COMPARATIVE ANALYSIS OF FARM ECONOMIC VIABILITY ASSESSMENT METHODOLOGIES

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Abstract

The paper deals with the economic assessment methodologies the strengths and weaknesses. It was found that, farm economic viability assessment differs from country to country: that is determined by differences in the natural environment, a different support policy, return on equity, labour productivity and land productivity. Methodologies rely on 23 financial ratios and 10 non-financial indicators, including 5 recurring indicators, namely Return on Equity, Expense to Income Ratio, Debt Ratio, Net Return, and Output to Economic Size Unit Ratio. After an empiric comparative analysis of economic viability assessment methodologies was conducted, their applicability by the example of Lithuanian farms was assessed, the obtained results were compared to similar results from farms in the EU states, and it was found that, there is no best methodology of the assessment of the economic viability of agricultural holdings for Lithuania. However a combination of methodologies by J. Scott and J. H. Tobraegel would result in a more efficient assessment of the economic viability of agricultural holdings.

Keywords: Economic viability assessments, farmers' farms, the EU countries, financial indicators, non-financial indicators

Introduction

Lithuania's accession to the European Union signalled changes in the external farming conditions, including the support and taxation environment, and consequently assessment of farm economic viability has become topical. Scientists (Tobraegel, 1998; Tillack, et al., 2000, etc.) argue that for the farms to remain viable they do not necessarily need to increase their efficiency since successful farming may depend on the farmer's ability to

choose a farming activity that fits the size of the farm in order to maintain the farm economic viability in the long term.

There appears, however, to be little research on economic viability of Lithuanian farms. Nevertheless, assessment of economic viability can serve as a crisis management management tool. Economic viability can be boosted and maintained by adopting different measures, including preferential loans, support/grants, tax policy measures, etc. The EU support exerts a very considerable influence on the prospects of the agricultural sector as it constitutes a significant part of the farm revenue. Support available to different type farms varies and that determines the economic viability of the farms.

Typically scientists (Scott, 2001; Scott, et al., 2008; Adelaja, 2005; Popelier, 2005; Scott, 2005, etc.) use financial indicators and statistical methods to measure the economic viability of agricultural holdings. Some scientists (Lappin, et al., 1982; Scott, 2005; Cain, at al., 2006; Whitaker, 2009; Offermann, et al., 2009) focus on the effect of support in assessing farm economic viability. Others (Lappin, et al., 1982; Popelier, 2005; Scott, 2005; Cain, at al., 2006; Adelaja, et al., 2007; Savickiene, et al., 2012) analyse the internal and external factors of economic viability. However, there is no unanimity about which indicators are the most significant with regard of economic viability or which methods are the most suitable to measure the economic viability of agricultural holdings.

It is evident that research does not devote sufficient attention to the assessment of farm economic viability through a relevant choice and use of assessment methodologies. Therefore the proposed scientific problem is which methods should be used in measuring the economic viability of agricultural holdings and how to identify the main methodology describing economic viability. Therefore this problem is relevant on both a theoretical and practical level. The research novelty lies in choosing the most appropriate methodology by comparing the methodologies suggested by scientists with findings of empiric research.

Research object: methodology of farm economic viability assessment

Research purpose: to analyse farm economic viability assessment methodologies and to estimate their applicability.

The following *tasks* will serve the purpose of the research:

- to analyse, assess, and theoretically justify the strengths and weaknesses of economic viability assessment methodologies suggested by scientists;
- to conduct an empiric comparative analysis of economic viability assessment methodologies, to assess their applicability by the example of Lithuanian farms (in Marijampole District), and to

compare the obtained results with comparable results from farms in the EU states

- to give recommendations on the most appropriate methodology for the assessment of farm economic viability in Lithuania.

Methods and conditions

To define and assess the research problem, comparative and systematic analysis of works by Lithuanian and foreign scientists, economic literature, laws and other regulatory documents, and analytical works was completed. Empiric research and result interpretation involve data clustering, specification, and classification, analysis of relative indicators/ratios, graphical representation of data, and methods of statistical analysis.

The research is based on the data of analysis of the performance accounting results in farms included in the Farm Accounting Data Network (FADN). The research used performance in formation from Marijampole farms (FADN) for 2009. It was decided to use the data for that year to compare them with data of other EU states published in *EU farm economics overview FADN, 2009).* More recent consolidated statistics on the level of all the EU states is not available. The economic viability of Marijampole family farms is assessed from two perspectives: the farm size (agricultural land, ha) and the type of farming (field-crop and mixed (field-crop and husbandry) farms). Marijampole District was selected as a typical region, which is actively engaged in agribusiness.

