS IN TRINIDAD AND TOBAGO

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Abstract: *As the competitive landscape of the food and grocery retailing sector in Trinidad and Tobago is being transformed and consumers are separated from producers, shoppers are more reliant on price/quality cues in making their purchase decisions. The purpose of this study is to identify the retail outlet with the lowest and or highest price for a selected number of fresh produce items, in an effort to direct shoppers to relatively cheap nutritious sources of fresh produce. ANOVA and the Games-Howell test were the analytical procedures used. The ANOVA results indicated that there is statistical difference for all the items at the different retail outlets – farmers' markets, roadside markets, public markets and supermarkets. The Games-Howell results obtained indicated that the supermarket mean prices were the highest for all items. Shoppers who purchased pineapple at the farmer's market instead of the supermarket in 2016 could have potentially achieved the greatest savings of $6.52/kg.*

Keywords: *Fresh produce, Retail prices, ANOVA, Games-Howell Test, Trinidad and Tobago shoppers.*
(JEL Classification: *C12, Q13, M31*)

Introduction

Despite the overwhelming evidence in the diet/health literature of the numerous benefits from an adequate daily consumption level of fresh produce, in the Caribbean where there is supposed to be an abundant supply, many populations fail to achieve the recommended daily intake levels. As a direct result there has been increasing levels of Non-Communicable Diseases (NCDs) being experienced globally, including the Caribbean. In 2015 the Global Burden of Disease Study reported that the total deaths from NCDs reached 39.8 million. Table 1 illustrates the top five causes of death in Trinidad and Tobago (T&T) as reported by the World Health Organization (WHO) in 2014. As can be seen in this table cardiovascular diseases top the list, while injuries come in at number 5. Of the 13,000 deaths reported, 80% was attributed to NCDs. Root Crops and fruits and vegetables are rich sources of fibre, antioxidants, and phytochemicals that have beneficial health effects, such as aiding in the prevention of many chronic diseases, including type-2 diabetes when consumed. Increasing their consumption is one means of reducing the level of NCDs in many developing countries.

Table 1: Top five causes of death in T&T

diseases/injuries	Percent of total deaths
cardiovascular	32
cancers	16
other ncds	15
diabetes	14
injuries	11

Source: WHO Non-communicable Diseases Country Profiles, 2014

Traditionally, in the Caribbean, as was the case in most developing countries, fresh produce retailing was limited to public markets, roadside stands and at farm gate. However, in the last few decades consumers in developing countries in general, and Trinidad and Tobago specifically, have been offered increased options – supermarkets, public markets, roadside stands, farmers' markets and at farm gate – from which to purchase fresh produce. While supermarkets provide potential customers the benefits of "one stop" shopping and a pleasant shopping environment, in many developing countries price of goods is a major determinant of where one shops. The purpose of this study is to compare the retail prices for a selected number of fresh produce items in an attempt to identify the outlet with the highest or lowest price. The products selected for the study were from the Staples (Dasheen and Sweet Potato) and Fruits and Vegetables food groups (Pineapple, Watermelon, Cucumber and Pumpkin,) over the period January to December 2016 in Trinidad and Tobago.

Recently, several studies have suggested that healthier foods and diets are more expensive than less healthy options (Roa et al 2013, and Wiggins & Keats 2015). In a study titled "Obtaining Fruit and Vegetables for the Lowest Prices: Pricing Survey of Different Outlets and Geographical Analysis of Competition Effects" Pearson et.al (2014) state "Perhaps the most consistently noted barrier to adequate consumption of fruits and vegetables is cost". Appleton et.al (2016) focusing on just vegetables alone (i.e. not fruit and vegetables, just vegetable) suggest that besides individual preferences, higher vegetable consumption in adults is also related to increased availability and reduced cost, and low consumption is

largely associated with lower socio-economic status lower income, living in a more deprived area or lower income neighborhood (an indirect measure of socio-economic status) and lower education. Hence, being able to direct customers to cheap nutritious sources of fresh produce should therefore contribute to increased purchase and consumption levels. This study is an attempt to compare the prices of cucumber, pumpkin, pineapple, watermelon, dasheen and sweet potato at supermarkets, public markets, roadside vegetable/fruit stands and farmers' markets in T&T in an attempt to identify the retail outlet with the lowest and/or highest prices.

Minten and Reardon (2008) in a study titled "Food Prices, Quality, and Quality's Pricing in Supermarkets versus Traditional Markets in Developing Countries" looked at survey-based evidence from ten developing countries plus primary data from Madagascar. They concluded that there is a stable and predictable pattern in supermarket pricing and quality offerings versus traditional markets, as follows:

- In the early stages, supermarkets are better than traditional retailers by charging lower prices for processed products—taking advantage of procurement systems that allow economies of scale. The poor consumers take advantage of this to buy processed foods and semi-processed foods from supermarkets.

- In the early stages, supermarkets sell especially vegetables more expensive than do traditional retailers. Eventually, they do reduce their prices and compete on fruit and eventually vegetable prices.

- Supermarkets in the early stages tend to focus on packaged and high-quality products, but as time goes by, they extend their quality range to attract the mass market.

- Recognizing the data limitations, supermarkets tend to differentiate price based on quality. However, in the case of potatoes in Ecuador, they thought supermarkets provided better quality and lower prices.

They however suggested that these were early findings and should be verified at a later date adjusting price to take account of transaction costs. Since the "Supermarket Revolution" can be considered to be still in the early stages in the Caribbean, for purpose of this study we hypothesize that supermarket prices would be highest.

Several studies that compare prices at farmers' markets and supermarkets, Sommer et al (1980) and Swenson (2012) for example, suggest that fresh produce prices are lower at farmers' markets. Swenson (2012) compared the prices of sweet onions, broccoli, Romaine lettuce, butternut squash, vine ripened tomatoes and Navel oranges at farmers' markets and supermarkets in San Luis Obispo County, California over a five week period. She concluded, "The hypothesis that farmers' markets would have lower prices on average than their paired supermarkets was proven to be correct through intensive price analyses". Based on the six chosen commodities, the average price at the farmers' markets was 25 cents lower than at the supermarkets.

As Valpiani et al. (2016) state "Whether direct farmer-to-consumer outlets compete with supermarkets on produce prices remains an empirical question". Consequently, the approach and analytical rigor applied will be very dependent on the researcher. Based on the review provided above, the problems that will be addressed in this study are as follows:

(1) To compute the average prices for cucumber, pumpkin, watermelon, pineapple, sweet potato and dasheen at the four retail outlets;

(2) To test if the mean prices are statistically different at the different retail outlets.

HO_1: The farmers' market, public market, roadside market and supermarket mean prices are equal;

HA_1: The farmers' market, public market, roadside market and supermarket prices are not equal,

(3) If the prices are not equal, to try and identify the outlet with the lowest and or highest price;

MATERIAL AND METHOD

Food price comparison studies are plagued with problems. Minten et al (2009) state "Three important issues in traditional food retail markets in India, as well as in a number of other developing countries, exist that might complicate the measurement of prices. They include bargaining, differential pricing, and cheating. First, prices are mostly not posted and bargaining might take place between the buyer and the seller before they settle on a price, especially for fresh produce". Further complicating things is the issue of similar quality, especially in the case of fresh produce, when comparisons are made between supermarkets and traditional outlets.

Being cognizant of the problems stated above this study utilized data collected by the National Agricultural Marketing and Development Corporation (NAMDEVCO), of Trinidad and Tobago. NAMDEVCO, a State Agency, manages the wholesale markets in T&T and is well positioned to collect the prices for a selected range of products in these markets regularly. To complement the data from the wholesale markets, their trained data enumerators also collect data at other selected retail outlets for agricultural products. This study uses monthly data (TT$/kg[1]) for the period January 2016 to December 2016 from the National Agricultural Marketing Information Systems (NAMIS), a part of NAMDEVCO.

The study uses the one-way analysis of variance (ANOVA) to see if there was a statistically significant difference between the mean prices of the fresh produce items at the different retail outlets.

1 US$1.00 = TT$6.73

The ANOVA is an analytical procedure that uses the variance to determine whether means are significantly different, by apportioning the variances between the groups of means versus the variance within the groups (the null hypothesis Ho: $\mu 1 = \mu 2 = \mu 3 = \ldots = \mu k$, where k = the number of groups). There are a number of a posteriori or post hoc tests, run after a significant ANOVA, to determine which differences are significant. In the general case of multiple pairwise comparisons where we compare each of the pairs we make K(K-1)/2 comparisons (where K is the number of groups). As Field (2009), page 375 recommends, the Games–Howell test should be carried out when one is not sure that the homogeneity of variance assumption holds. Consequently, this was the a posteriori test used to identify the retail outlet with the lowest price and or highest price. The relevant data were analyzed using SPSS version 21.

RESULTS AND DISCUSSION

Figure 1 illustrates the average prices over the period January 2016 to December 2016 for the selected products at the various retail outlets. As is observed in the chart, the farmers' markets seem to have the lowest prices for the products except for pumpkin, where the lowest price is obtained in the public market. The supermarket appears to have the highest price for all of the products.

Figure 1: Average prices of the products at the retail outlets: January 2016 to December 2016

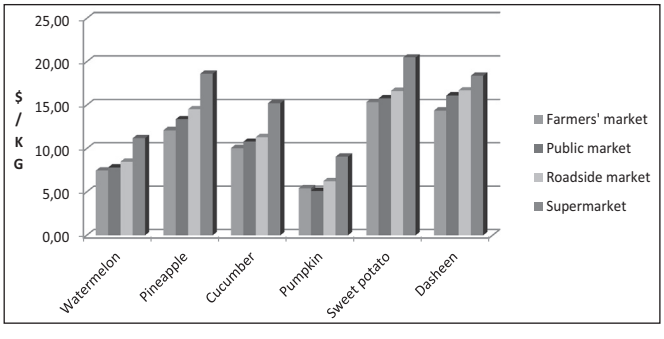

Table 2 illustrates the descriptive statistics of the various prices. As can be observed from this table, sweet potato at the supermarket had the highest mean price while public market for pumpkin the lowest mean price. The standard deviation is a measure that is used to quantify the amount of variation of a set of data values. A low standard deviation indicates that the data points tend to be close to the mean of the set, while a high standard deviation indicates that the data points are spread out over a wider range of values. It is worthy to note that the standard deviation of the public market mean price for watermelon was the lowest standard deviation, while the supermarket mean price for sweet potato had the highest standard deviation.

Table 2: Retail market prices for the period January to December 2016 descriptive statistics

Retail market prices	Mean	Std. Deviation	Std. Error
Watermelon			
Farmers' market	7.47	1.63	0.47
Public market	7.83	0.60	0.17
Roadside stand	8.49	0.85	0.25
Supermarket	11.21	0.78	0.23
Pineapple			
Farmers' market	12.11	1.56	0.43
Public market	13.38	0.61	0.18
Roadside stand	14.53	0.85	0.25
Supermarket	18.63	0.82	0.24
Cucumber			
Farmers' market	10.07	1.63	0.47
Public market	10.80	1.76	0.51
Roadside stand	11.32	2.19	0.63
Supermarket	15.23	2.32	0.67
Pumpkin			
Farmers' market	5.43	0.76	0.22
Public market	5.12	0.80	0.23
Roadside stand	6.25	0.71	0.21
Supermarket	9.07	1.25	0.36
Sweet Potato			
Farmers' market	15.35	2.37	0.68
Public market	15.79	2.32	0.67
Roadside stand	16.65	2.83	0.82
Supermarket	20.50	3.62	1.04
Dasheen			
Farmers' market	14.38	0.97	0.28
Public market	16.11	1.25	0.36
Roadside stand	16.71	1.42	0.41
Supermarket	18.40	1.84	0.53

An assumption of the ANOVA test is that each group of the independent variable has the same variance. Moderate deviations from this assumption of equal variance do not seriously affect the results in ANOVA, but we will normally check to see if the assumption holds. Table 3 shows the results of the Levene's Test for equality of variances. As is observed the p-value of the test statistic obtained was greater than 0.05 in all cases. As a result the null hypotheses cannot be rejected for pineapple, watermelon, cucumber, pumpkin, sweet potato and dasheen, so we can therefore proceed for the ANOVA test on the assumption of equality of variances.

Table 3:
Levene's Test for homogeneity of variances results for the products

Products	Levene Statistic	df1	df2	Sig
Watermelon	1.253	3	44	0.302
Pineapple	0.639	3	44	0.594
Cucumber	0.441	3	44	0.725
Pumpkin	0.858	3	44	0.470
Sweet Potato	0.943	3	44	0.428
Dasheen	1.737	3	44	0.173

Table 4 illustrates the ANOVA results for the six fresh produce items. The F-statistics obtained are statistically significant at the $P<0.05$ level. The null hypothesis that there is no significant difference between the average prices at the various outlets is therefore rejected. The data therefore suggest there is a statistically significant difference between the retail prices for the products at the different outlets.

The results of the ANOVA test do not inform us of the retail outlet with the lowest price. A cursory look at the mean prices as displayed in figure 1 suggests that the farmers' market prices are lowest and the supermarket prices are highest. The Games-Howell test is one of a number of a posteriori or post hoc tests, run after a significant ANOVA to help to identify which of the comparisons are lowest or highest. The Games-Howell test does not rely on equal variance and sample size and as a result was used here.

Table 4: ANOVA test results

Watermelon	Sum of squares	df	Mean Square	F	Sig.
Between Groups	103.155	3	34.385	31.616	.000
Within Groups	47.854	44	1.088		
Total	151.009	47			
Pineapple	Sum of squares	df	Mean Square	F	Sig.
Between Groups	286.689	3	95.563	95.425	.000
Within Groups	44.064	44	1.001		
Total	330.753	47			
Cucumber	Sum of squares	df	Mean Square	F	Sig.
Between Groups	191.650	3	63.883	16.068	.000
Within Groups	174.937	44	3.976		
Total	366.587	47			
Pumpkin	Sum of squares	df	Mean Square	F	Sig.
Between Groups	116.789	3	38.930	47.392	.000
Within Groups	36.143	44	0.821		
Total	152.932	47			
Sweet Potato	Sum of squares	df	Mean Square	F	Sig.
Between Groups	197.960	3	65.987	8.225	.000
Within Groups	353.011	44	8.023		
Total	550.971	47			
Dasheen	Sum of squares	df	Mean Square	F	Sig.
Between Groups	99.593	3	33.198	16.776	.000
Within Groups	87.069	44	1.979		
Total	186.662	47			

Table 5 illustrates a summary of the Games-Howell test results for the selected products. The results suggest that the farmers' market mean price and the supermarket price are significantly different for all of the fresh produce items. Similarly, the mean public market price and supermarket price are significantly different for all of the produce items with all p-values less than 0.05. Also, the results of the test in table 5 suggest there is no statistically significant difference between the farmers' market and public market mean prices except for dasheen. In the case of dasheen there is no statistical difference between the roadside market and supermarket mean price and public market and roadside market mean price, while there is statistically significant difference for all the other dasheen retail outlet price comparisons. For pineapple and pumpkin there is statistical difference between the public market and the roadside market mean prices. In the case of pineapple there is statistically significant difference between the farmers' market and roadside markets mean prices.

Table 5:
Summary of Games-Howell post hoc Multiple Comparisons test results

test	water-melon	pineapple	cucumber	pumpkin	sweet potato	dasheen
fm-pm						*
fm-rm		*				*
fm-sm	*	*	*	*	*	*
pm-rm		*		*		
pm-sm	*	*	*	*	*	*
rm-sm	*	*	*	*	*	

****The mean difference is significant at the 0.05 level***
Where: FM = farmers' market; PM = public market; RM = roadside market; SM = supermarke

The results of the study do support the view that the mean supermarket price is highest. Hence, an examination of the difference between the supermarket mean price and the other outlet prices should provide an indication of potential savings for shoppers that purchased the items from the other outlets instead of the supermarket. Table 6 illustrates the differences of the mean supermarket price from the mean farmers' market price for the selected items in an attempt to illustrate the potential savings for shoppers that purchased the items at the farmers' market versus the supermarket in 2016. As is observed in this table the largest savings was for pineapple of $6.52/kg. An examination of the difference of the mean supermarket price from all the other mean market prices indicate that the smallest difference was for dasheen between the roadside market and supermarket – mean supermarket price minus mean roadside market price $1.69/kg. An examination of table 5 shows that the mean supermarket price was not statistically different from the mean roadside market price for dasheen.

Table 6: The differences of the mean supermarket price from the mean farmers' market price

Product	Supermarket – Farmers' market price	Potential savings ($/kg)
Watermelon	$11.21- $7.74	$3.74
Pineapple	$18.63 -$12.11	$6.52
Cucumber	$15.23 - $10.07	$5.16
Pumpkin	$9.07 - $5.43	$3.64
Sweet potato	$20.50 - $15.35	$5.15
Dasheen	$18.40 - $14.38	$4.02

Research suggests several reasons for low levels of fresh produce consumption ranging from taste, socioeconomic status and education, however, ability to buy is particularly important in many developing countries. As the food retailing landscape in these countries are transformed and shoppers are offered an expanded range of options, making decisions become more complex. Being able to identify cheap nutritious sources of fresh produce is a fundamental intervention needed in an effort to facilitate increased purchase and consumption.

The ANOVA results for this study suggest that there is statistical difference between the mean market prices of all the produce items analyzed at the different outlets. This study found that for the selected fresh produce items the price at the supermarket – modern retail – was higher than the other retail outlets. This result is opposite to that of Minten et al (2010). In the case of pineapple shoppers who purchased at the farmer's market instead of the supermarket in 2016 could have potentially achieved the greatest savings of $6.52/kg while shoppers of dasheen at roadside markets instead of supermarkets would have received the smallest potential savings of $1.69/kg. However, it is important to note that there was no statistically significant difference between the mean price at the farmers' market, roadside market and the public market for pumpkin, cucumber, sweet potato and watermelon. Also, in the case of dasheen while the farmer's market means price was statistically different (less) than the other outlets there was no statistical difference between the roadside market and public market mean prices. In the case of pineapple there was no statistical difference between the mean farmer's market price and the public market, while the roadside market was statistically different from all other markets.

These findings are significant to both marketers and consumers. From a theoretical perspective marketers are provided with an indication of the price differences that exist between the different outlets. This information could be useful to them, especially the small operators, in developing countries as they develop their marketing strategies. In T&T, like many other Caribbean countries, the pricing strategy of small operators for many agricultural products is not very scientific, but based more on "gut feelings" of what the market can bear. If this information promotes the use of more science based pricing methods, for example cost-plus pricing, which results in lower prices of the fresh produce, the study would have served a useful purpose. As Darian & Tucci (2013) point out the most important factors that would make it more likely that the respondent would eat more vegetables are "If vegetables cost less" and "If vegetables tasted better". Helping to identify where cost savings can be had when purchasing vegetables should therefore be useful information for shoppers.

For fresh produce that a barrier to consumption is financial cost, to achieve the desired goal of increased purchase and consumption, some consideration should be given to interventions that focus on lowering the cost. Various studies have looked at marketing and or pricing strategies on the choice of food in general and vegetables specifically in developed countries, for example Darian & Tucci (2013); Waterlander et. al. (2012), French (2003), French et al (1997), however to date to the best of our knowledge no such study has been done for T&T. Further research on the comparison of food prices between modern and traditional retail outlets is required in an endeavor to guide food policy development in T&T and the wider Caribbean.

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SCIENTIFIC PAPER

OWNERSHIP STRUCTURES WITHIN HUNGARIAN FAMILY BUSINESSES – THEORIES AND PRACTICE

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Abstract: *We can talk about family business if the notions of family, ownership and business are closely connected to each other, namely if the business is in the possession of the family, managed and controlled by the family members. A family owned company is a business where a family has the majority ownership and/or the majority management and at least one family member actively works in the firm, the family owns the business. The study contains the results of research on ownership structure of family owned businesses. The examined family businesses are interested in long-term preservation of values, thus succession of generations plays a key role in their case. They attaches great importance how the ownership structure develops. The methotology to know more about the ownership structure of family businesses 11 expert interviews were made between november 2016 and september 2017 with owners and next generations of family owned agri-food enterprises in Hungary. A case study has been prepared too in this topic with the participation of companies with different activities (production, service, trade). In order to classify the analysed companies six categories of ownership were developed. These are non-owner, emotional owner, partial owner, controlling owner, majority owner and exclusive/sole owner. Each generation of the analysed FBs were classified to these categories. According to the results the analysed family owned companies even are sharing the property within family. There are only two interviewed companies whose case we can talk about exclusive/sole ownership.*

Keywords: *Generation, Expert Interviews, Ownership Categories*
(JEL Classification: *G32*)

Introduction

The family business form is popular all over the world. But what is family business? Several countries, many definitions, but the essence is the same. M. CANO-RUBIO et al. (2017) examined the lack of a standard definition of FBs (Family Business). Their work analyse and publicise many definitions of family firms. Basing their study and according to Ramadani-Hoy (2015) and DE MASSIS et al. (2012) the most commonly used concepts/terms/expression in literatures in connection with FBs (Family Business) definitions are the followings: ownership, management, directorship, self-identification, multiple generations, intra family succession intention.

We can talk about family businesses if the notions of family, ownership and business are closely connected to each other, namely if the business is in the possession of the family, managed and controlled by the family members.

Based on the work of Mandl (2008) And Csákné (2012) the three most important element of comprehensive definition of family businesses are the ownership, the participation in management and the transfer or the intent of the transfer between generations.

In short, a family business is a business where a family has the majority ownership and/or the majority management and at least one family member actively works in the firm, the family owns the business.

CHU (2011) analysed factors influencing the business's achievement paying attention to family management and control and the size of the business.

According To Chu (2011) And Giovanni (2010) the indicators of achievement in the business are the most appropriate for measuring effectiveness. In striving economies the capital markets are not perfect and the proportion of debt-own assets is usually high, thus there is a strong connection to achievement and risk.

A survey of 240 state enterprises in Thailand supported the fact that in the case of family ownership there is a more positive relation between the Return On Assets (ROA) ratio of the enterprise and the net sales revenues of sales than in the case of enterprises that are not family-owned, which points to a greater and better achievement, to the will to perform (CHU, 2011).

CHU (2011) used the data of 786 family businesses from Taiwan in his study. According to his view a company is stronger if the family members are present as chairmen, corporate executives, presidents or managers. If the family members do not participate in the management and control of the business, then the company becomes weaker. The results of his study show that the positive effects of family ownership are realised with a greater probability if the family ownership is paired with family management and control. The relation between family ownership and business achievement is stronger in the case of small or medium businesses, than in bigger corporations. In his view the determinant of success is the output of the business, thus

one consequence of power of family. Performance depends on internal and external conditions. The characteristics of business, and especially the size of the company influences the relation between family ownership and profitability. The effect of family ownership on profit depends on family management and control and the size of the company.

As the definition reported by ARREGLE et al. (2012) stated that a firm only could be considered as a FB if the „ownership by persons outside the family should not exceed 49%". Also as stated in a study about family-controlled firms "a family business is one in which at least 50.1% is owned by one family" (CALABRÒ et al., 2016).

According to RANTANEN-JUSSILA (2011) the F-CPO (Family-Collective Psychological Ownership) phenomena does not only represent the potential influence of the family, it also indicates real effect. The F-CPO takes several correlations into consideration, such as collectivity, identification and interdependency among family members in business correlations. Reasons for such Psychological Possessions can exceed the motives of social-emotional affluence and can help in enlarging the present-day knowledge concerning the non-exclusively financial aims of the family business.

'This business is mine.'

This could be the key sentence for this structure, since the Psychological Possession is a state of mind which is activated by the need for owning. This kind of emotion can emerge in connection with material or immaterial goods.

From the aspect of psychological possession, the family can be interpreted as a social system, while the business can be considered as a social and physical organisation. Namely, business is in the family.

The F-CPO – scale can be characterised by the following statements:

- We (my family and me) feel that the business is ours.
- We (my family and me) are strongly attached to the common business possession.
- We (my family and me) share the feeling that the business – as a whole – belongs to the family.

On the basis of the paper by Randel S. CARLOCK (2012) in THE TIMES the flow of ownership and control between generations – passing the baton – is a challenge which family businesses have to face. Unfortunately, several family businesses do not work out a plan for the further operation of the business. However, this is one element of the strategic planning which is inevitable for the future operation.

All family businesses whose founders created the unity of aims concerning the acquisition of values and the future want to hand over business values and attitude directly to their children, namely would like to pass over their experiences inside the family. The reality and immediacy of generation succession has become a necessary current issue (Nagy, 2007).

There are expected and unexpected events within an operation of family business. The succession is a foreseeable fact while the events like birth, death, marriage, divorce or retirement are unpredictable and may upset the family balance. These kind of changes forces the family businesses to rethink the ownership structure.

The following parts of the study contains the results of research on ownership structure of family owned businesses. The examined family businesses are interested in long-term preservation of values, thus succession of generations plays a key role in their case. They attaches great importance how the ownership structure develops.

MATERIAL AND METHOD

Analysed Family Businesses

The focus area of the research is the examination of successful operation of family owned businesses from agri-food sector. To know more about the operation of family businesses 11 expert interviews were made between november 2016 and october 2017 with owners and next-generations of family owned agri-food enterprises.

A case study has been prepared too in this topic with the participation of companies with different activities (production, service, trade). There are 3 companies who took part in both research methods (Master Good Group, Tatár Bakery Ltd., V-Trade Ltd.). In their case the statement is the same according to both approach. The illustration the result was built on the expert interview (Table 1).

The question framework of expert interviews included questions about the ownership structures. The current ownership sturcture has been stated in case of analysed FBs. The information about the ownership structure based on the contatnt of the official bylaws of each analysed family owned company. The results show current sturcture of ownership. The table below (Table 1) shows the relevant information about analysed enterprises.

Table 1.Summary data of analysed enterprises

Method	Name and form of FB (Ltd./LLC , PLC)	Generation	Activity
Expert interview	Aqua Plastech LLC	2	agri-food enterprises
	Bold Agro LLC	2	
	Flavon Group Ltd.	2	
	Gál Tibor Winery	2	
	Heimann Winery	2	
	La Fiesta LLC	1	
	Master Good Group	2	
	Szamos Marzipan LLC	3	
	Tatár Bakery Ltd.	2	
	Tranzit Group (Tranzit-Ker PLC)	2	
	V-Trade Exhibitions Ltd.	2	
Case study	Krajcár Packaging Ltd.	2	production, service, trade
	Pata József Machinery Ltd.	2	
	Vivaco LLC	2	

Source: own work

1 According to Hungarian Statistical Office both the Ltd. and LLC means the same, limited-liability company. Basically the abbreviation of LLC was used except in case of those companies who has an own english name. (The sources of the english names are the companies websites.

The column of the Table 1. named "generation" shows the current state of the FB. The number indicates which generation is present in the business in 2017. The first generation nearly in all cases are the founder thus the first generation is the founder generation in Hungary. There are one analysed company which is a third generation enterprise (Szamos Ltd.). Typically, the second generation are active in Hungarian FBs nowadays after historically significant changes in business economics.

Examination criteria of analysed family businesses

It was necessary to work out a criteria for the clear classification of generations of examined enterprises. Six categories were developed to classify FBs. Table 2. lists the categories and main characteristics of each ownership level. The characterization based on various criteria like:

- age group category of next generation (MiniGen, JuniorGen, Discoverer, Owner/New manager)[2],
- family links (wife, husband, children, new family member(s), sibling(s), cousin(s)),
- ownership proportion according to articles of association.

Furthermore there are some common criteria which shall be taken into account, such as:

- the number of family members (parents, children, family links),
- the number of family members which divides the possession,
- the number of family members in top management,
- the number of family members in management,
- the exact proportion of ownership,
- the number of external owners, shareholders.

Table 2. The main characteristics of ownership categories[3]

Name of ownership category	The main features of the categories
1.Non-owner (NO)	• MiniGen (less than 14 years old) • Wife/husband/new family member(s) • No ownership proportion (0% proportion)
2.Emotional owner (EO)	• MiniGen (less than 14 years old) • JuniorGen (between 14 and 18 years) • Wife/husband/new family member(s) • Emerging collective psychological feeling (F-CPO) of ownership (0% proportion) (Rantanen-Jussila, 2011)
3.Partial owner (PO)	• Discoverer (more than 18 years old) • Owner/new manager (more than 25 years old) • Family members (head of the family, sister(s), brother(s)) • Wife/husband,new family member(s) sibling(s), cousin(s) • Has 0%-49% ownership proportion
4.Controlling owner (CO)	• Discoverer (more than 18 years old) • Owner/new manager (more than 25 years old) • Head of the family • Wife/husband/new family member(s) • has proportion more than 50% of ownership and is in a leading position
5.Majority owner (MO)	• Discoverer (more than 18 years old) • Owner/new manager (more than 25 years old) • Head of the family • Has a high proportion of ownership (more than 50%)
6.Sole owner (SO)	• Discoverer (more than 18 years old) • Owner/new manager (more than 25 years old) • Head of the family • The exclusive/sole owner of the business (100%)

Source: own work

The most questionable category is the emotional owner. The member of the next generation becomes an emotional owner when he/she starts to feel that the company plays an important role in the life of the family and thus starts to help to operate the business at least in a low level.

The following table (Table 3.) contains the theoretical coherence between the typical ownership categories, the next generation's age, the degree of responsibility (low, medium, high) and the senior's working activity. If the next generation already works in the company the senior - who is typically the founder the company in case of interviewed enterprises – can be classified into three groups according to the degree of working activity. Actively working (AW), activity decreasing (AD) and there are some cases when the previous generation is not presented (NP). The event determining activity level of the senior could be suddenly and unexpectedly or consciously.

Table 3.
Theoretical contexts of NextGen, Senior, responsibilities and ownership

Name	Categories				
Next generation (name, age) (children)	MiniGen (less than 14 years old)	JuniorGen (between 14 and 18 years old)	Discoverer (more than 18 years old)	Owner/new manager (more than 25 years old)	
Ownership categories[4]	NO EO		EO PO CO MO SO		
Responsibility, Management, Independence[5] (independent management, independent decision-making, the degree of responsibility)	L	L	M	M/H	H
Senior (working activity)[6] (parents)	AW			AD NP	

Source: own work

2 The classification of age groups are built on the NextGen Strategy of FBN-H (2014).

3 These are generalized characteristics. There are many dif ferent cases in practice.

4 Ownership category abbreviations have been applied, indicated in Table 2.

5 L=low, M=medium, H=high

6 AW=actively working, AD=activity decreasing, NP=not present.

The next chapter specialize the examined FBs to ownership classification in the light of successive generations and shows the contexts with the currently working generations. There are indicating which generation is presented in the business activity during the period of research. In the case of interviewed FBs the second generation are the children and third generation are the grandchild of the first generation. The table highlights the relation of the next gen's responsibility and the senior generation's working activity.

RESULTS AND DISCUSSION

In the last year during a theoretical research it was identified that there is "also a great quantity of international literature and case studies available, at the same time there is not much national experience, applied method and database to use" (TOBAK – NÁBRÁDI, 2016). For the purpose to expand the Hungarian practical knowledge about family owned businesses 11 interviews and a case study were made. The theoretical and practical context of the Hungarian practice is summarized in Table 4.

Table 4.
Theoretical and practical contexts based on the Hungarian results[7]

Name of FB	Generations (involved in entrepreneurial activity)	Ownership category of succesive generations[4]			Responsibility, Management, Independence[5] NEXT GEN	Working activity[6] SENIOR
		1st gen	2nd gen	3rd gen		
Aqua Plastech LLC	1, 2	SO	NO	-	M	AW
Bold Agro LLC	1, 2	PO	PO	-	H	AW
Flavon Group Ltd.	1, 2	PO	PO	-	H	AW
Gál Tibor Winery	2	NO	MO	-	H	NP
Heimann Winery	1, 2	PO	PO	-	L	AW
La Fiesta LLC	1	SO	-	-	L	AW
Master Good Group	1, 2	PO	MO	-	H	AD
Szamos Marzipan LLC	2,3	NO	PO	PO	H	1st NP 2nd AD
Tatár Bakery Ltd.	2	under negotiation	PO	-	H	NP
Tranzit Group (Tranzit-Ker PLC)	1, 2	MO	PO	-	H	AW
V-Trade Exhibitions Ltd.	1, 2	MO	PO	-	H	AW
Krajcár Packaging Ltd.	1, 2	MO	PO	-	L	AW
Pata József Machinery Ltd.	1, 2	MO	EO	-	H	AD
Vivaco LLC	2	MO	NO	-	M	AW

Source: own work

Based on the results it can be concluded that the property even are sharing within family in case of the analysed family owned companies. There are only two interviewed companies whose case we can talk about exclusive/sole ownership.

The international and national practice shows a specific context. When the activity is decreasing (AD) the senior starts to pass the rights of independent management and decision-making to the next generation. The proportion of ownership and the responsibility is growing at the same time.

In general where the responsibility of the next gen is medium or low (M/L), the senior generation is working actively (AW) and the larger ownership proportion is in the hand of the senior generation in the most analysed cases (Aqua Plastech LLC, Heimann Winery, La Fiesta LLC, Krajcár Packaging Ltd., Vivaco LLC). In case of the other analysed companies the high (H) responsibility is accompany with decreasing working activity of the senior generation and more divided ownership proportion. In these cases the next generation typically is in the age category of "Owner/new manager" which means they have more than 25 years old.

Concerning the analysed enterprises most of the successors are family members. However there are one case (La Fiesta LLC) where the founder owner was forced to educate the appropriate successor from among the employees.

As in the introduction part was mentioned there are unexpected events which forces the family businesses to rethink the ownership structure. The events like birth, death, marriage, divorce or retirement are unpredictable and may upset the family balance. For example in case of Tatár Bakery Ltd. happened a family and business crisis. The majority owner and founder of the company died in the last year that is why only the 2nd generation is involved in the entrepreneurial activity. The Tatár Bakery's second generation belongs to the partial owner (PO) category instead of category of controlling owner (CO).The change in the article of association it is still under negotiation (question of inheritance). In their case the next generation (2nd generation) has high responsibility and the senior is not presented. For instance another story of Gál Tibor Winery is a positive example to show how it is possible to resume again after a family and business tragedy with cooperation and with a lot of work.

Each company has an own story and in the life of family firms maybe it has more importance. In case of them beyond the family tragedy and crisis there are a business and financial crisis. The stability and the security of the family and the business becomes questionable which means a financial instability in the life of the family.

Since the change of the regime passed nearly 30 years in Hungary. It means that it is a time to pass the baton (NÁBRÁDI et al., 2016) together with responsibilities and ownership proportion in case of the most analysed company. The legal regulation and the possibility to share the ownership proportion makes this process easier.

In line with international practice to become a manager, top manager or controlling manager and owner from the next generation it is necessary to work in another company and gain more experiences. These kind of learning process is

7 Abbreviations have been appled according to Table 2. and Table 3.

mainly contributing to become a great successor and leader, and perform the leadership tasks well.

FB researches are related with many disciplines as to anthropology, economic science, social psychology, sociology and psychology. Because of the diversity of the topic further research and analytical work is needed to outline a Hungarian situation. It would be an interesting research direction the question of social categories in connection with succession. During the conscious generational transfer within family it is necessary to take into account the social generational differences.

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SCIENTIFIC PAPER

LEARNING MOTIVATIONS, STYLES AND EXPECTATIONS OF STUDENTS – A SURVEY AT THE UNIVERSITY OF DEBRECEN

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Abstract: *Based on the experience of the authors, today's university students have different learning habits, expectations of learning and knowledge compared to previous generations. This raises the question of how traditional teaching, teaching methods effectively suited to their development. In this study, the authors examined with quantitative method the expectations of bachelor and master students concerning the business education at university. The survey was conducted among university students assessing whether students with different BSc/BA or MSc/MA majors show the willingness to continue their studies, and the authors were interested in their expectations concerning the business higher education. The authors also tried to find answers in the survey how well-prepared the students feel for the offered opportunities by today's market environment, or may prefer proceeding with their studies. Among the issues authors searched what are the most effective ways of learning for them, based on learning style, what motivates them to continue learning. What kind of education form is preferred by them to continue studying? They also respond the need of having theoretical and practical knowledge and the importance of developing practical life skills. In addition, it has also been surveyed what other expectations the students have in continuing their studies with regard to the institutions. The authors of this paper are working as team coaches at the Team Academy Debrecen. In the last six years, they worked with numerous teams and have experiences in developing students' skills in teams.*

Keywords: *Higher Education, Motivation, Expectation, Learning Styles.*
(JEL Classification: *A22*)

Introduction
Expectations towards higher education

Recently the higher education has been criticized a lot because of its obsolete structure, and that it prepares the students to get their diploma instead of the expectations of the labour market. The research on expectations to higher education is of high interest among the researchers and the educators. It is important to get to know the expectations since the training programmes could be more tailored and have a higher satisfaction on both sides of the service providers and the 'customers' (i.e. students). Expectations on higher education are generally connected with the world of labour and the required competences. According to BODA and STOCKER (2012), talented students realize themselves (or their family teach it for them) that their expectations must be determined in connection with their employability. Unfortunately, in Hungary filling the timespan of being a university student to the maximum has become a trend phenomenon which aim is not to increase the relevant knowledge but to maintain a distance from the labour market. Another trend is getting the paper (degree) instead of acquiring the knowledge with the lowest effort (Boda And Stocker 2012).