Strengths and weaknesses of farm economic viability assessment methodologies

Analysis of research by different scientists (Tillack, et al., 2000; Scott, 2001; Scott, et al., 2008; Argiles, 2001; Popelier, 2005; Koleda, et al., 2009; Koleda, et al., 2010, etc.) conducted in the field of farm economic viability assessment revealed that there is no unanimity about which indicators in the methodologies are the most suitable to measure the economic viability of agricultural holdings. Differences of opinion often result from views of the scientists on economic problems, and therefore the variety of opinions only further demonstrates the importance of deciding on the methodology of farm economic viability assessment.

Scientists (Vrolijk H. C. S et al., 2010) argue that the assessment of economic viability of agricultural holdings in various countries demonstrates significant differences. That is determined by differences in the natural environment, a different support policy, return on equity, labour productivity, land productivity, etc. It is therefore essential to analyse and evaluate economic viability assessment methodologies and the feasibility of

using those methods in assessing economic viability of agricultural holdings in Lithuania.

Generally, absolute and relative ratios are used to assess the economic viability of agricultural holdings. The ratios, which have to be assessed in each individual case with due regard to the changing situation in the farm, are very important since they enable to ascertain the crucial aspects and the strengths and weaknesses of the farm. The interpretation of the ratios allows to assess and suggest potential solutions.

The use of relative financial ratios might be the simplest way to asses the economic viability of agricultural holdings. Mostly, those ratios are classified into four main categories: profitability, short-term and long-term solvency, efficiency, and capital market.

It is recommended to use the above financial ratio groups and respective ratios in assessing the economic viability, financial position, performance, cash flows, and other areas of an agricultural holding. Since farm economic viability is a continual process, scientists usually conduct retrospective and prospective analysis of the relative ratios. In their research, they perform trend analysis, assess reliability, and analyse deviations from the normal state of business (Liou, 2008).

Table 1 presents indicators which are commonly found in scientific literature and recommended as indicators that best reflect economic viability of agricultural holdings (Scott (2001); Scott, et al. (2008); Popelier (2005); Adelaja (2007); Vrolijk, et al. (2010); Scotti, et al. (2011), etc.).

Since the first article by J. Scott (2001) was published, financial indicators have become a predominant approach in assessing the economic viability of agricultural holdings and its causes. Relative financial ratios represent primary indicators of farm economic viability and therefore in pursuit better economic viability assessment methodologies, analysis is usually based on sets of relative indicators, which are combined with other financial and non-financial information and macro-economic indicators.

Table 1. Indicators of farm economic viability and their thresholds (Scott, 2001)

Indicators	Viability Threshold
Return on Equity Ratio, %	Over 5%
Expense to Income Ratio, %	Under 80%
Debt to Income Ratio, %	Under 600%
Production Subsidy to Income Ratio, %	Under 20%

In his research, J. Scott, et al. (2008) added another indicator of general solvency, which he found to be very important for farmers as it signals the debt level. However nowadays the importance of this indicator in Lithuania is low since family farms have low levels of indebtedness. The general liabilities-to-assets ratio in EU-27 is low since the assets of the

farmers exceed their debt liabilities by 4-6 times (EU farm economics overview FADN 2009).

J. Scott (2001), J. Scott, et al. (2008), N. Koleda, et al. (2010), N. Lace, et al. (2010) determined that the most important factors are financial ratios and their indicators. They are the fastest and easiest way to reveal the economic viability of agricultural holdings. However, there still remains the problem of choosing financial ratios and deciding which of them are more important.

N. Koleda, et al. (2009) suggested 43 financial ratios, which were divided into qualitative and quantitative. In pursuance of the methodology recommended by the International Monetary Fund, they pinpointed 5 main ratios, which measure the economic viability of agricultural holdings: Debt to Equity, Return on Sales, Interest Coverage, Return on Assets, and Return on Investment (Table 2). They calculated the thresholds and defined the economic viability of farms, which reflects the allocation and utilization of financial resources (Koleda, Lace, 2009).

Table 2. Indicators of farm economic viability and their thresholds (according to Koleda, Lace, 2009, 2010; Koleda, et al., 2010)

Indicators	Viability Threshold
Return on Sales Ratio	Over 39.751%
Debt to Equity Ratio	Under 49.9%
Interest Coverage Ratio	Over 1%
Return on Assets Ratio	Over 3%
Return on Investment	Over 5.9 %

N. Koleda, N. Lace (2010) argue that farming is a process, which is oriented towards a successful operation in the market in the long term. That depends on different circumstances, the ability to maintain a positive result and to ensure continuous monitoring of the farm economic viability. The monitoring of the economic viability represents one of the farm crisis management instruments. The analysed factor analysis indicators (Return on Sales, Debt to Equity Ratio, Interest Coverage and Return on Assets) measure the growth rates of the financial ratio dynamics. It was found that the greatest impact on the economic viability of an agricultural holding is made by the sales price, production volumes, expenses, and decision-making aimed at viable farming (Koleda, Lace, 2010).

P. Tillack, D. B. Epstein (2000) analysed farm economic viability problems in the Central and Eastern Europe. Their assessment of farm economic viability was based on 3 financial ratios: the Quick Ratio, the Expense to Income Ratio, and the Short-term Liability to Earnings before Interest and Taxes (EBIT) Ratio (Table 3).

Table 3. Indicators of farm economic viability and their thresholds (Tillack, Epstein, 2000)

Groups	Indicators		
	PP1 - Quick Ratio	PP2 –Income / Expenses	PP3 – Earnings before Interest and Taxes (EBIT) / Short-term Liabilities
Group 1	PP1 >= 1.5 and PP2 >= 1 and PP3 >= 1		
Group 2	PP1 >= 1.3 and PP2 >= 0.85 and PP3 >= 0.9		
Group 3	PP1 >= 1.1 and PP2 >= 0.7 and PP3 >= 0.5		
Group 4	PP1 >= 1.1 and PP2 >= 0.7 and PP3 >= 0.5, if values are lower		

Based on the calculated indicators, P. Tillack, D. B. Epstein (2000) broke farms into 4 groups:

Group 1: if the indicators are within those values, farms are considered to be viable and stable;

Group 2: farms are not viable, however they have a good potential to become viable;

Group 3: farm viability is low and they are unlikely to become viable; farms need to be restructured;

Group 4: farms are non-viable and they show no signs of viability (either profitability or solvency).

Since the article by P. Tillack, D. B. Epstein (2000) was published, financial ratio analysis has become a predominant methodology in determining the reasons of farm economic viability in Russia. Relative financial ratios are primary indicators of farm economic viability and therefore in search of better farm economic viability assessment methodologies, analysis is usually based on relative indicators.

In pursuit of the EU support in Lithuania, one of the most important steps is the assessment of farm economic viability. The assessment of the economic viability of agricultural holdings is based on rather simple quantitative indicators of farm economic viability. Those indicators must be directly related to the aims and objectives of farm economic viability and there must be a possibility to monitor the progress on a regular basis.

So far, three versions of rules for measuring the economic viability have been adopted, which define the criteria of economic viability. All the versions of rules for measuring the economic viability include indicators given in Table 4.

Table 4. Indicators of farm economic viability and their thresholds (based on Economic Viability Measurement Guidelines (2007-2013)

Indicators	Viability threshold
Net Return	Over 1%
Debt Ratio	Under 80%
Loan Life Coverage Ratio	Over 125%

The objective of the assessment of viability measurement systems is to determine whether the applied economic viability rules including potential

alternative methodologies are in line with the objectives of the EU Structural Funds. The rules of assessing economic viability are essentially based on financial analysis, which scrutinises the actual data and forecasts the data of financial statements. Thus, "positive" (a viable farm) or "negative (a farm with financial difficulties) data can be estimated in advance.

The advantage of the first four methodologies is that they define viability thresholds, which enable to measure the economic viability of agricultural holdings, while their disadvantage is that the thresholds are based on empiric data in individual countries an may fail to reflect the actual farm condition if they are used to assess the economic viability of agricultural holdings in other countries.

In addition to relative financial ratios, the authors also use non-financial indicators, which include the farm size, the type of activities, the manpower, the education and training, the age of the farmer, the age of the farm, knowledge, and other characteristics, which often lead to successful performance of a farm (Argiles, 2001; Tobraegel (1998)). Therefore analysis of farm economic viability assessment must also include non-financial data because according to J. Grunert, et al. (2005) analysis of non-financial indicators boosts the possibilities of economic viability assessment. The size of the farm (a natural logarithm of sales and a natural logarithm of assets); man hours per hectare and per relative stock unit; value added created by one worker; value added of products per unit of land area, the indicator of working hours in agriculture, and the ratio of total production to economic size unit (ha, labour units, assets, equity, etc.) are considered to be the most important indicators. Furthermore, a major role is played by human abilities and labour productivity (Grunert, et al., 2005).

The above methodologies of farm economic viability assessment use financial indicators to measure farm economic viability. Scientists (Argiles, 2001; Tobraegel, 1998) describe financial and non-financial indicators in the assessment of the economic viability of agricultural holdings. J. M. Argiles (2001) rates the indicators below as the most important (Table 5), however the viability threshold is not determined.