According to Farrington (2002) the following factors can be realistically expected from the higher education institutions (HEIs) by the students:

- flexible, short courses at a convenient time and place for the students,
- competent educators who are able to communicate the complex theories in a clear and understandable way,
- recognition of the previous knowledge by the educators and the degree program,
- honesty concerning the labour market relevance of the program,
- and the HEI knows and understands the students' motivations.

Concerning the Hungarian research fields, the doctoral dissertation of Mihály (2008) is worth highlighting as she analysed the criteria of student satisfaction in the mass education. She also determined the other influencing factors of the satisfaction, e.g. the time factor, the role of socio-demographic factors, the influence of cognitive dissonance and contrast effect, and the issue of identity, which are all biasing elements for the customers' thinking of quality.

Horváth (2014) formed clusters based on the student expectations and perception. In forming the clusters the

following expectations were significant in different orders of the clusters:

- convenience,
- flexibility,
- labour market relevance,
- support system,
- qualifying the learning-teaching,
- partnership.

Learning motivation

More and more research deal with the learning motivation of the students, since without motivation the education and thus the learning cannot be effective for sure. It is proven that the learning motivation is influenced by the organizational process of the education-teaching-learning (Báthory, 1992).

Motivation is an internal mind-set which inclines the people to behave in a way or make actions (Roóz and Heidrich 2013).

HOULE (1961) defined 3 main motivators in his research which inclines them to continue their studies in the higher education: learning motivation, goal orientation and action orientation. Goal-oriented students chose the university, because they see the tool in the higher education to build a career by getting a special qualification. Concerning the action-oriented students, he found that they were motivated by the fact that they could meet new people, build new contacts, participate in activities outside the class and/or avoid situations like entering the world of work.

The reasons behind the motivation of learning divided into 6 main groups by BOSHIER (1982):

- searching for social contachts – the desire to cooperate with others,
- searching for social impulse – the desire to get out of the private life,
- professional development – more stable financial background, the desire of a professional career,
- community work – becoming more effective in the community work,
- external expectations – for external pressure, not for self-actualization, but for expectation.
- the desire for knowledge – the aim is to acquire the most knowledge.

Many researchers use the expressions of extrinsic, i.e. external motivation and intrinsic, i.e. internal motivation when analysing the learning motivation in the higher education (Tóth, 2007; STAGE and WILLIAMS 1990; PINTRICH et al. 1993).

Learning style

Nowadays, the higher education is mostly a standardized service for the mass. Mass education can hardly take the individual student needs, the learning style into consideration. Several researchers agree that knowing the learning style is an extremely useful knowledge for both of the educators and the students. With the learning style in hand, the educator can actually apply a personalized pedagogy, or at least such tools that could be the most effective for the most students' learning style. Nevertheless, the satisfaction of the educators and the students can be enhanced (LUBAWY, 2003).

Whatever reason stand behind the learning, it is important for the individual to take responsibility for their own learning, and their thinking, feelings, actions should be formed according to that (PIEROG et al. 2016). Knowing the learning style supports the person's responsibility in his own development.

Several researchers have been trying to describe the learning styles, however, because of the lack of conceptual frames, both the learning style theory and its measurement have been continuously criticized (ROMANELLY et al. 2009). A benchmark definition of "learning styles" is: 'characteristic cognitive, effective, and psychosocial behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment (CURRY, 1981).'

According to BALOGH (1993) the learning style is the set of style characteristics in the individual learning of a learner. MEZŐ (2002) argues that the learning style means the preferred external and internal learning conditions.

The model of KOLB (1984) describes four types of learning styles (Cserné, 2008), which are basically different abilities and all of them are needed for a successful learning process, however, the people are different in which they prefer among them.

Its dimensions:

- concrete (getting concrete experiences) - abstract (creating abstract concepts);
- active (active, experimenting) - reflective (reflective observation).

At some development our aim can be that the neglected fields would also be involved in the learning process based on the strengths. The four dimensions of the four learning styles are the following (Cserné, 2008):

1. Accommodating. Its strength is the active experimentation based on the concrete experiences. Intuitive, action-oriented, adapts well to the circumstances. Feelings are very important in his learning, he likes learning with others. He appreciates the human relations, the more realistic situations, and opened to solve problems. He is intent on applying the acquired knowledge.
2. Diverging, opened. He collects concrete information, experience, he is a reflective observer. He processes the information through observation and understanding. He can create many answers by imagination and problem-solving.
3. Assimilating. This style is characterized by the abstract conceptualization and theoretical observation. He collects the experiences through observation, creates theoretical models, but he does not really deal with the practical application.
4. Converging. He applies abstract information in a practical and action-oriented way, aim and plan-oriented.

Honey és Mumford (DE VITA, 2001) developed an alternative tool, called LSQ – Learning Style Questionnaire). This tool has been developed in its validity and predictive preciseness compared to its former types.

According to this method there are four distinct types of learners:

- activists (learn primarily by experience),
- reflectors (learn from reflective observation),
- theorists (learn from exploring associations and interrelationships),
- and pragmatics (learn from doing or trying things with practical outcomes).

An alternative of LSQ is the CLSI (Canfield Learning Style Inventory), which determined again 4 dimensions concerning the learning styles. These dimensions take the learning conditions, the interests, the learning method and the performance criteria into consideration (CANFIELD, 1992).

MATERIAL AND METHOD

The primary research was done in April-May in 2017 in the circle of students at University of Debrecen. During our survey quantitative methodical elements were applied by paper-based and online questionnaire. The questionnaire had 3 parts: in the first part we asked questions on their motivation and plans to study further which was followed by a learning motivation and a learning style part. To measure the motivation and learning style, tests in the work of BORBÉLY et al. (2017) were used.

The motivation part contained 30 statements about what motivates them in their studies. Students had to consider these sentences and mark if it is true for themselves. For help in the decision, they were suggested to choose those which like on the Likert-scale from 1 to 5 (where 1 meant that it is not characteristic for him at all, 5 is absolutely true) are in the value of 4 or 5.

The questionnaire divided the statements into six groups:

1. Motivated by long-term goals – planning on long term, to get better job and opportunities in life.
2. Motivated by their own interest – having internal curiosity and interest.
3. Motivated by the learning as a task – hard-working, persistent behaviour.
4. Motivated by results from sense of duty – better marks, higher scores are important from sense of duty.
5. Motivated by recognition – recognition of others is important.
6. Motivated by rewards – reward for the good performance, primarily in the family.

In the learning style test the students had to rank 24 statements in groups of four sentences from 1 to 4 (4 points for the most characteristic feature, 3 points for the less characteristic, 2 for the even less characteristic, and 1 point for the least characteristic). In one group one sentence can only get one type of point. According to the points, this learning style model divides the students into four dimensions (yellow, green, blue, red) if they have theoretical or practical interest, and organised or disorganized.

- Students in the yellow zone have theoretical interest and they are organised. They like reading, working from books and other sources during their studies or work. They like paper work and prefer working alone than in teams. They plan their learning and its process in a sound way.
- Green people are practical and organised. They like if they are told exactly what to do. They love the regularity and paying close attention to the details. They prefer practical work and executing the tasks step by step.
- The red are practical and disorganized. They like challenges, so if there is a problem to be solved, they are happy to elaborate their own new ideas. They are fond of understanding and seeing the problem through.
- People in the blue section are theoretical and disorganized. They love if they can work with people, since they like discussing things with others. They understand others' feelings well. They use their imagination very often, they are creative, like the drama, arts and music.

225 students participated in our survey, 39% of them are male and 61% are female in the sample. All questionnaire were valuable, so the sample contained 225 answerers. The youngest was 20, the oldest was 24 years old in the examined sample, their average age was 22.23 years. 80% of the questioned are studying on Bachelor's level, the others are on Master's. Mostly students from majors of Tourism and catering (30%), Commerce and marketing (21%) and Finance and accounting (19%) filled in the questionnaire. Almost half of the participants (49%) would like to work after finishing their studies, 43% would like to study further at a higher education institute. Approximately 8% of the students would like to both work and study simultaneously. More than one-fourth (26%) of the students who said that they wanted to work after their studies admitted that they imagine their life by starting their own company right after graduation.

RESULTS AND DISCUSSION

Motivation of the students

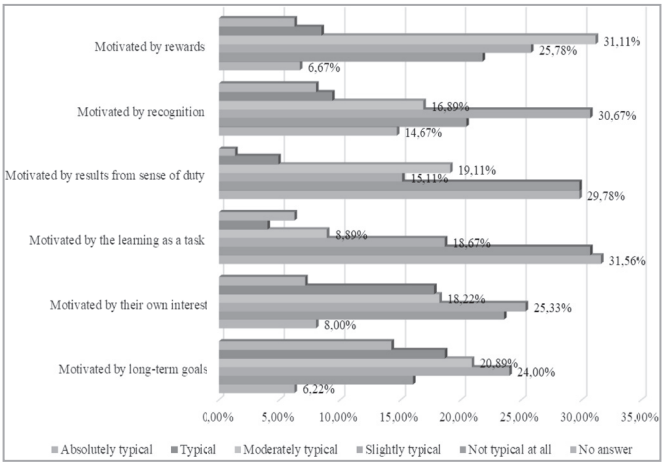
The six types of motivation in the sample are presented in Figure 1. The questionnaire consisted statements and the respondents had to mark those which were typical or absolutely typical for them (4-5 in the Likert-scale from 1 to 5). The statements belonged to 6 motivation groups.

Among the motivators, the intrinsic (internal) motivations are the ones by long-term goals, by interests and the learning as a task itself. Extrinsic (external) motivating factors are the rewards, the recognition, and the results. According to the research results, the following sequence can be set up:

1. Motivated by long-term goals – intrinsic motivator
2. Motivated by recognition – extrinsic motivator
3. Motivated by their own interest – intrinsic motivator
4. Motivated by rewards – extrinsic motivator
5. Motivated by the learning as a task – intrinsic motivator
6. Motivated by results from sense of duty – extrinsic motivator

Figure 1. Different motivating factors in the sample (N=225)

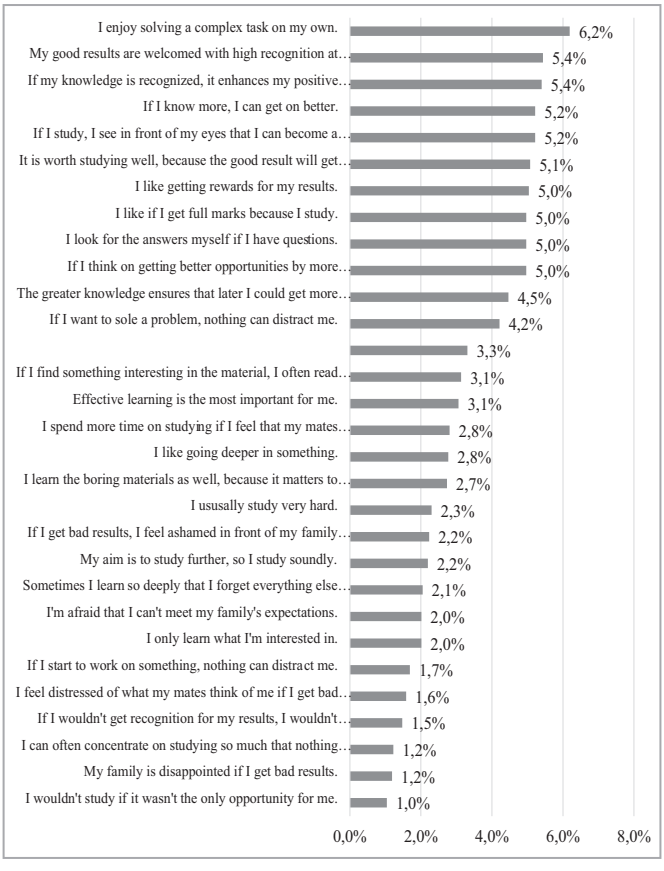
Source: own research results, 2017



Among the extrinsic motivators, the highest value is the 'moderately typical' in the category of 'Motivated by rewards'. The least typical in the examined sample is the motivation by the learning as a task. The 'absolutely typical' category was the lowest in case of the 'motivation by results from sense of duty'.

Figure 2. shows the evaluation of the statements (%).It shows that those statements got the highest values which connect to some recognition, achieving success, reward, which are mostly external motivators with some exceptions.

Figure 2. Evaluation of the statements in the sample (N=225)



Source: own research results, 2017

LEARNING STYLE OF THE STUDENTS

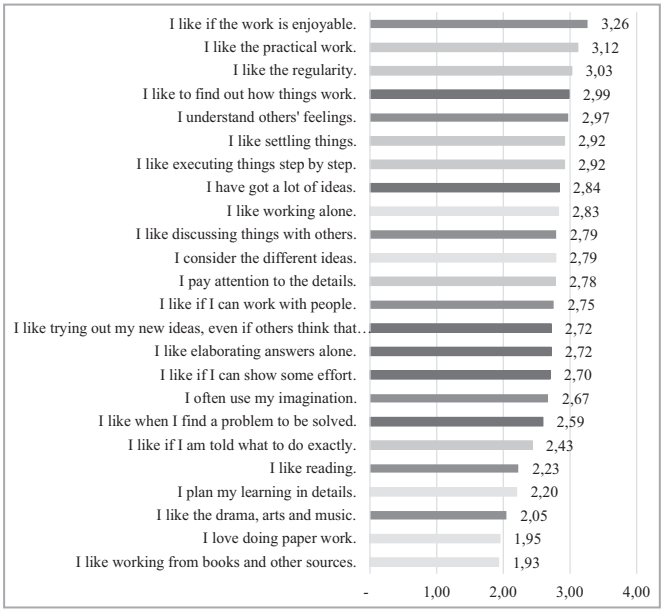
Statements of measuring the learning style and their average values are shown in Figure 3. in descending order. The colour of the columns shows which statement belongs to which learning style. It is eye-catching based on the colours that the highest average values belong to the green colour, so it means that most of the questioned students are practical and organized. Statements of the yellow learning style (theoretical, organised) got the lowest scores.

The statement about that 'The students like if the work is enjoyable' got the highest value, which is followed by the fact that they like the practical work. It is common among the questioned that they like the regularity and they think they understand others' feelings quite well. They like working individually and if they can try out their new ideas.

In the middle third of the statements there are ones concerning exactitude and attention, and that they like meeting problems to be solved and planning the solution step by step. Furthermore, they are keen on dealing with others.

The least they like if they have to do paper work and if they have to work from books and other sources. They do not even have good feelings if they are told what to do exactly and they do not plan their learning in details.

Figure 3. Evaluation of the statements of the learning styles (N=225)

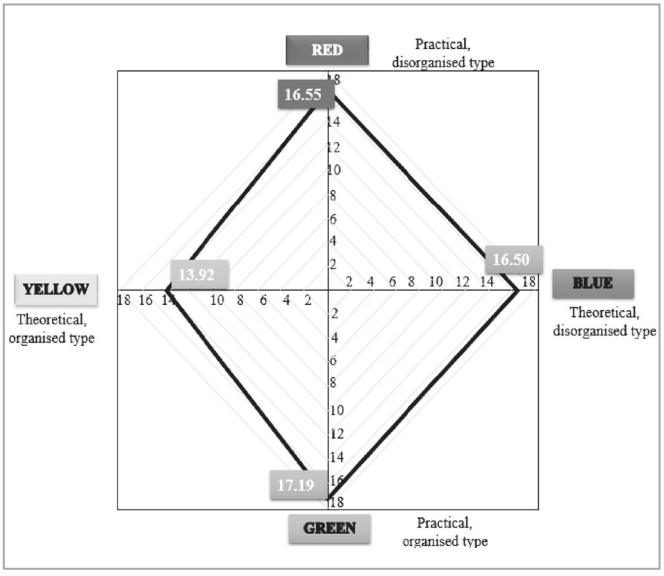


Source: own research results, 2017

Figure 4. shows the summarized results. These values were calculated in a way that the scores were summed by respondents and after that the average of the sums was received for each statements.

Based on the results we can state that most of the questioned students belong to the green learning style (practical, organised type; 17.19), after that the red one follows is by less than 0.64 (practical, disorganised; 15.55). Then comes the blue learning style (theoretical, disorganised; 15.50). The lowest value belonged to the statements of the yellow type (13.92) who have theoretical interest and disorganise in their learning.

Figure 4. Learning styles of the surveyed students (N=225)



Source: own research results, 2017

CONCLUSIONS

It can be concluded in general that recent students at universities have the need for the joy of exploration and getting the practice-oriented knowledge in the learning. They are mostly motivated by long-term goals and rewards. These young adults like team work and collaboration with others. This was also proved by this research that they prefer the cooperation, thinking with others, using their creativity to solve complex tasks and to use the theoretical knowledge in practice. Instead of written materials and books, they would like to learn through practice. Therefore, it is advisable to change the conventional frontal teaching with practice-oriented teaching/learning methods, like action-learning, inquiry learning, or project-based learning. These are called inductive learning methods which can be easily applied even at a normal classroom. If such methods are used in the education which cause joy during the learning of the students, they will become more motivated and interested in what they learn. On a longer term, this way they could start to learn to direct their own learnings, so they will be able to leave the university as open-minded adults who care about their own development in their professional life.

Actually, taking the students' or individuals' learning styles into consideration is not a novel thing. It is included in the training methodology of adult education and in the soft skill development on corporate, business level, such as training, mentoring, coaching, etc. It is easier to pique the individuals' personal motivation if his preferred learning style is taken into account. Thus, the authors believe that such development in methodology and curricula would be justified at every education level.

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SCIENTIFIC PAPER

ASSESSING READINESS LEVELS OF PRODUCTION TECHNOLOGIES FOR SUSTAINABLE INTENSIFICATION OF AGRICULTURE

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Abstract: *The modern agricultural production is facing the problem of a growing society connected with the growing asking for food as well as different environmental threats. To solve this issue, agricultural production should be more sustainable and efficient which can be reached by using new technologies. In the paper the most important technologies, which were evaluated by different research methods to find how and when they could be used for a sustainable intensification of agriculture were highlighted by applying technology and market readiness models. By asking professionals from different fields of agriculture in practice as well as academia it was found that technologies that collect or utilize advanced data (sensors, drones) used for knowledge based management are more applicable for use, contrary to nanotechnologies where the costs of development and applications limits the readiness.*

Keywords: *Sustainability, Technology Readiness, Market Readiness, Poland, Germany*
(JEL Classification: *Q16*)

Introduction

Agriculture is a major area of human activity affecting both its safety and well-being and the environment in which it lives. It thus becomes the primary factor conditioning global changes. Agriculture should be treated as a complex system with inherent adaptive abilities (Maciejczak, 2017). The complexity of agriculture is the result of the interplay of its individual elements as well as the interconnections of elements throughout the system and between the system and its surroundings. Over the centuries the economic pressures have led to systemic domination of agriculture based on the mechanisms of commercialization, concentration, specialization, agrarian structural change and capital-intensive intensification. Such actions have led to the imbalance in both the natural and the social systems interacting with agriculture. Currently, agriculture is facing many problems, i.e. the need for the increase of food production by 60-110% by 2050 due to the population growth while ensuring at the same time the protection of the environment under the sustainability demand (Foley at al., 2005). In order to face these issues, the dominating concept of quantitative (solely economic) growth is being replaced by the approach of the development based on the qualitative - more sustainable nature. Tittonell postulates adaptation actions within the complex agricultural system, based on strategies for further intensification, however based on the sustainable assumptions (Tittonell, 2014). This could be induced in a number of different ways with only the two most effective ones being pointed out here. The first is called industrial intensification and aims to maintain the industrial path based on innovation in the technological and organizational sphere. The second named as agro-ecological intensification is focusing on the intensification of more targeted agro-ecosystems, the use of more production-friendly technologies that provide better harmonization of production and environmental objectives. The future prospect of modern industrialized agricultural systems is being challenged on several fronts because of its dependence on capital, external energy and agrochemical inputs, and for its adverse impact on biodiversity and on human health (Struik et al., 2014).

Regardless of the strategic options of sustainable intensification, this concept requires application of innovative technologies. Today agriculture is demanding technological solutions with the aim of increasing production or accurate inventories for sustainability while the environmental impact is minimized by reducing the application of agro-chemicals and increasing the use of environmental friendly agronomical practices. The technologies of modern agriculture are however in different stages of development and use. This significantly influences the dynamics of changes in agriculture. Therefore,

the main objectives of the paper are threefold. Firstly, the paper aims to present, based on literature review, the needs and solutions for innovative technologies which are most promising for further development of modern model of sustainably intensive agriculture. However, due to the paper's limitations the discussion about the issues of the sustainability of the technologies will not be made. It is assumed that the selected technologies are sustainable based on the researches of other authors. Secondly, using the foresight approach, it aims to assess the technology and market readiness levels of selected technologies. Finally, based on experts' opinion, it will provide the recommendations for development and diffusion of the most perspective technologies. It is assumed that the more information for knowledge based management is collected by the technology the better its diffusion and use.

MATERIAL AND METHOD

This paper uses different methodologies selected to correspond best to the goals set. The investigations are based on primary and secondary data sources. Firstly, the literature review of scientific papers was performed. Using different key words, based on abstract review, there were selected 79 papers, which later, after full text analysis, were reduced to 17. Based on the review 10 most promising technologies were selected, 6 from crop production and 4 from animal production. The primary data comes from the Real-Time Delphi survey. The rationale for the choice of the foresight heuristic Delphi method was more the hypothetical then empirical impact of selected technologies for modern agriculture. There was used Real-Time Delphi approach (GRISHAM, 2009). Using a web-based tool a qualitative and quantitative survey was held. The questionnaire was open from 1st May 2017 to 31st August 2017. There were identified 10 experts from two countries: Poland and Germany. From each country participated 5 experts being: farmers, technology developers and traders, consumers, policy makers and academics. All experts were chosen deliberately because of their knowledge about agriculture and its technological advancement. However, due to the relatively limited number of the experts, their opinions and through results of the foresight study should be considered with appropriate reservation. There was a basic assumption about possible application and impact of assessed technology in mid-term perspective of 2025 having in mind the needs of sustainable development. Two scales of Technology Readiness Level (TRL) and Market Readiness Level (MRL) were applied. TRL enables the assessment of the maturity of a particular technology and the consistent comparison of maturity between different types of technologies. It is based on a scale from 1 to 9, with 9 being the most mature technology (EARTO, 2011). MRL enables the assessment of the readiness of technology for commercialisation and diffusion. It is based on a scale from 1 to 5, with 5 being the most marketable (AASRUD et al., 2010). To analyse linkages between TRL and MRL the rho-Spearman correlation test was used (PARLIŃSKA and PARLIŃSKI, 2011).

RESULTS AND DISCUSSION

Modernisation in agriculture is a very relative concept (ILO, 1991). It differs very much depending on the country, the region as well as on individual farm perspective. Many factors are associated with the progress made due to implementation of new techniques, technology or other innovative solutions. Therefore, for the purpose of this research, the framework for the concept of the modernization of agriculture will be established. The analysis is limited to the European perspective with the focus on developed farms which are considered as enterprises. For such farms, implementation of innovations, esp. in forms of new technologies is attached to the umbrella approach of precision agriculture. It is a farming management concept based on observing, measuring and responding to inter and intra-field variability in crops, or to aspects of animal rearing (TAKACS-GYORGY et al., 2014). The benefits to be obtained are chiefly due to increased yields and/or increased profitability of production to the farmer. Other benefits are better working conditions, increased animal welfare and the potential to improve various aspects of environmental stewardship. As stressed by (WEISS, 1996) the implementation of precision farming has become possible as a result of the development of innovative technologies i.e. sensors, or drones combined with procedures to link mapped variables to appropriate farming practices such as tillage, seeding, fertilization, herbicide and pesticide application, harvesting and animal husbandry. Subsequently, it is relying on automatic monitoring of individual animals and is used to monitor animal behaviour, welfare and productivity as well as their physical environment. Advances in nanotechnologies could also be implemented in a wide spectrum i.e. for health maintenance of both animals and plants. Nevertheless, one needs to remember that the adoption of this concept encounters specific challenges not only due to the size and diversity of farm structures but also due to the readiness of available technologies to meet high demands of technological, economic, social and environmental efficiency. The detailed literature review enabled us to distinguish 10 technologies that could contribute the most to the development of precision agriculture (table 1).

The Delphi results of the technological and market readiness levels of selected technologies (fig. 1 and fig. 2) showed for both perspectives similar results. Also, the calculated rho-Spearman correlation between TRL and MRL confirmed a strong correlation on the level of 0.933 ($r < 0.001$). It means that the market readiness is closely associated with the technological readiness. The more technology is prepared to be implemented on the market the more market is creating conditions for its release.

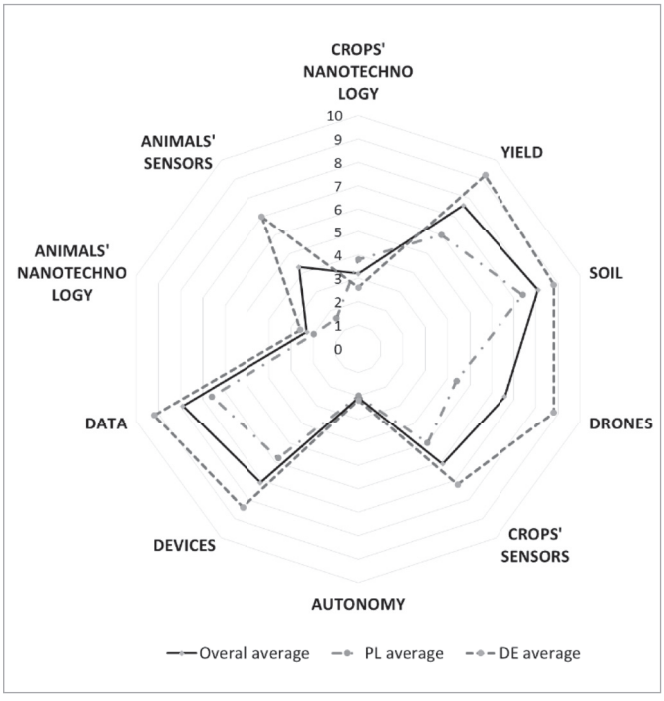
With this respect, the majority of experts agreed also on the importance of knowledge, which could be considered as a fourth dimension of market readiness (BOS et al., 2013). The farmers need to know how the technology works and what the benefits of its use are, not on experimental fields, but in other farms.

Table 1. Top 10 technologies of future sustainable agriculture – a literature review

Technology	Description	Authors
Crop production		
Nanotechnology	Use nanotechnology for disease control in crop production.	Fraceto et al., 2016, Kuzma & VerHage, 2006
Yield	Use all the data that is collected from guidance system to get an overview over your work and in- and output.	Takacs-Gyorgy et al., 2013, Francik, 2010
Soil mapping	Use tractor mounted sensors to get information about the nitrogen in the soil to control the fertilizer use.	Frewer et al. 2011, Sanders and Masri, 2016
Drones	Use drones to analyse e.g. the chlorophyll content of the crops to use fertilizer or pesticides more precisely.	Gozdowski et al., 2010, Dukaczewski and Bielecka, 2009
Sensors	Get more sensors connected through new and cheaper systems than SIM Cards.	Jensen et al., 2012, Ojha et al. 2015
Autonomy	Use fully autonomous tractors to reduce labour costs and work more efficiently.	Dukaczewski and Bielecka, 2009; Xiweia and Xiangdong, 2007
Animal production		
Devices	Use smart devices like electronic earmarks to get information about the position and health of animals.	English et al., 2013, Cupiał et al., 2015
Data	Use on-time software to get recent information about e.g. the feeding behaviour of your animals.	Tyler and Griffin, 2016, Cupiał et al., 2015
Nanotechnology	Use nanotechnology to make a more precise diagnoses as well as creating smart medicine.	Parisi et al., 2014, Głód et al., 2014
Sensors	Use more sensors to monitor and control different variables of the digestion and wellbeing of the animals.	Kopiński ,2014, Ojha et al., 2015

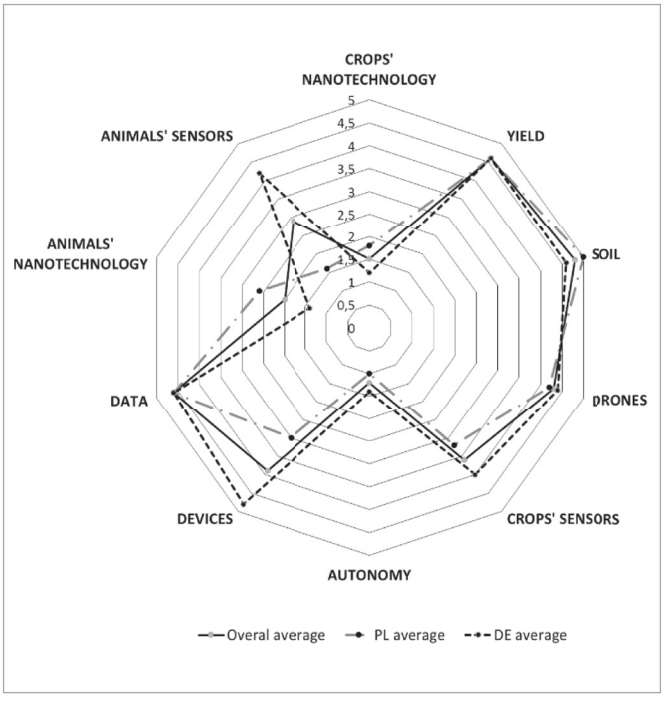
Source: own research results, 2017

Fig. 1. Technology Readiness Level of analysed technologies.



Source: own investigationreview

Fig. 2. Market Readiness Level of analysed technologies.



Source: own investigationreview

The analysis and evaluation of the different opinions of the experts showed that there are many similarities as well as differences in the way Polish and German experts are seeing the market and technology readiness of the chosen technologies. The average value for nanotechnology in crop production in terms of technology readiness was 3.2. This is a quite low value. The German experts saw an average TRL at 2.6 and the Polish experts at 3.8. The market readiness was on average also very low (1.5). With 1.8 the Polish experts were more optimistic with this technology while the German experts saw it at a low value of 1.2. The most common opinion was that nanotechnology in crop production is an interesting technology but application will need more time and a high investment. Some experts were not optimistic at all but this is often the case when talking about technologies of the far future. Nanotechnology in animal production seems to be again a technology that will be more interesting in far future. Thus, it gets low values of TRL (overall average 2.3, Germany 2.6 and Poland 2) and MRL (overall 2, Poland 2.6 and Germany 1.4). It is interesting that those values are lower than the values for Nanotechnology in crop production. The argumentation was in part the same, but it seems that the experts are more comfortable to use this technology with crops than with animals. Despite the numerous potential advantages of nanotechnology and the growing trends in publications and patents, agricultural applications have not yet made it to the market (Parisi et al., 2015). Several factors could explain the scarcity of commercial applications, i.e. agricultural nanotechnology does not demonstrate a sufficient economic return to counterbalance the high initial production investments (Chena and Yadab, 2011).

Collecting data from your guidance system is far readier in terms of technology and market readiness. With an overall average TRL of 7.6 and 9.2 in Germany and 6 in Poland and an average MRL of 4.6 in general, in Poland and Germany the technology is already adopted in those countries. From German experts, there were concerns about the user-friendliness of the product. In Poland, this technology is just used by big farms which means that there is some space for development. Beside data collection, soil analysis was also a technology that was ranked highly in terms of readiness levels. The average values for TRL were 8.1 overall, 7,4 for Poland and 8.8 for Germany. The values for MRL were 4.8 in general, 5 in Poland and 4.6 in Germany. This technology is also already adopted to the market and needs some improvements in terms of costs so that also small farmers can use it. As informed by some authors data collecting and analysis will form new dimension for decision making in agriculture (WANG et al., 2006). The big farms already benefit from the bid data approach and through contribute for sustainable intensification. Now the gravity point is moving towards smaller farms whom needs to see the direct benefits for the cost-effectiveness of their operations and risk reduction as well as for external benefits for the environment and society, i.e. reducing carbon emission.

Drones had average values more in the middle field (6.6). What was interesting is that the TRL for Germany (8.8) and Poland (4.4) were quite different. The same occurred for the MRL where the average for all was 4.1, for Poland 3.8 and for Germany 4.4. The German experts were still not happy about the costs. Furthermore, experts argued that the technology is not useful due to the fact that modern satellite pictures could bring the same information. The Polish experts were really sure that this technology will help to become more sustainable. Mazur showed that drone technology will give the agriculture industry a high-technology makeover, with planning and strategy based on real-time data gathering and processing (MAZUR, 2016). PwC estimates the market for drone-powered solutions in agriculture at over 30 billion USD. The show that thanks to robust investments and a somewhat more relaxed regulatory environment, it appears their time has arrived, especially in agriculture (PwC, 2016).

Sensors left also some room between both experts. In general, the TRL was 6,1 while the value in Germany was 7.2 and in Poland 5. The market readiness was in average 3.5 and in Poland 3 and Germany 4. The opinion of the Polish experts was really positive on that technology. The opinions of the German experts were also positive. One expert said that the technology will only be important if a farmer uses a completely automatic system. For sensors in animal production the average value for TRL was 4,3 while Germany was really high with 7 and Poland really low with 1.6. The MRL was in average 2.8 while in Poland 1.4 and in Germany 4.2. The Polish experts are seeing many problems in the difficulty of measuring the values. German experts were more optimistic, due to the fact that sensors are getting cheaper. One key of this technology is that the data should be made usable. One can agreed that sensors-based technologies provide appropriate tools to achieve the sustainability goals (Pajares et al. 2013). The explosive technological advances and development removed many barriers for their implementation, including the reservations expressed by the farmers themselves. Precision Agriculture is an emerging area where sensor-based technologies play an important role.

With autonomy in crop production, that last technology was a big topic of the future. The TRL in general was 2.1 in Germany 2.2 and in Poland 2. The MRL was low as well. In average, it was 1.4 in Germany 1 and in Poland 1. The biggest problem from German experts were the legal issues while the Polish experts argued more that autonomy will just be a topic of some niches. In animal production, the devices got an average TRL of 7.1. The value for Poland was 5.8 and the value for Germany 8.4. The MRL was 3.9 in average, 3 in Poland and 4.8 in Germany. Here you can see again big differences. The Polish and German concerns are that this technology is too expensive to be adopted. For data analyses in animal production the values of TRL are also different. In average, it is 7.9 while for Poland it is 6,6 and for Germany 9.2. The MRL is in both cases 4.6. In Germany, the technology should be better developed in terms of usability. The Polish doubts are connected with the farmers' knowledge for using this technology. The autonomous tractors were among the first autonomous vehicles by land, water or air but only now are they starting to be sold in

volume (HARROP et al., 2017) showed. Current driverless tractor technologies build on recent developments in hybrid powertrains - more controllable and environmental - other autonomous vehicles and new agricultural technology. The idea of a versatile, programmable driverless tractor emerged in 2011 and 2012 out of "follow me" technology. It indicates that the capability to execute autonomous actions or doing this remotely enabling better decision making and actuation, not only at the production stages, but also throughout the whole value chain.

CONCLUSIONS

The conducted research confirmed that development of modern model of agriculture requires strategic options based on sustainability approach applied similarly and comprehensively on the intensification concept. This could be obtained and driven by the application of modern technologies. These technologies have a great potential to provide benefits of sustainable values. It was proved, however that the technologies that could bring these values are on different technological readiness and thus its market readiness is also different. The highest TRL and MRL results showed technologies that collect (i.e. sensors or drones) or use (soil or yield management systems) of data. The lowest results were obtained with very advanced technologies connected to nanomaterials. This suggest that for sustainable management of modern agriculture the more detailed data are needed and the more technology is fulfilling this requirement for knowledge building the bigger its readiness and diffusion. On other hand nanotechnologies, which development is very expensive are very promising, but in mid-term perspective they application due to the costs and efficiency is limited.

It needs to be pointed out that the technological development of agriculture, based on a number of technologies coming concurrently from outside the agricultural sector, such as global positioning systems, cloud computing, drones and the Internet of Things (IoT), under the sustainability framework, raises also significant legal and socio-ethical questions. These concern the terms of safeguarding sustainable agri-food production, the conditions under which farmer - related data are collected and processed and the role of the individual farmer. This requires further research as more technologies will be ready for commercial use in close future, that will make the significant difference for the future.