Table 5. Indicators of farm economic viability (Argiles, 2001)

Classification of indicators	Indicators
Financial ratios	Debt to Assets (D/A)
	Current Liabilities to Current Assets (CL/CA)
	Net Worth to Fixed Assets (NW/FIXA)
	Percentage of Leases and Financial Charges to Total Output (PLIN/O)
	Percentage of Debt to Family Farm Income plus Depreciation (DEBT/FFID)
	Total Expenses to Total Assets (TOEXP/AS)
	Output to Assets except Land (OU/AEXL)

	Family Farm Income Less Financial Charges and Taxes to Total Assets (FFILI/TA)
Manufacturing KPI	Work unit indicator in agriculture = Family Work Unit to Annual Work Unit in a per one basis (FWU/AWU)
	Output to Annual Work Unit (OUTPUT/AWU)
	Output to Economic Size Unit (ha, labour units, assets, equity, etc.) (OUTPUT/E)

According to J. M. Argiles (2001), financial indicators reveal information on the economic viability of agricultural holdings, since growing financial liabilities of farms, low levels of net profit, and long-term return on assets are often resultant from contingent events in agriculture that lead to reducing revenue and endanger farm viability. The greatest impact on the decline in income of an agricultural holding is made by falling prices and natural conditions, which affect the production, revenue, and net cash flow. As a result, the farm fails to cover the increased debts and in order to become solvent/viable has to start selling land, stocks, inventory, etc. (Argiles, 2001).

L. H. Tobraegel (1998) sought an integrated assessment of the economic viability of family farms. The research was based on three types of indicators, which describe the costs of production, performance results, and financial position (Table 6).

Table 6. Indicators of farm economic viability (Tobraegel, 1998)

Classification of indicators	Indicators
Indicators of the costs of production	Subsidies (LTL/ha)
	Agricultural Assets (LTL/ha, LTL/labour unit)
	Investment (Lt/ha)
	Agricultural Land per Labour Unit (ha/labour unit)
Manufacturing KPI	Total Output (LTL/ha)
	Revenue (LTL/ha)
	Net Value Added (LTL/ha, LTL/labour unit, LTL/equity, LTL/assets)
Financial ratios	Return on Equity
	Expense to Income Ratio
	Material Investment Ratio (Material Investment to Value Added Ratio)

To assess the economic viability of agricultural holdings, the methodology uses three types of indicators, which help to efficiently assess different aspects of farming activities with respect of the efficiency of the use of the key production factors and the economic viability of agricultural holdings (Tobraegel, 1998).

The research (Tobraegel, 1998) holds that the growth of the value added is consequent on increasing sales volumes, the producer prices, and labour productivity. Furthermore, the growth of the value added has a positive impact on the economic viability of agricultural holdings. However it can be argued that the main cause of decline in the economic viability of

agricultural holdings is low-tech morally and physically obsolete equipment and machines. Thus most countries demonstrate a lower consumption of fixed capital, which is a constituent part of value added (Tobraegel, 1998).

Consequently, the scientist (Tobraegel, 1998) included the Material Investment Ratio in his research. An insufficient Investment Ratio interferes with farm development including its profitability. Therefore a research was conducted to prove that new technologies and ability to implement and use them have a positive effect on the productivity, production development and economic viability of agricultural holdings (Tobraegel, 1998).

With respect of the analysis of economic viability assessment methodologies, the authors argue that the following objectives of farm economic viability should be taken into consideration when deciding on relevant indicators of farm economic viability: to expand agricultural production; to guarantee a normal standard of living among farmers; to stabilise the market; to secure supply and storing conditions of food and other agricultural products; to ensure that food products reach the user at acceptable prices (the Common Agricultural Policy after 2013).

Since the key objectives of farm economic viability are related to profitable operations of the farm and a sufficient living standard of the farmers, the key focus is placed on the assessment of the indicators. However H. Bossel (1999) indicates that the interpretation of the assessment of the economic viability of an agricultural holding, which focuses on ratios and ignores other important aspects, reveals the weaknesses of the farm economic viability. For instance, indicators can only communicate certain information but they do not indicate how a higher level of the economic viability of agricultural holdings could be reached (Bossel, 1999).

It should be noted that the methodology of farm economic viability assessment depends on the objectives of the research, differences in the natural environment, a different support policy, land productivity, etc. and therefore the methodology uses different indicators to assess the economic viability of agricultural holdings. The methodologies used 23 financial ratios and 10 non-financial indicators, including 5 recurring indicators. Most methodologies relied on Debt and Return on Equity ratios.

In consideration of the economic viability assessment methodologies, it can be noted that in the assessment of the economic viability of agricultural holdings scientists usually relied on 3-8 financial and non-financial indicators. The advantage of the first four methodologies is that they define viability thresholds, which enable to measure the economic viability of agricultural holdings. However other methodologies use financial ratios and non-financial indicators to measure farm economic viability. The rates are considered to be more than indicators of short-term viability. They are regarded as a very important tool in the assessment and forecasting of

long-term economic viability of agricultural holdings. An empiric research based on the data from family farms in Marijampole District was targeted at evaluating the possibilities of practical application of the described methodologies.