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SCIENTIFIC PAPER

THE ROLE OF „HANDBALL AT SCHOOL" PROGRAM IN ABILITY DEVELOPMENT AND REPLENISHMENT TRAINING

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Abstract: *In Hungary the undisputable merit of TAO subsidy is realized in replenishment training, human resource development and development of sports infrastructure. The other important base of replenishment development is „Handball at School" programme managed by Hungarian Handball Federation. „Handball at School" programme was launched in relation to every-day physical education and we undertook the skills-building role of its impact assessment. A survey programme was organised by us in the autumn and spring semesters of 2015/ 2016 academic year aiming to prove that project has positive effect on aiming accuracy and performance stability results of pupils, as well as their precision of technical implemetation. 183 pupils were examined who had two sponge-handball lessons a week out of their 5 physical education lessons. When choosing the pilot scenes it was considered important to get Budapest, Eastern- and Western Hungary also involved. To examine aiming accuracy two tests were applied. One is „throwing at a target from throwing straddle without previous swing" performed by the pupils. The children were expected to hit the small box five times with right technical implementation meaning that it was done with lifted elbow. After the first implementation they were given some time to relax and the the shots were repeated five times again. The children were asked another task to perform, a similar one to the first, but it had to be performed from running up, that is they ran back from a line, took the sponge ball, ran back to the line and had to hit the small box again with lifted elbow. At this task several aspects were noted and measured again: the time needed for implementation, target accuracy and also whether the technical implementation of the throw was accurate.*

Keywords: *: Handball, TAO, Every-Day Physical Education, Aiming Accuracy, Speed Coordination*
(JEL Classification: *I21, Z28*)

Introduction

TAO subsidy system for visual team sports was introduced in Hungary in 2011. The objective of the modification of Act LXXXI of 1996 on Corporate Tax and Dividend Tax (abbrev. TAO) was legal regulation of the sports-friendly tax (András, 2014). The act was accepted by EU, which became unprecedental, thanks to its regulations concerning sports. On 1. July 2011. Act LXXXII. of 2011on the Modification of Certain Acts on Sports Subsidy and its Implementing Regulations came into effect (Bardóczy 2014).

The objective of the Act is to ensure direct state subsidy for visual team sports (football, handball, basketball, ice hockey, and water polo).

The beneficiaries can spend the resources comingfrom TAO on tangible investment, renovation, personal expences and educational costs. In 2011tax year 2618 tax payers benefited 20,4 bn HUF tax advantage on sports purposes, until 2012. 21 December it was already 25 billion (Bardóczy 2014).

An undisputable merit of TAO is that it has outstanding role both in replenishment training and in professionals' training as well (Dajnoki et al. 2015). Although in Debrecen football is outstanding from TAO aspect, in handball sport they applied in 2011-2014 for 660 108 000 HUF for replenishment training from which 509 129 000 HUF was won on this purpose, meaning 77% efficiency (Bács And Bácsné 2014B). When examining subsidized areas of five visual team sports in general in Debrecen in 2011-2013 is can be stated that the least is spent on personal expences and then on infrastructural investments, the amount of which was even exceeded by the sum spent on replenishment training tasks. University students can take part in the competition (organised by TAO) as a result of which several universities have developed their sport infrastructure by means of tenders (Bács and Bácsné 2014A; Pfau 2015A,B).

The importance of replenishment training is crucial, seen from the Hungarian data of 2006 issued by National Sports Strategy Sport XXI. (2007-2020) showing that there were 200000 sports people having competition permit in our country, of which 138000 people were from the six popular visual team sport categories (football, handball, basketball, ice hockey, volleyball and waterpolo). The five visual team sports were completed by volleyball from this year (2017). Team sport (especially football, basketball, handball) play a very important role in the Universites

sport (Bács and Bácsné 2014a, Bácsné 2014, Bácsné 2015; Pfau 2014a,b; PFAU and Domokos 2016).

Thanks to TAO, in every visual team sport increased the number of sports people (Ráthonyi-Odor and Borbély 2017). In handball sport TAO had inspiring effect on the growth of sports people's number, since in 2011.there were 24 000 persons, in 2012. There were 25 000 persons, in 2013. There were 29788 persons and in 2014. There were 31 227 registered sportsmen (Bardóczy 2014; András 2014).

A research concerning basketball (Váczi 2017), based on a questionnaire filled in by 53 clubs from the 125 basketball teams working in Hungary (playing in National 1/A, National 1/B, National 2), speaks about the usefulness of TAO. The clubs revealed how much they were helped in different areas by the TAO. The clubs had to evaluate the areas on a scale from 1- to 5. (1=not at all helped, 5= totally helped). The clubs were mostly helped by TAO in implementation of investments (average=4,38, deviation=1,14), then in replenishment training (average=4,42, dev.=0,79), and in HR development (average=4,11, dev=0,78).

It is not only TAO which plays crucial role in replenishment training in Hungary. A good example on it is „Handball at School" programme managed by Hungarian Handball Federation.

In the Hungarian society value preference changed after the changes of the regimes, this way new expectations were expressed by the society about education as well concerning skills (Hamar 2005). This way curricula were continuously altered in education, four National Curriculums were issued. The latest alteration was in 2012 when the government accepted and ordered in Act (110/2012. (VI. 4.) the introduction of everyday physical education (Hamar 2013). This way everyday physical education was introduced in phasing out system from 2012, that is in the first year it was compulsory for the 1st and 5th year children of the primary school and for 9th year students of secondary schools, then it became compulsory gradually for the other classes as well. For everyday physical education "Handball at School" programme was created, a methodological material for training handball in junior classes (1-4 classes). This way schools could opt for two handball lessons out of the five physical education lessons a week. Hungarian Handball Association ensured the necessary equipment and training of the teachers. A curriculum was made for this handball programme which was published in Magyar Közlöny 2016. year 126. issue 5. attachment 22/2016. (VIII.25) EMMI order.

"Handball at School" programme was introduced in 2013 and schools continuously joined it: in 2013 year 1430 students took part in the programme from 50 schools, then in 2014 already 3400 children took part in it from 91 schools, by 2015 the number of children rose to 4565 from 117 schools.

Within the programme the children got acquainted with the basics of sponge handball in two lessons a week where they acquired the basic sport skills besides the elements of dribbling, possession and passing. The teachers training the children were trained, prepared and continuously controlled by Hungarian Handball Association.

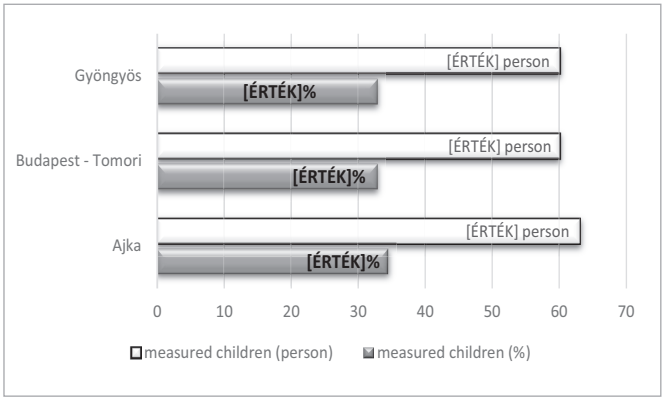
Several Hungarian and international researches have dealt with the testing and choice of adult handballers (Granadoset al. 2007; Nikolaidis and Ingebrigtsen 2013; Serrien et al. 2016, Schweising et al. 2016; Gürhan et al. 2016; Sabido et al. 2016, Schwesig et al. 2016; König and Ökrös 2016; König et al. 2017), and the importance of ICT in education (Czeglédi 2007, 2008; Nagy and Müller 2016 a,b; Nagy et al. 2017). Researches dealing with the measurement of children playing handball at school age also have literature background (Ingebrigtsen and Jefferys 2012; Diana et al. 2016; Karadenizli 2016; Muratovic et al. 2015; Kayapinar et al. 2015; Ingebrigtsen et al. 2013). Role of conditional abilities, mental stamina and performance indicators of adult elite sportsmen has also been examined by several professionals (Rivilla et. al. 2011, Csukonyi et al. 2015; Gürhan et al. 2016; Ökrös, 2016). The handball research done with children has proven that the sport has beneficial influence on the development of motorous skills of children (Ion 2015).

Before starting our research the following questions were asked we tried to find the answer for during our research. Which are the tests and procedures to examine the major conditional and coordinating skills, which are suitable to help the selection process of junior section pupils in handball sport? How will „Handball at School" programme affect in connection with general and sports-specific coordinational skills? How will target accuracy and speed coordination of pupils taking part in the survey change due to the project during the year? Which parameters will mostly have changed by the autumn and spring check? We consider that tests to check and examine conditional and coordinational skills, sports-specific tests must be approached in holistic way when finding talents for a sport in junior school age. We presume that there will be bigger development at children doing specific trainings in handball when doing ball coordination and speed coordination tests.

MATERIAL AND METHOD

The pupils were chosen, that in 2015-16 academic year at least 10% of all the students of the junior section take part in the programme. Out of 1430 pupils of the junior section 183 took part in the survey, that is 12,8% of it. The locations were chosen so that from Western- and Eastern Hungary and a school from the capital city be in the sample, so all the regions of Hungary were represented. It can be seen that there were about the same proportion of children from all the three locations (Figure 1.).

Figure 1. Sample by location

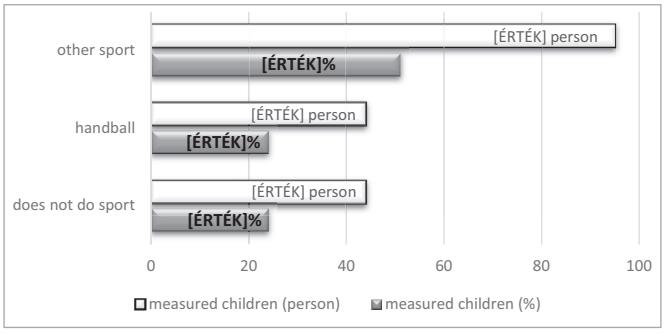


Source: Private edit 2017

94 persons (51.4%) of the measured junior section children were boys, while 89 persons (48.6 %) were girls.The surveyed

ones came from 2., 3. and 4. classes, with about the same proportion: 63 persons (34.4%) 2. class, 57 persons (31.1%) 3. class, and 63 persons (34.4%) 4. class children. The Figure 2. shows the sporting habits of the sample:

Figure 2. Sporting habits of the sample



Source: Private edit 2017

Our experience concerning sporting frequency was that 24%, that is 44 children of the sample do not do any sport besides physical education lessons, while 76% of the do some kind of sports activity. In the test group 24% of junior class children mentioned handball as sports activity, while 51% declared to do other sport.

The children were grouped by the age and the age groups were made by decimal age calculation. Our finding showed that 34,4% of the children in the sample were in the age group of 10 years old, representing the dominant part of the sample. 30,6% of the children were in the 9 year old category, while the 8 years old made 25,7% of the sample and the 11years old merely 4,4% of it and the 6-7 years old 5% of the sample.

To test the survey material pilot measurements were done in Ózd, Vasvári Street Primary School, to make sure the test material offered for the survey matched the abilities of the age group and to get information about the feasibility of the exercises and general and special technical level – related to the tasks - of the students of different age and pre-training. This school was chosen to have a location where underprivileged children could also be tested and the venue is suitable to play sponge handball.

During the pilot research alterations were made in the previously suggested material, since the 1. and 2. class pupils could not perforn the 2. task (Alternate hand dribble with ball) even at basic level in alternative way. Therefore the above mentioned age group had to perform this task only with one hand (on the dominant side) during the survey. (Evaluation of this task will be published in a future article.)

Besides this – as the pilot test was done at the beginning of the school year -, the 1. year pupils could not be surveyed, since even understanding the task caused serious problems for them, as, lacking pre-training, they had never faced such kind of movement material.

The Surveyed Features and Positions

Movement accuracy is a very complex category in handball, therefore we tried to examine it through different factors in order to be able to give a complex summary on them later.

In our present article the results of our two surveys to test aiming accuracy are described. Therefore the description of these tests and their evaluation is also shown in details.

Shooting in transversal straddle position without running up (to survey sports specific coordination skills)

The aim of this trial was to measure sports specific coordination skills of the children, which means aiming accuracy and target accuracy in handball sport.

This trial is implemented by the children in the way that they stood behind the line drawn on the floor, then they had to hit the small box five times in standing position without previous swing. After the first implementation they were given some time to relax and the the shots were repeated five times again. The distance of the small box that is of the target surface was changed according to the age: the taget surface for 1-2 classes was 5.5 meters, while for 3-4 classes it was 6 meters from the line. The size of the target surface, small box: 26 cm height, 62 cm length, 42 cm width. When hearing the whistle of the teacher the student had to throw a ball taken from the nearby small box and hit the target surface so that the ball hit it with direct contact. Precise technical implementation was required, that is with upper throw.

Shooting in transversal straddle position with running up

At this task sports specific coordination of children was measured, with target shooting from movement typical of handball.

This trial, similarly to the previous one, had to be performed by standing behind the line drawn on the floor, they ran back from a line to the small box place 2 meters from the line, took a sponge ball from it, ran back to the line and had to hit the small box five time with the better hand, with proper technical implementation, the after some rest they did five new trials again. The distance of the small box that is of the target surface was changed according to the age, placed at the distances mentioned above.

The data gained during the survey were processed with the help of SPSS statistical software, basic statistical measures were calculated, like: average, deviation, median, modus. To measure correlations two-sample trial was applied. The results were drawn in graphic and table system.

RESULTS AND DISCUSSION

Implementation of shooting in transversal straddle position without running up, from stabil position is a task which can be expected from and can be performed by school children of junior age, since it is practised not only when being taught with sponge handball, but small-ball throw and throw are part of the natural exercises of athletics in the curriculum,

it appears in school physical education games (dodgeball) or even in competitive- and relay races. The size of sponge handball used at the survey was the one used by the age groups, since the size of the palm is also different at the different age groups. This way grip stability implemented with a suitable sponge handball was adequate to the certain age groups.

However, it is well-known that there is a significant difference between the throwing technics, coordination abilities, muscular power of arms, etc. of the first- and fourth-year pupils. Therefore the tasks had to be differentiated, so different shooting distances were chosen, that is the distance between the target and the shooting place was different accordingly to the different age groups, which had been resultful in our previous surveys (pilot research). Since if the different age groups have to throw from the same dictance, the younger ones find it too difficult, while the older ones complete it almost without mistakes. The task accordingly with the age was determined in the way that the distance of the vertical surface of the small box for 2nd year pupils was 5.5 meters, while for 3-4th year pupils it was 6 meters. Differentiation of the shooting distance was necessary because not only throwing technics get better with age, but throwing performance as well, while aiming accuracy shows improving tendency, presumably thanks to taking part in the handball programme, and also the above mentioned distances are signed just like goal line for the different age groups. The students had two attempts. At each attempt they performed five shots so after some rest they had another five shots as second attempt.

In case of students the average score from the first 5 throws was 1,35 (deviation=1,17) in the autumn survey.

Table 1. The results of shooting in transversal straddle position without running up related to aiming accuracy, target accuracy, time results and technical implementation

	Autumn result		Spring result		paired t test (p)
	average	deviation	average	deviation	
First attempt Score (pieces)	1,35	1,17	1,94	1,28	$p<0,05$
Second attempt Score (pieces)	1,42	1,15	1,95	1,22	$p<0,05$
First attempt Lifted elbow (pieces)	3,29	1,92	3,8	1,56	$p<0,05$
Second attempt Lifted elbow (pieces)	3,29	1,84	3,84	1,53	$p<0,05$
First attempt Time(sec	11,57	2,23	10,78	1,97	$p<0,05$
Second attempt Time(sec)	11,13	2,13	10,29	1,98	$p<0,05$

Source: Private edit 2017

After the first five shots they had some rest and then threw five times again, where the average value was 1,42 (deviation=1,15). The results of the second attempt, second aiming steadily showed better values. Müller (2004) had 10 relay kicks done by primary- and secondary school students to test aiming accuracy. It is proven that the fourth kick attempt was the best, because of the above mentioned ones. The tenth attempt proved the weakest result, as tiredness caused unfavourable tendencies in soft coordination (Table 1.)

In our research more precise aiming is shown by the fact that the deviation value measured at the second time is smaller, that is variation range of the output decreased showing more balanced aiming performance.

At the spring survey even efficiency of sponge-handball practices can be seen. During the spring survey the students performed this shooting task at 1,94 (deviation=1,28) value on average at the first attempt showing better shooting accuracy after the first semester than in autumn. The shooting results of the two measurements show significant differences. During the second row of throwing attempts students produced better values again, since the average of of scores improved from 1,42 to 1,95 on average and deviation increased from 1,15 to 1,22 from autumn to spring. The cause of it may be that progression to output may increase variation range of scoring performance. When checking the second series significant improvement was experienced at students ($p<0,05$), that is spring results are better than the autumn ones (Table 1.).

Besides scoring accuracy technical implementation, movement accuracy was also checked, the surveyor also watched at the certain throws how many times the attempt was performed with lifted elbow. The students performed the throw with lifted elbow 3.29 times, with 1.92 deviation value, out of 5 attempts at the first autumn series. At the spring measurement the task was performed with right techics 3.8 times on average, and with lower deviation value (1,56). The more precise technical performance also improved efficiency, target accuracy. Compared to autumn results the improvement in technical implementation was proven by not only the smaller deviation, but also significant differences were experienced after doing the two sample-T probe. ”Handball at School” programme had good effects also on improving technics. In the second series of the autumn survey students performed the exercise with lifted elbow 3.29 times, with 1,84 deviation value. The spring results were improved to 3.84 on average (deviation=1.53), which can be considered a significant difference (Table 1.).

Time spent on implementation was also measured, since motion pressed by time is also a peculiarity of ball games, determining in open-skill sports. However, understanding sports-specific connection between fastness and accuracy is also important.

The students performed the first series in 11.57 sec (deviation=2,23) in autumn, which value decreased to 10.78 sec (deviation=1,97) by spring. The average value of the second series in autumn was 11.13 (deviation=2,13), which

got improved to 10.29 sec (deviation= 1,98) by spring (Table 1.).

The next task was similar to the previous one, but the students had to implement the shooting task performed with running up characteristic in handball through a series of throws, with similarly different ball and shooting distance corresponding their age, as mentioned in the previous trial. The results are shown in the following table (Table 2.).

Similar results and tendencies can be seen to the previous

Table 2. The results of shooting in transversal straddle position with running up related to aiming accuracy, target accuracy, time results and technical implementation

	Autumn result		Spring result		paired t test (p)
	average	deviation	average	deviation	
First attempt Score (pieces)	1,26	1,07	1,92	1,34	p<0,05
Second attempt Score (pieces)	1,36	1,07	1,88	1,29	p<0,05
First attempt Lifted elbow (pieces)	3,12	2	3,76	1,66	p<0,05
Second attempt Lifted elbow (pieces)	3,28	1,95	3,77	1,61	p<0,05
First attempt Time(sec)	18,3	2,98	17,57	2,86	p<0,05
Second attempt Time(sec)	17,99	2,71	17,5	2,94	p<0,05

Source: Private edit 2017

trials when examining the results, shooting accuracy, technical implementation and time results of the pupils. It can be stated that pupils shooting accuracy of the second series of throws is more favourable, and with smaller variation range. It is true for pupils that target accuracy by scores in the autumn measurement is worse and the spring results are significantly better. When checking technical implementation and compared to autumn results the improvement in technical implementation was proven by not only the smaller deviation, but also significant differences were experienced after doing the two sample-T probe. Significantly better results were proven for pupils in both score results, technical implementation and implementation time as well.

Running trial with direction change: (to measure speed coordination - without using ball) The pupil stands behind the line in standing start position. Three cones are placed every five meters on the 15-meter-long track. The pupil sets off on the whistle by by-passing the cones starting at the first one from the left hand. Having rounded the third cone he performs the by-passing task without ball. There are five attempts. After two attempts there is a long break (he has a rest while the other members of the class also perform the task) after which he has two more attempts. Evaluation: By a digital watch, the hundredth of a second punctuality.

In the Table 3 time results of running trials with direction change, by-passing cones can be seen. Running without ball, running by changing direction is also an important element of handball, when in an attack one has to get forward fast without ball, possibly by by-passing defender players. This task was performed four times both in autumn and in spring, so average and deviation values of the time results of the four attempts can be seen here.

Table 3. Time results of running trial with direction change (without using ball) in the autumn- and spring measurements

	Autumn result		Spring result		paired t test (p)
	average	deviation	average	deviation	
First attempt	8.67	0.90	8.40	0.89	p<0.05
Second attempt	8.94	1.01	8.64	0.99	p<0.05
Third attempt	8.72	1.05	8.41	0.97	p<0.05
Fourth attempt	8.98	1.00	8.69	0.96	p<0.05

Source: Private edit 2017

During the autumn attempts the time result of the first performance was 8.67 sec. having a smaller deviation value (dev=0.90). The time result of the second attempt decreased since it was performed below the average =8.94 sec, which had higher deviation value =1.01. As there was a rest time after the second attempt, the result of the third attempt got better compared to the second one. The time of the fourth attempt got worse since tiredness decreases the results of speed coordination (Table 3.).

In the case of the spring time results similar was experienced; while the distance was managed to be completed in 8.4 sec, (dev=0.89), the time result of the second attempt decreased, as it was 8.64 seconds (dev=0.99). After the break the result of the third attempt was experienced to be better again, the value of which was 8.41 seconds (dev=0.97), which was close to the results of the first attempt. The time of the fourth attempt was the worst, which also may be related to tiredness. When the spring- and autumn results are compared by paired test, it can be seen that speed coordination of the children improved, since the spring results were usually better compared to the autumn ones proven also by the significant differences (Table 3.).

Dribble with direction change: (to measure speed coordination (with using ball). The pupil stands behind the line in standing start position with a ball in his hand. Three cones are placed every five meters on the 15-meter-long track. The pupil sets off on the whistle by by-passing the cones starting at the first one from the left hand. Having rounded the third cone he performs the by-passing task backward as well dribbling the ball. The dribbling must be done with changed hands in the way that after the start he starts dribbling with right hand and changes for left hand after having by-passed the first cone as long as he has by-passed the second cone.

Having by-passed the second cone he goes on with right hand again until the third cone has been by-passed. The way back is the same as above, keeping the opposite side dribbling rule concerning the cone. (In 1st and 2nd classes the teacher may conduct it – if necessary – which hand to use when dribbling in the given position.) There are four attempts. After two attempts there is a long break (he has a rest while the other members of the class also perform the task) after which he has two more attempts. Evaluation: By a digital watch, the hundredth of a second punctuality.

Dribbling trial with direction change is a sports specific test where the students accomplish the track with a sponge ball. This trial also measures speed coordination, however, possession of the ball, measuring ball skills is also done in dynamic conditions.

Table 4. Time results of running trial with direction change (with using ball) in the autumn- and spring measurements

	Autumn result		Spring result		paired t test (p)
	average	deviation	average	deviation	
First attempt	13.36	3.58	12.41	3.40	$p < 0.05$
Second attempt	13.11	3.26	12.37	3.02	$p < 0.05$
Third attempt	12.45	2.89	11.80	2.65	$p < 0.05$
Fourth attempt	12.65	2.97	11.95	3.19	$p < 0.05$

Source: Private edit 2017

In the autumn test we experienced that the first attempt was accomplished in 13.36 seconds in general (dev.=3.58), while the second attempt in 13.11 seconds (dev.=3.26), the third attempt in 12.45 seconds (dev.=2.89), while the fourth attempt was accomplished in 12.65 seconds (dev.=2.97). It was experienced that the time results of the third and fourth trials were better compared to the first two ones. The experience of the first two accomplishments may have helped the better that is faster implementation, of the third and fourth trials, "they got to the task" (Table 4.).

When looking at the spring time results in the dribbling task, similarities can be experienced to the autumn measurements, (first attempt average=12.41 sec (dev.=3.40), second attempt average =12.37 (dev.=3.02), third attempt average =11.80 (dev.=2.65), fourth attempt average =11.95 (dev.=3.19), that is the time results of the 3rd and 4th attempts were better compared to the first two ones. Proper warm-up is indispensable for speed tasks, which also may have resulted in the better results (Table 4.).

In case the autumn- and spring results are compared, improvement can be stated in all the four attempts, since the tasks were implemented faster, which not only show a tendency, but it could be proves statistically as well, as results of paired test showed significant differences.

In our pilot research and survey we experienced that in junior school age tests measuring and checking conditional a coordinational abilities, sports specific tests of handball must be applied in holistic approach when wording talent and choosing a sport. Our research has proven that in case of certain parametres (technical implementation, accuracy, shooting accuracy) „Handball at School" programme has positive effect on pupils performance.

„Handball at School" programme – meaning two sports specific lessons a week - has improved shooting accuracy results, technical implementation and speed coordination of all pupils alike. The programme improved speed coordination as well manifested in improving time results of trials with- and without ball proven statistically as well.

In our former measurements (Juhász et al. 2016; Juhász et al. 2017) we could also prove favourable impact of the programme on students of different age, gender and pre-education.The handball can play a very important role as a tools in the every-day physical education, because the program developed the motor skills for the pupils.

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SCIENTIFIC PAPER

DETERMINANTS OF MONGOLIAN ECONOMIC GROWTH

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Abstract: *Mongolia is the second largest landlocked country, which has unique economic condition. This paper aims to examine Mongolian economic growth from 2000 until 2016 and identify its determinants. The growth was studied based on the growth rate of National Domestic Product. Initially, 20 macroeconomic variables are chosen and tested for the economic growth determinators such as; unemployment rate, human capital index, import growth, inflation rate, export growth, and interest rate, etc. The results showed that the growth rate of dollar exchange, inflation rate, and the growth rate of export were the main factors (81.4%). Mongolian GDP per capita and poverty rate were compared with other Asian lower-middle-economies, which are classified in the same classification as Mongolia. An increment of average salary was adjusted by the inflation rate, which showed the purchasing power declined in 2015. Statistics of Central Bank of Mongolia, Central Intelligence Agency, World Bank's statistics, and the statistics from National Statistics Office of Mongolia are used for the research.*

Keywords: *Ndp (National Domestic Product), Economic Growth, Export Growth Rate, Inflation Rate, Dollar Exchange Growth Rate*
(JEL Classification: *H0, H30, H6, H70*)

Introduction

Mongolia is a landlocked East Asian country which is bordered by the Russian Federation to the north and the People's Republic of China on the east, west, and south. Mongolia is the 18th largest country in the world by area, and second-largest landlocked country behind Kazakhstan, which has a land area of 1,566,600 square kilometers. Mining is the most important sector to Mongolian economy, which constituted 20.7 percent of the GDP, accounted for 69.2 percent of the country's gross industrial output in 2016, and 70.86 percent of its export revenue. Mongolian economy relies heavily on mineral extraction, particularly, copper, coal, and gold which constitute 32.7%, 19.8%, and 15.4% of 2016's export, respectively. Mongolian economy faced with an economic recession with regards to its dependency on the mining sector, from a double-digit economic growth. Mongolian economic condition is considered to being affected by two factors. First, more than 90 percent of Mongolian exports consistently goes to China; and so, any slowing of Chinese growth affects Mongolian economy. Second, economic policies designed to protect Mongolia's sovereign interests and to respond to the expectations of the Mongolian public which have discouraged FDI (Foreign Direct Investment) (Charles .Brown, 2014).

Tsembelsuren et al., (2012) noted "Mongolia has 20 billion tons of proven coal reserves, and total estimated resource is 150 billion tons, most of them are low-rank brown coal, but remains are undeveloped due to a lack of infrastructure". With extensive reserves of natural resources, Mongolian economy is potential to increase its production, considerably.

There are plenty of research works on the economic growth. For example, Mazurek (2017) examined the economic growth of 32 European countries from 2005 to 2015. It is concluded that the growth was directly proportional to human and physical capital, and indirectly proportional to the initial level of GDP and the democracy index. Prochniak (2011) analyzed the economic growth determinants in the 10 Central and Eastern European (CEE) countries from 1993 until 2009. The most important economic growth determinants in the CEE countries were determined as investment rate, education level of the labor force, financial sector development, right fiscal stance, economic structure, low-interest rates and low inflation, population structure, and development of information technology. Cuaresma et al., (2009) investigated the determinants of regional economic growth based on a dataset of 255 European Union regions, from 1995 until 2005. Ramanayake and Lee (2015) argued that the export growth is the most robust, in addition to export specialization, while that traditional variables of trade openness and FDI are not robust. Zarra Nezhad et al., (2014) identified robust determinants of economic growth in Organization of Petroleum Exporting Countries (OPEC), which concluded that variety of trade policy measures were a robust and supported hypothesis of export-led growth. Maningi and Borda (2015) re-examined the issue of the determinants of economic growth in the countries of the Organisation of Eastern Caribbean States (OECS) in the

period 1980-2011. External debt, natural increase rate, and private consumption were found to negatively affect economic growth in the short-term, while in the long--term trade openness and foreign direct investment (FDI) positively impacted economic growth. Vedia-Jerez and Chasco (2015) developed an empirical study of long-run determinants of economic growth in South American countries from 1960 to 2008. Results suggested that the economic growth was driven the most strongly by physical and human capital accumulation, as well as by sectorial exports. Simionescu et al., (2017) conducted an empirical analysis on Czech Republic, Slovak Republic, Hungary, Poland, and Romania in the period of 2003-2016, which employed Bayesian generalized ridge regression. The primary results indicated that the FDI promoted economic growth in all countries, except the Slovak Republic. Sezer and Abasiz (2016) determined economic growth indicators in 34 OECD countries, which concluded that logistics and fixed capital investments were positive and statistically significant.

As for now, there are not many published pieces of research of Mongolian economic growth, except Tsembelsuren et al., (2012) compared the ratio of coal market price with coal export price to China. Nixson et al., (1999) attempted to highlight the importance of administrative reform and economic development in Mongolia, 1990-1997.

The purpose of this paper is to reveal the determinants of Mongolian economic growth. The analysis covers the period of 16 years, from 2000 to 2016. Correlation and regression analysis are executed on SPSS statistical program.

The main hypotheses are:

- Export of mining products significantly, positively affects Mongolian economy.
- Foreign Direct Investment (FDI) significantly affects Mongolian economy growth.

The rest of this paper organized as follows: Section two provides the data and variables, and the methodology of this study. Section three consists of empirical results and discussion. Finally, conclusions are drawn in section four.

DATA, VARIABLES AND RESEARCH METHODOLOGY

National Domestic Product (NDP) is one of the key indicators of country's development. However, NDP per capita in level or growth terms have been criticised that they ignore quite some items, particularly the environmental endeavors (Mamingi & Borda, 2015). Despite its flaws, the annual growth rate of NDP is used as the measurement of economic performance.

Research has been carried out on data derived from four sources: World Bank, NSO (National Statistical Office), Mongol Bank's statistics (Central Bank of Mongolia) and Mongolian Statistical Information Service. From these databases, 20 variables are chosen as potential factors of Mongolian economic growth. To get a better understanding of Mongolian economy, descriptive statistics of its variables are given in Table 1.

Table 1. Descriptive statistics of variables related with Mongolian economy

Variables		Mini-mum	Maxi-mum	Mean	Std. Deviation
Growth rate of NDP	Y	0.53	48.04	20.63	12.83
Domestic investment to NDP ratio	x1	6.94	21.83	14.68	4.14
Foreign investment to NDP ratio	x2	6.92	49.32	17.52	11.82
Government debt to NDP ratio	x3	8.19	61.23	36.98	16.69
Export to NDP ratio	x4	35.96	51.41	44.39	4.62
Import to NDP ratio	x5	32.29	69.11	50.19	9.10
Dollar exchange growth rate	x6	-6.65	19.29	4.67	6.91
Human development index	x7	0.67	0.76	0.72	0.03
Unemployment rate	x8	2.80	11.60	6.03	2.94
Inflation rate	x9	1.10	22.10	9.12	5.74
Poverty gap	x10	18.80	33.20	27.36	4.55
Depth of poverty	x11	4.90	9.40	7.53	1.48
Export growth rate	x12	-25.61	65.64	17.86	26.14
Import growth rate	x13	-34.11	106.19	16.19	34.58
Domestic investment growth rate	x14	-31.59	86.67	25.73	36.56
Foreign investment growth rate	x15	-56.59	144.08	25.85	49.01
Central bank's interest rate	x16	6.54	15.51	11.26	2.46
Commercial bank's interest rate	x17	16.61	37.35	25.08	7.29
Copper export growth rate	x18	-39.94	171.21	22.83	51.95
Gold export growth rate	x19	-88.75	155.41	15.99	67.59
Livestock output growth	x20	-46.67	89.19	16.20	43.94

Source: Central Bank and National Statistical Office's data 2000-2016

It is clear from Table 1 that the growth of copper export and the gold export were fluctuated wildly, which were the results of the economic recession. For example, the quantity of copper export increased by 0.7% in 2009; however, the amount of money from copper export plummeted from 835.6 million USD to 501.9 million USD (39.9%). Likewise, the export of gold plunged from 599.8 million USD to 308.4 million USD (48.5%). In contrary, dollar exchange growth rate and unemployment rate were the highest, while the growth of NDP was the lowest. Those statistics imply that the Mongolian economy is dependent on the exports especially, export of mining products.

Research Methodology

The methodology applied is correlation and regression analysis. The correlation coefficients between explanatory variables and the NDP growth rate were executed on SPSS statistical program. The correlations between the economic growth and five variables were chosen statistically significant at the 0.05 level (2-tailed), namely:

dollar rate growth, inflation rate, export growth, import growth and the growth of domestic investment. Therefore, four more variables which were statistically significantly correlated at the 0.1 level (2-tailed) were not used, namely: the growth of foreign investment, copper export growth rate, foreign investment to NDP ratio, and import to NDP ratio. Somewhat surprisingly, the livestock output growth was shown to be statistically insignificant to the NDP growth rate, although Mongolia has traditionally been based on agriculture and livestock.

Although the variables are significantly correlated with its explained variable, macroeconomic variables are often judged by their multicollinearity. In this paper, variables were examined for a potential multicollinearity via the Variance Inflation Factor (VIF). A rule of thumb states that for values of VIF larger than 10, the multicollinearity of a model can be considered a serious problem (Mazurek, 2017). In this paper, variables which have VIF less than 3.0 are selected; therefore, import growth and growth of domestic investment were not considered for further analysis. After correlation and multicollinearity testing, growth rate in NDP, dollar rate growth, inflation rate, and export growth rate were chosen.

RESULTS AND DISCUSSION

In Table 2, the growth rate in NDP and the growth rate of export have a robust uphill correlation (positively), see also Figure 1. Moreover, dollar rate growth played an important role in stimulating economic growth in Mongolia. It shows a very strong negative relationship with the rate of economic growth: the correlation coefficient equals -0.65 with the p-value of 0.005, see also Figure 4. The inflation rate exhibits significant correlation with economic growth: a coefficient of 0.60 with the p-value of 0.01 (Figure 5). Correlation and regression analysis allow identifying economic growth determinants.

Table 3. Linear Regression Results

Indicators	Growth rate in NDP	Dollar rate growth	Growth rate of export
Growth rate in NDP	1.00	-	-
Dollar rate growth	-0.65	1.00	-
Growth rate of export	0.79	-0.55	1.00
Inflation rate	0.60	-0.03	0.40

Source: Author's calculation

Linear regression result is shown in Table 3. The adjusted coefficient of determination R2 = 0.814, which means the dollar rate growth, inflation rate, and growth of export are responsible for 81.4% of the variation in NDP growth rates of Mongolia.

Table 3. Linear Regression Results

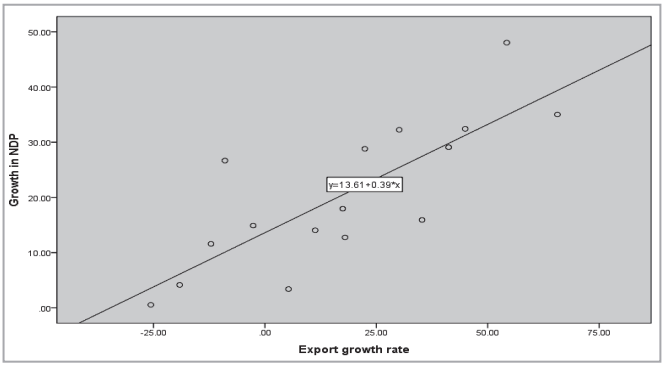
Model	R	R square	Adjusted R square	Sig. F Change
1	0.921	0.849	0.814	0.000

Source: Author's calculation

Figure 1 shows that export growth rate contributed much to economic growth in Mongolia. Export growth itself can explain 63.9% of Mongolian economic growth. In figure 2 and 3 exports by location and exports by major products are illustrated.

Figure 1. The relationship between NDP growth and the export growth rate.

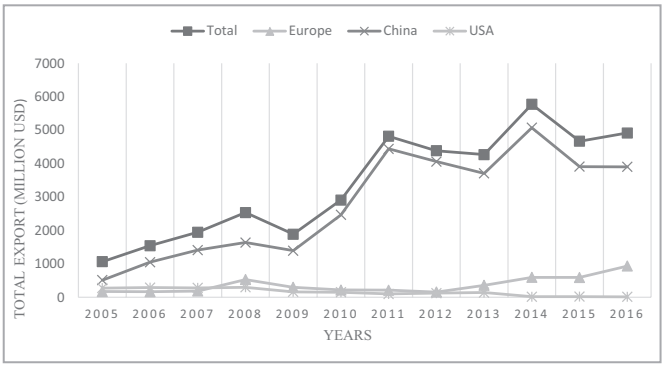
Source: Author's calculation



In Figure 2, total export is described in a squared line, while the x-marked line shows the amount of export to China. From the figure, we can conclude that from 48.2% to 92.5% of the total Mongolian export directly goes to the China, which implies Mongolian economy is highly dependent on China.

Mongolian main export products are mineral products, cashmere products, and animal products. In Figure 3, mineral products such as; copper, coal, gold, and crude oil are shown in a line, while textile products are on a dotted line. Textile products' export is almost stable compared with mineral products' export amount. Earlier than 2005, the export amount of textile and mineral products were close.

Figure 2. Exports by location



Source: author's calculation

Figure 2. Exports by location

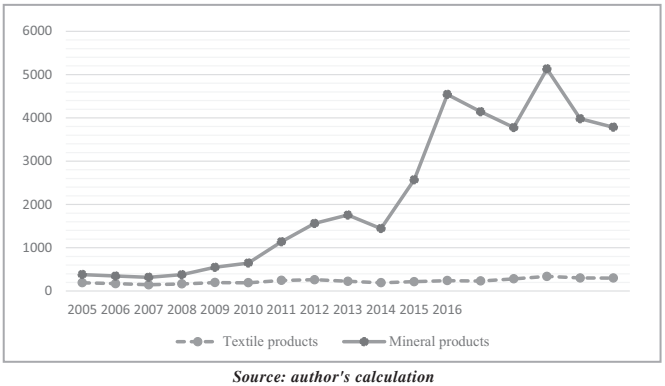


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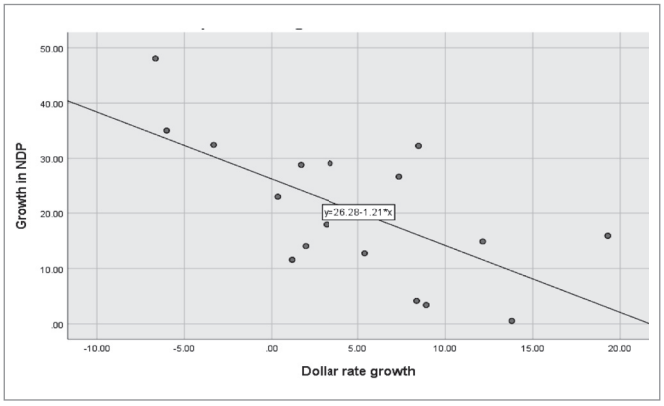
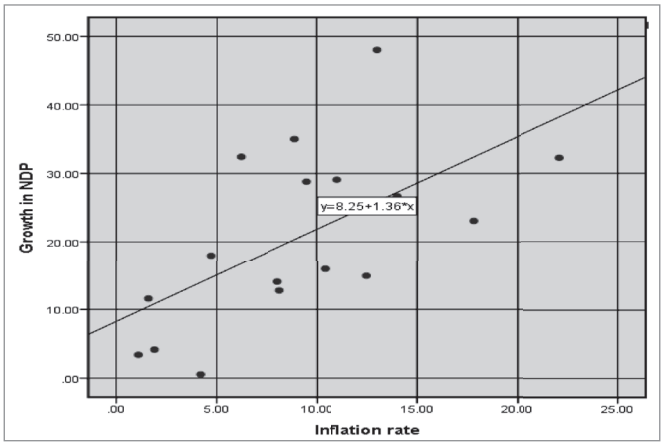
Figure 4. The relationship between NDP growth and the Dollar Exchange Rate Growth



Source: author's calculation

Figure 4 provides a robust and negative graphical relationship between the NDP growth rate and dollar rate growth, which supports Vedia-Jerez and Chasco's results. As we can see from the figure, dollar exchange rate growth is responsible for 42.2% of the economic growth. However, there is a mutual relationship between dollar exchange rate growth and export growth rate. Export growth rate as we see in Figure 1, results in NDP growth. Exports are usually made in USD; therefore, export growth is connected with an increase in dollar reserve. When dollar reserve increases, dollar rate decreases.

Figure 5. The relationship between NDP growth and inflation rate



Source: author's calculation

A definite positive relationship between inflation rate and the rate of economic growth is plotted in Figure 5. Empirical analysis indicates that inflation rate is an essential factor of economic growth. Simionescu et al., (2017) noted that the relationship between inflation and GDP growth, especially in the short and middle term, tends to be specific for the country. For example, they mentioned Poland has a positive correlation between economic growth and inflation rate, like Mongolia.

For the 2018 fiscal year, low-income economies are defined as those with a GNI per capita (dollar value of a country's final income in a year divided by population), calculated using the World Bank Atlas method, of $1,005 or less in 2016; lower-middle-income economies are those with a GNI per capita between $1,006 and $3,955; upper middle-income economies are those with a GNI per capita between $3,956 and $12,235; high-income economies are those with a GNI per capita of $12,236 or more (Desk, n.d.). Mongolia is classified as a lower-middle-income economy. According to World Bank classification, Mongolia is ranked 107th out of 178 countries. The percentage of people below the poverty line is one of the proper variables for economic growth, although that measure is not often produced. In Table 4, lower-middle-income Asian countries' GDP per capita and poverty rates in 2016 are shown. According to the Table 4, Mongolia is 4th of the ranking GDP per capita. However, it is in the 9th of the ranking its poverty rate, which means GDP per capita cannot determine the living standard of the country. For example, those countries' economic conditions are much different than Mongolian economy. Mostly those countries' economies are based on agriculture, industry, or service, while Mongolian economy is hugely dependent on mining sector and export.

Table 4. Asian lower-middle-income economies and poverty rates

№	Country name	GDP per capita ($)	Rank	Poverty rate (%)	Rank
1	Armenia	3,606.0	5	32.0	12
2	Bangladesh	1,359.0	11	31.5	11
3	Bhutan	2,804.0	7	13.3	5
4	Cambodia	1,270.0	12	17.7	7
5	Georgia	3,854.0	2	9.2	2
6	Indonesia	3,570.0	6	10.9	3
7	Jordan	4,088.0	1	14.2	6
8	Moldova	1,900.0	9	20.8	8
9	Mongolia	3,687.0	4	21.6	9
10	Pakistan	1,468.0	10	29.5	10
11	Sri Lanka	3,835.0	3	6.7	1
12	Vietnam	2,178.0	8	11.3	4

Source: Statistics of World Bank on poverty 2016, Central Intelligence Agency

As for 2016's statistics, the poverty rates were quite high, i.e., 27.1% in the capital city Ulaanbaatar, and 34.9% in the countryside. Therefore, the growth of an average salary was tested as if the increase is real for purchasing power.

The average monthly salary is adjusted for inflation rate

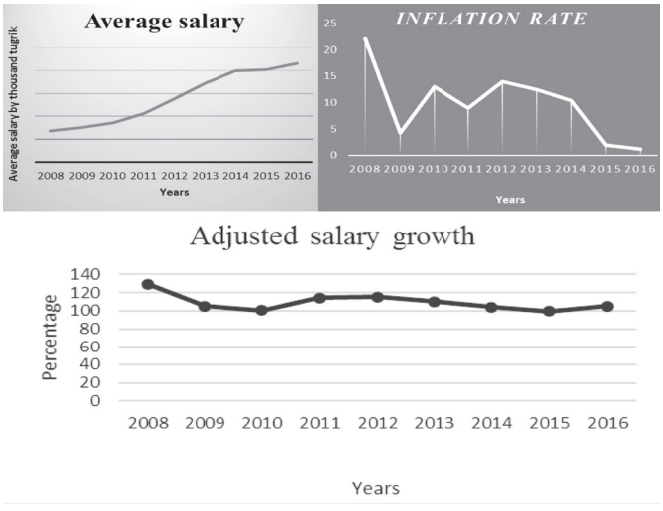
Table 5. Actual increase in the average salary after-inflation rate adjustment

Statistical indicator	2008	2009	2010	2011	2012	2013	2014	2015	2016
Average salary ₮	274.2	300.4	341.5	424.2	557.6	692.3	796.6	808.0	861.9
Inflation rate %	22.1	4.2	13.0	8.9	14.0	12.5	10.4	1.9	1.1
Adjusted growth %	129.8	105.1	100.6	114.1	115.3	110.4	104.2	99.5	105.0

Source: Author's calculation based on the statistics from National Statistics Office of Mongolia

in Table 5. It shows that an increase in salary does not always mean an increase in purchasing power. For instance, the salary increase in 2015 was lower than that of the inflation rate, which implies there was a decrease in purchasing power, see the Figure 6.

Figure 6. The relationship between NDP growth and inflation rate



Source: author's calculation

Inflation-adjusted salary growth improves the data comparability, but it cannot represent the actual purchasing power nevertheless. In 1st line graph of Figure 6, we can see that the amount of average salary was continuously increasing. However, after inflation adjustment, the salary did not increase significantly from 2000 until 2016.

CONCLUSION

1. This article presents an empirical analysis of Mongolian economic growth determinants from 2000–2016. The analysis is composed of the following steps: descriptive statistics of the variables, correlation analysis, and regression analysis.
2. Correlation results suggest that the most important economic growth determinants are inflation rate, export growth rate, import growth rate, domestic investment growth rate, and dollar rate growth. However, due to the multicollinearity domestic investment growth rate and import growth rate were excluded from the regression analysis.
3. In the regression analysis, the selected variables explained 81.4% of the variation of Mongolian economic growth. Export growth rate correlated positively with NDP growth which supported Ramanayake's result, Dollar exchange rate correlated negatively, and inflation rate had significant correlation with NDP growth which supported Simionescu's research in Poland's case.
4. Regression analysis and correlation analysis rejected the hypothesis that FDI significantly affects Mongolian economy growth. Also, it conflicts the results of Ramanayake and Lee (2015) which concluded the FDI variable is signi cant in developing countries but insigni cant in developed countries. However, research result supported the hypothesis that mining products' export has a significant and positive effect on Mongolian economy.
5. Mongolian economy is compared with other Asian lower-middle-income economies. Mongolia is ranked in the 9th by its poverty rate, while it is ranked in the 4th by its GDP per capita, which showed Mongolian economic conditions was much different than Mongolian economy. Mostly those countries' economies are based on agriculture, industry, or service, while Mongolian economy is hugely dependent on mining sector and export.
6. Inflation-adjusted salary showed that the increase in the salary is not always a real growth in purchasing power. There were decreases in some year in purchasing power regardless of salary rise.

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SCIENTIFIC PAPER

SMALLHOLDER FOOD MARKETING BEHAVIOUR: EXPLORING THE ROLE OF INFORMAL CREDIT AND TRADERS IN STABILIZATION OF FOOD CROP PRICES

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Abstract: *Many farmers in Africa sell their produce at low prices immediately after harvest because they need cash. They could solve temporary liquidity constraints by use of credit and store their produce to sell when prices are high. However, due to various reasons such many poor farmers have been excluded from formal financial services. In response, the informal financial market has expanded, but the question why informal credit has not facilitated storage to enable farmers benefit from intertemporal arbitrage opportunities remains largely unanswered. To answer this question, we investigate the role of informal credit markets and traders in stabilizing seasonal food crop prices. Our analysis is based on a household survey data, and in-depth interviews with key players in the informal credit market and grain traders in rural south-western Uganda. We find that community-based self-help savings and credit associations provide credit for the majority (62%) of farmers. Informal credit still excludes the very poor and is not sufficient to enable farmers benefit from intertemporal arbitrage opportunities. Thus, poor farmers continue to 'sell low and buy high'. The study also addresses a related fundamental aspect of food marketing: why is there no competition between traders bidding up prices after harvest and eliminating seasonal price fluctuations? We analyse traders' costs and profit structure in the study area, and shed some light on imperfections in the grain market and the barriers that limit competition between traders. We find that grain trade is not highly competitive. High transaction costs and limited access to credit are the main barriers limiting competition. Supporting community-based self-help savings and credit associations to raise their portfolio can enable more farmers to borrow at the same time. Investing in infrastructure, organising and supporting small scale farmers to bulk their produce might lower transaction costs, promote competition and dampen price fluctuations.*

Keywords: *Narbitrage, Credit Market, Seasonal Price Variation, Trade Barriers*
(JEL Classification: *D53, O13, O16, Q12, Q13)*

Introduction

Agricultural production in most African countries is dominated by small-scale farmers who depend on their produce for home consumption and income generation. As smallholder households increasingly engage in market production, their opportunity to increase household income and food security largely depends on the functioning of agricultural markets and other relevant markets such as the financial market. In the absence of well-functioning markets, prices of agricultural commodities in most sub-Saharan African countries typically fluctuate across space and time (Minot, 2014). Food crop prices are usually low at harvest but rise gradually until the next harvest. This seasonal price fluctuation is largely due to variation in domestic or even local supply and demand, as markets are imperfectly integrated. Most smallholder farmers sell their produce at low prices immediately after harvest, and buy food later during the lean period at a higher price. This has been referred to as the 'selling low and buying high puzzle' (Burke, 2014; Stephens and Barrett, 2011).

Food crop price instability is of significant interest to development economists. Price variability of the type described above adversely affects household income. It hinders intensification of input use, adoption of technologies necessary for production efficiency and negatively affects productivity growth and food security (Gabre-Madhin et al., 2002). Seasonal variation in food prices affect household dietary intake and the nutritional outcome might be detrimental to health. Addressing the food crop price instability problem would help farmers to realize the potential economic and nutrition advantage of engaging in market production (Gilbert et al., 2017).

The persistence of non-stochastic food price variability is puzzling. One would expect that predictable price movements will affect decisions on when to sell or store produce by farmers and third parties. As opposed to perishable crops, grains can be stored in case of unfavourable markets conditions and sold later when prices are high. While seasonal price variations are predictable, a majority of farm households seems not to take advantage of this to benefit from inter-temporal arbitrage opportunities. Even more puzzling is; why is there no competition between traders, bidding up prices soon after the harvest, and dissipating rents from arbitrage? In theory, both storage by farmers and traders could help to attenuate price volatility.

To date only a few studies have assessed why farmers do not store but choose to sell at low prices. The existing literature offers various explanations, including lack of strong supporting institutions and market-based risk management instruments such as warehouse receipts, forward price contracts and insurance (Byerlee et al., 2006; Coulter and Onumah, 2002). Lack of storage facilities or high storage costs and lack of liquidity might equally explain why households sell their produce at low prices immediately after harvest. Stephens and Barrett (2011) argue that poor households which are liquidity constrained may be compelled to sell their produce at a time when prices are low in order to take care of other needs. This is consistent with Fafchamps and Minten (2001) who mention that for most farmers the decision to sell or not to sell a staple (and how much to sell) is largely driven by the needs of the household rather than the price of the crop.

Temporary liquidity constraints can be solved by use of credit. Credit can improve farmers' income from production and food security through different pathways; (i) it can be used to smooth consumption and manage liquidity during seasonal income fluctuations (Matin et al., 2002; Yasuharu and LaStarria-CorNhieL, 2015); and related to this point, (ii) it may facilitate households to temporarily store their produce and sell when prices are high (Khandker, 2005; Matin et al., 2002). While the role of credit in agricultural production has been widely discussed (Conning and Udry, 2007) only a few studies have linked credit to agricultural commodity marketing (Burke, 2014; Stephens and Barrett, 2011). In these studies, the authors show that access to credit significantly influences smallholder sales and purchase behaviour of food grain. In Kenya for instance Burke (2014) finds that access to credit increases farm net revenues as it enables farmers to store their produce and sell when prices have gone up. Not only does storage affect household income, it also affects local price dynamics when markets are not integrated. Burke (2014) finds that local price fluctuations are dampened if sufficient farmers have access to credit. Expansion of credit access in rural areas may thus help reduce price dispersion.

However, due to various reasons such as lack of collateral, high interest rates and transaction costs many farmers, especially the illiterate and the poor typically have limited access to formal financial services (Ahmad, 2003). In recent years, the informal credit market has expanded and provides alternative sources of finance for households. Are farmers unwilling to borrow, or are they equally limited in accessing informal credit? Why don't informal financial institutions, such as private moneylenders and savings and credit cooperative associations/societies (SACCOs), help to meet temporary borrowing needs of farm households?

Alternatively, traders could bid up prices and dissipate rents from arbitrage. Why does this not happen? Several explanations have been offered. One is that there are no excessive returns in grain trade, that the gap between low and high prices is due to high transaction and storage costs incurred by the traders (Svensson and Yanagizawa, 2009). This means that traders only receive a fair compensation for their effort and the risk they run (e.g. theft or price drop). This argument is supported by the findings of Kikuchi et al. (2015) on rice marketing in Uganda and Fafchamps et al. (2005) in Benin, Madagascar and Malawi that marketing costs are nearly proportional to transaction size with very little evidence of returns to scale in agricultural trade. Sitko and Jayne (2014) equally argue that food markets are highly competitive in terms of number of traders and marketing margins and that traders improve farmers' access to markets in remote areas in Sub-Saharan Africa and should be supported in order to further develop competitive rural markets.

Yet, others claim that traders are monopolists and earn non-competitive rents (Muto and Yamano, 2009; Svensson and Yanagizawa, 2009). These studies show that crop traders use information asymmetries to gain substantial surplus beyond normal profits. Some traders form networks that restrict farmers from selling directly to wholesale traders thus limiting competition. For instance, in West Bengal, due to high transaction costs and mistrust, wholesale traders are unwilling to negotiate small trade volumes directly with farmers but rather deal with small village traders (Mitra et al., 2016). As a result, village potato traders collude on the price to offer farmers and ultimately earn large margins due to limited competition. Using a field experiment, Bergquist (2016) also finds a high degree of collusion among maize traders in Kenya and this affects competition. While a number of studies have been done in sub-Saharan Africa, there is little evidence on whether food crop markets are competitive or not (Dillon and Dambro, 2016).

This paper makes a contribution in addressing the above issues by focusing on the role of informal credit and traders in stabilizing food crop prices. We address two objectives; one, we analyse how semi-formal financial intermediaries (SACCOs) and informal credit sources which serve the majority of the rural population (Klapper and Singer, 2015) influence the marketing behaviour and affect food security of rural households. Two, we attempt to better understand the food marketing dynamics focusing on grain trade in rural Uganda and the barriers that maintain excess margins (if they exist) in equilibrium in the rural food market. To address these objectives, we conducted a set of surveys involving farmers (a household survey), managers of informal savings and credit associations, individual money lenders, and food grain traders.

This paper adds to the literature, an analysis of the

contributions and limitations of the (informal) credit market in stabilizing seasonal food crop prices and ultimately smoothing income fluctuations. Further, we provide insights in the underlying causes of imperfect competition in the food markets in rural areas which as a result, have maintained excess margins in the grain market. Our focus is on marketing of food crops, specifically grains (rice, maize, millet, beans and ground nuts) which are commonly traded in the area. We seek out strategic interventions for policy makers to leverage food crop prices for food security by improving the functioning of markets.

Our findings reveal that households which obtained credit were less likely to sell their produce immediately after harvest. However, we find that informal credit is not sufficient to enable farmers to store their produce and participate in intertemporal arbitrage. We also find that the local grain market does not have sufficient competition between grain traders. The main barriers to competition include high cost of credit, poor infrastructure and marketing systems particularly individual marketing. Addressing these factors may significantly contribute to dampening seasonal food price fluctuations.

In the following section we explain how data were collected, section three gives an overview of food crop price trends in the study area highlighting the market and price structure. In section four we analyse the factors influencing farmers' decision on when to sell their produce. Section five discusses the rural credit market in Uganda with special interest on how informal credit influences farmers' marketing behaviour. Section six presents the role of traders in stabilizing food crop prices, and we conclude in section seven.

DATA AND METHODS

We collect all primary data from Kanungu district, western Uganda. The district borders Rukungiri district to the north and east, Kabale district to the south east, Kisoro district to the south west and the Democratic Republic of the Congo to the west. A majority of the population derives its livelihood from agriculture especially crop production. This study combines primary and secondary data on food grains trade and informal financial institutions, to analyse rural food and financial market imperfections. Primary data were collected from farmers and local traders to understand the marketing systems at the local level. Grain traders were interviewed to gain insight in local trade activities. We collect qualitative data using semi-structured interviews with individual money lenders, managers of SACCOs and representatives of other informal financial institutions (rotational savings and credit associations (ROSCAs) and accumulating savings and credit associations (ASCAs)) to better understand their lending technology.

Interviews with SACCO and ROSCA managers, money lenders and traders

We approached SACCO and ROSCA managers, money lenders and traders individually. For the first three groups, we used a semi-structured questionnaire to ask about their credit market experiences with farmers, with particular interest in borrowing and repayment, as well as transaction costs. In total 47 interviews were conducted; 15 with SACCO managers, 16 with chair persons of community-based credit and savings associations and 16 with money lenders/traders who offer credit or buy crops at a fixed forward price. We faced a challenge of identifying money lenders as most of them are operating 'illegally' (i.e., they not registered). Out of the 16 interviewed, only one is registered as a money lender. Those we interviewed were identified through their clients and colleagues. Whoever was interviewed was requested to provide names of other money lenders in the area. In order to better understand individual operations, some questions were respondent-specific. Although the sample size appears statistically small, we believe it is a good representative of money lenders as not many people are involved in the business. Five grain traders were also interviewed using a semi-structured questionnaire. We asked about the type of buyers and sellers they deal with, their transactions to better comprehend their cost structure, and the constraints and challenges they face in the grain trade.

Interviews with households/farmers

Household data were extracted from a household survey on market production and household food security. The survey was conducted in 2014 (March – June) and involved 1137 rural households. The sample was drawn from seven sub counties; five sub counties were purposively selected to represent market-oriented crop production and two represent subsistence crop production. Respondents were randomly selected from the list of households in randomly selected villages. We use data on household socio-economic and demographic characteristics, credit access and use, production and marketing of major food crops (rice, maize, beans and ground nuts).

Table 1 presents a summary of descriptive statistics of sample households. A majority of households are headed by males with an average age of 42.6 years. Their average education is 6 years of schooling, implying that the majority has only primary education. It is important to note that this has implications for one's capacity to operate a bank account as well as transactions in marketing agricultural produce. The average household size in our sample is 6.2 persons, which is above the national average of 4.7 persons per household (Uganda Bureau of Statistics, 2014a). The surveyed households are typically smallholders with an average land size of 1.8 hectares. Their average annual household income –UGX 3.4 million is far above the mean national household income (UGX 2.0 million) in rural areas (Uganda Bureau of Statistics, 2014b). Crop sales contribute the bigger proportion (54.3%) of household income. This means that households mainly rely on seasonal income and therefore credit access is critical for households to manage liquidity constraints. The household survey reveals an average household annual expenditure of about UGX 2.7 million which translates into average monthly expenditures of approximately UGX 0.23 million. This is

close to UBOS estimates of UGX 0.22 million for western Uganda and slightly above the national average household consumption expenditure of UGX 204,200 per month in rural areas (Uganda Bureau of Statistics, 2014b). The bigger proportion of income is spent on food (37.4%) and school fees (29.5%), expenditures that cannot be postponed. School fees for instance are paid three times in a year – the beginning of first and second term coincide with harvest period (end of January and May, respectively) while the beginning of third term falls in the growing period (end of September). It is for such expenditures that households would need credit in order to store their produce awaiting higher prices.

Analysing the factors influencing the decision on when to sell produce

Table 1: Descriptive statistics of sample households

Variable name	Observations	Mean	Standard deviation	minimum	Maximum
Age of household head	1137	42.6	13.4	18	85
Gender of household head; male (percentage)	1137	82.9	-	-	-
Education of household head (years)	1127	6.2	3.9	0	20
Education of household head's spouse (years)	1100	4.9	3.2	0	17
Household size	1135	6.2	2.6	1	24
Size of land owned (acres)	-	4.5	5.4	0	35
Average annual household income (million UGX)	1137	3.5	4.3	0.1	44.5
Average anual household crop income (million UGX)	1026	1.9	2.0	0.1	13.5
Average annual household expenditure (million UGX)	1132	2.7	3.1	0.1	32.3
Wealth (million UGX)	1137	19.3	20.5	0.1	72.1
Distance to the main road (km)	1137	2.56	3.68	0	48
Distance to the main market (km)	1137	6.08	4.48	0.048	72
Distance to input shop (km)	1114	4.64	3.68	0.016	27.2
Access to credit; Yes (percentage)	1125	83.7	-	-	-
Proportion that used credit (percentage)	996	67.7	-	-	-

Note: exchange rate: 1 USD ≈ 2650 UGX

To investigate the role of informal credit in stabilizing food crop prices it is important to understand the various factors that influence farmers' decision on when to sell their produce. During the household survey, the sampled farmers were asked when they normally sell their produce and we categorise the responses into two; one, immediately after harvest (within the first 4 weeks post-harvest) and two, after 4 weeks post-harvest. A common modelling framework to analyse marketing decision under this framework is a binary choice model, usually a probit or logit specification. We use the binary logistic regression model as it allows predicting the discrete outcomes of dichotomous or polytomous dependent variables from a set of categorical or continuous independent variable. This is appropriate as it fits the dichotomous choice, taking on values of 1 or 0. We use a simple logistic regression model to identify the factors influencing farmers' decision on when to sell. The simple logistic regression model estimates the probability of the household selling immediately after harvest (1= less than 4 weeks after harvest) or store and sell at least 4 weeks after harvest (=0). The binary logistic model has the advantage that it does not depend on the assumption of linearity between dependent and independent variable. The model is specified as follows;

$$Prob\ (Y_i = 1) = P_i = F(Z_i) = (F(\delta + \Sigma\beta_i X_i) = \frac{1}{1+e^{-Z_i}} \quad (1)$$

Where P_i is the probability that a farmer sells produce immediately after harvest (Y_i takes the value 1)

X_i represents explanatory variables including household characteristics, socioeconomic, farm and institutional factors which influence the decision on when to sell. δ and β are parameters to be estimated and e is the exponential constant.

$$\text{Prob}(Y_i = 0) = 1 - \text{Prob}(Y_i = 1) = (1 - P_i) = \frac{e^{-Z_i}}{1+e^{-Z_i}} \quad (2)$$

From equation 1 and 2 we get,

$$\frac{Prob(Y_i=1)}{Prob(Y_i=0)} = \frac{P_i}{1-P_i} = e^{Z_i} \quad (3)$$

Taking the natural log of equation (3), we get;

$$Z_i = \frac{P_i}{1-P_i} = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta n\ X_{ni} + u_i \quad (4)$$

DESCRIPTION OF VARIABLES

The smallholder farmer's produce marketing behaviour is influenced by the farmers' decision on when to sell. The decision on when to sell depend on various factors including; personal and household socioeconomic characteristics (age of household head, education, number of children, off farm income), farm characteristics and other factors such as institutional and access related variables (size of land owned, distance to the market, member of farmer group). Age of household head is used as a proxy for experience in farming business. The older are expected to store awaiting better prices. Educated farmers are assumed to be better able to store as they may have other sources of income as well as better access to information. The household head's formal education is also posited to increase the understanding of

market dynamics. The number of children may influence when to sell due to their requirements especially education fees. Households with other sources of income are likely to store and sell at peak prices. Households with no storage facilities are more likely to sell their produce immediately after harvest. Distance to the market negatively influences the decision on when to sell. For farmers in remote areas, geographic isolation through distance may deny them easy access to traders and markets (Key et al., 2000). Households with membership in farmer groups are likely to delay produce sales since they have easy access to credit and market information.

3. Trends in food crop prices in the study area

Since the liberalization of markets in early 1990's food crop prices in Uganda are subject to forces of supply and demand. Due to the rain-fed nature of agriculture, food crop prices are driven by seasons, the overall national harvest, and whether the crop is traded in the international and or domestic market. Apart from rice and maize, which are internationally traded, the prices of other crops are largely determined by domestic supply and demand. Food crops are mainly traded on the spot market, where farmers sell their produce to neighbours, local traders and in various local markets. Figure 1 presents retail prices of major grains in local markets in Kanungu district. We observe low prices during the post-harvest periods in January-February and July –September, and rising prices during the growing season (reaching the peak around May and October-November).

Figure 1: Average retail prices of grains in local markets in Kanungu district

Source: author's calculation

We compute relative price variability to understand the magnitude of seasonal price dynamics. Table 2 casts some light on the extent of price variability of the key crops. Consistent with findings of Kijima et al. (2012), rice prices do not show very strong variability as they seem to be linked to international rice prices. Millet price variability is relatively low because the demand for millet is rather low compared to other grains. Seasonal price variability is much higher for maize grain. This can be explained by a relatively very high supply of maize immediately after harvest and hence attracting very low prices. Yet, the demand for maize remains high as it is the main food for institutions such as schools and prisons. The world food programme equally demands significant quantities of maize for distribution as food aid. In addition, there is significant cross boarder export of maize to Kenya, Rwanda and Sudan. Our findings are consistent with those in other African countries (Gilbert et al., 2017).

Table 2: Relative price variability of key grains in Kanungu district

Crop	Rice	Maize	Millet
Average price in the month before harvest (UGX)	2850	1500	1500
Average price in the month after harvest (UGX)	2000	500	1000
Price variation (UGX)	850	1000	500
Relative price variability (%)	42.5	200	50.0

Note: price variability for rice, maize and millet is based on local market prices.

Exchange rate: 1 USD ≈ 2650 UGX. Relative price variability = (price variation/av. price after harvest)100

Source: Uganda Bureau of Statistics (unpublished data)

Variation in average monthly retail prices could potentially reflect high storage costs as well as changes in market conditions specifically supply and demand fluctuations. In seasonal agriculture, food supply in isolated markets during the lean period comes from storage. Producers store food to smooth consumption between harvest and non- harvest periods and to take advantage of future high food prices. In a competitive market, storage plays a big role in ensuring that prices are dynamically consistent.

Seasonal price variations would be reduced if farmers could limit supply after harvest, and store their produce to sell a few months later. This strategy would also earn them higher income. Using our household survey production and marketing data, and market prices we show that households can raise their revenue from crops specifically grains by 64.6 percent if they could store their produce and sell at least three months after harvest. Table 3 presents the average returns that sampled households could earn from different food crops at the lowest and peak prices in the season. Farmers who sell immediately after harvest, may lose 25% to 200% of the crop sold after harvest depending on the type of crop. Maize and beans display the highest loss (200 and 100 percent, respectively). As mentioned above this is explained by the high demand for the maize and beans.

The quantity sold are the averages of crops sold by the sampled households. The average annual grain revenue is the unweighted average of total grain revenue from different crops for each household.

Table 3: Average estimated revenue by food crop at different prices in the marketing season

Crop	Number of farmers	Quantity sold (kg)	Average price per kg immediately after harvest (UGX)	Revenue if sold immediately after harvest (UGX)	Average price per kg before harvest (UGX)	Revenue if sold before harvest (UGX)	Percent change in revenue
Rice	408	541.8	2000	1,083,600	2850	1,544,130	42.5
Maize	914	309.6	500	154,800	1500	464,400	200.0
Millet	800	206.9	1000	206,900	1500	310,350	50.0
Beans	1,086	187.7	1000	187,700	2000	375,400	100
Ground nuts	529	102.4	2800	286,720	3500	358,400	25
Average annual grain revenue	-	-	-	836,782	-	1,377,230	64.6

Source of data: survey conducted by the authors.

For households that mainly depend on income from crops, they must have enough savings or access to credit to take care of household needs if they have to store their produce awaiting peak prices. Whereas, it is known that savings are low due to low income, the question is; why don't they borrow to offset temporally liquidity constraints? For instance, assuming two equal cropping seasons in a year, and that a household spends all crop income before the next harvest and not able to cut expenses, the average household would require a loan worth UGX 418,391 (one season crop income (836,782/2)) to defer grain sales for at least 3 months to the high price period just before the next harvest.

4. Factors influencing farmers' decision on when to sell their produce

Using our household survey data, we run a simple logistic regression model to understand the various factors that may influence the farmers' decision on when to sell their produce. The results are presented in Table 4.

Table 4: Logit model estimates of factors influencing farmers' decision on when to sell produce

Variables	Coefficients	Std. Err.	z
Household obtained credit (1= yes, 0 otherwise)	-0.2625*	0.1392	1.89
Age of household head	-0.0035	0.0060	0.59
Education of household head	-0.0549***	0.0191	2.87
Number of children	0.0471	0.0328	-1.44
Household has off farm income	-0.0421	0.1387	-0.3
Farm size (acres)	-0.0344**	0.0150	2.29
Membership in a farmer group =1, otherwise=0	-0.0071	0.1438	0.05
Distance to main market	-0.0233	0.0242	0.96
Constant	0.8052**	0.3177	-2.53
Number of observations	920	-	-
Log likelihood	-623.218	-	-
LR chi2	27.5***	-	-
Prob>chi2	0.0006	-	-

*Source of data: survey conducted by the authors. *Significant at 10%; **Significant at 5%, *** Significant at 1%*

Results indicate that credit, education of household head and land size significantly influence farmers' decision on when to sell produce. Households which obtained credit were less likely to sell their produce immediately after harvest.

This confirms the hypothesis that obtaining credit can help the farmer to postpone sales at least for more than 4 weeks to a relatively high price period. The coefficient on education is negative and significant implying that every additional year of education reduces the likelihood of selling immediately after harvest. This might be explained by enhanced ability to understand marketing dynamics by those who have higher levels of education. We find that households with large farms are more likely to store their produce at least for more than four weeks and sell later at higher prices. This might be attributed to the fact that farmers with large farms tend to be market oriented and therefore are likely to sell their produce at a profitable price. Surprisingly we find no evidence that membership in farmer groups influence the decision on when to sell yet it was expected to be a source of credit to enable farmers to store and sell later in the peak period. A possible explanation is that not all group members can borrow at the same time and therefore some members may still sell immediately after harvest.

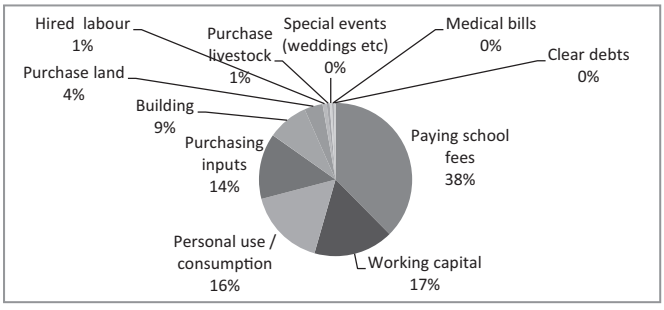
In what follows, we assess the role of informal credit in the food crop market focusing on how credit has influenced farmers to participate in intertemporal price arbitrage opportunities, but first, we present an overview of the rural credit market in Uganda.

5. Rural credit market in Uganda

5. 1 Credit use in rural Uganda

There has been a general increase in demand for credit in Uganda. The national statistics indicate that the proportion of adults (aged 18 years and above) demanding loans increased from 17% in 2009/2010 to 22% in 2012/13 (UBOS statistics 2012/2013). Consistent with national statistics (UBOS statistics 2012/13), our survey reveals that the main purpose for which a majority (38%) of households borrow money is paying school fees. This is followed by working capital (17%) and consumption (16%) (Figure 2). Similar findings have been reported in other developing countries such as Nepal (Prina, 2015).

Figure 2: Percentage of households mentioning a particular purpose for borrowing



Uganda's credit market consists of formal and informal sources of credit supply. Our findings indicate that a majority (84.2%) of sampled households has access to some form of credit. About 68.4 % of the households had obtained a loan in the past twelve months prior the survey and a majority (93%) obtained credit from informal financial services. Community-based saving methods, including accumulating savings and credit associations (ASCA) and rotational savings and credit associations (ROSCA) categorised as 'self-help associations', seem to dominate (Figure 3).