Comparative empiric analysis of economic viability assessment methodologies and assessment prospects in Lithuanian farms

The comparative analysis of economic viability assessment methodologies addressed six methodologies based on the works of scientists J. Scott (2001), J. Scott, et al. (2008), N. Koleda, et al. (2009, 2010), N. Koleda, et al. (2010), P. Tillack, et al. (2000), J. M. Argiles (2001), J. H. Tobraegel, (1998), and the Rules for Measuring Economic Viability.

When the economic viability of agricultural holdings is measured using the methodology suggested by J. Scott, et al. (2008), it can be maintained that in the field-crop sector only large family farms (at least 30 ha) are viable. Small farms (under 30 ha) are non-viable regardless of whether they are subsidised or not (Fig. 1). That is indicated by a negative Return on Equity, Expense to Income, and Subsidy to Income ratios. However the performance of mixed farms is much better than that of field-crop farms. It should be noted that the size of a mixed farm has no significant influence in the assessment of the economic viability of agricultural holdings.

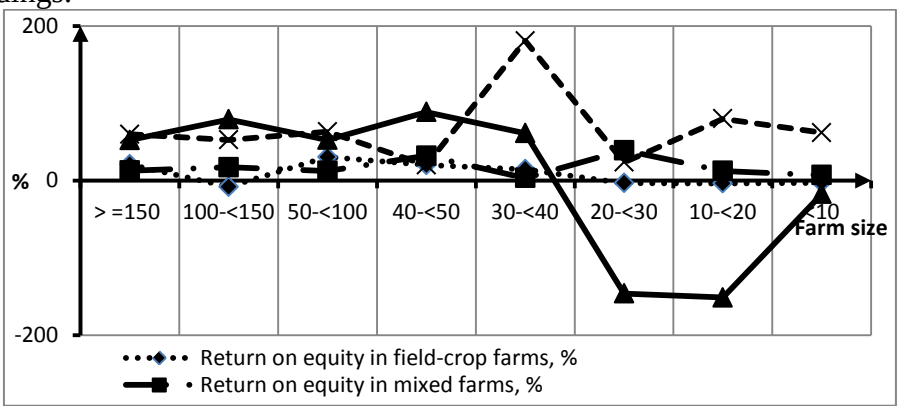

Fig. 1 Assessment of farm economic viability in pursuance of J. Scott (2001), J. Scott, R. Colman (2008) methodology by the example of Marijampole District family farms, 2009

J. Savickiene, et al. (2012) used the data from Lithuanian respondent family farms to calculate their economic viability. The Return on Equity is one of the key vitality indicators. In 2009, the Return on Equity (subsidies included) amounted to 4.6%; however excluding subsidies it was negative (7.83%). Thanks to the national aid and support received from the EU, in all years, except 2009, the Return on Equity was 5% higher than the minimum

vitality threshold. That can be seen as an artificial maintenance of farm economic viability, as subsidies can be regarded as a relatively temporary measure. However it is essential that the subsidies have a long-term lasting impact rather than a short-term effect on the development of farm economy.

It should be noted that if the farms are not categorised according to the two criteria (farm size and type of farming), based on the data from Lithuanian respondent family farms, Lithuanian farms are viable, since all their indicators are below the minimum threshold (Fig. 1), except the Subsidy to Income Ratio, which is very distant from the viability threshold and is as high as 180%, while the recommended viability threshold is 20%. By comparison, in EU-27, subsidies on average accounted for 40% of the total revenue although this indicator differs substantially across the countries (EU farm economics, 2012). This means that in pursuance of J. Scott's, et al. (2008) methodology, subsidies, farm size, and type of farming have a major impact on the assessment of farm economic viability.

Farmers must decide on a relevant management strategy and optimal results and they must seek to improve agricultural performance without relying on subsidies (Savickiene, et al., 2012).

In the light of the EU membership, changing policies under the CAP, and the trends of changes in the rural economy, where the increase in the value added in agriculture essentially depends on the support and tends to decline, diversification of economic activities in agricultural holdings is an important issue. It represents one of the tools for generating higher value added and maintaining the viability of small and medium farms in the pursuit of the CAP objective to enhance the viability of the agricultural sector.

When the economic viability of agricultural holdings is measured using the methodology suggested by N. Koleda, et al. (2009, 2010), N. Koleda, et al. (2010), it can be maintained that the Return on Sales in field-crop farms depends on the farm size and the utilisation of agricultural land (Fig. 2). Fallow land has a major impact in the assessment of farm economic viability: if the fallow land exceeds 20% of the total land area, the farm vitality decreases. This indicator ranges from 3.3% to 21%, whereas in the EU it amounts to approximately 3% (EU farm economics overview FADN 2009).

In mixed farms, the viability is also affected by livestock production and its share in the total output. Mixed farms are viable if their livestock production exceeds 50% (Fig. 2). This indicator ranges from 3% to 30%, whereas in ES-27 it comes up to approximately 5% (EU farm economics, 2012).

In mixed farms, the Return on Assets ratios are significantly higher than in field-crop farms (Fig. 2). A decrease in this indicator evidences that the farm assets are managed inefficiently. The best Return on Assets ratio is

displayed by farms the size whereof ranges from 40ha to 100ha. It should be noted that there is a decreasing trend in the ROA across the European Union. In comparison to 2008, in 2009 the average decrease in all EU-27 was approximately 1.8% and it amounted to about 0.4%. However the highest ROE in the EU is observed in the Baltic States, Hungary, Romania, and Bulgaria. Those countries usually tend to display the highest Return on Assets. A negative Return on Assets was recorded in 13 MS, with the lowest indicators in Slovakia and Sweden (EU farm economics overview FADN 2009).

Fig. 2 Assessment of farm economic viability by the example of Marijampole District family farms, 2009 (Koleda, Lace, Ciemleja, 2010)

In their methodology, N. Koleda, et al. (2010) suggest using the indicator of Interest Coverage (Table 2), however insufficient information, where interest amounts are not recorded, makes it difficult to calculate it.

If the economic viability of agricultural holdings is measured using the methodology suggested by scientists P. Tillack, et al. (2000), it can be argued that this methodology is not relevant in Lithuania since the levels of farmers' debts are low. The calculations of the Output to Short-term Liabilities and the Quick Ratio show that all farms by farm size and farming type are viable, even though the previous two methodologies claimed that farms are viable only if they are over 30 ha. This methodology can be used by farms, which have debts. The debt level in ES-27 is low. The assets are 4-6 times higher than debt liabilities (EU farm economics overview FADN 2009).

It should be noted that this methodology relied on 3 indicators, including two debt indicators that were rejected by us. An interesting indicator is the third one, which is the Total Output and Subsidy to Cost Ratio. In measuring the economic viability of agricultural holdings, the indicators should be calculated both including and excluding subsidies to production. Farms are considered viable if this ratio exceeds 100% (Tillack, et al., 2000). Figure 3 shows that field-crop farms are non-viable whether

they are subsidised or not. In the case of mixed (field-crop and livestock) farms it should be noted that an unsubsidised 39.51ha farm with 29.99 relative stock units falls within the second group (88.8%) with viability potential, however based on the indicator calculations including subsidies, the farm is considered viable.

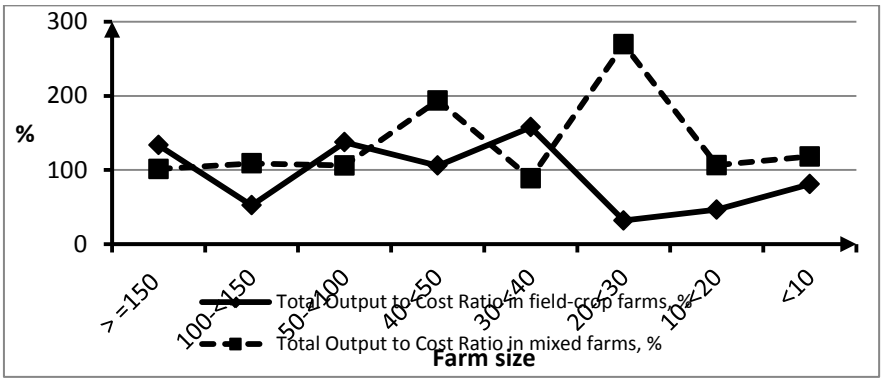

Fig. 3 Assessment of farm economic viability by the example of Marijampole District family farms, 2009 (Tillack, et al., 2000)

A farm has a great potential of becoming viable if the indicator ranges from 85% to 100%. Figure 3 shows that only one of the previously described farms falls within this category.

The farm viability is low and radical changes in field-crop farms with the indicator ranging from 70% to 85% are imperative. Such changes are critical in field-crop farms and those where fallow land accounts for a major share. Where the indicator goes below 70%, the farms are unprofitable, insolvent and they display no vitality signs. There are farms where such results are obtained if the calculations of the indicator exclude subsidies, however once subsidies are included, the indicator falls into Group 3 (70-85%). It is concluded that production subsidies have a major impact on the economic viability of agricultural holdings.