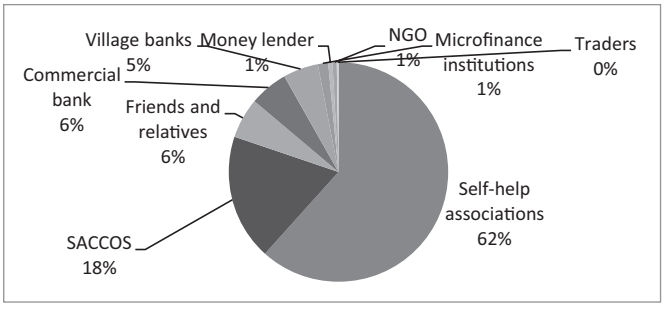


Figure 3: Source of credit

5. 2 Formal credit market

The formal credit market includes commercial banks and microfinance institutions. Uganda's credit market is highly segmented and the proportion of the population accessing formal credit is still very low especially in rural areas. Financial exclusion of the rural population is attributed to lack of savings and reliable investment enterprises (Fletschner, 2008), high account transaction costs (Prina, 2015), documentation requirements and proximity to financial intermediaries (Allen, et al., 2016). Individuals in civil service and non-agricultural business are more likely to apply for credit compared to those in the agricultural sector (Mpuga, 2010). National statistics indicate that only 0.36 million (9.1% of 3.95 million) agricultural households access credit (MAAIF, 2011). This is explained by various factors, such as high risk associated with rain-fed agriculture and lack of physical assets for collateral. While land is the most credible asset for collateral, a large part of the land is not titled due to high costs involved, but also due to the customary land tenure system where individuals have user rights but do not own the land. While those with land titles can access credit, in the absence of insurance markets they are unwilling to bear the risk of loss which may arise in case they are unable to payback (Boucher et al., 2008). For short term consumption credit, one would expect produce to be accepted as collateral. However, this is not viable due to poor marketing structures (individual marketing) and price fluctuations of agricultural commodities. High price of inputs/credit relative to output price and income volatility may significantly affect profits thus discouraging borrowers (Njeru et al., 2015). The small number of banks and delayed loan approval decisions equally discourage borrowers (Leon, 2015).

Moreover, there is a gender gap in use of formal financial services. Lending requirements of financial institutions limit rural women's access to financial resources (Fletschner and Kenney, 2014). Considering their employment status (perceived as house wives), women are less likely to use formal financial services due to their lower level of income and education (Aterido et al., 2013). In Uganda 48% of women are not empowered and lack access to or decision-making ability over credit (Alkire et al., 2013). Women are more likely to be credit constrained to the extent that even those who apply get smaller amounts compared to men (Fletschner, 2009).

While the Government has introduced microfinance institutions (MFIs) to help farmers' access credit, only 1% of sampled households had borrowed from microfinance institutions in the previous year before this study. MFIs have not helped poor farmers in rural areas as their requirements and procedure are not much different from those of commercial banks. This is further aggravated by insufficient infrastructure, low education levels and greater risks associated with agriculture production. Unless risks such as erratic weather conditions and income shocks are covered with micro insurance which is still lacking in Uganda financial markets microcredit will not benefit the rural poor farmers (Akotey and Adjasi, 2016). Consequently, most of the rural households have resorted to informal credit sources, which have relatively larger flexibility and where social capital may serve as collateral.

5.3 The role of informal credit market and its limitations in stabilizing food crop prices

Close to 100 million adults in sub-Saharan Africa use informal methods to save and borrow (Klapper and Singer, 2015). The informal credit market is not just a symptom of underdevelopment as viewed by many but complements the formal sector by supporting rural people who are excluded from the formal sector. Due to its flexibility, informal credit also provides another source in case of formal credit rationing (say when a borrower is offered less than requested for). Informal financial services are mainly community-based and exist in various forms including; savings credit and cooperatives organization (SACCO), unregulated village banks, accumulating savings and credit associations (ASCA), rotational savings and credit associations (ROSCA), traders,

private money lenders, friends and relatives (Anderson and Baland, 2002). The informal credit market plays an important role in supporting economic activities, including food crop production and marketing. Moreover, informal financial markets enable households to smooth consumption and deal with shocks, such as ill health. Proximity and economies of scope enjoyed by informal lenders reduce transaction costs and risks and enable them to serve various types of clients excluded from the formal sector (Guirkinger, 2008). The ability of the informal sector to utilise social networks to gather information on borrowers gives the informal market a comparative advantage over the formal sector in dealing with smallholder rural households that lack collateral and documented income records.

Why don't farmers borrow money against their expected high future produce prices to stabilize their income and smooth consumption?

To gain insight into the borrowing behaviour of farmers, and how this shapes their commodity marketing behaviour, it is important to understand the different sources of informal credit, the terms and conditions of borrowing, and the challenges faced on the supply and demand side. The most common sources of credit in the study area include self-help associations (ASCAs and ROSCAs), SACCOs and money lenders. We discuss each category in the subsequent section.

Community-based self-help associations (ASCA and ROSCA)

To minimise the effects of income fluctuations, households attempt to develop 'self-help' associations that enable them to smooth consumption. There are various community-based savings and credit associations in the study area, but their numbers could not be established because they are not registered. These are small village groups that operate almost a similar model of accumulating savings and provide loans to members with or without interest. About 62% of sampled households had received credit from the village associations in the past year prior to this study. The most widely used approach, especially by women, is a savings and credit association commonly known as 'Akabox' (a small box). The group derives the name from a metallic box that acts as a safe, it has 3 padlocks and the keys for each padlock are kept by 3 different people to ensure maximum safety of the money and books of account. Households select themselves and form small groups, each comprising about 30 people who are residents of the same village and known to each other. Each member of the group buys shares at Ug. 2,000 (0.6 USD) each and the maximum number of shares for one member is five (UGX 10,000). Every member is then required to save at least UGX 1000 – 5000 on a weekly basis and the money is borrowed by one or more members on application for a loan. The interest rate is determined by group members based on what they can afford. For most groups the interest rate varies between 3 and 5 percent per month. After a period of 12 months, all the loans must be paid. The fund and the accumulated profits are shared by the members and they start afresh.

ASCAs and ROSCAs have improved credit access for many resource-poor households especially women to deal with shocks like ill health, payment of education expenses, and purchase of inputs such as seed and labour. Members do not need collateral to apply for a loan, they rely on social collateral and the main deterrent to default is the threat of community sanctions and fear of losing access to credit in future. The groups only require one to have a known source of income (e.g., a cash crop garden, livestock) and guarantors with a credible credit history within the group. However, the groups have established mechanisms for assessing their members' capacity to pay back the loan. They have a loans committee that does regular monitoring and categorises the risk profile of their clients based on land size, cash crop acreage and number/type of livestock owned. For example, in one of the groups (Rwentondo Tubebamwe) a member can access a loan of UGX 500,000 if s/he has at least one acre of rice. This suggests that there are still many households excluded from this category of informal credit market. What matters is not only access to credit but also how much credit one can access.

Although ASCAs and ROSCAs have helped to some extent in relaxing farmers' liquidity constraints, group loans are not sufficient to bail out farmers from selling produce during the peak season when prices are low. This is attributed to various limitations; The savings are generally very low and consequently the groups have limited capital. Credit rationing then becomes inevitable. A majority of the members are smallholder farmers depending on seasonal agriculture characterised by low yields and low prices. Some members have to sell produce to fulfil the requirement of weekly savings. In fact, some of the key respondents claim that 'akabox' contributes to food insecurity for poor households. We heard statements like; 'A woman will sell the only beans in the house to raise money for weekly contributions.' Others borrow from friends or relatives to raise weekly contributions; hence, they remain in a cycle of debts that compel them to sell their produce at low prices. Moreover, most rural households are involved in similar activities (agriculture), as a result credit needs (e.g labour, school fees) of group members tend to be concentrated in the same period hence decreasing the utility of intra-village credit. If all group members cannot borrow at the same time, this means that those who are credit constrained will sell their produce even when the prices are low.

Other risks include failure to pay back often times due to genuine reasons. Farmers borrow with the hope that they will generate sufficient crop revenue to repay the loan. However, they face the risk of commodity market imperfections. In the absence of government price support mechanisms and insurance, farmers bear price risks and may fail to repay the loans.

Savings and Credit Cooperative Societies (SACCO)

Savings and Credit Cooperative Societies (SACCO) are another source of credit for rural households in Uganda. About 18% of the households in the study area had borrowed from a SACCO in the year prior the survey. SACCOs are

community-based, member driven cooperatives managed by the board as representatives. Unlike ROSCAs and ASCAs, SACCOs are organized under one umbrella body; Uganda Cooperative Savings and Credit Union Limited (UCSCU) which is registered under Uganda Cooperative Society. We can therefore, categorise them as semi-formal financial institutions. However, some SACCOs that do not meet minimum requirements are not registered. SACCOs are much bigger than community saving and credit associations and membership is open for anybody who can afford to buy shares.

To become a member, one must have shares and a savings account. One share is worth UGX 20,000 (7.5 USD). Members are required to deposit savings which finance members in form of loans. Credit access in SACCOs is restricted to members only. The interest rate ranges between 2% to 5% per month and is determined by members in the annual general meeting. Whereas the interest rate for SACCOs is often lower than that for community-based associations, a majority of households prefers to join the associations. This is explained by various factors such as; high costs, bureaucracy, and lack of trust based on a history of poor management and corruption (Mugenyi, 2010). Similar findings have been reported in Kenya by Dupas et al. (2014). For instance, it costs a total of UGX 34,000 to open an account in KICOD, one of the big SACCOs in the study area. This includes; an application fee, 3 passport photographs, shares, membership fee, savings ledger and a passbook. As pointed out by managers we interviewed, many poor households cannot afford such a cost. When poor households are excluded from a credit source that has one of the lowest interest rates, the only option they have is to sell their produce at the prevailing price even when it is low. Moreover, farmers decry the bureaucracy involved in accessing a loan. From the time of application, it may take four weeks or more to access a loan in a SACCO and this discourages borrowers.

Credit rationing is high in SACCOs as demand exceeds savings. Often times, applicants do not access loans due to limited capital which is a result of little savings by members. Similar to ROSCAs and ASCAs, loan demands tend to accumulate in the same period. Even those with access, the contribution of rural SACCOs is insufficient to offset farmers cash needs given the small size of loans. While SACCOs can borrow from commercial banks and microfinance institutions, most of them lack collateral. Hence, they cannot access loans. Moreover, farmers are given a short grace period of one month before they start paying back the loan and the maximum term is twelve months. This is not favourable for a farmer who would want to store produce for at least two to three months. Like in the formal credit market, imperfect information/information asymmetry is one major challenge that SACCOs face. The lender has less information than the borrower on ability and willingness to repay the loan. While some borrowers may have genuine reason for failure to pay back such as adverse weather conditions that may lead to crop failure, for others it is a moral hazard problem. Some borrowers acquire loans from various sources and there is no record to track them due to lack of coordination and limited credit information sharing among lenders (Ghosh and Ray, 2016).

Money lenders/traders

The number of individuals who have joined the credit market as money lenders has increased in the rural areas. They provide credit to about 1% of the households in our sample. Table 5 presents summary statistics on money lenders. Most money lenders are business people including traders who offer credit in form of cash or traders who offer goods on credit. The average money lender has primary education and has been in the money lending business for about 8 years. While money lenders are required by the government to register, only one out of sixteen lenders interviewed is actually registered. The rest operate illegally. They are therefore reluctant to provide information about their business. The money lenders we interviewed are willing to formalize their business but report to be constrained by a number of factors including; limited capital, rigorous procedures of forming a company, high registration fees and other charges as well as lack of information.

Table 5: Summary statistics on characteristics of money lenders covered by the survey (N=16)

Variable	Mean	Std. Dev.	Min	Max
Age of respondent	38.5	10.3	27	65
Education of respondent (years)	8.0	4.0	0	16
Experience in the business (years)	7.6	5.7	1	23
Interest rate (per month)	15.9	6.3	10	50
Repayment period (months)	2.7	1.3	1	6
Highest amount of loan given (thousand UGX)	1,058.3	771.6	500.0	3,000.0
Credit worth (thousand UGX)	26,400	37,600	250	120,000
Average monthly costs incurred in the business (thousand UGX)	164	156	5	400
Loan recovery rate	93.1	7.5	70	100

Note: exchange rate: 1 USD ≈ 2650 UGX

Money lenders charge the highest variable interest rate ranging from 10 to 50 percent per month. This is above the profit margin obtained by grain traders (Table 6) implying that money lenders may not help farmers to store their produce. The interest rate depends on the client, and is determined by many factors including; the amount of loan required, loan period, credit history, credibility and status of the borrower, personal relationship and commercial bank interest rates. The maximum loan period recorded is six months. The lender offers a contract based on his or her assessment of the risk of default. This perhaps explains the

high loan recovery rate ranging between 70% to 100% with a mean of 93.1%. The terms and conditions for borrowing include; collateral (land, commercial buildings, a car), a written agreement witnessed by a spouse, guarantor and a local government councillor. The registered money lender, in addition charges an application fee of UGX 50,000 and transport fee of UGX 100,000, which is used to verify the land, if used as collateral. Most of the land is not titled, however it can still be accepted as collateral by a money lender on the agreement that it has been sold to the lender. The contract/agreement involves the lender, borrower and witnesses who include a local council chair person, a spouse and parents or guardian if the borrower is not married. The agreement reads; "I (the borrower) have sold my property (land, house etc (collateral)) to... (lender) at a cost of UGX.... (market price)" Such an agreement is risky for the borrower as often the value of the collateral is much higher than the loan amount and some people have lost their property.

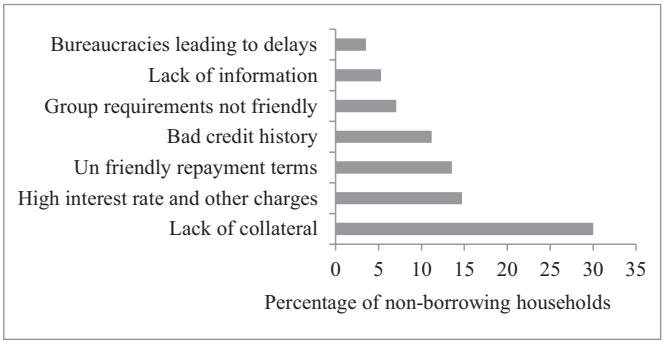
In addition to cash loans, some traders offer credit in the form of items such as seed (especially rice). What is striking is the interest attached on rice seed. Traders are not interested in cash but rather demand that at harvest, the borrower pays back twice as much of the seed quantity borrowed. For instance, if a farmer borrows 100 kg of seed, they pay back 200 kg of rice. This translates into 100% interest for a period of 4 months, and may significantly reduce the farmer's returns by twice the value of the seed used. Given such conditions and terms of borrowing it is clear that a majority of households cannot borrow from money lenders. And those that do borrow cannot store their produce to engage in arbitrage since they have to pay back as soon as they harvest.

There is evidence of lenders reluctance to lend large sums of money to one individual. On average, the highest amount of loan offered is UGX 1.1 million. The amount of money given to one individual depends on what they can offer as collateral, the loan period and personal relationship. Land, vehicles and motorcycles are the most commonly accepted collateral for relatively large sums of money. Most farmers however, cannot afford such items as collateral and therefore can only access small loans from money lenders. The key challenge faced by money lenders is information asymmetry. There is no full information about the borrower, their capacity and willingness to pay back the loan. Strict measures are therefore taken to minimize "bad type" borrowers. Credit rationing is one way of reducing risks associated with moral hazard. In case of default, there is little faith in the ability of courts of law to seize collateral to recover the loan. One of the high court judges in Uganda Justice D. Batema is quoted by the national newspaper (The new vision 03/09/2015) warning money lenders to stop using courts as a way of recovering money from civil debtors: "A debt is not a crime. When you are recovering a loan of 1m you do not sell a house of 36m" The solution proposed by the judge is to renegotiate the payment schedule. Under such circumstances, money lenders charge high interest rates to cover the risk. Limited capital is another constraint to both money lenders and potential borrowers. All the money lenders interviewed acknowledge limited capacity to satisfy their potential clients. Even when money lenders may borrow from SACCOs and banks, they are constrained by high interest rates in commercial banks, since their borrowers may not pay in time to enable them to service their own loans.

Limitations to credit access

Our survey reveals that a portion (13.1%) of sampled households could not borrow from the informal credit market and have no access to credit due to various reasons (Figure 4). Lack of collateral, high interest rate and unfavourable repayment terms are most dominant. This is not unique to Uganda, even in more developed countries like China some poor households are still excluded from the informal credit market (Yuan and Xu, 2015). If some households cannot borrow, and those who have access cannot borrow at the same time, or borrow enough to offset their liquidity constraint they will be compelled to sell their produce even when prices are low.

Figure 5: Flow of grains from the farm gate to the final



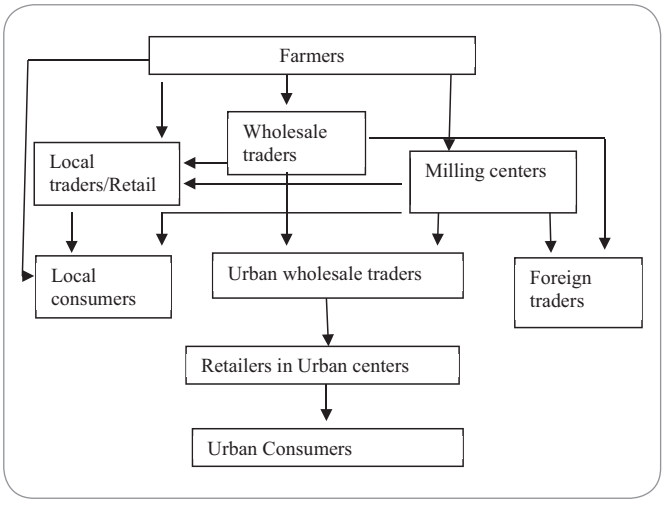
6. The role of traders in stabilizing food crop prices

Economic theory predicts that, if a trader offers a lower price to the farmer than the equilibrium arbitrage price, another trader will offer a slightly higher price. The price will be bid up until the farmer achieves a full optimal arbitrage price for his produce. Why doesn't this happen in the food crop market? We attempt to answer this question in this section. But first it is important to understand the food crop marketing chain.

6.1 Marketing chain of food crops

Our interaction with farmers and traders revealed there is no organized marketing system for food crops. The food crop market is characterised by many small buyers engaged in primary marketing and assembly. Figure 5 depicts the marketing chain of grains (specifically rice) from the farm gate to the final consumer.

Figure 5: Flow of grains from the farm gate to the final



Farmers sell their produce to three categories of buyers who include small local traders/retailers, wholesale traders and millers. While some local traders go to the villages and buy from the farm, some farmers deliver their produce to traders in the nearest trading centre. In our study area, we find four categories of traders; 1) Small local traders/retailers who buy produce from farmers, millers and other traders and sell directly to consumers. 2) A few traders with stores who go to the villages, buy produce from farmers, assemble it and do wholesale to retailers and large traders (from outside the district). 3) Millers who buy directly from farmers and sell to large wholesale traders (from outside the district), retailers and consumers. 4) Large wholesale traders from neighbouring urban centres especially Kabale and Kasese, as well as foreign traders from neighbouring countries, including Rwanda and the Democratic Republic of Congo, who buy from millers and local traders and sell to urban retailers.

6.2 Marketing margins and costs by type of grain traded

Middle men/traders operate at different stages of the market chain. While some deal directly with farmers, others only transact their business with fellow traders. In our case we assess average costs and profits of a local wholesale trader since they buy produce from a majority (73%) of the households. A total of five local traders were interviewed to gain insights in the grain trade dynamics at local level. The data were collected shortly after harvest in July 2016. Traders claim that this is their peak season confirming that most farmers sell shortly after harvest. We obtained the details of the most recently completed transaction of one wholesale local trader. A summary of the average marketing costs and profits is presented in Table 6. We present costs and profits from one trader because unlike the others interviewed, he is only engaged in marketing food grains. We therefore believe that he presents relatively accurate information. The others we interviewed could not easily separate grain marketing costs from costs of marketing other commodities in their shops.

Table 6: Marketing margins, costs and farmers' share of wholesale/ retail price by type of grain traded

Marketing margins and costs per ton			
Type of grain	Rice	Maize	Millet
Purchasing price (UGX)	2,100,000	700,000	1,100,000
Selling price (UGX)	2,300,000	800,000	1,300,000
Total distance traded (km)	22.5	25.7	22.5
Quantity purchased (tons)	3	2	4
Sales period (days)	14	21	56
Gross margin (UGX)	200,000	100,000	200,000
Marketing costs (UGX)	71,407.4	70,861.1	37,930.5
Total costs (purchase price + marketing costs)	2,171,407.4	770,861.1	1,137,930.5
Net profit (UGX)	128,592.6	29,138.8	162,069.4
Marketing costs as a percentage of gross margin	35.7	70.9	18.9
Net profit as a percentage of total cost	12.6	5.3	7.8
Purchase price as a percentage of sales price	91.3	87.5	84.6
Marketing costs as a percentage of sales	3.1	8.8	2.9
Profit margin (net profit as a percentage of sales)	12.0	5.2	6.6

Note: Gross margin = selling price – purchase price, Profit =gross margin– marketing costs, and the time dimension for profit margin is one month (30 days)

Marketing costs are a comprehensive measure of all costs incurred in the marketing process from purchase to sale (assembly, transport, storage, processing, packaging, communication) and operating costs (rent of shop/storage facility, pest control, electricity, and market taxes, income tax on trading and wages). We find that local traders do incur relatively low costs (less than 10% of sales price) as they share some of these costs with farmers. For instance, farmers provide the bags, load the produce when collected from the farm and sometimes deliver the produce to the traders. Marketing costs for rice and millet form a relatively small percentage of the gross margin implying that traders get relatively higher returns from these crops.

Grain marketing in the study area is a profitable venture. The profits vary with different types of grains. In absolute terms, millet displays the highest net profit followed by rice and maize. However, it is important to note that millet had a relatively longer sales period. In terms of profitability rice marketing is more profitable. The local trader interviewed obtains a larger profit margin as a percentage of the cost price in rice (12.6%) marketing followed by millet (7.8 %) and maize (5.3%)). This is expected in the local market where, compared to other crops rice has a higher demand from regional traders. Millet and maize are domestically traded and maize supply is much higher than the other grains as it is one crop grown by majority of households. The returns to money invested in grain trade is higher than the interest rate in

SACCOs implying that a trader can make profit by borrowing money to engage in grain trade. The traders interviewed do not add value in terms of transformation, they essentially undertake both spatial and intertemporal arbitrage.

One might argue that the food grain market is highly competitive and the wide gap between high and low food crop prices is due to high storage costs and risks incurred by the traders. We do not find evidence in the study area to support this argument. When prices are low, local wholesale traders buy produce in large quantities which they later supply to retailers and other traders from within and outside the district. Some of the produce purchased is immediately re-sold. For example, traders buy rice at UGX 2100 per kg and sell at UGX 2300/kg (Table 6) an increase of about 9.5%. Traders store part of the produce in expectation of higher prices in future. However, speculative returns may not be realized from inter-annual storage since most grains are produced for two seasons in a year. Storage costs therefore, are relatively low since grain stocks cannot be kept for a long time as they must be depleted before the next harvest. Considering all the traders interviewed, the storage period for grains reported ranges between 14 days to 84 days for a given consignment with an average of 45 days which is relatively short. It is also important to note that for most traders, the storage facility is multipurpose (acts as store, shop and residential for some). Thus, storage costs are spread across the different grains and enterprises. During storage, traders incur various costs including direct costs such as the cost of pesticides, rental costs, storage losses and the opportunity cost of capital. Save the high opportunity cost of capital, other costs are relatively small. For example, storage losses in case of rice were on average 0.44% of the grain stored in a period of about 38 days. These findings are consistent with reports from other studies (Delgado et al., 2017; Minten et al., 2016) in developing countries.

We acknowledge underestimation of costs due to lack of data on some unobserved trader costs such as opportunity cost of capital, time and risks such as quality deterioration in case the crop is not properly dried. Other risks such as theft and price shocks may be very small as they were not reported by the traders. Theft is not a big threat as most traders stay at the storage facilities and transportation risks for local traders are minimal considering a very short distance (25.7km) they move. Price shocks are not expected because traders store produce for short periods. We also note the difficulty in accessing true information from traders due to suspicion that they will be required to pay higher taxes. The other challenge is that most traders are involved in trade of different types of produce as well as selling other items, therefore it becomes difficult to isolate costs specific to food crop marketing from costs related to other activities. In the following section we discuss factors affecting competition in food crop trade in the study area.

6.3 Why is there no competition between traders, bidding up prices after the harvest, and dissipate rents from arbitrage?

Barriers to trade competition

Although the food market is free entry and exit there seem to be some barriers to competition at different levels in the market chain, which could explain why farmers continue to receive low prices for their produce. Other than trade barriers, insufficient competition could also arise out of collusion among traders such that marginal changes in market entry cannot induce significant changes in competition (Bergquist, 2016). From our interviews with local traders an inquiry on why traders from neighbouring urban centres do not buy produce direct from farmers reveals two major barriers; limited information and high transaction costs. The traders outside the villages cannot easily identify the farmers since they operate as individuals. The non-local traders buy from their fellow traders or engage them as agents for procurement. In addition, farmers rely on traders for market information and this tends to establish personal relationships. There is therefore, an element of mistrust between farmers and traders who are not known to each other. Most, farmers are not willing to engage in direct transactions with strangers because of fear that they may not get a fair price. As alluded to by Mitra et al. (2016) such a situation becomes a barrier to competition and farmers may be exploited by local traders.

High transaction costs are caused by various factors, but mainly poor infrastructure and individual marketing. The area is characterised by a poor road network which makes it difficult and costly for traders to access the villages especially during the rainy season. Such conditions may discourage potential traders from outside the district. Poor roads not only increase transportation costs but also uncertainty about market prices and other transaction costs hence may significantly reduce producer shares (Cirera and Arndt 2008). Some remote areas have poor access to telephone networks which limits communication such that traders can only access the villages physically and this increases search costs especially for the non-local traders. Furthermore, poor storage infrastructure and other associated costs equally constrain traders from taking temporal arbitrage opportunities. We observed that traders lack proper storage facilities. The traders interviewed store the produce in their small shops which contain other items. This limits the quantity they purchase at a given time.

In absence of collective marketing by farmers, the low production levels of smallholders contribute to high transaction costs. Small quantities of output discourage potential traders to buy directly from farmers as it implies high search and transportation costs. While local traders make use of personal networks as well as get deliveries by the farmers, it becomes costly for non-local traders to acquire information about farmers' location, what and how much produce they sell. Consequently, the number of actors in the market chain increase as small local traders take advantage of assembling the small volumes for the large traders from regional markets in big towns. These conditions thus create an environment where the price margin becomes wide.

Despite efforts by government and NGOs to revive cooperatives and support farmer groups under the hypothesis that farmers bulk their produce to increase their bargaining

power (Bernard et al., 2008), we find that farmers continue to sell as individuals, a fact that may compromise their market selling prices. Consistent with Latynskiy and Berger (2016) our findings reveal that even farmers who belong to a marketing group prefer individual marketing through middle men and traders. They claim that traders can be easily accessed because they find them on the farm and that traders, in contrast to the farmer group, pay with cash on the spot (which enables farmers to manage liquidity constraints). While individual marketing may be convenient for farmers, in such circumstance farmers may be subjected to price discrimination as the trader negotiates the price with each farmer individually. Collective bargaining for example in farmer groups could reduce the number of middle men hence increase the farmers' share of the consumer price (Gruère et al., 2009). For instance, in Kenya female farmers who participate in groups, bulk their harvest and sell directly to the large trader, obtain higher prices for millet (Handschuch and Wollni, 2015). Moreover, lack of social capital and high-level organization to strengthen internal and external relations with farmer groups and market chain actors equally influence individual marketing behaviour which in turn affect farmers' sales prices (Fafchamps and Minten, 2001; Kaganzi et al., 2009)

Limited credit availability is another barrier to grain trade competition. The traders interviewed assert that due to limited access to credit and high cost of capital, they operate with low capital such that they are not able to make large purchases in advance of sales. Lack of; start-up working capital required for financing grain trade (purchasing and transporting grain), storage facilities and risks equally present substantial trade barriers for most potential entrants in the rural areas. The higher the fixed costs, the fewer traders the market will support, and the more likely farmers will receive a low price for their produce. Moreover, we do find that some poor households tend to sell to specific traders who offer them credit either in form of inputs and or food. Such households sell their produce at a fixed forward price to some local traders who offer them loans. The traders say they keep monitoring their clients' rice gardens to recover the loan as soon as they harvest. We cannot rule out effects of personalized relationship between farmers and traders as well as 'indirect monopoly power' by some local traders. Similar findings have been observed in other countries such as India (Minten et al., 2011).

CONCLUSIONS

This study investigates the role of informal credit market and traders in stabilizing seasonal food crop prices. We discuss the imperfections in the rural Uganda credit market and how it shapes farmers' food crop marketing behaviour. Given the significance of traders in the market chain, we analyse traders' costs and profit structure in the study area, and we try to understand the imperfections in the grain market and the barriers that limit competition between traders at the local level.

While farmers do borrow from informal credit sources (specifically community-based self-help savings and credit associations), the credit that can be extended via these channels is insufficient to enable farmers to benefit from intertemporal arbitrage opportunities. It essentially supplements income from production rather than facilitate storage. In fact, loan repayment is one reason why farmers sell at low prices immediately after harvest. This is attributed to very small savings and reliance on agriculture as the only source of income. We also find that most of the (very) poor are unable to access informal credit to smooth their consumption. Thus, poor farmers will continue to 'sell low and buy high'. Local traders provide a valuable marketing service to many smallholder households by assembling and buying their small quantities of produce some from remote hard to reach villages. However, price volatility is consistent with limited competition in grain trade at the local level. We have provided several reasons why grain markets could be characterised by lack of competition. High transaction costs associated with poor infrastructure and individual marketing, and limited access to credit seem to be the main barriers to competition which in turn maintain excess margins in the grain market. Evidence from other sources suggest there may be collusion among traders, helping them to secure a greater share of the rents. For a colluding coalition it makes sense to maintain a condition where food can be purchased low and sold high. It remains to be researched how such a coalition can be maintained. We speculate that the many barriers to entry in the trader sector posed by information asymmetries, transaction costs, low trust between farmers and traders, and capital scarcity, help to maintain the current situation.

The policy implications of these findings in terms of market production and food security are several. There is need to reduce the cost of credit and increase access to credit. This can be done by encouraging and supporting community-based self-help savings and credit associations to raise their portfolio so as to enable more farmers to borrow at the same time. Low cost credit can stimulate investment in non-farm enterprises which may increase household income as well as savings. Other initiatives include the organisation of small-scale farmers to form cooperatives, and the creation and support of farmer- managed warehouses to facilitate storage of agricultural commodities. The receipts then can serve as collateral for farmers to access credit. Existing farmers groups at village level can be supported to bulk and store their produce, enabling them to negotiate for a higher price. Moreover, bulking will reduce search costs and promote competition. Investing in infrastructure will lower transaction costs and promote competition. This will in return raise farm-gate food crop prices. The relative effectiveness of these various options should be analysed in the future.

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SCIENTIFIC PAPER

FREE TRADE AGREEMENT: IMPACTS ON THE COSTA RICAN DAIRY MARKET

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Abstract: *According to the Free Trade Agreement with Central America, Dominican Republic and United States signed in 2008, milk import tariff reliefs will stagger down from 59,4% to 0% by 2025. This study determined milk demand and supply curves in the Costa Rican domestic market. Several variables and two different models were conducted to estimate milk demand and supply: Ordinary Least Squares and Two Stages Least Square simultaneous equations. In both cases, demand was estimated by income and milk prices as independent variables; while supply was estimated by input and milk prices. Nonetheless, the best fit was obtained by TSLS model because it accounts for endogeneity among price and quantity. Based on this model, if domestic prices are supposed to decrease due to increasing quantities of imported lower-priced milk, then national demand would increase (9% average) and national production is expected to decrease (26% average). The gap between national milk demand and supply is expected to be filled by milk imported from United States; assuming 0% tariff, no transaction costs and constant share of exports within national production.*

Keywords: *Milk Market, Costa Rica, Free Trade Agreement*
(JEL Classification: *F1, Q17)*

Introduction

The agricultural sector in Costa Rica is the only one in which the country has had a historical positive balance of trade (Procomer, 2016), which has increasing since 2010. In 2008, Costa Rica signed the Free Trade Agreement with Central America, Dominican Republic and United States (DR-CAFTA); however, how the DR-CAFTA may affect the consumption and production patterns of national agricultural products is not clear, since there are no estimations on future economic changes of this free trade agreement.

Although fluid milk was included in the DR-CAFTA, the impact it would eventually have on the national market has not been estimated. Fluid milk used to have a 59.4% tariff and according to the DR-CAFTA`s conditions, this tariff would stagger down until its total elimination in 2025. Costa Rica has signed several free trade agreements with different countries, including Chile, China, Canada, Singapore, Panama, European Union and Mexico; however, this research is motivated exclusively by the tariff-rate reduction established by the DR-CAFTA, since United States (US) is among the largest dairy producer worldwide. The five largest milk producers in the base period are the European Union with a share in global production of 20%; India at 19%; the United States at 12%; and China and Pakistan, both at 5%.

The structure of Costa Rican dairy production is widely distributed among many small farmers; however, industrialization is more concentrated in few larger companies, especially by a farmers' cooperative, named Dos Pinos, which is the most important dairy company in the country with 85% of fluid milk market share and 63.9% of dairy products (Euromonitor, 2018) and 88% of retail sales value (Euromonitor, 2015). Production-wise, Costa Rica has a large proportion of small dairy farms since 48% of them are small (INEC, 2014) by national standards i.e. less than 15 cows (INEC, 2014). Therefore, tariff reliefs are expected to impact a large proportion of the small-scale farmers (Rodríguez and Montero, 2016).

The abovementioned cooperative, as well as other companies have a wide range of dairy products; yet, 70,9% of drinking milk products is fluid milk (Euromonitor, 2018). Regarding international market, Costa Rican exports have increased in the past years, especially to Central America; the value of exports increased from 2011 to 2015 in 45.6% (TICA, 2015); in which fluid milk represent 61% of exports (TICA, 2015).

In terms of competitiveness, while The Global Competitiveness Index ranked Costa Rica in the 52nd position from 140 countries, the United Sates is ranked in the 3rd position (World Economic Forum, 2016). Currently, the US dairy market is one of the strongest worldwide, exporting 6% of the World´s butter, 14% of cheese, and 26% skim milk powder (OECD/FAO, 2016). On the other hand, the strengthening of both the US Dollar and the Euro is expected to put pressure on the growth of exports of these regions, as

their competitiveness is threatened by their strong currencies (OECD/FAO, 2016).

The above-mentioned situation places Costa Rican dairy market in an uncertain position regarding dairy trade with US, since there are no previous studies and the results of the tariff relief for the local market are yet unknown. Since there are no estimates, our main goal is to contribute by providing a model which can explain demand and supply behaviour by analysing how the DR-CAFTA would affect the consumption and production of fluid milk within Costa Rican economy.

LITERATURE REVIEW

The following section describes the main methods used in agriculture and dairy production systems to model changes in demand and supply. Consequently, the following literature review includes similar research related to the agricultural sector, especially milk or dairy production but does not intend to be a comprehensive overview of modelling in agriculture. A summary of similar researched topics and their corresponding methods can be observed in table 1.

Modelling the diverse effects of agricultural trade has been heavily documented. Hinojosa-Ojeda et al. (1995) modelled trough a Computable General Equilibrium (CGE) how the potential costs and benefits of supply chain integration can be distributed among countries, sectors, and social classes for the North American Free Trade Agreement (NAFTA) between US, Mexico, Central America and the Caribbean. This model consists of 11 sectors, four social groups, and four sub-regions (plus the rest of the world), linked though trade, capital, and migration flows; main results are targeted towards policy strategies to convey in optimal outcomes for the region.

Shepherd (2006) used the Kalman Filter algorithm to estimate a structural time series model for cotton supply for 30 countries and 16 regions. This research focuses on the impact of different policy measures. Results demonstrated countries differ significantly in their supply responsiveness to world price changes and therefore parameters for analysis need to be adjusted correspondingly. Since variables need to be country-specific it may reduce cross-country comparability when dealing with a mixture of stationary and non-stationary models.

Regarding the dairy and milk market, Davis et al. (2009) used a trans-log demand system, a censored demand system and Almost Ideal Demand System (AIDS) model to analyse consumption of different fluid milk products. This research considered home consumption and preferences of whole milk, whole flavoured milk, reduced fat milk, flavoured reduced fat milk, buttermilk, canned milk, and all other fluid milk products. Main results demonstrated show how price and consumers' income are the main drivers of consumption. Hannan et al. (2010) used a variation of the AIDS model to determine the impacts of per capita total expenditure, food prices and demographic variables on household demand for dairy products in Bangladesh. The research collected data of 7440 households and analysed expenditures meat, eggs, milk, butter, ghee, cards, sweets and tea and coffee from which price and income elasticities were estimated.

Ramirez Jaspeado et al. (2010) used a Two-Stage Least Square (TSLS) model considering demand, supply, prices and imports to estimate the effects of the US-Mexican free trade agreement in the milk market. Variables used in this model were: milk quantity, price paid to milk producers, sorghum and alfalfa-bean prices (and their respective lags), industry price of milk, international powder milk price, real retail milk price, quantity demanded of milk, maximum milk price (retail), refreshment real average price, banana and bread prices. Changes in world market prices do not reflect on changes in the Mexican market because of protectionist policies in the dairy market. Protectionist policies are responsible for the lack of explanatory power of the variables in this case ($R^2=0.35$). On the other hand, during 1994-2005, results showed the free trade agreement had positive effects on milk production because of the reduction of agricultural input prices; these are sorghum and alfalfa prices, reducing the negative effect of low worldwide milk prices for Mexican dairy farmers. In regards of refreshment and milk crossed elasticities, an inelastic response of milk was obtained from changes in refreshment prices.

Regarding technical efficiency Zhu et al. (2012) analysed Dutch, German and Swedish farms between 1995 to 2004 and developed a trans-log model for determining efficiency of farm production. Independent variables used were: subsidies, farm size, degree of specialization regarding milk production, family labour, rented land, long and short- term debt and time trend. Results suggest that the motivation of farmers to work efficiently is lower when they depend to a higher degree on subsidies as a source of income. Results indicate that the composition of subsidies have a much smaller effect on efficiency than the composition of total farm income does. Subsidies were one of the main aspects evaluated in this research and although they are not part of Costa Rican agriculture, the effects these may have in the behaviour of European farmers can affect the milk market in smaller countries.

Considering the incorporation of environmental variables into sustainable development, Mukherjee et al. (2012) adopted panel data of a Stochastic Production Frontier (SPF) to measure technical efficiency. Variables used in the model were: milk sold by farm, number of dairy cows, feed use, full time equivalent workers, capital flow, time trends, technological changes and heat stress indexes.

The specific DR-CAFTA and milk sector was analysed by Huang and Durón-Benítez (2015). Cheese, fluid milk and powdered milk demand was estimated using the generalized least square (GLS). Elasticity estimates, showed that cheese was considered an inferior good in Costa Rica, also, demand was significantly affected by import prices of milk in El Salvador and by powdered milk in Costa Rica. Cheese and fluid milk were income and price inelastic in most countries. Also, cheese and fluid milk import prices were elastic, however powdered milk was inelastic. Substitution effects suggest that increases in imported fluid milk prices would increase the demand for powdered milk.

Muluwork-Atsbeha et al. (2016) analysed the price-modelling scheme of milk based on its components (protein, fat and lactose). In this case the modelling scheme used was symmetric normalized quadratic (SNQ) functional form under a quota regime. For this research, 261 farms were used from estimation from which 1127 observations were considered for 4.3 years. A model for milk component supply was estimated under a profit maximizing dairy farm assumption in a tradable quota regime. As expected, price incentives affect milk composition in the short run and component supplies respond accordingly to price changes. Results suggest policy must allow for flexibility to make sure dairy production can respond to changes in component demand.

Table 1. Summary of literature review on methods used in agricultural modelling

Author	Method(s) used	Topic
(Davis et al., 2009)	Translog demand system, censored demand system, AIDS	Milk and dairy products
(Ramirez Jaspeado et al. 2010)	Two stage least square method	Milk and dairy products + Free Trade Agreement
(Shepherd 2006) (Muluwork-Atsbeha et al. 2016)	Structural time-series Theoretical model of component supply under tradable quota regime by the symmetric normalized quadratic (SNQ) functional form	Cotton Milk
(Huang and Durón-Benítez 2015)	A double-log model. Two types of demand: (a) domestic and (b) import, using generalized least squares (GLS).	Cheese and fluid milk in Central America
(Mukherjee et al. 2012)	Stochastic production frontier (SPF)	Milk production
(Hannan et al. 2010) .	A variation of the Almost Ideal Demand System (AIDS)	Dairy products in Bangladesh
(Hinojosa-Ojeda et al 1995)	Multi-regional CGE framework.	General perspectives on Free Trade Agreement on America
(Zhu et al. 2012)	Translog specification of the output distance function for a better representation of the technology than the Cobb-Douglas function	Dairy production

MATERIALS AND METHODS

Monthly data from January 2006 to December 2015 were used to estimate demand and supply curves by two methods: OLS and TSLS. Nonetheless, monthly milk production and consumption data are not available for Costa Rica; instead annual data were collected from Euromonitor and then transformed into monthly data. In order to do so, we collected monthly data from BID/OEA (1973) which are the only available monthly estimates for Costa Rica. Then we calculated the average monthly share in order to determine seasonal patterns within a year.

Once the proportion of milk produced each month was obtained, we assumed this behavior would remain steady along the whole period of time of our research. In order to estimate this, annual differentials were distributed by month (equation 1):

$$Dif = Cy_{t+1} - Cy_t \quad (1)$$

Where Cy=yearly milk volume

According to BID/OEA`s (1973) data, a proportional monthly production was estimated and assumed to be steady trough time. This procedure was conducted using equation 2:

$$C_m = \frac{Cy}{12} + Dif * \% \quad (2)$$

Where % stands for proportion of milk produced each month (estimated). Finally, our milk volume was obtained by a seven-month moving average in order smooth our increasing trend. Simple demand and supply OLS models

DEMAND

Several variables were tested to estimate demand: on a general perspective, demand is dependent on prices, income, and related products. We tested different variables as complimentary and substitute products, including coffee, tea and fruit juices. None of these were significant at 5% level, even though several functional forms and structures were tested.

Milk prices were obtained from national retail prices. On the other hand, as a proxy of income, the monthly index of economic activity (IMAE) was used; which estimates the relative monthly change in the volume of production of various industries (BCCR, 2018). The demand model was specified in equation 3:

$$Q = \partial P_{mt-1} + I + \partial Q_{t-1} \quad (3)$$

Where:

Q=7-month moving average of milk production

∂P_{mt-1} = Log *of* lagged milk prices

I=Monthly economic activity index (as proxy for income)

∂Q_{t-1} =*Lag of Q*

SUPPLY

In order to estimate supply, milk prices were used, as well as input prices since one of the most important variables for estimating supply is input prices. In this case, feed corresponds to 49.9% of total milk production costs according to The Costa Rican Milk Chamber`s estimation (2013-2014). We have included the following inputs which stand for our input index (equation 4). Weights were given according to animal feed needs adapted for the Costa Rican dairy sector (Sánchez, 2014).

p_s= Sugar prices as a proxy for molasses: 3%

p_v= VAPFEED prices: 50%

p_z= International maize prices: 46%

p_u=International urea prices: 0.07%

Therefore:

$$n_i=0.03 * p_s+0.5 p_v+ 0.46 p_z+0.07 p_u \quad (4)$$

Sugar, maize and urea prices were obtained from Index Mundi data sets and VAPFEED prices were obtained from the Costa Rican Milk Chamber. This index was tested, however we decided to include only maize international prices as our variable for input prices. Other variables such as technology and transportation costs were tested but were not significant. Equation (5) depicts our supply function.

$$Q = \partial P_{mt-1} + \partial Pa \quad (5)$$

Where:

Q = *7 – month moving average of milk production*

∂P_{mt-1} = *Log of lagged milk prices*

∂Pa = *Log of lagged milk prices*

SIMULTANEOUS EQUATIONS

Simultaneous equations were considered for analysis due to the existence of reciprocal relationships between economics variables, such as price and quantity that determine demand and supply. This kind of model uses endogenous and instrument variables. In this case, we followed two stages least square (TSLS) methodology in which price and quantity are both endogenous variables and on the other hand, IMAE and international maize price were considered instruments, which main function is to identify the slope of each curve. The following equation system depicts the functional form used to estimate demand and supply curves through TSLS.

$$Q= \partial P_{mt}+\partial I+\varepsilon \quad (6)$$

$$Q= \partial P_{mt}+\partial P_{ma}+\varepsilon \quad (7)$$

Where:

Q=7-month moving average of milk production

∂P_{mt} = *Log of milk price*

∂I = *Log of IMAE index*

∂Pma = *Log of international maize price*

ε = *Error term*

As can be observed, equation (6), uses the price of milk as endogenous predictor and IMAE as an independent variable and instrument. Similarly, equation (7), takes into account price as endogenous variable but international maize price as an instrument.

RESUTLS AND DISCUSSION

Simple demand and supply OLS models

Demand

Several functional forms were tested and the following model provided the best fit for our data. According to Akaike´s criterion (-1285, 184) with a R^2=0.998 and 119 observations, results from our demand function can be observed in table 2.

Table 2. Costa Rican milk demand function from OLS 2006:2015.

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	sig
const	0.449508	0.0117642	38.21	<0.0001	***
∂P_{mt-1}	–0.00877386	0.000997512	–8.796	<0.0001	***
∂Q_{t-1}	0.162915	0.00336876	48.36	<0.0001	***
I	0.000105145	6.02653e-05	1.745	0.0837	*

Tests for autocorrelation and heteroscedasticity were run. Although several tests and remedy procedures were conducted, this model provides the overall best fit in spite of having autocorrelation (12 order with p-value=P(F(12, 103) > 24.8439) = 3.66618e-25) and heteroscedasticity problems (Breusch-Pagan p-value P(Chi-square(3) > 10.3452) = 0.015848).

Prices show an inverse relationship with consumption and income a direct positive relationship which is expected from a demand function. On the other hand, lagged quantities are the most important variable for demand estimation.

SUPPLY

As well as in the demand estimation, several functional forms were tested and the following model provided the best fit for our data, according to Akaike´s criterion (445.6528.) with a R^2 = 0.944 and 119 observations. This model was run

and then corrected by heteroscedasticity, results are depicted in table 3, however, this model presents autocorrelation which could not be corrected.

Table 3. Costa Rican milk supply function from OLS 2006:2015.

	Coefficient	Std. Error	t-ratio	p-value	sig
const	0.264964	0.0165581	16.00	<0.0001	***
∂P_{mt-1}	0.0910224	0.00448749	20.28	<0.0001	***
∂Pa	–0.0177310	0.00292628	–6.059	<0.0001	***

Input prices depict a negative relation with milk quantity which is expected by the model´s structure; higher input prices mean less production. On the contrary, milk prices show a positive relationship.

Simultaneous Equations

Regarding demand estimation, all three parameters considered in this model show high significant values, with a $R^2 = 0.93$. This model shows an Akaike criterion of -507.2143; which is the lowest value among all others functional forms tested. Table 4 shows the result for the demand function.

Table 4. Costa Rican milk demand function from TSLS 2006:2015

	Coefficient	Std. Error	p-value	sig
Const	-1.3679	0.1195	<0.0001	***
∂P_{mt}	-0.0405	0.0106	<0.0001	***
∂I	0.3309	0.0259	<0.0001	***

As expected, the parameter of milk prices shows a negative sign, in this sense, higher milk prices imply less quantity demanded. On the other hand, the IMAE´s sign is positive, result which is in line with economic theory.

Regarding supply curve, table 4 shows that retail prices have a positive sign and international maize prices exhibit a negative sign, which is aligned with economic theory since maize is considered the main input for milk production; positive changes in international maize price will shift supply curve to the left and vice versa. In this case the predicted model shows a R2 = 0.80 and an Akaike criterion of -507,2143. Coefficient values as wells as p-values for each independent variable can be observed in table 5.

Table 5. Costa Rican milk supply function from TSLS 2006:2015

	Coefficient	Std. Error	p-value	sig
Const	0.3444	0.0239	<0.0001	***
∂P_{mt}	0.1206	0.0006	<0.0001	***
∂Pa	-0.0321	0.0044	<0.0001	***

Next, we have divided our results in two sections. The first one considers a comparison between the results showed by standard OLS and TSLS. The second one exhibits the effect on volume due to changes in prices, considering Costa Rican current milk prices and US national prices as proxy for imported milk prices.

In order to start the comparison between OLS and TSLS, table 6, summarizes the coefficient results of OLS and TSLS.

Table 6. OLS and TSLS demand coefficient comparison

	Coefficient OLS	Coefficient TSLS
const	0.4495	-1.3679
∂P_{mt-1}	–0.0088	
∂P_{mt}		-0.0405
∂Q_{t-1}	0.1629	
I	0.0001	0.3309 (∂I)

Regarding price coefficients, the TSLS price coefficient is 4.66 times the OLS´s. In the case of the last one, a lagged price, as well as a lagged quantity is used in order to partially avoid autocorrelation. However, this did not solve autocorrelation and consequently a sub estimated coefficient was obtained. In this sense, TSLS´s coefficients take into account the endogeneity problem, therefore, more reliable coefficients are obtained using this method. Similarly, the IMAE´s coefficient depict a big difference among methodologies; as mentioned before, due autocorrelation problems in OLS, TSLS coefficient represents a trustful result. According to our model if milk prices increase by 1% quantity demanded is going to decrease by 0,04 units on average. In the case of IMAE´s variations, demand is going to increase in 0,33 units if IMAE increases by 1%.

Regarding the supply curve, similar coefficients were obtained by OLS and TSLS, however, as in the case of the demand model, the supply equation obtained by OLS exhibits autocorrelation problems. In this sense TSLS coefficient are taken into account in order to understand how supply is going to behave against changes of milk price or international maize price. Table 7 shows the OLS and TSLS supply coefficients.

Table 7. OLS and TSLS supply coefficient comparison

	Coefficient OLS	Coefficient TSLS
const	0.264964	0.3444
∂P_{mt-1}	0.0910224	
∂P_{mt}		0.1206
∂Pa	–0.0177310	-0.0321

In this case, if the price of milk increases by 1%, the quantity supplied will increase in 0,12 units on average. Regarding the instrumental variable, international maize price, if there is an increase of 1% on maize prices, supply is going to fall by 0,03 units on average, which means that the supply curve is going to move leftward.

Although in the rest of Central America, demand exceeds supply (Huang and Durón-Benítez, 2015) in Costa Rica supply exceeds demand; import tariff reliefs for the country are

expected to change market opportunities for actors along the supply chain, not only local but international trade partners who could benefit from easier access. On the other hand, since prices are expected to decrease, local consumers may access lower prices and national production would be expected to adjust to lower prices.

When comparing national milk retail prices, the US milk retail price for 2017 was $3.156/gallon which is equivalent to $0.833/liter while the Costa Rican milk retail price for 2017 was $1.33 which is almost 60% higher. Then demand and supply equations were estimated under two scenarios:

- Assuming national prices remained the same for 2017, i.e no decrease in Cosa Rican prices due to the free trade agreement.
- Assuming the free trade agreement and tariff reduction will cause Costa Rican market to lower national prices to meet at least US national retail prices.

If national milk prices remain at $1.33/liter, ceteris paribus, demand would be determined by equation (8):

$$Q_D = -1.3679 - 0.0405 * \ln(1.33) + 0.3309 * \ln(119.59) \quad (8)$$

$$Q_D = 0.2036$$

Nonetheless, if prices were to be reduced to meet U.S milk prices, then demand would be determined by equation (9):

$$Q_D = -1.3679 - 0.0405 * \ln(0.833) + 0.3309 * \ln(119.59) \quad (9)$$

$$Q_D = 0.2225$$

On the other hand, if national milk prices remain at $1.33/liter, ceteris paribus, supply would be determined by equation (10):

$$Q_S = 0.3444 + 0.1206 * \ln(1.33) - 0.0321 * \ln(1.33) \quad (10)$$

$$Q_S = 0.2182$$

Nonetheless, if prices were to be reduced to meet U.S milk prices, then supply would be determined by equation (11):

$$Q_S = 0.3444 + 0.1206 * \ln(0.833) - 0.0321 * \ln(1.33) \quad (11)$$

$$Q_S = 0.1617$$

If prices were to decrease to meet US national prices, demand would increase 9% while supply would decrease 26%, meaning two main aspects:

- Price decreases disincentives milk farmers to produce. In this case, if the Costa Rican milk supply chain structure remains the same, a proportion of farmers would need to search for new alternatives, especially the smaller ones which are more dependent on prices (Rodriguez and Montero 2016). In this scenario, the proportion of milk supply would be covered by milk dairy products imports which can compete at lower prices. In this sense, the supply chain structure can change and shift towards larger farmers who can compete at lower prices; therefore, the proportion of larger farmers would increase and can potentially compete with cheaper dairy products imported.
- Price decreases would increase demand, this result is expected and is aligned with Huang and Durón-Benítez (2015), who estimated price elasticity in Costa Rica for fluid milk imports (-1.428), meaning price decreases would increase imported milk consumption. Our demand curve estimation is specific for the Costa Rican market and therefore corresponds to national retail prices. We have also estimated the demand function according to US prices, assuming these would be the benchmark for imported milk, lowering national average prices.

If milk prices decrease, then demand will increase but national farmers are expected to produce less according to economic theory and empirically tested by our results. The abovementioned situation means there would be an increasing gap between national demand and supply.

This study corresponds to a first approach in order to have a better understanding on the impact of the DR-CAFTA would have on the Costa Rican economy. Since this is a first approach within the national context, we faced important limitations regarding data availability such as the lack of monthly prices for complementary and substitutes milk products as well as monthly production and consumption patterns; however, our fitted models show coefficients of determination above 0.8.

Costa Rican supply and demand equations for fluid milk were estimated using OLS and TSLS. There is a clear difference between the obtained OLS and TSLS coefficient values, in which the first ones are usually sub estimated. Due to the lack of monthly production data, we transformed annual series into monthly ones, through the implementation of trend and seasonal index. This procedure caused autocorrelation problems which were not possible to fix, however all coefficients sings are aligned with economic theory. If, domestic prices are supposed to decrease due to increasing quantities of imported lower-priced milk, then national demand would increase (9% average) and national production is expected to decrease (26% average); gap which is supposed to be filled by USAs´ milk imports. These results hold for 2017 data, assuming 0% tariff, no transaction costs and constant share of exports within national production.

Further research is needed on a micro level to understand the behavior of different actors along the milk supply chain since our results are useful on a macro level but not on understanding farmers´ reaction towards the DR-CAFTA; we have only included an analysis based on milk prices changes. However, even if prices are certainly one of the most important variables in most industries, there are other factors which should be analyzed such as capital, labor and wages, transaction costs, land use and structural changes of the supply chain.

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SCIENTIFIC PAPER

INTEGRATION EFFORTS IN AGRICULTURE IN HUNGARY AFTER THE REGIME CHANGE

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Abstract: *: The economic and political transition brought many challenges for the Hungarian agricultural sector. The break-up of large agricultural holdings had serious negative impacts on food production and on the export of agricultural products. Capital intensive profit-seeking intermediaries dominate the trading of agricultural goods that has injurious effects in terms of downward pressure on production prices and an increase in consumer prices. Cooperatives have a key role in effectively tackling the common challenges that small-scale producers have to face. More vertical integration along the food chain could contribute to providing rural employment and to an increase in living standards in rural areas. This study reviews the development, the specific features and the driving forces of modern cooperatives in Central Europe in general, and in Hungary in particular. The focus is on the integrator role of cooperatives and their future role in our globalised world.*

Keywords: *Cooperatives, Hungary, Integrators, Producer Organisations, Transition*
(JEL Classification: *Q10, Q13)*

Introduction

One of the unintended effects of the regime change (i.e. the process of the economic and political transition) was the fragmentation of land ownership, land use and production in Hungary. As a result of the privatisation process and the land reform in the early 1990s, the number of large-scale farms declined significantly and a highly fragmented land ownership structure characterised by small parcels and plots emerged in Hungary. Unlike large agricultural holdings, these small private farms could not participate in large-scale commercial production. To gain access to markets, it became necessary that at least processing should be concentrated. Processes related to the transition have revalorised the role of cooperatives, greater prominence was given to voluntary cooperation more importantly in the more labour-intensive fruit and vegetable sectors.

COOPERATIVE GONDOLA AND TRADITION IN HUNGARY

The widespread and diverse cooperative movement began as early as in the 19th century in Western Europe. The importance of cooperatives was different in different countries in Europe, however, cooperatives were founded to meet the needs of producers. Agricultural cooperatives play a crucial role in a country's economy and they generate income and rural employment. There are two main types of co-operatives: the entrepreneur co-operatives and the co-operatives that enable farmers to exercise countervailing power.

Basic values of cooperatives such as self-initiative, responsibility for social and economic well-being, justice and solidarity have always been unquestionable. Cooperatives are also active in the fields of production, transit, storage, trade, services, etc. However, there are some areas of activity, such as agriculture, where their presence is even more reasonable (Botos & Schlett, 2010). Cooperatives that were established in the second half of the 19th century had two main objectives: an economic one (to offer material advantages to their members) and a social one (to promote social progress in them).

The Rochdale principles - ideals that were established by the Rochdale Society of Equitable Pioneers in 1844 and that are the basis for the cooperative principles even today - are as follows: open membership, democratic control, reimbursement proportionate to contribution, payment of limited interest on capital (dividend), political and religious neutrality, cash trading and promotion of education in cooperatives. These principles were adapted to the changing socio-economic circumstances several times, but the core idea has remained unchanged throughout the years.

The Congress of the International Cooperative Alliance made the principle of religious neutrality optional in 1934, and later congresses made the same decision with regard to cash trading and religious neutrality. In 1966 two additional

principles were set out: the obligation of transnational cooperation and the establishment of joint services (Csendes, 2004).

In 1995, the Congress of the International Cooperative Alliance (ICA) has defined the cooperative principles: Voluntary and Open Membership, Democratic Member Control, Member Economic Participation, Autonomy and Independence, Education, Training and Information, Co-operation among Co-operatives and Concern for Community. In 2002, the International Labour Organization (ILO) stated that "the promotion of cooperatives guided by the values and principles ... „should be considered as one of the pillars of national and international economic and social development" ... The European Commission, in 2004, found that the modernisation of the legal environment concerning cooperatives inevitable (Simko & Tarjanyi, 2011).

The history of the Hungarian cooperative movement can be traced back to the year of 1845, one year after the foundation of the Rochdale Cooperative. The first cooperatives in Hungary were established mainly in the credit and dairy sectors (Schilthuis & Bekkum, 2000). The commercial code which took effect in 1875 was the first code that regulated the cooperatives' commercial activity, and the term 'cooperative' appeared for the first time. Later, in 1898, the activity of economic and industrial credit unions was regulated. These laws were only subject to modification in 1920, when the general cooperative law entered into force and remained in force until the dawn of World War II.

Károly Ihrig, key author of the literature on cooperatives, believes that the economic advantages of cooperatives stem from the fact that they offer a higher level of organisation to small and weak actors, while through disintermediation they also save some extra costs to their members. Cooperatives are able to evaluate needs of both supply and demand, as well as to organise and adapt the production process to their specific needs. Their social significance stems from fostering the economic success of their members and, through this, promote their social and material progress by concentrating disperse energies (Ihrig, 1937).

Trade plays an important role in cooperatives as consumer goods get involved in trade on several occasions before reaching their consumer. Different products entail a different composition of costs (remuneration and salary, office management costs, taxes and other charges, interest of capital in stocks, etc.), and how these costs relate to the retail price also varies in each case. As to farmers, important trade-related costs and price changes can have particularly negative effects on them. Farmers of different size classes buy and sell their products and consumer goods at different prices. Bigger farmers are in a more advantageous situation than smaller ones, since they dispose of bigger volumes which offer them the chance of disintermediation, and thus find themselves in the position of appropriating a bigger share of the sales price than small producers. Two main factors can thus decrease the profitability of small farms: small farmers sell their products considerably below the wholesale price, while they also purchase production assets above wholesale prices. Besides agricultural disparity, the profitability of small farms is further decreased by the fact that retail prices exceed/fall behind wholesale prices. When considering agricultural disparity, the wholesale price index for agricultural goods has to be recalculated by taking cheaper buying and more expensive selling prices into consideration. Difficulties stemming from agricultural disparity are further compounded by a trade disadvantage the harmful effect of which can be minimised through the strengthening of the cooperative movement (Schlett A. , 2009).

The most significant cooperative in Hungary, Hangya (Ant in English), was founded in 1889 with the main objective of tackling the negative effects of dumped wheat and corn imports on price change and of protecting the country from the plague of usurious trade. Speculators often withdrew their products from the market causing shortage before putting them back onto the market at usurer's price. The number of Hangya cooperative members has reached 700,000 by 1940, and has included 30 canneries and 400 shops as well (Hangya , 1923).

After the Second World War, following the takeover of the communist regime, Hungarian agriculture set a new course. After a sustained period of collectivisation (1948-1956), by the early 1960s the communist regime forced peasants to join collective farms and large, state owned farms. In the era of communism forcing farmers into Stalinist, soviet type of cooperatives ('kolkhozization'), which had nothing to do with earlier types of cooperatives, resulted in the fact that after the regime change in 1989 the most popular political slogan has become: 'Down with cooperatives!'

CHANGES IN HUNGARIAN AGRICULTURE AFTER THE POLITICAL AND ECONOMIC TRANSFORMATION

In the transition period, Hungarian agriculture changed radically. Its ownership structure, farm structure and even its production structure was transformed. As a result of these changes, production decreased by one third and employment in agriculture decreased drastically (Takács, 2008).

Processes related to the transition have revalorised the role of cooperatives. As a result of the Land Compensation Act a dualistic farm structure has emerged which had a negative impact on efficiency and competitiveness (Cseszka & Schlett, 2009). Individual farms accounting for the vast majority (99.1%) of all farms own no more than 40% of all the land. While the average farm size for agricultural enterprise is 504 hectares, the same figure for individual farms is barely above 3 hectares (3.3). If we focus onto individual farms' size, 72% of them own less than 1 hectare or no land at all (farmers involved in animal husbandry or providing services). In addition, if one takes all the individual farms under 5 hectares into consideration, one will find that 90% of individual farmers dispose of no more than 5 hectares of land (Lentner, 2010).

During the first decade of the transition two third of the food industry, and the entirety of some other sectors, were

acquired by foreign companies. 90% of food trade is under the control of a small bunch of multinational companies. Very often foreign investment inflows entailed the closure of factories, which helped food processing companies to acquire new markets and offered the opportunity for them to gain superprofit. Companies that were acquired by international companies entered into a greater regional system of product development and specialization (vegetable oil, pasta and confectionary production) (Schlett, 2014).

The rapid transformation of Hungary's commercial network starting in the 1990s also included the quick spread of foreign hyper and supermarkets (Árva, Katona, & Schlett, 2013). Concentration and vertical integration keeps strengthening retailers' bargaining power when negotiating with agricultural suppliers. The abundance of producers with no dominant position on a given market poses the risk of some retailers gaining monopsony power. Small agricultural producers depend more and more on collectors. Very often collectors tie producers to themselves opening up doors for the abuse of a dominant (customer) position. Cultivation contracts often offer unilateral advantages to well-capitalised collectors.

Concentration and vertical integration can strengthen the bargaining power of retailers against agricultural producers as well. If many producers are present in a market, retailers might enjoy some degree of monopsonic power (Seres, 2006). Information asymmetry between retailers and suppliers strengthen the bargaining power of retailers: retail chains have information about the market conditions, buying habits of customers, due to having direct contact with customers. Barcodes enable retailers to store data about consumer preferences, habits and behaviours and this information can be used against the competing suppliers which may have distorting effects on the retail market. Retailers have information about the economic situation of the suppliers as well. Suppliers, on the other hand, have information only about the marketing plans of their own products therefore, due to the information asymmetry they have less bargaining power (Balto, 1999).

In the case of agricultural products price is determined not only by supply and demand but by the linking of buyers and sellers on the market as well. Agricultural producers are usually price takers rather than price setters. Their prices are determined by the demand for their products. Producers (small-scale farmers) have access to fewer alternative large buyers and therefore they have less bargaining power. Small-scale producers often do not have access to working capital, and it is not unusual that they have to buy even the seeds and propagating material from the purchasers. Contracts (often at predetermined prices) can ensure a stable income and make a direct contribution to the producer's annual household income. Long-term contracts, however, reduce the financial uncertainty and small-scale producers can gain a reliable flow of income.

As a result of concentration and integration, agricultural producers become more dependent on food processing and food retailing companies. Most agricultural auction-type, perfectly competitive markets are replaced by vertical control through the use of long-term production and marketing contracts. Small-scale producers become strongly dependent on purchasers who exercise their dominant buyer power over the producers. Contracts may also be a device to consolidate the buyers' market power that may result in the hold-up problem (e.g. excessively long delays in payment for the delivered product, the producer is forced to accept disadvantageous terms later or ex post renegotiations of terms).

In addition to the traditional role of retailers as purchasers, retailers today have had a new role as they have advance information about the markets, in-depth knowledge of their customer base and they have acquired increasing market power (Consumers International Report). Branded goods are increasingly replaced by own-brand (private label) products. Compared to Western European countries, in Hungary the share of own-brand products in the daily consumption of households is relatively low, however, it is increasing significantly (Fertő, G. - Szabó, G. G., 2002).

On the basis of consumer needs and preferences, retailers explore the market and select a potential supplier that is able to produce and supply the goods efficiently at low prices. Suppliers of own-brand products often team up with retailers to design, develop and market-test new own-brand products (Guba, 2001). Own brands make retailers serious competitors to branded good suppliers and shift the market power to retailers. An imbalance of bargaining power between retailers and their suppliers may foster abusive buying practices, claim suppliers (e.g. slotting fees, late payments for products already delivered, squeezing out branded goods, etc.). As the profitability of smaller suppliers is decreasing, the production of own-brands or specialisation may increase their market power. Suppliers may build their own production or manufacturing capacities and provide store brand products for themselves. If they have enough buying power, they might be able to negotiate a reduction in the retailer price. Own-brand prices are on average 20% to 30% cheaper than branded prices because of the absence of brand development, packaging, and marketing costs. Own-brand products often surpass the performance of manufacturer brands, but they are often inconsistent quality and do not always meet the required quality standards (Hoch, 1996). The rate of sales of own-brand products versus branded products are influenced by the allocation of shelf space and in-store promotions as well. Some forms of brand positioning - i.e. different messages can be vested with the own-brand goods ("Tesco Economical", "Tesco Value") - are important tools for image creation. Brands provide identification of their products with unique associations to the stores, therefore retailers can make higher gross profit margins on own brands.

THE EXPERIENCE LEARNED FROM PRODUCER ORGANISATIONS IN HUNGARY

It becomes now evident that a key contributor to productivity and effectiveness is the adaptation to market demands which includes a uniform, high quality production, an increased degree of processing and the access to consumers, i.e. the development and management of vertical coordination in agriculture (Németi, 2003).

The new ("western") types of cooperatives are collective forms of enterprises run by a family in which land and equipment are privately owned and the farms are owned and operated by the members and can produce enough for the family. The main aims of these cooperatives are to support individual members by providing various services and business advice, by pooling resources or by aggregating distribution, storage and purchases, while they have a limited liability, i.e. they do not take over the responsibility of the producers. The most important advantages of these types of cooperatives are to empower small producers in the supply chain (Hódi, 2007).

New types of cooperatives in Hungary are:

- producer organisations (TÉSZ in Hungarian)
- supply and marketing co-operatives (BÉSZ in Hungarian)
- production and sales cooperatives (TSZ in Hungarian).

Their basic principles are:

- voluntary and open membership,
- the one member – one vote principle that provides assistance for small producers and represent their interests,
- democratic member control,
- non-profit-making purposes.

The most important benefits and advantages of cooperation are:

- facilitating the drawing down of EU funds,
- reducing costs by pooling resources,
- reducing market risks,
- improving their bargaining or purchasing power,
- providing services at a price that is lower than the market price
- providing education and training,
- providing loans to members,
- increasing members' incomes that they might not otherwise be able to earn by themselves (Szabó, 2010).

In the first half of the 1990s, Hungarian producers regaining their independence did not want to hear about forming cooperatives. Besides this anti-cooperative mood, the lack of development resources also excluded this option. Cooperation always has to compete with investing into producers' own farms. However, individual farmers were finally convinced of the need for cooperation by their own experiences. The first significant attempts to form new cooperatives in Hungary were made in the middle of the 1990s. The number of new type cooperatives has reached 400 by the year 2000 having around a total of 10,000 members. Compared to the overall number of agricultural producers and in the light of cooperative practices in developed countries (where each producer is often a member of more than one cooperatives), this shows a low level of organisation. Despite the aids at their disposal, at the beginning (and very often in recent days as well) cooperatives proved to be unable to seize opportunities partly due to the lack of preparatory actions and control.

In cooperatives of a new type activities which can be efficiently organised on an individual basis (i.e. the production of raw materials) are subject to individual initiative and responsibility, while those for which this is not the case (such as the preparation of sales activities, market research, business advice, infrastructural investments, etc.) will be managed collectively. Cooperatives are organised around specific professional activities: cereal storage, animal husbandry (pigs, bovine, goats, sheep), milk production, poultry meat, fruit and vegetable production, viticulture and wine production, pet husbandry, production of herbs, etc.). Specialised cooperatives have been forming sector-specific associations.

Their weakness to attract capital is related to the dual nature of cooperatives. As far as capital is concerned, personal attachment is uncommon as it only is interested in achieving the highest possible rate of return. In order to fulfil growing capital needs, it has become necessary to revise the principle of 'one member, one vote'.

The compulsory application of this principle could have played a part in the slow erosion of cooperatives. International experiences show that in some branches of cooperatives in many countries, it is possible to regulate voting based on different principles, such as the nature of a member's business relations with the given cooperative or capital contribution. In some cases, each member's voting power has a ceiling. In other cases, the 'one member, one vote' principle is applied when laying down the statutes and electing board members, while in business decisions, different rules may apply. Besides successful cooperatives one can also refer to many failed attempts, especially when it comes to producer cooperatives. At least as many lessons can be learned from these failures than from successful attempts. The causes behind these failures can be as follows:

Lack of cooperative culture: Due to depressed prices, some producers try to sell their products on the free market, thus not fulfilling their obligations and undermining cooperation on the long run. Selling these products on the market simply makes a big part of the fund of commodities disappear. Due to state aid proportionate to credit and turnover, cooperatives are interested in generating high turnover without having the fund of commodities set in the contract at their disposal. This is the reason why some goods have to be imported or purchased on the free market. It was not uncommon that cooperatives were formed only to the purpose of being eligible for the state aid. Such cooperatives could not be efficient since they were formed without considering economic and social needs.

Lack or weakness of regulations: The maximum number of cooperatives per region was not regulated, and high turnover was made one of the payment conditions of state aid (this has also encouraged 'carousel fraud'). This situation can be held responsible for the excessive number of cooperatives in Hungary compared to the size of its markets, most of which

were interested in making fast profit rather than investing in long-term cooperation.

The high number of cooperatives results in a strong price competition, as big multinationals can deal with large quantities of goods every day, acquired below market prices. This brings cooperatives, normally interested in long-term cooperation, into a difficult situation. Depressed prices take their toll in cooperatives as a consequence of which their members are only offered sales prices below market levels.

Strict EU regulations – indebtedness: Substantial investments (cold stores, sorting and packaging machines, refrigerated trucks, etc.) have to be made in order to obtain a EURO GAP specification which allows for selling to chain stores. This is partly financed by credit.

Monopoly of large multinationals: As the market is dominated by supply, the above described situation is further aggravated by the lack of storage capacity, which makes farmers even more vulnerable. Only large multinationals can guarantee large quantity acquisitions, and this is why cooperatives are obliged to tolerate slotting fees, unfavourable payment deadlines, contractual penalties, etc. Multinationals tend to depress prices by making unverifiable quality complaints, and demand contractual penalties for insufficient quality or quantities.

COOPERATION AS A KEY TO SUCCESS

The cooperatives system can contribute to solving two major difficulties of the country. One of them is the low rate of employment, while the other is the limited ability of rural areas to attract workers. Farmers who normally would not survive individually can increase their competitiveness through cooperating with each other, and can thus prevent further concentration of properties and the decrease in employment possibilities. A first step would be to improve acquiring and selling cooperatives. Through the expansion of their services, these improving cooperatives could offer new jobs on the long run. Creating credit unions could help cooperatives in different agricultural sectors to make improvements. This all could even entail the rebirth of the processing industry, as it would increase the added value and shorten the distribution chain, making Hungarian food products competitive on the global market. In recent years, some promising initiatives have proved that, even at an early stage, cooperatives have business potentials. The beneficial effect of cooperation is self-evident, but stakeholders' interest in forming cooperatives can be further increased, as voluntary cooperation is a key to competitiveness on the global market. This would be all the more vital that, in the short run, agriculture in Hungary will be facing challenges such as the possible ceasing of the agricultural support in 2020.

Cooperation can be an effective response to these challenges. However, the integration of cooperatives can only bring success if they can also efficiently deal with acquisition, storage, transport, packaging, processing, distribution and exportation as well. This also requires warehouses, processing plants, logistics centres, etc. Even if cooperatives dispose of the required means and resources, it is hard to compete with large multinationals, to improve distribution performance and to sustain their level of competitiveness. This is why improving possibilities and finding and disseminating solutions and techniques of cooperation, which could integrate local communities into the network of cooperatives, are of utmost importance.

CONCLUSION

Family farms have large potential benefits in the cultivation of labour-intensive agricultural products, whereas the biggest advantage of large-scale farms is the better use of capital. Large-scale farms can make larger purchases while cooperatives offer small-scale farmers improved access to markets (Schlett, 2015).