The assessment of the economic viability of agricultural holdings in EU–27 by farming types shows that the Output and Subsidy to Cost Ratio is negative in all sectors except pig and poultry farms. It should be noted that in EU-27 average subsidies represented 40% of the total revenue, while the average in field-crop and mixed farms was 60% and 58%, respectively (EU farm economics overview FADN 2009). In Lithuania subsidies stand at approximately 50%. In field-crop farms and mixed farms of Marijampole District subsidies range from 20% to 55% and 10% to 20% of the total revenue, respectively.

If farms want to benefit from the EU support, their economic viability is checked pursuant to the Economic Viability Measurement Guidelines (2007-2013). Indicators described in previous methodologies (Net Return,

Debt Ratio, Loan Life Coverage) are used to assess the economic viability of agricultural holdings. It can be concluded that the selected indicators are suitable for the purpose since most methodologies (Scott, et al., 2008; Koleda, et al., 2010; Tillack, et al., 2000) rely on those indicators to measure the economic viability of agricultural holdings.

The assessment methodologies by L. H. Tobraegel (1998) and J. M. Argiles (2001) are similar and they aim at an integrated assessment of farm economic viability. They rely on the indicators of production costs, performance, and financial position.

The indicators describing the financial position include the ratios of Material Investment, Return on Equity, and Total Output and Production Subsidies to Costs (Tobraegel, 1998). It should be noted that the investment indicators in field-crop farms are significantly higher than in mixed farms. Such difference was affected by the EU support. A higher value of the investment indicator is resultant from the aspiration to maintain a higher level of viability in expanding markets, preconditioned by cutting-edge technologies, innovation, and qualification of the labour force.

Apart from relative financial ratios, J. H. Tobraegel (1998) introduces production cost and performance indicators. The production cost and performance indicators are absolute relative values, which help to make a relevant assessment of the economic viability of agricultural holdings (Table 7).

Table 7. Assessment of farm economic viability based on *production cost indicators* by the example of Marijampole District family farms, 2009 (Tobraegel, 1998)

Indicators	> =150	100-<150	50-<100	40-<50	30-<40	20-<30	10-<20	<10
Agricultural assets (LTL/ha)	Field-crop farms							
	5524.6	5199.5	6268.0	3260.6	4078.0	8491.5	11942	15249
	Mixed (field-crop and husbandry) farms							
	11475.8	14468.7	10754.9	10024.6	21404	11886.9	3136.2	32598
Investment (LTL/ha)	Field-crop farms							
	0	900.06	0	0	0	0	2227.9	0
	Mixed (field-crop and husbandry) farms							
	46.10	904.27	0	0	0	0	0	4816.5
Agricultural land per labour unit (ha/labour unit)	Field-crop farms							
	261.64	68.78	29.71	83.25	40.41	19.51	9.037	6.58
	Mixed (field-crop and husbandry) farms							
	88.26	44.705	35.16	23.86	16.06	12.4	7.239	4.74
Subsidies (LTL/ha)	Field-crop farms							
	542.49	366.16	709.76	572.82	322.6	413.1	817.2	72.78
	Mixed (field-crop and husbandry) farms							
	580.31	874.96	744.68	594.38	1210.4	773.57	315.31	1432.6

The calculated indicators show that small farms tend to have higher average assets per hectare of farmland (LTL/ha) and in 2009 most investments were made in field-crop (2,228 LTL/ha) and mixed farms (4,816

LTL/ha), while the investments of large farms (100ha or more) stood at about 900 LTL/ha. Most benefits of production subsidy per one hectare are captured by mixed, including very small farms. In conclusion, small farms can be viable if they manage to take advantage of investments and benefit from largest subsidies. That means that the government policy should focus on preserving small farms.

In EU–27, the average asset value of a farm is LTL863 thousand, although the asset value in field-crop and mixed farms is lower. In Lithuania, the average size of farms in terms of asset value is approximately LTL431 thousand.

It should be noted that in EU-27 subsidies in field-crop and mixed farms on average accounted for 22% and 13% of the total revenue, respectively (EU farm economics overview FADN 2009). While in Lithuania subsidies stand at approximately 18%. In field-crop farms and mixed farms of Marijampole District subsidies range from 20% to 55% and 10% to 20% of the total revenue, respectively.

When production performance indicators are used in measuring the economic viability of agricultural holdings, it can be maintained that the total output in mixed farms amounts to at least 79-90 %, which means that the share of subsidies is small and the farmers strive to maintain viability without the EU support. However that is different in field-crop farms, where the total output stands at 57-78 %, meaning that subsidies in field-crop farms have a large impact on the economic viability of agricultural holdings.