In the food chain, the producers and the consumers have the weakest bargaining position and are most vulnerable since they do not have advance information and are not flexible. Retailers and food processors on the other hand have advance information, are often large, and flexible so that supply can match consumer needs quickly.

In Western Europe, most agricultural cooperatives are specialised and can improve the efficiency which is beneficial for each member of the cooperative. The cooperatives can provide a countervailing power to counteract monopolistic competitors, which can increase competition. Producers (farmers) gain big benefits from agricultural cooperatives as cooperatives can address the problems of small farm inefficiencies and have stronger bargaining power. In the agricultural market an efficient marketing system is vital – the competitiveness of cooperatives is ensured not only by the rate of sales of the products but by the efficiency of the institutions and loans facilities as well.

The future of cooperatives in Hungary will largely depend on the governments' intentions, state aids, effective cooperation between the members, credit facilities, acquiring a share in processing capacities in order to assert interest, as well as on harmonisation and cooperation with other agricultural cooperatives. Due to early difficulties that cooperatives of a new type had to face, developments requiring massive state subsidies and mistrust towards new cooperatives, it has become a widespread concern that companies, rather than cooperatives, should be favoured when it comes to agricultural production.

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SCIENTIFIC PAPER

SUBSIDIES ARE POTENTIAL SOURCES OF PROFITABLE MANAGEMENT – THEIR PAYMENT BETWEEN 2010 AND 2016

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Abstract: *: Based on the allocations and distributions of subsidies in the sheep sector in the previous years (2004-2009), the authors examined the sum of aids claimed and paid from 2010 to 2016 and their farm-size related changes. The following data were collected from the Agricultural and Rural Development Institute on payments under specific subsidy titles, classified by sheep and goat farm sizes: 0-50; 51-100, 101-200, 201-300 and also 0-100, 101-300, 301-500, 501-1000, 1001-5000 and above 5000. Data procession was carried out by the SPSS for Windows 22 program. The size and population of the examined sheep sector underwent visible changes during the studied years leading to a reduction rather than growth. Their analysis highlights that size distribution of sheep farms has changed significantly in recent years, combined with simultaneous modifications of their sheep stock sizes in production. Their conclusions suggest that effects of years and farm sizes in the sheep and goat sector have considerably modified the aid sums paid under different titles.*

Keywords: *Sheep Farmers, Goat Farmers, Farm Size Distribution, Subsidy Titles*
(JEL Classification: *H5, Q14)*

Introduction

Subsidies play an essential role in the daily life of sheep farms. Experience acquired in the last few years indicated that sheep farms merely received the minimum percentage of total gross subsidies.

The number of examinations on the distribution of subsidies according to specific farm sizes is somewhat limited.

Cehla and Kukovics (2010 A) carried out examinations on the distribution of subsidy payments in 2009 across the sheep and other sectors. Their results revealed that the Hungarian agricultural sector received directly 614 billion HUF and indirectly 45 438 774 758 HUF from subsidy payments equal to 7% of the amount allocated to sheep sector. The amount of normative ewe, ewe de minimis and supplementary ewe subsidies was 3 010 953 039 HUF, merely 0.4 % of the subsidy allocated by MVH (Department of Agriculture and Regional Development).

In the given year a total of 7095 sheep farms submitted applications for aid to the authority. 59% of the farms - 4177 farms - had 0-100 ewes. 28 % of sheep farms - 1967 farms - carried out farming activities with 101-200 ewes. As a whole, it can be concluded that more than 98% of sheep farms used fewer than 1000 ewes in their production and breeding activities.

The number of applications submitted leads to a shift of ratios in the case of farms with fewer than 1000 ewes. Given the number of subsidies claimed, farms with 501-1000 ewes were in the first place and claimed an allowance of 12.4 billion HUF. Farms with fewer than 300 and 100 ewes were ranked second and third. The weighted average of subsidy per application, by farm size, was 1.5 million HUF, whereas the amount of subsidy per farm was 6.4 million HUF. Farms in which the population of ewes was under 100 were granted a subsidy of 2.3 million HUF on average, whereas the sum per one application was 613 thousand HUF within the same category.

The same authors (Cehla - Kukovics, 2010 B) investigated subsidy payments in the first six years following Hungary's EU accession (2004-2009) and observed various tendencies.

Until 2007 the related period saw a growth of subsidy rates in the sheep sector (10.20%) within the total sum of aids that dropped back to 7.40% in 2009. The combined ratio of supplementary and "de minimis" ewe subsidies showed a similar tendency: they increased intensively (from 0.0 to 0.72%) until 2007, and then reduced to 0.45% in approximately two years.

The number of applications received was continuously growing in all farm size categories in the examined period.

With regard to the sum of subsidy payments, farms with 101-300 ewes were the biggest recipients of aid in 2004 - 2006 and 2007, while the sum of payments for farms in the smallest

category reached its peak in 2005. The amount of aid granted to farms with a flock of 0-100 ewes ranked second on the list in 2006 and 2007 and ranked only third in the following years. The amount of aid granted to farms with a flock of 501-1000 ewes ranked first from 2008 in the farm size categories, its "leading position" prevailed in 2009 and farms with 101-300 ewes ranked only second in these years.

The number of entitlements used by sheep farms was growing gradually in all farm size categories in the period of 2004-2009.

To conclude the examinations, the authors have come to the following conclusions:

- The ceiling of normative support has yet to be exploited, and this is unlikely to change substantially in the coming years;
- Direct payments in the sheep sector play their full role more or less, but they are not in themselves sufficient. Sheep farmers can maintain their farms only by using additional, indirectly claimed payments (e.g. area payments, agro-environmental management. etc.).
- The composition of payment entitlements reveals the high number of those farms where sheep production is not the single activity.
- Increasing farm sizes lead to the use of fewer payment entitlements by sheep farms. The underlying causes of the process include that the more concentrated a sheep farm is, the more intensively it can cap its sphere of activities.
- Area payment has a significant role among subsidies; its leading role is not 'jeopardized' by other payments in any payment schemes.
- Regarding the amount and percentage of subsidies, agro-environmental management ranks second in the sheep sector.
- Although the combined volume of these two subsidies was gradually decreasing (from 71% to 49.6%) in the examined years (2004-2009), their possible lack would 'smash' the sector entirely; a further substantial decrease would induce a nosedive (number of animals and farms) (not to mention its impact on society and the sustainability of the environment).

Kukovics (2014) In his study on the distribution of subsidy payments in 2013 came to similar conclusions. He highlighted one of the crucial facts, i.e. subsidy payments in the given year under the given title failed to reach the highest possible ratio in any entitlement categories.

Kukovics And Jávor (2017) Also, drew similar conclusions in their analysis on subsidy claims and payments in 2010-2016 in the sheep and goat sector, although entitlements available in 2015 and 2016 differed in many aspects from the ones used in the first six years of Hungary's EU membership.

At the current production and trade level, Hungarian farmers are heavily dependent on subsidies, and due to the single dominant market and main product, they have become vulnerable when buying-in takes place. The majority of farmers hold the view that only payments are reliable subsidies. Entitlements in calls merely represent possibilities, but not concrete payments.

The Hungarian sheep sector has witnessed a dual process recently. On the one hand, KSH (Central Statistical Office) data reveal that the number of ewes decreases, almost 50 thousand animals were eliminated from production in the past three years, and data in June 2017 suggested that the number of animals was only 812 thousand. (This number was lower by 22.000 animals a year earlier, on 1 June 2016.) On the other hand, the annual ENAR (Individual Identification and Registration System) data of the Hungarian Sheep and Goat Association indicates that the number of (more than one-year-old) females entitled to subsidies has been growing recently. Considerable growth in the number of registered sheep and goat farmers is peculiarly inherent in this change.

The following analysis will focus primarily on the analysis of subsidy payments for sheep (and goat) farmers in 2010-2016, but will also evaluate production data and changes in the number of animal populations. The particular reason for this is the fragmentation of animal populations over the past years and from 2015, but the real cause is the modification of entitlements from 2016 manifested in payments.

MATERIALS AND METHODS

Population numbers in KSH (Hungarian Central Statistical Office) database

A study to explore processes in the small ruminant sector requires the analysis of changes in the productive ewe population. The analysis needs the above data instead of the total number of livestock because it involves the total number of lambs (and rams) in the country surveyed at a given date. However, the number of ewes may constitute a realistic starting point in production. Accordingly, we collected sheep population related data from the KSH database and analyzed its changes in the period of 2010-2016 as of data on 1 December. We calculated the volume and ratio of annual and half-yearly changes.

Number of animal population and farms in ENAR database

Farm size data were collected and structured from the Periodic Report of the Association of Hungarian Sheep and Goat Breeders between 2010 and 2016 according to the following farm size categories:

1. above 0-100, 101-300, 301-500, 501-1000, 1001-5000 and 5.000
2. farms with 0-9, 10-20, 21-50, 51-100, 101-200, 201-300 animals.

The number of farms to be classified into certain farm size categories and the number of ewes in the registries of sheep farms in given size categories was calculated.

Payments by subsidy entitlements used for payment

In practice, the conditions of operations in two farms are always different, therefore our comparison could merely set

against payments of various subsidy entitlements for farms in equal size categories.

Moreover, our study had to comply with data management related legislation, so we agreed with officials in the Department of Agricultural and Rural Development (now Hungarian –Treasury, Department of Agricultural and Rural Development) on the collation of farm size based payment categories and the provision of these data for us. The study period ranged from 2010 to 2016. Data of payments by specific entitlements (the number of submitted claims for subsidies, the number of payments, the total amount of subsidies) were put into the following categories by farm size: farms with a population of 0-50, 51-100, 101-300, 301-500, 501-1000, 1001-5000 and above 5000.

Data collection by farm size comprises all the subsidy entitlements that enabled sheep and/or goat farmers to receive grants in the examined years. Consequently, our analysis is more comprehensive as if only resources for the direct support of sheep and/or goat farmers were studied.

This methodology, i.e. classification according to farm size, was in accordance with the one used by Cehla – Kukovics (2010), Kukovics (2014) and Kukovics – Jávor (2017) in their research with the exception that the current research paper also evaluated data related to farm categories with the animal population of 0-50 and 51-100 sheep or goats separately.

Methods of data processing

Data collection, procession and assessment were carried out by Microsoft Excel 20 and SPSS for Windows 22 programs. Annual distributions were calculated on the basis of the above data; however, the present study decides to defer the presentation of χ^2 test results in the framework of this paper. Instead, it focuses on the analysis of payment percentages in the given farm size categories.

The present study does not discuss the operating profitability analysis of farms in specific farm size categories and the roles of subsidies in the development of revenues for the given farm size categories.

RESULTS AND DISCUSSION

KSH data suggest that after some fluctuation, the number of sheep dropped markedly by the end of the studied period (Table 1.) The total number of sheep declined by more than one hundred thousand in two stages in 2010 and 2011 in comparison with 2009, and the rate of total loss exceeded 8.5%. With a view to the similar, prevailing gradual reduction in 2009, the total loss exceeded 9.6%. In the following two years (2012 and 2013) the number of livestock increased, although at a much slower pace and in total it almost approximated the level in 2009 (the rate of overall increase reached 8.1%). The increasing tendency was interrupted by a setback recorded in 2014, which was followed by a prolonged increase in 2015. 2016 saw another considerable (-4.1%) decline in the total number of sheep.

Table 1: Development of sheep and ewe stock in December

Years	Sheep			Out of which ewes		
	total	change compared to the previous year		total	change compared to previous year	
	thousand animals	thousand animals	%	thousand animals	thousand animals	%
2009	1 222.8	-13.0	-1.05	967.6	4.1	0.43
2010	1 180.5	-42.3	-3.46	844.3	-123.3	-12.74
2011	1 120.2	-60.2	-5.10	858.3	14.0	1.66
2012	1 185.1	64.8	5.78	864.7	6.4	0.75
2013	1 213.8	28.7	2.42	873.9	9.2	1.06
2014	1 185.0	-28.8	-2.37	855.2	-18.7	-2.14
2015	1 189.7	4.7	0.40	848.7	-6.5	-0.76
2016	1 140.6	-49.1	-4.13	800.8	-47.9	-9.88

Source: Authors' calculation based on KSH STADAT 6.4.1.21. 2017.

The total number of productive ewes showed merely slightly similar changes. The minor growth in 2011, 2012 and 2013 (+3.47%) was unable to compensate the plunge in 2010 (-12.74%). In the following years (2014 and 2015) a decreasing trend was the typical feature in the change of the number of ewes, whereas the rate of decline fell to about a third last year. 2016 experienced a significant plunge (-9.88%) repeatedly. As a result, almost 167 thousand ewes dropped out of production between the onset (2009) and the end of the examination (2016) from production (and from the register).

The results of half-yearly data analysis and its publication (Table 2.) show an interesting correlation. Whereas data for June in 2014-2016 indicate a downward trend followed by a visible growth in 2017, data for December show a gradual reduction in the number of ewes. Also, the directions of changes within certain years also deviated. In 2013 and 2016 the number of livestock increased in the second half of the year (although its rate was not exactly half as much in 2016). On the contrary, the rate of growth exceeded 1 % in 2014 and 2015.

Table 2: Changes in the number of ewes

Year	1 June	1 December	Difference	Change
	Number of ewes (thousand animals)		thousand animals	%
2013	841.7	873.9	32.2	3.83
2014	866.2	855.2	-11.0	-1.27
2015	857.9	848.7	-9.2	-1.07
2016	790.2	800.8	10.6	1.34
2017	811.7	?	?	?

(Source: KSH STADAT 4.1.1 - 2017)

Changes in the ENAR registry

The number of sheep and goat farmers in the ENAR registry experienced perceptible fluctuations in the period of 2010-2016; however, in practice (data from 2015-2016) rather an increasing tendency is unfolding with some negative aspects.

The number of sheep farmers

Data in Table 3. point out that the number of sheep farms in 2010-2016 rose by almost 1.800, and 50% of them (900) became sheep farmers in 2016. The number of sheep farms with a small animal population grew remarkably.

The number of sheep farmers with 0-100 animals grew by 600 in 2014-2015 and by 800 in 2015-2016. Their number already exceeded 6000, which indicates further fragmentations of the number of domestic livestock. The number of farms with 101-300 animals grew in 2014, dropped in 2015 and increased by almost 140 in 2016. The number of farms with 301-500 sheep decreased by about 20 following a slight growth in 2015. On the contrary, the number of sheep farms with 501-1000 animals increased by 4 in 2015-2016. The number of farms with 1001-5000 dropped by 3 in 2016 than in 2015. However, the number of farms with more than 5001 animals "surged" from 2 to 7, and it is due to the relapse of farms with 10.000 animals into this category, leading to the cessation of the largest farm size category.

The results of summarized inventory data from 2016 suggest that the total number of sheep farmers was 8625 in the country; 6001 out of them kept fewer than 100 animals, i.e. 69.58% of the total number. The number of farms with 101 and 300 animals was 1 853 (21.48%), meaning that 91.06% of sheep farmers fell into the two lower categories. The rate of farms with 301-500 sheep was 5.34%, that of farms with 501-1000 sheep was 2.99%, 1001-5000 was 0.53%, with more than 5000 merely 0.08%.

The shift and fragmentation of this percentage is another point to think about, as the stock sufficient to maintain a family included 300 ewes 10-12 years ago. This number currently amounts to 400-500; according to certain estimates, it approximates 500. In other words, the majority of Hungarian sheep farmers can be grouped into the hobby category, and the rate of market producers is lower than 9% (about 800 sheep farms)! Naturally, it does not mean that other sheep farmers sell their slaughter animals outside the market (through forestallers). There is much more the risk that when a batch in trade (trucks or levels in one truck) is compiled, it comes from increasingly mixed stocks of a growing number of producers.

Distribution of small sheep farms

In the 0-300 animal size category, the number of animals increased remarkably in the past three years (Table 4.). It may almost seem natural and to the extent known that the growth of farmers' number decreased in parallel with the rise of the animal population category.

In practice, the number of sheep farmers with some (0-9) sheep doubled in 2013-2016. Over this period, the number of farmers with 10-20 and 21-50 rose by 500-500, respectively. The number of those with 51-100 sheep increased by "merely" 240. The number of farmers with 101-200 sheep increased by 140. After the setback in 2015, the category of 2001-300 animals was likely to reach the number in 2010.

Growth in the number of small size sheep farms is in all likelihood in connection with the introduction of new subsidy entitlements, with an actual/probable crucial role of production and greening related subsidies.

The number of sheep population

The number of females entitled to subsidies in the ENAR registry (Table 3.), a special development was observable in the past seven years. In 2016, in the wake of the reduction in the order of hundreds of thousands in 2011 followed by a gradual increase, repeatedly exceeded 969 species by 700. The fact that the sharp decrease of 2011 could be "offset" and can be regarded favorable in itself. Unfortunately, KSH data contradict the above result and claim that merely 807 out of this animal population were productive ewes in December 2016 and almost 50 thousand ewes disappeared in the past three years.

The number of females above one year in sheep farms with 0-100 animals rose by about 50 thousand by the growth of the number of farmers in the examined period and ranked second highest on the list of animal number categories. Today the majority of animals are kept in the 101-300 category, where their population has grown by about 20 thousand. The number of sheep in the 301-500 category remained in the third place in the study period; however, it decreased by about 10 thousand. The number of sheep in the 501-1000 category has descended from the second place to the fourth and "lost" more than 15 thousand animals. In the research period the 1001-5000 category "lost" 25 thousand animals but safely retained its fifth place on the list. The category above 5001 increased by 14.500 animals in 2015-2016 and it was due to the fact that sheep in the category of above 10.000 were also classified here, making the overall picture a bit misleading, as the most significant category disappeared.

The number of sheep on small farms

The number of total females above one year in the category of 0-300 sheep farms increased by 60 000 animals in the studied period (Table 4.). Naturally, the distribution of this growth is uneven in the given categories. The rate of growth was about 1.500 in the 0-9 category. It was about 9 thousand in the 10-20 category, 21 thousand in the 21-50 category, and 15 thousand in the 51-100 category (the last two categories saw a growth of more than 9 -9 thousand in 2015-2016, respectively). The number of animals grew by 15 thousand in 2015-2016 in the 101-200 category. The animal population increased by more than 8 thousand in the 201-300 category in 2015-2016, but it was just 2000 less than the total number in 2010.

The number of registered goat farmers

The number of goat farms in the ENAR registry (Table 3.) showed a gradual increase in the research period. The vast majority of goat farmers belonged to the 0-100 size category (96.58%). The 101-300 category only included 33 farms in 2016, whereas the 301-500 category was limited to a single farm.

With regard to certain small-size categories (Table 4.), the studied years witnessed a gradual increase of animal population in the study period, and most goat farmers fell into the 0-9 category. It was followed by the 10-20 and then the 21-50 category. The differences between them are less than several times ten. The 51-100 category included only one-third of the farmers compared to the previous ones. The 101-200 category had only 20-30 and the 201-300 category just some goat farmers.

The number of goats

The number of female goats above one year along with the number of registered farms increased (Table 3.) and growth was experienced in all size categories, even if not at an equal pace. It might be associated with the fact that the majority of goats (20.126 animals in 2016, 77.74%) were kept in the 0-100 category. The number of goats in the 101-300 category failed to reach 5000, and there were merely 852 goats in the 301-500 group in 2016.

It must be noted, naturally that neither the number of goat farmers nor that of their goats (ENAR) even remotely reached the level of KSH data (34.000 ewes). Consequently, this number could not represent the total number of goats on Hungarian farms.

Regarding the number of goats in specific small goat size categories (Table 4.) it can be concluded that the number of livestock showed a gradual increase, in parallel to the number of farms. The leading role of the 21-50 category is evident. The 51-500 category ranked second, the 20-50 category third, whereas the 101-200 category fourth on the list. The difference between certain categories was merely 1-2 thousand. The fifth place was taken up by the group of 0-9, showing a great growth. The 201-300 category (regarding the farm size, almost evidently) ranked sixth on the list.

Annual changes in subsidy payments

Certain payment entitlements experienced significant variations in the research period, therefore the amount of subsidies paid for sheep and goat farmers changed accordingly. Given that payments take place twice annually (in autumn and in spring), payments may "overlap", and a higher number of payments can be made simultaneously in a particular year than the number of farmers in certain size categories in the payment period. Moreover, payments in various years (2010-2013; 2014; 2015-2016) may be shifted to a period when the related measures are no longer in effect; however, rightful payments will be made for some reason (lack of supervision, completeness check, the shift of payments) in another period.

The present study does not discuss the amount of certain subsidy entitlements per farm or per animal, but exclusively focuses on the distribution of subsidy amount paid.

In light of the considerable growth in the number of farmers in the small farm categories in the past three years, the authors have slightly modified the categories used in our research previously (0-100; 101-300; 301-500, 501-1000; 1001-5000; 5001-) for the years of 2014-2015-2016. As the most prominent change took place in the 0-100 category, our analysis divided this category (0-50 and 51-100) into two parts in these three years.

The first part of the analysis has the potential to give an insight into payment modifications in the research period. In addition to entitlements launched in the previous period but paid in 2016, we point out and present the amounts and distributions of entitlements in force in 2016.

Following the introduction of the full amounts of subsidy entitlements paid, the present study describes the percentage that represents - according to the Hungarian Sheep and Goat Farmer Agency - the correlation of registered numbers and the farm numbers registered by MVH and also MÁK (HUNGARIAN STATE TREASURY) MVH in payments (i.e. the percentage of recipients (farms)).

This percentage fails to reflect the actual number of subsidy claims in all cases, although it is widely known that the number in certificates of payment entitlements issued and the actual number of females might show an annual 3-7% difference at national level annually. The discrepancy between the farms that require subsidies and all the existing sheep/goat farms (ENAR registry) is 12-17% annually, but it can reach even 50% per county.

As the number of farms with 0-100 animals “soared” in 2016, the final section of our analysis examined the payments paid in the following small categories: 0-10, 11-20; 21-30, 31-40; 41-50; 51.60, 61-70, 71-80; 81-90, 91-100.

Subsidy payments shifted to 2016

Ewe premium scheme

The amount of subsidies based on payment entitlements already in force in 2010 indicated a gradual decline in the past years (Table 3/1). The percentage of recipients (farms) shrunk to slightly more than 0.5 % by 2016 whereas the number of applications to as low as 59. The only exception to this is the year of 2015 when the number of users (farms) and the number of subsidy claims increased substantially.

In previous years, subsidy payments in the case of this entitlement arrived mostly in the 101-300 category, whereas the 0-100 ranked second and the 301-500 category the third, alternately. Out of sheep farms with a number of animals under 100, the aid amount paid to the above 50 category proved to be higher, although the difference between the two categories was within 1%. The amount paid in the other categories decreased gradually in parallel to a drop in the number of farms. These data clearly show that payments for those in the 301-500 and the 101-300 categories shifted mostly to 2016.

De minimis subsidy for ewe production

This entitlement also belongs to the "expiring" category, as although the amount of subsidy paid grew by more than 400 million HUF in 2015, the amount and percentage of payments shifted to 2016 dropped back to a minimal level (Table 5/1).

Except 2013 (where the subsidy amount rose to an unprecedentedly high level in the 0-100 category), the 301-500 category received the highest subsidy amounts out of payments in case of this entitlement. Farms in the other categories were granted gradually lower subsidy amounts.

As for this this entitlement, the phenomenon observed in the previous case was also detected, i.e. the sheep farmers with 50-100 animals were granted a more significant amount of payments than those in the 0-50 category. A discrepancy between the two categories was not flagrant, but the volume of subsidy payments in the two categories over the past three years fell only to a small proportion. Naturally, it correlates/may correlate with the fact that the payment of "remunerations" paid for farms in this category was less likely to shift for the following years than it could be observed in sheep farmers of large categories.

Supplementary aid for ewes - separated from 2007

From 2011, there was also a gradual decrease in the amount of this subsidy payment and in 2016 slightly more than 21 million HUF was "allocated" to farmers. It also represented an expiring subsidy entitlement, where payments were made in only 59 cases. In parallel to a decrease in the volume of subsidy payments, the number of sheep farmers who used this subsidy followed a declining trend as well (Table 5/1.).

The number of claimers in the case of the previous entitlement was also valid here, as the largest proportion of the full amount was granted to the 0-100 category (50%) in 2013, whereas in the other years the 101-300 category received the highest subsidy payments. The 301-500 and the 0-100 categories ranked second and third, respectively, and their place on the list varied from year to year. Payment amounts for other size categories under this entitlement were on a gradual decline.

The 0-50 and 51-100 categories benefited from the subsidy to a lower extent in 2014-2016. However, the quantity of aid payments showed a slight change. The tendency that farms in large categories were likely to receive their money with delay was observable. It means that the amount of payments for the 1001-5000 and the 501-1000 categories was the highest in 2015. In payments for 2016, the participation of above 5001 farms was determinant (above 60%).

Aid for restructuring: ruminants

This entitlement was introduced in 2012. However, payments were launched in 2013-2015, and no payments were shifted to 2016 (Table 5/1). The entitlement was in force only for a transitional period and savings in the previous period enabled its payments. It was hoped to exert a more significant effect on the expansion of livestock numbers than what took place in sheep farming (in contrast to the beef sector, where subsidies granted in the framework of the same entitlement multiplied animal numbers). In the three years of payments not only the volume of payments but the number of claimers (farms) and payments indicated a gradual decrease.

The proportion of the 0-100 category in subsidy payments in the case of this entitlement in 2013 was massively dominant (49%), whereas in the following two years the 101-300 and the 301-500 categories were safely in the second and third places; the 0-100 category descended to the fourth place in 2014, but ranked third again in 2015. As for the 0-50 and 51-100 categories, a constant decrease was observed over the years and also the fact that the participation rate of farms in the 51-100 category exceeded its previous percentages, especially in 2015.

Agri-environmental management aid

This entitlement was only used for foregone/shifted payments after the original 5-year period, in the sixth year (Table 5/2). This aid scheme was an enormous help for sheep breeders, but unfortunately, the number of its recipients (farms) steadily decreased from the initial 31% (2011), and in 2016 merely 6.54% of farms received the of aid granted. The number of claims paid decreased to a lower extent as compared to amounts paid (500 pc) in 2011-2014, and then it plunged to one third in 2015 and showed a slight increase in 2016.

The exceptionally high proportion (46.65%) of farmers with 0-100 sheep could also be observed in the distribution of payments between certain farm size categories. In other years, benefits of sheep farmers with 101-300 animals were the highest from this source of support, and regarding the amount of payments, farmers with 0-100 sheep topped the list again in 2015 and 2016. The discrepancy between the 0-50 and 51-100 categories, indicating mostly the 5% advantage of the latter one, reversed in 2016, and the smaller category gained 5% advantage in access to payments.

Natura 2000 (grasslands) (ÚMVP) (New Hungary Rural Development Programme)

This category of aid was launched in the previous economic cycle (Table 5.2.), but its payments meant enormous amounts for sheep farms even in 2016. The amount of annual payments, the percentage of recipients (farms) and the number of claims paid indicated massive annual variations. The exceptional situation of 2013 was observed in all the three previous categories repeatedly; moreover, benefits of farms with 0-100 animals from this category of aid were also the highest in this year (71.55%). The amount paid in the previous categories dropped back to merely 60% in 2016 compared to 2015; however, the number of users and claims paid plunged to one-third or nearly 50%.

The percentage of amount paid in the 0-100 category was at the top of the list again in 2016. In other years of the investigated period, the percentage of the 101-300 category was the highest, but that of payments in other categories varied from year to year.

Less-favoured areas (ÚMVP)

This aid category played a pivotal role in supporting sheep farmers in previous years (Table 5/2.), and the amount of payments in this category followed a specific curve. First, it fell sharply to two-thirds set against the previous year in 2012, then in 2013 it doubled, followed by a gradual decrease, whereas by 2016 it dropped to slightly more than one-fourth

of the amount in 2013.

The previous change is detectable both in the numbers of sheep farmers who used this entitlement and in claims paid. With regard to benefits for given size categories, 2013 revealed the preponderance of farmers with 0-100 sheep (72%). In other years, the first place of the 101-300 category was taken over by the group of 1001-5000 size category only in 2016, and the 0-100 category ranked second at that time. If the latter category is divided into two, an interesting phenomenon emerges: whereas in 2014-2015 the 0-50 category, in 2016 the 51-100 category received higher amounts within this aid category.

TOP UP

This payment entitlement has been in force since the year of Hungary's EU accession (Table 5.2.), and it was definitively scaled down regarding payments in 2016. In the studied years, roughly 50 claims were paid per year, which number rose to above 80 in 2013, but fell to 59 by 2015. Therefore, this aid scheme was only used by a very small percentage of sheep farmers. The amount of subsidy payments grew by about 40% in 2010-2013, then after a slight decline in 2014, it substantially increased in 2015.

This aid category was "exploited" primarily by sheep farms with 501-100 animals in the first three years (above 50%), then in 2013 and 2014 the percentages of aids paid for the 101-300 category ranked first (49%), and the former category descended to the second place. Proportionately, the payment percentage of the 0-50 category increased enormously in 2014 and 2015. This growth ranked the 0-100 category second in the first year, and first in 2015.

Electronic tagging of sheep and goat

Payments in this aid category were made from the second year (2012) following the introduction of the original policy and the amount and percentage of payments and the number of claims paid soared in 2013, followed by a dramatic fall to 3 payments of the related subsidy amount in 2015. With a view to the fact that it was a priori meant to be as a transitional and gradually decreasing support in this category of aid, the whole process is understandable (Table 5/3).

In the first year, payment percentages were the highest in the 101-300 category, and in 2013 the 0-100 category took the leading role (49.73%). Interestingly, in 2014 the 0-50, and in 2015 the 51-100 group topped the list. As indicated above, farms in the other categories were granted substantially lower percentages from this category of aid.

De minimis subsidy for ewe production

As a result of our several years' efforts to introduce subsidies for ewe production, this entitlement was launched in 2006, and due to considerably increased support amount recently, it has exerted possible influence on the inclusion of increasingly more farmers and animals in the ENAR system (Table 5/3).

Given the above, the total amount of payments in this category of aid rose gradually until 2015, then the volume of payments fell to 50% in 2016. Interestingly, the proportion of farms using this entitlement went through marked fluctuations, where 2013 was outstanding. In parallel, the number of claims paid increased steadily until 2015, and it fell back to slightly more than one-third in 2016.

The majority of this support source was distributed among the 0-100 category farms in each studied year. Within the categories split over the past three years an exciting change can be observed: In 2014 and 2016 the 0-50, and in 2015 the amount paid to the 51-100 group was the highest. From this, due to the above mentioned and the low number of farmers in the significant size categories, the share of other categories was limited.

Disposal of carcasses and animal waste

It is typically a category of aid used by a very small percentage of sheep farmers. The number of claims was the highest in 2013 (181 pcs), and in the following years, this number went sharply down (Table 5/3). The slow increase of the subsidy amount increased by more than eightfold in 2013 and fell back to only a small percentage in 2015. This category of aid was used by the 0-100 group of sheep farmers (almost 100%) practically in the initial four years. 100% of a couple of claims paid in the past two years belonged to the 101-300 category.

Area payment

It is the aid scheme that provided sheep farmers with most resources (Table 5/3), and it mainly influenced the maintenance and survival of their farms, but in fact, independently of livestock farming. Nonetheless, the utilisation rates of the given farm size categories varied significantly.

The amount paid in this aid category fell back to slightly more than 50% in 2011, almost doubled in 2012, constantly increased until 2014, and then dropped gradually below the 2012 level by 2016. The "share" of sheep farms was 70 % of this support, although this percentage decreased to 63% by 2016. The number of claims paid fell sharply in 2011, and then, apart from a slight slowdown in 2014, it was on a gradual increase until 2016.

In the first three years the share of sheep farms in the 101-300 category was the highest, it went through a massive change from 2013 (52.00%), and the farms in the 0-100 category received the greatest slice of this "cake", although in the following years this leading role "weakened" and the 101-300 category ranked second.

The breakdown of the 0-100 category revealed that the 0-50 category ranked second in itself regarding the percentage of payments following the 101-300 category, and the share of the 51-100 category from this resource was substantially lower than that of the latter one.

Modernizing livestock farms (ÚMVP)

This entitlement is not identical with the ÁTK regulation on sheep and goat production subsidies currently in force (Table 5/4), and the evaluation of claims submitted is still ongoing in May 2017. On the basis of payments in the first year and in the period of 2013-2016, over the past seven years, a very small percentage of existing sheep farms submitted their applications under the still existing entitlement category. Accordingly, only a few hundreds of payments took place in the given years, and in the majority of cases, the recipients of this support participated in the modernization of other livestock units instead of sheep farms. The entitlement did not

contain species-related isolation. Thus farms that performed modernization in beef cattle or other farms could be included in the registry. Consequently, the validity of these data is assumed to be limited to the small ruminant sector.

The analysis of this category of aid should focus on the past three years (2013-2015), as 2016 saw merely the payment of a single claim. The volume of payments started in 2013 almost doubled in 2014 and decreased by one-third in 2015.

Whereas farmers with 301-500 animals ranked first in 2013 in the utilisation of this resource, followed by the 101-300 and the 0-100 categories, those in the latter category became the first on the list in the coming years. The biggest recipients of aid were the 501-1000 farms in 2014 and the 301-500 ones in 2015. Moreover, the breakdown of the 0-100 category shows that the 0-50 group was the second biggest recipient of support in itself.

Other subsidies for sheep farmers

This group comprises all entitlements in addition to the above mentioned where recipients maintained sheep, but the purpose of the aid was something different (Table 5/4).

The amount of subsidies under this entitlement increased gradually until 2014, almost doubled in 2015 and then fell to less than 60% in 2016, showing an eclectic movement. Payments in this category of aid caused substantial fluctuations in 32-75% of sheep farms. The number of claims paid was significantly lower than the number of sheep farms in 2010, 2012 and 2013, whereas exceeded it in other years. Of these, 2015 is worth highlighting, when this number increased by almost 100% compared to data in 2014. While it is true that the previous jump was followed by about a 40% sharp decline.

In the initial two years of the research period, most of these resources were used by farms in the 0-100 category, and the 101-300 category ranked second on the list. In the following four years, the above two categories switched places on the list and in 2016 farms in the 0-100 category became the biggest recipients of subsidies proportionally. For the reasons set out above, farms in the large size category received less support proportionally.

The breakdown of the 0-100 category indicates that farms in the 0-50 group were bigger recipients of support in each year than that of the 51-100 farms. The difference between the two groups was about 3% in each studied year.

Subsidies in 2016 other than those referred to above

Of these entitlements, there are two that were introduced in the framework of ÚMVP, but the related payments were still carried out in 2016. In case of the other entitlements, farmers received their first subsidies in 2016 (Table 5/5).

Transitional national support for maintaining ewes

The amount of payment in this category of aid is not too high. Nevertheless, more than 73% of users (sheep farmers) are recipients, and the number of claims paid is much higher than the number of sheep farmers. The biggest beneficiary of this resource is the 101-300 category proportionally (30.1%), and other categories were significantly lower than this percentage. There was no relevant difference between the two categories under100.

Support for young agricultural producers

In this category of aid 708 claims were paid for slightly more than 5% of sheep farmers, but in fact, the full subsidy amount was many times higher than the latter. The biggest beneficiaries of this entitlement were the 101-300 and the 0-50 categories, and these two used more than 70% of the full support. In addition to them, those in the 51-101 category received considerable amounts. The payment amount in the other categories were strictly limited.

De minimis supplementary ewe subsidy

Not more than seven payments were carried out in this entitlement category, and percentages from the total support were the following: 301-500 (62.18%); 501-1000 (23.51%) and 101-300 (14, 29%). The other categories received no subsidies from this resource.

Support for smallholders

220 claims were paid under the quantitatively limited entitlement per farmer, which amounted to 1.57% of the total number of sheep farmers. This type of support was mainly obtained by farmers with 0-50 ewes (86.51%), recipients had 8.8% in the 51-100 category and 4.64% in the 101-300 category.

Coupled support for ewe production

This entitlement exerts a massive influence on willingness to become sheep farmers, as it is revealed by the growth of their numbers. This category represented the second biggest recipients in 2016. Registry data indicated that 72.01% of sheep farmers were recipients of this support, but 11.240 claims were paid, demonstrating that a single producer received multiple payments. The biggest recipients were those in the 101-300 category (30.05%), the 510-1000, the 301-500 (17.19%) and the other categories (18.43%) followed far behind.

VP-M10 Gene preservation-animal (ÚMVP)

Under this entitlement, only six payments were carried out, and 86.30% of this support was provided for the 101-300 category. The 0-50 category received 13.70%.

VP-M10 Support for indigenous breeds (ÚMVP)

A total quantity of 49 claims was paid under this entitlement. The significant proportion of this amount (48.59%) was paid to farms in the 1001-5000 category. The 101-300 category obtained the second biggest share (36.41%). While the previous one provided support for sheep maintenance in national parks, the latter was allocated for private farms. The percentage of the other categories was about merely 3-4%, and the 51-100 category received just 0.88%. It included mostly hobby sheep owners.

VP-M10.1.1-Agro-environmental management

The new AKG (Agri-environmental) subsidy was not tailored towards sheep breeders. Only 76 recipients who maintained sheep received payments. It included merely 8.8% of sheep breeders. About one-fourth of the amount paid was allocated to the 101-300 category, the share of the others was relatively well distributed, with minor discrepancies. It must be mentioned nevertheless that farms in the 0-50 category received 16.44% of the amount paid.

VP-M11.1.1-Ecological conversion

Merely 77 claims were paid in this entitlement category, where the biggest recipients were the following: 101-300 (30.39%); 501-1000 (1918%); 0-50 (18.35%), 51-100 (17.08); 1001-5000 (10.61%); 301-500 (4.39%). Farms in the greatest category claimed no such kind of subsidies.

VP-M11.2.1-Ecological maintenance

This entitlement was mostly used by small size farms and payments in 51 cases were carried out. 0-50 sheep farmers received 44.53%, whereas farms in the 101-300 category (31.59%) ranked second on the list. The 51-100 category was granted efficient support of 13.70%.

Greening aid

The amount of almost 16.1 billion HUF was distributed among 9.901 claims in 2016, where the percentage of sheep farms was 63.32%. The biggest recipients of the amount paid were 0-50 sheep breeders (23.37%). Farms of the 101-300-as category were second (22.31%), the 301-500 (15.30%) category the third. The percentage for the other categories was about 12-13%. The smallest recipients were farms in the above 5001 category (0.65%).

Evaluation of subsidy payments to decimal points in 2016

The following two tables of the present study will present the "involvement" of 0-50 and 51-100 farms, broken down into 10 categories per animal, in payments. The amounts paid under specific entitlements were also summarised by categories.

Table 6/1 demonstrates the percentages of farms in the 0-50 size range from certain entitlements. The number of sheep and goat farmers in certain size categories was significantly different. The summary of the whole category suggests that several subsidy payments were allocated for only 2.745 farmers and merely 158 of them were goat breeders. It could also be concluded that there were no applications submitted in certain entitlement categories; if there were, their number per group was insignificant. Naturally, the number of applications was significantly higher in the case of entitlements providing higher resources.

Table 6/2. gives an in-depth insight into the claims and received payments of 51-100 size farms in 10 categories per animal. Similarly to the previous one, there were substantial discrepancies between farm numbers classified in groups of tens. However, it must be emphasized that merely 1.098 farmers were the recipients of more than several ten thousands of claims paid, and there were only 23 goat farmers among them. Our experience suggests that there were no claims submitted in certain categories of aid whatsoever, while farmers tended to target entitlements with higher potential "gains".

CONCLUSION

The results revealed in our analysis point to the significant conclusion that although the aid scheme has gone through some transformation, direct ewe aid has gained a key role, the significance of AKG support declined, and the previous concerns on utilization still prevail CEHLA - KUKOVICS, 2010 A ÉS B; KUKOVICS, 2014; KUKOVICS – JÁVOR B. 2017). In addition, the fragmentation of farms by animal numbers as a result of direct ewe aids and support gave rise to growth in the number of hobby sheep farmers. In addition to direct area payments, the restructured AKG support also helped this process.

Data contained in the tables of this study illustrate that although the number of small size animal farmers grew substantially in 2016, they did not necessarily submit their claims for subsidies. These farmers were most likely to use production-related ewe premiums, area-based, greening or other types of subsidies in production. Accordingly, the number of animal breeders has grown, but the utilization of given entitlements did not necessarily follow this tendency.

Several factors account for the unexpectedly low utilization rate of subsidies. One of its crucial elements is that a massive number of sheep breeders failed to submit their claims to obtain ewe premiums. Besides this, a growing number of sheep farms did not use the available support under the ewe premium scheme. (Table 7).

In the research period, the number of claims submitted for 3-5% of above one-year-old females in the ENAR registry was zero. Moreover, out of the sharply increased number of sheep breeders in the previous two years, about 1100-1200 sheep farms did not use this subsidy.

There is some cause for debate owing to the phenomenon that in 2013-2017 the number of above one-year-old females in the ENAR registry was growing steadily, and over the same period the number of sheep for which assistance had been requested also grew gradually.

In relation to the above, it must be noted that due to the new aid scheme (direct ewe premium) the number of newly registered sheep farms grew by 853 in 2015 and by 1266 in 2016, which fell back to 533 in 2017. It indicates the quasi balance between the numbers of discontinuing and newly entering sheep breeders in 2017. It is crucial to note that in 2015 the percentage of sheep farmers claiming support almost jumped and then gradually declined in the past two years. A contributing factor to this change could have been the fact that merely 20% of sheep farmers could obtain the AKG subsidy from 2016, which they could spend on the additional payment of their operating costs in the previous period.

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Table 3. Sheep and goat farms and the number of animals maintained in production

Name	Year	farm size (ewe or goat/farm)						Total
		0-100	101-300	301-500	501-1000	1001-5000	5001-	
Number of sheep farms	2010	4 235	1 783	487	302	59	3	6 862
	2011	4 043	1706	422	251	43	3	6 488
	2012	4 134	1 698	464	250	50	2	6 598
	2013	4 212	1 683	465	253	45	2	6 660
	2014	4608	1 729	456	249	49	2	7 093
	2015	5 235	1 718	488	254	49	2	7 746
	2016	6 001	1 853	461	258	46	7	8 625
Number of ewes	2010	156 387	315 822	186 202	198 991	84 267	27 518	969 182
	2011	150 931	304 500	162 669	163 670	58 781	25 924	866 474
	2012	151 512	302 465	179 502	166 547	72 452	20 934	893 412
	2013	158 194	300 938	177 898	170 092	68 539	21 085	896 746
	2014	165 109	311 640	176 239	164 125	71 398	21 236	909 747
	2015	180 918	303 318	187 338	169 049	69 473	20 049	930 145
	2016	201 774	326 255	176 420	171 459	59 381	34 625	969 914
Number of goat farms	2010	508	32	0	0	0	0	540
	2011	522	21	1	-	-	-	544
	2012	610	25	1	0	0	0	636
	2013	600	33	-	-	-	-	633.
	2014	755	35		-	-	-	790
	2015	844	35	1	-	-	-	880
	2016	959	33	1	-	-	-	993
Number of ewes	2010	11 715	4 690	0	0	0	0	16 405
	2011	12193	1706	412	0	0	0	15 484
	2012	13771	3203	317	0	0	0	17 293
	2013	14124	4882	-	-	-	-	19006.
	2014	15880	4831	-	-	-	-	20711.
	2015	18065	4833.	353.	-	-	-	23251.
	2016	20126.	4911.	852.	-	-	-	25889.

Source: Magyar Juh- és Kecsketenyésztők Országos Szövetsége (National Association of Hungarian Sheep and Goat Breeders) (The National Association of Sheep and Goat Breeders) 15.-20. Collection by Sándor Kukovics based on Periodical Information Report

Figure 4: Number of small-size sheep and goat farms and animals maintained there

Name	Year	farm size (ewe or goat/farm)						Total
		0-9	10-20	21-50	51-100	101-200	201-300	
Number of sheep farms	2010	390	1153.	1531.	1154.	1225.	558.	6011.
	2011	381.	1041.	1489.	1132.	1160.	546.	5749.
	2012	402	1087.	1544.	1101.	1167.	531.	5832.
	2013	345.	1120.	1621.	1126.	1156.	527.	5895.
	2014	491	1273.	1666.	1178.	1184.	545.	6337.
	2015	592.	1520.	1 880	1243.	1194.	524.	6953.
	2016	782.	1685.	2169.	1364.	1299.	554	7853.
Number of ewes	2010	2085.	16823.	53321.	84153.	177 834	137 988	472 204
	2011	2 032	15145	51 177	82 576	169 893	134 607	455 430
	2012	1 865	16058	53196	80393	171324	131141	453977
	2013	1633	16793	56279	83489	169910	131028.	459132.
	2014	1 943	18625.	58055.	86486.	174456.	137181.	476746.
	2015	2809.	22076.	65143.	90890.	174786.	128532.	484236.
	2016	3597.	25319.	74424.	99434.	189896.	136359.	529029.
Number of goat farms	2010	159.	152.	132.	65	27	5	540
	2011	156.	153.	155.	58	20	1	543
	2012	198.	168	174	70	24	1	635
	2013	186.	160.	188.	66.	29	4	633.
	2014	247	232.	209	67.	32	3	790
	2015	255	288	218	83	31	4	879
	2016	321	294	263	81	29	4	992
Number of ewes	2010	823	2 090	4 292	4 510	3 470	1 220	16 405
	2011	739.	2210.	5072.	4172.	2664.	215.	15072.
	2012	908.	2347.	5603.	4913.	2998.	207.	16976.
	2013	914.	2291.	6168.	4751.	3960.	922.	19006.
	2014	1108.	3227.	6770.	4775.	4099.	732.	20711.
	2015	1300.	4100.	6840.	5825.	3891.	942.	22898.
	2016	1501.	4199.	8607.	5819.	3931.	980.	25037.

Source: Magyar Juh- és Kecsketenyésztők Országos Szövetsége (National Association of Hungarian Sheep and Goat Breeders) (The National Association of Sheep and Goat Breeders) 15.-21. Collection by Sándor Kukovics based on Periodical Information Report

Table 5/1: Trends in subsidy claims paid in the sheep and goat sector in 2010-2016

Name of Entitlement/Measure	Year	Total amount of subsidies paid HUF	Percentage of recipients (sheep farms) %	Number of claims paid	Distribution of the amount of claims paid by categories (%) - farm size (ewe or goat/farm)							Total
					0-50	51-100	101-300	301-500	501-1000	1001-5000	5001-	
Ewe aid scheme	2010	1 595 391 530	85.95	5915	15.60		32.66	19.12	20.11	9.70	2.80	100
	2011	1622551357	89.72	5821	15.57		33.44	19.32	20.01	8.70	2.90	100
	2012	1 031 867 997	83.74	5536	16.63		34.96	19.72	18.11	7.42	3.16	100
	2013	280 364 412	70.17	4683	25.00		40.00	16.00	11.00	6.00	2.00	100
	2014	12 875 056	54.28	3 850	12.67	13.47	33.09	21.64	16.77	2.38	0.00	100
	2015	18 355 332	75.07	5 846	9.03	9.25	33.75	19.17	16.73	10.01	2.06	100
	2016	262 226	0.57	59	2.87	3.62	31.10	36.15	17.45	8.81	8.81	100
De minimis ewe subsidy scheme	2010	1 030 021 429	85.91	5 907	17.63		36.85	21.53	19.24	4.55	0.20	100
	2011	1 000 693 985	89.64	5 823	17.88		38.53	22.28	17.42	3.73	0.16	100
	2012	1 266 568 437	83.74	5 523	21.04		44.18	21.17	11.23	2.23	0.16	100
	2013	1 302 385 567	84.16	5 620	48.45		31.50	12.19	6.31	1.44	0.11	100
	2014	1 616 409 524	79.91	5 703	10.08	12.19	44.28	20.27	10.91	2.18	0.09	100
	2015	2 062 449 590	67.48	5 255	9.03	9.25	39.99	22.34	15.49	2.98	0.15	100
	2016	30 284 294	0.56	59	3.35	4.05	38.76	31.26	14.20	8.38	0.00	100
Complementary premium for ewe production - separated from 2007	2010	394 489 680	14.75	1 014	8.53		25.21	21.66	23.13	14.32	7.15	100
	2011	466 221 918	15.06	977	8.35		25.09	21.31	23.95	14.00	7.30	100
	2012	357 015 220	12.32	814	7.56		24.06	22.44	24.10	12.43	9.42	100
	2013	235 322 497	10.42	695	50.00		21.00	10.00	10.00	5.00	4.00	100
	2014	132 637 884	8.06	572	5.89	9.07	30.17	15.81	20.71	13.20	5.79	100
	2015	736 118 987	9.95	1446	0.26	2.29	11.17	13.16	27.76	32.89	12.47	100
	2016	21 754 285	0.14	13	0.00	1.83	6.57	9.16	0.00	20.82	61.63	100
Restructuring in the ruminant sector - Ewes	2010	0	0	0	-	-	0	0	0	0	0	0
	2011	0	0	0	-	-	0	0	0	0	0	0
	2012	?	-	-	-	-	-	-	-	-	-	-
	2013	4 006 908 235	61.71	4 118	49.00		22.00	12.00	10.00	6.00	1.00	100
	2014	3 732 632 358	53.33	3 833	8.04	8.35	31.43	22.12	18.35	9.81	2.00	100
	2015	3 687 259 997	45.83	3 681	7.86	10.78	30.80	21.06	17.92	9.44	2.13	100
	2016	0	0	0	0	0	0	0	0	0	0	0

Source: Data from MÁK (HUNGARIAN STATE TREASURY) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) and Magyar Juh- és Kecsketenyésztők Országos Szövetsége (National Association of Hungarian Sheep and Goat Breeders)
(15.-21 Calculations by Sándor Kukovics based on Periodical Information Report)

Table 5/2.: Trends in subsidy claims paid in the sheep and goat sector in 2010-2016

Name of Entitlement/ Measure	Year	Total amount of subsidies paid HUF	Percentage of recipients (sheep farms) %	Number of claims paid	Distribution of the amount of claims paid by categories (%) farm size (ewe or goat/farm)							Total
					0-50	51-100	101-300	301-500	501-1000	1001-5000	5001-	
Agro-environmental management	2010	?	?	?	-	-	-	-	-	-	-	-
	2011	10 465 553 893	31.66	2 934	15.83		26.81	22.45	20.57	11.58	2.75	100
	2012	10 060 228 091	26.04	2 521	17.78		27.23	23.12	15.63	12.81	3.43	100
	2013	7 572 143 635	25.15	2 585	46.65		14.82	13.61	6.81	16.68	1.43	100
	2014	7 782 706 212	22.12	2 253	9.66	10.05	28.99	18.43	15.62	15.58	1.67	100
	2015	3 408 111 422	6.17	718	10.01	15.10	21.58	21.47	10.08	17.79	3.97	100
	2016	2 005 901 126	8.88	766	16.44	10.94	24.85	11.82	17.77	17.56	0.00	100
Natura-2000 (grasslands) (ÚMVP)	2010	416 424 886	13.31	1 093	24.47		34.32	17.21	21.60	2.11	0.30	100
	2011	958 106 024	31.66	1 597	15.83		26.81	22.45	20.57	11.58	2.75	100
	2012	711 991 327	14.82	1 142	15.52		31.83	22.90	16.67	6.75	6.34	100
	2013	1 455 053 850	21.23	2 245	71.55		13.60	6.57	4.98	1.62	1.68	100
	2014	928 559 975	18.20	1 537	7.80	9.34	28.85	22.03	24.03	6.35	1.62	100
	2015	778 074 164	15.00	1 350	8.70	10.12	34.99	20.64	17.43	5.83	2.29	100
	2016	459 318 994	6.54	569	8.44	15.41	17.91	16.38	19.32	16.87	5.63	100
Less-favoured Area (ÚMVP)	2010	1 147 363 012	21.61	1 799	21.32		31.47	22.60	19.95	3.55	1.13	100
	2011	1 224 287 845	21.04	1 832	19.88		29.76	22.37	21.18	4.03	2.79	100
	2012	881 391 850	15.87	1 203	18.36		30.45	24.46	18.12	5.02	3.59	100
	2013	1 660 048 386	21.32	2 231	72.00		14.00	6.00	5.00	1.00	2.00	100
	2014	1 076 031 561	17.96	1 553	11.34	9.31	28.43	21.44	23.10	4.96	1.42	100
	2015	975 910 453	15.67	1 441	12.06	12.02	36.78	17.13	16.34	4.19	1.52	100
	2016	441 485 547	5.46	474	8.88	10.41	16.97	17.27	16.60	28.62	1.25	100
TOP-UP	2010	584 004 619	0.76	57	9.13		18.90	5.24	56.43	10.29	0.00	100
	2011	693 880 135	0.74	52	17.48		17.95	5.75	50.50	8.32	0.00	100
	2012	681 655 182	0.77	53	12.35		20.53	2.87	59.31	1.53	3.40	100
	2013	713 648 053	1.14	81	18.19		49.03	4.16	25.45	0.12	3.05	100
	2014	708 817 351	0.83	62	26.74	1.93	34.57	7.28	26.25	0.00	3.13	100
	2015	731 099 535	0.71	59	30.57	1.82	31.49	23.04	13.08	0.00	0.00	100
	2016	0	0	0	0	0	0	0	0	0	0	0

Source: Data from MÁK (HUNGARIAN STATE TREASURY) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) and Magyar Juh- és Kecsketenyésztők Országos Szövetsége (National Association of Hungarian Sheep and Goat Breeders)
(15.-21 Calculations by Sándor Kukovics based on Periodical Information Report)

Table 5/3.: Trends in subsidy claims paid in the sheep and goat sector in 2010-2016 - 3.

Name of Entitlement/ Measure	Year	Total amount of subsidies paid HUF	Percentage of recipients (sheep farms) %	Number of claims paid	Distribution of the amount of claims paid by categories (%)							Total
					farm size (ewe or goat/farm)							
					0-50	51-100	101-300	301-500	501-1000	1001-5000	5001-	
Electronic tagging of sheep and goat	2010	?	?	?	-		-	-	-	-	-	-
	2011	?	?	?	-		-	-	-	-	-	-
	2012	420 638 418	73.63	9 262	15.30		34.38	20.84	19.88	7.20	2.41	100
	2013	99 774 347	62.10	5764	49.73		23.66	10.91	8.79	4.89	2.02	100
	2014	467 040	0.34	24	35.23	7.74	19.30	14.19	23.54	0.00	0.00	100
	2015	43 726	0.04	3	0.00	83.96	16.04	0.00	0.00	0.00	0.00	100
	2016	0	0	0	0	0	0	0	0	0	0	0
De minimis subsidy for ewe production	2010	37 818 000	48.70	264	63.61		31.99	4.39	0.00	0.00	0.00	100
	2011	38 862 000	55.70	304	74.26		25.74	0.00	0.00	0.00	0.00	100
	2012	42 723 000	56.60	360	74.33		25.67	0.00	0.00	0.00	0.00	100
	2013	46 611 069	62.72	397	78.00		22.00	0.00	0.00	0.00	0.00	100
	2014	57 102 438	44.23	429	46.13	28.37	25.50	0.00	0.00	0.00	0.00	100
	2015	91 158 286	58.52	516	10.82	63.28	25.9	0.00	0.00	0.00	0.00	100
	2016	43 505 549	18.55	185	55.56	26.76	17.68	0.00	0.00	0.00	0.00	100
Disposal of carcasses and animal waste	2010	55 358 643	0.15	35	99.87		0.00	0.00	0.13	0.00	0.00	100
	2011	125 163 751	0.17	102	99.80		0.13	0.00	0.07	0.00	0.00	100
	2012	222 938 483	0.17	130	99.86		0.07	0.00	0.07	0.00	0.00	100
	2013	1 835 286 053	0.26	181	99.98		0.02	0.00	0.00	0.00	0.00	100
	2014	57 102 438	0.01	6	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100
	2015	618 898	0.01	3	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100
	2016	0	0	0	0	0	0	0	0	0	0	0
Area payments	2010	22 825 692 300	74.76	7 186	22.12		25.10	16.56	21.10	12.87	2.24	100
	2011	12 589 394 547	77.37	6 116	24.07		26.71	19.28	17.28	10.95	1.71	100
	2012	24 485 761 158	77.90	9 990	23.32		27.75	19.63	16.05	10.39	2.86	100
	2013	27 035 713 929	76.89	10 156	52.00		19.00	10.00	8.00	9.00	2.00	100
	2014	29 422 015 954	71.86	10 095	19.68	11.31	25.48	17.19	16.76	8.46	1.12	100
	2015	27 567 458 836	70.06	10 303	22.90	13.61	27.86	15.13	12.05	7.69	0.76	100
	2016	23 711 409 539	63.28	10 527	26.64	13.71	23.36	11.95	12.93	10.42	0.98	100

Source: Data from MÁK (HUNGARIAN STATE TREASURY) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) and Magyar Juh- és Kecsketenyésztők Országos Szövetsége (National Association of Hungarian Sheep and Goat Breeders)
(15.-21 Calculations by Sándor Kukovics based on Periodical Information Report)

Table 5/4.: Trends in subsidy claims paid in the sheep and goat sector in 2010-2016

Name of Entitlement/ Measure	Year	Total amount of subsidies paid HUF	Percentage of recipients (sheep farms) %	Number of claims paid	Distribution of the amount of claims paid by categories (%)							Total
					farm size (ewe or goat/farm)							
					0-50	51-100	101-300	301-500	501-1000	1001-5000	5001-	
Modernizing livestock farms (ÚMVP) (ÚMVP)	2010	2 101 825 741	1.4	209	13.89		32.51	9.58	33.10	10.91	0.00	100
	2011	?	?	?	0.00		0.00	0.00	0.00	0.00	0.00	0.00
	2012	?	?	?	0.00		0.00	0.00	0.00	0.00	0.00	0.00
	2013	3 169 869 551	1.94	170	17.33		22.69	36.59	16.85	6.45	0.09	100
	2014	6 359 279 782	5.06	495	11.91	10.71	15.90	13.02	29.79	8.76	9.90	100
	2015	4 666 398 829	3.12	390	19.27	12.87	14.24	29.84	12.13	11.46	0.19	100
	2016	1 200 000	0.01	1	100.00	0.00	0.00	0.00	0.00	0.00	0.00	100
Other payments for sheep farmers	2010	4 751 289 039	37.69	5 344	23.12		21.20	13.84	25.87	14.31	1.67	100
	2011	5 733 536 451	46.64	7048	26.54		24.70	21.10	16.60	10.36	0.71	100
	2012	5 835 604 002	51.02	6 646	24.28		26.60	21.37	17.77	8.13	1.83	100
	2013	5 809 621 969	32.06	4 603	29.00		31.00	17.00	15.00	6.00	2.00	100
	2014	8 933 576 682	65.21	11 413	14.62	11.89	27.18	17.79	18.69	8.90	0.93	100
	2015	17 535 760 141	75.42	21 627	16.22	12.78	29.37	19.38	13.73	7.13	1.38	100
	2016	10 858 912 491	60.52	13 699	16.13	13.58	26.44	18.07	13.16	11.99	0.63	100

Source: Data from MÁK (HUNGARIAN STATE TREASURY) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) and Magyar Juh- és Kecsketenyésztők Országos Szövetsége (National Association of Hungarian Sheep and Goat Breeders)
(15.-21 Calculations by Sándor Kukovics based on Periodical Information Report)

Table 5/5.: Trends in new subsidy claims paid in the sheep and goat sector in 2016

Name of Entitlement/ Measure	Total amount of subsidies paid HUF	Percentage of recipients (sheep farms) %	Number of claims paid	Distribution of the amount of claims paid by categories (%) farm size (ewe or goat/farm)							Total
				0-50	51-100	101-300	301-500	501-1000	1001-5000	5001-	
Transitional national support for ewe production	17 942 675	73.23	11 437	9.23	9.16	30.10	16.87	18.08	13.29	3.27	100
Support for young agricultural producers	427 844 485	5.47	708	35.27	16.22	35.50	9.96	2.05	1.32	0.00	100
De minimis supplementary ewe aid	3 163 927	0.08	7	0.00	0.00	14.29	62.18	23.53	0.00	0.00	100
Support for smallholders	49 120 913	1.57	220	86.51	8.85	4.64	0.00	0.00	0.00	0.00	100
Coupled support for ewe production	6 339 129 742	72.01	11 240	8.27	8.76	30.05	17.19	18.43	13.89	3.40	100
VP-M10 Gene preservation-animal (ÚMVP)	15 576 232	0.06	6	13.70	0.00	86.30	0.00	0.00	0.00	0.00	100
VP-M10 Support for indigenous breeds (ÚMVP)	252 510 071	0.53	49	3.09	0.88	36.41	3.65	4.24	48.59	3.13	100
VP-M10.1.1-Agro-environmental management	2 005 901 126	8.88	76	16.44	10.94	24.85	11.82	17.77	17.56	0.00	100
VP-M11.1.1-Ecological conversion	149 551 503	0.89	77	18.35	17.08	30.39	4.39	19.18	10.61	0.00	100
VP-M11.2.1-Ecological maintenance	76 784 396	0.36	51	44.53	13.70	31.59	1.34	2.48	6.35	0.00	100
Support for greening	16 093 585 636	63.32	9 901	23.37	12.66	22.31	15.30	12.53	13.19	0.65	100

Source: Data from MÁK (HUNGARIAN STATE TREASURY) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) and Magyar Juh- és Kecsketenyésztők Országos Szövetsége (National Association of Hungarian Sheep and Goat Breeders)
(15.-21 Calculations by Sándor Kukovics based on Periodical Information Report)
ÚMVP: New Hungary Rural Development Programme

Table 6/1: Distribution of 0-50 sheep / goat production in 2016 [...]

Entitlement/Measure	FARM SIZE								
	0-10			11-20			21-30		
	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)
Ewe aid scheme	0	0	0	6	7	2 515	2	2	1 155
De minimis ewe subsidy scheme	0	0	0	6	7	335 000	2	2	165 000
Complementary premium for ewe production - separated from 2007	0	0	0	0	0	0	0	0	0
De minimis subsidy for ewe production	26	26	1 393 000	54	54	5971000	37	37	6825000
Transitional national support for ewe production	214	368	52 458	916	1 617	349 982	666	1 185	402 414
Applications in support of young agricultural producers	16	23	9 427 039	65	94	52 855 808	48	74	31 673 037
De minimis supplementary ewe aid	0	0	0	0	0	0	0	0	0
Applications for smallholder support	9	12	1 804 433	58	100	19 421 042	36	61	15 223 734
Coupled support for ewe production	210	367	15 383 392	872	1 554	103 005 141	634	1 144	123 534 613
Area payments	165	321	454 702 343	643	1 223	1 811 034 543	515	988	1 438 761 088
VP-M04 Modernizing livestock farms (ÚMVP)	0	0	0	0	0	0	1	1	1 200000
VP-M10 AKG (ÚMVP)	0	0	0	0	0	0	4	5	7 628 349
VP-M10 Gene preservation-animal (ÚMVP)	0	0	0	2	3	2 133 592	0	0	0
VP-M10 Support for indigenous breeds (ÚMVP)	1	1	126 392	5	6	4 847 133	2	2	334 307
VP-M10.1.1-Agro-environmental management	16	16	45 424 444	39	39	105 572 334	40	40	75 711 217
VP-M11.1.1-Ecological conversion	2	2	2 264 993	6	6	16 505 424	5	5	1 767 408
VP-M11.2.1-Ecological maintenance	3	3	3 418 677	3	3	10 900 529	5	5	10 292 431
VP-M12 Natura 2000 (ÚMVP)	6	6	2 333 247	27	27	5 778 847	31	31	15 302 696
VP-M13 Less-favoured areas (ÚMVP)	4	4	5 154 676	25	25	9 853 153	25	25	15 261 311
Applications to elicit greening aids	166	296	263 007 363	639	1 149	1 049 660 152	515	913	872 360 309
Other payments	138	391	152 735 157	523	1 295	405 592 382	430	1 151	565 202 528
TOTAL:	217	1 836	957 227 614	919	7 209	3 603 818 577	668	5 671	3 181 646 597

Source: Magyar Államkincstár (Hungarian State Treasury) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) - Calculations by Sándor Kukovics

Table 6/1: Distribution of 0-50 sheep/ goat production in 2016 [continued]

Entitlement/Measure	FARM SIZE								
	31-40			41-50			TOTAL:		
	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)
Ewe aid scheme	2	2	1 176	3	3	2 667	13	14	7 513
De minimis ewe subsidy scheme	1	1	135 000	3	3	380 995	12	13	1 015 995
Complementary premium for ewe production - separated from 2007	0	0	0	0	0	0	0	0	0
De minimis subsidy for ewe production	25	25	6 335 000	11	11	3 647 000	153	153	24 171 000
Transitional national support for ewe production	448	808	359 169	491	894	491 145	2 735	4 872	1 655 168
Applications in support of young agricultural producers	38	62	26 197 684	37	55	30 733 089	204	308	150 886 657
De minimis supplementary ewe aid	0	0	0	0	0	0	0	0	0
Applications for smallholder support	13	18	4 974 387	3	4	1 073 141	119	195	42 496 737
Coupled support for ewe production	438	791	115 482 651	489	881	167 149 817	2 643	4 737	524 555 614
Area payments	358	682	1 285 908 382	414	790	1 327 162 373	2 095	4 004	6 317 568 729
VP-M04 Modernizing livestock farms (ÚMVP)	0	0	0	0	0	0	1	1	1 200 000
VP-M10 AKG (ÚMVP)	0	0	0	1	1	2 644 753	5	6	10 273 102
VP-M10 Gene preservation-animal (ÚMVP)	0	0	0	0	0	0	2	3	2 133 592
VP-M10 Support for indigenous breeds (ÚMVP)	0	0	0	2	2	2 491 537	10	11	7 799 369
VP-M10.1.1-Agro-environmental management	28	28	62 923 742	29	29	40 225 414	152	152	329 857 151
VP-M11.1.1-Ecological conversion	4	4	4 783 572	3	3	2 124 843	20	20	27 446 240
VP-M11.2.1-Ecological maintenance	3	3	3 421 329	1	1	6 161 297	15	15	34 194 263
VP-M12 Natura 2000 (ÚMVP)	27	27	6 810 801	28	28	8 554 014	119	119	38 779 605
VP-M13 Less-favoured areas (ÚMVP)	13	13	2 080 198	20	20	6 843 739	87	87	39 193 077
Applications to elicit greening aids	356	638	754 433 729	414	747	821 571 254	2 090	3 743	3 761 032 807
Other payments	294	785	248 929 591	365	990	378 845 243	1 750	4 612	1 751 304 901
TOTAL:	450	3 887	2 522 776 411	491	4 462	2 800 102 321	2 745	23 065	13 065 571 520

Source: Magyar Államkincstár (Hungarian State Treasury) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) - Calculations by Sándor Kukovics

Table 6/2: Distribution of support for 51-100 sheep/ goat farms in 2016 [...]

Entitlement/Measure	FARM SIZE								
	51-60			61-70			71-80		
	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)
Ewe aid scheme	0	0	0	0	0	0	3	3	4 515
De minimis ewe subsidy scheme	0	0	0	0	0	0	3	3	645 000
Complementary premium for ewe production - separated from 2007	1	1	127 995	1	1	82 110	0	0	0
De minimis subsidy for ewe production	8	8	3 199 000	5	5	2 303 000	2	2	1 085 000
Transitional national support for ewe production	278	496	331 246	242	440	328 008	217	384	331 016
Applications in support of young agricultural producers	16	25	7 469 754	20	29	12 277 543	24	36	22 432 279
De minimis supplementary ewe aid	0	0	0	0	0	0	0	0	0
Applications for smallholder support	5	9	2 279 320	5	6	1 464 953	0	0	0
Coupled support for ewe production	272	486	108 795 268	239	435	110 270 501	217	384	111 002 303
Area payments	234	446	762 230 247	217	421	654 859 716	191	376	774 999 757
VP-M04 Modernizing livestock farms (ÚMVP)	0	0	0	0	0	0	0	0	0
VP-M10 AKG (ÚMVP)	2	2	2 857 562	3	4	7 732 685	1	1	2 644 753
VP-M10 Gene preservation-animal (ÚMVP)	0	0	0	0	0	0	0	0	0
VP-M10 Support for indigenous breeds (ÚMVP)	0	0	0	1	1	379 176	1	1	312 504
VP-M10.1.1-Agro-environmental management	24	24	65 462 957	21	21	25 480 476	24	24	47 788 313
VP-M11.1.1-Ecological conversion	3	3	985 910	2	2	1 291 357	6	6	20 527 789
VP-M11.2.1-Ecological maintenance	1	1	9 343 148	0	0	0	2	2	478 641
VP-M12 Natura 2000 (ÚMVP)	25	25	16 561 053	22	22	7 298 310	13	13	8 581 212
VP-M13 Less-favoured areas (ÚMVP)	25	25	13 642 138	14	14	3 058 554	10	10	6 792 407
Applications to elicit greening aids	234	426	453 654 301	216	388	347 258 358	192	355	532 517 792
Other payments	209	542	159 100 628	205	554	347 618 564	190	484	235 694 464
TOTAL:	278	2 519	1 606 040 527	242	2 343	1 521 703 311	218	2 084	1 765 837 745

Source: Magyar Államkincstár (Hungarian State Treasury) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) - Calculations by Sándor Kukovics

Table 6/2.: Distribution of support for 51-100 sheep/ goat farms in 2016 (continued]

Entitlement/Measure	FARM SIZE								
	81-90			91-100			TOTAL:		
	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)	Number of farms in the category (pc)	Number of claims paid (pc)	Total amount of subsidies paid (HUF)
Ewe aid scheme	0	0	0	1	2	4 982	4	5	9 497
De minimis ewe subsidy scheme	0	0	0	1	2	583 000	4	5	1 228 000
Complementary premium for ewe production - separated from 2007	1	2	187 830	0	0	0	3	4	397 935
De minimis subsidy for ewe production	6	6	3 675 000	2	2	1 379 000	23	23	11 641 000
Transitional national support for ewe production	134	241	212 657	225	402	440 007	1 096	1 963	1 642 934
Applications in support of young agricultural producers	11	15	11 747 723	18	25	15 458 245	89	130	69 385 544
De minimis supplementary ewe aid	0	0	0	0	0	0	0	0	0
Applications for smallholder support	0	0	0	1	2	602 964	11	17	4 347 237
Coupled support for ewe production	134	241	74 949 537	224	397	150 135 011	1 086	1 943	555 152 620
Area payments	126	247	401 113 833	204	390	657 990 188	972	1 880	3 251 193 741
VP-M04 Modernizing livestock farms (ÚMVP)	0	0	0	0	0	0	0	0	0
VP-M10 AKG (ÚMVP)	0	0	0	1	1	1 185 743	7	8	14 420 743
VP-M10 Gene preservation-animal (ÚMVP)	0	0	0	0	0	0	0	0	0
VP-M10 Support for indigenous breeds (ÚMVP)	1	1	540 326	2	4	998 005	5	7	2 230 011
VP-M10.1.1-Agro-environmental management	15	15	36 683 675	24	24	44 157 883	108	108	219 573 304
VP-M11.1.1-Ecological conversion	1	1	1 891 749	1	1	849 167	13	13	25 545 972
VP-M11.2.1-Ecological maintenance	1	1	697 134	0	0	0	4	4	10 518 923
VP-M12 Natura 2000 (ÚMVP)	11	11	7 101 681	23	23	31 236 356	94	94	70 778 612
VP-M13 Less-favoured areas (ÚMVP)	10	10	2 718 608	20	20	19 730 041	79	79	45 941 748
Applications to elicit greening aids	127	238	237 671 825	202	370	466 007 235	971	1 777	2 037 109 511
Other payments	129	327	101 654 024	223	497	630 327 410	956	2 404	1 474 395 090
TOTAL:	135	1 356	880 845 602	225	2 162	2 021 085 237	1 098	10 464	7 795 512 422

Source: Magyar Államkincstár (Hungarian State Treasury) Mezőgazdasági és Vidékfejlesztési Hivatal (Agricultural and Rural Development Institute) - Calculations by Sándor Kukovics

Table 7: Percentage of ewes and farm receiving support

Year	Ewe number*	Number of sheep farms supported: Number of ewes**	Percentage of sheep farms supported: %	Total number of sheep farms	Number of new sheep farms	Number of sheep farms supported: ***	Percentage of sheep farms supported: %
2 005	1 163 819	1 136 436	97.65	7 712	802	6 669	86.48
2010	969 182	949 601	97.98	6 892	208	7 045	86.97
2011	891 799	861 102	95.09	6 468	540	6 468	86.94
2012	893 412	865 517	96.88	6 598	325	5 763	87.34
2013	896 746	863 906	96.34	6 660	234	5 869	88.12
2014	909 747	871 409	95.79	7 093	563	7 093	85.11
2015	930 145	909 907	97.82	7 747	853	7 746	88.94
2 016	969 924	927 034	95.58	8 625	1 266	7 569	87.76
2 017	986 057	939 065	95.23	8 950	553	7 784	86.97

*the number of above one-year-old females in the ENAR registry

**the number of animals entitled to receive ewe premium in the given year

**the number of sheep farms entitled to receive ewe premium in the given year

Source: Magyar Juhtenyésztők Szövetsége Periodical Report 10 (2005), and

Magyar Juh és Kecsketenyésztők Szövetsége Periodical Reports 15-22 (2010-2017)

Calculations and summary by Sándor Kukovics

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