Table 8. Assessment of farm economic viability based on *production performance* by the example of Marijampole District family farms, 2009 (Tobraegel, 1998)

Indicators	> =150	100-<150	50-<100	40-<50	30-<40	20-<30	10-<20	<10
Total output (LTL/ha)	Field-crop farms							
	1961.94	884.45	2347.2	1309.41	558.3	326.17	1083.44	2084
	Mixed (field-crop and husbandry) farms							
	4937.21	4580.6	3696.6	4937.48	4483.2	3955.1	1154.00	5367
Total output + subsidies (LTL/ha)	Field-crop farms							
	2504.42	1250.6	3056.9	1882.23	880.9	739.26	1900.66	2157
	Mixed (field-crop and husbandry) farms							
	5517.52	5455.6	3696.6	5531.9	5693.6	4728.7	1469.31	6800
Net profit + subsidies (LTL/ha)	Field-crop farms							
	1031.58	462.83	1347.9	646.1	526.6	-283.0	1795.1	-422
	Mixed (field-crop and husbandry) farms							
	685.76	2149.2	4441.3	2983.0	645.0	3261.0	390.16	7074
Net value added/ labour unit	Field-crop farms							
	280294	-26452	84969	54092	24113	-5333	-3877	-2778
	Mixed (field-crop and husbandry) farms							
	777641	231405	51511	79631	10762	40440	2854.5	10955
Net value added/equity	Field-crop farms							
	7.2	-7.9	30.5	20,30	14.6	-3.20	- 4.00	-3.00
	Mixed (field-crop and husbandry) farms							
	12.86	17.31	12.55	30.19	32.4	39,18	12.6	7.1

The assessment of the economic viability of agricultural holdings in EU–27 showed that the average farm net value added was approximately LTL76 thousand, while in **the field-crop and mixed farms it was below the average and stood at approximately LTL70 thousand and LTL52 thousand, respectively.** The net value added is calculated per annual work unit (AWU), including salaried AWU and family labour, and its levels significantly differ both within Lithuania and across the EU. In the EU states the average farm net value added (FNVA) is about LTL52 thousand per year, while in Lithuania it is half as much (EU farm economics overview FADN 2009).

However the data in Table 8 reveal that the FNVA in small field-crop farms is negative. It is interesting that the FNVA per AWU can be as high as LTL280 thousand or even LTL777 thousand. That means that farmers provide inaccurate information, when they say that one family member cultivates 260ha of land or more.

J. M. Argiles' (2001) methodology of farm economic viability assessment relies on financial (debt, assets, revenue and profit) and production performance indicators. In this methodology, debt indicators do not arouse interest since farms have low levels of indebtedness. However asset indicators, such as Net Worth to Fixed Assets Ratio, Farm performance indicator, Output to Assets except Land, etc. are very important.

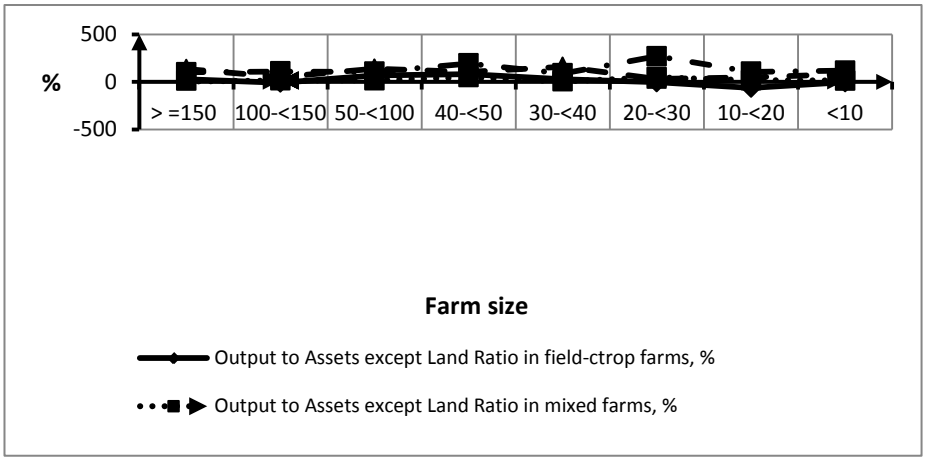

Fig. 4. Assessment of farm economic viability based on *financial ratios* by the example of Marijampole District family farms, 2009 (Argiles, 2001)

The indicator of family farm income/savings was not analysed. The smallest amounts of savings are used by large and mixed farms, while field-crop farms with the area from 50 ha to 100 ha and from 20ha to 30ha use the largest amounts that account for approximately 22 percent (Fig. 4). However

the ratio of Total Output and Subsidy to Fixed Asset minus Land is higher in the field-crop sector and large farms, and lower in small farms (30% or less).

In the methodology suggested by J. M. Argiles (2001), the key farm performance indicator is the total output with subsidies for production, which is compared to assets, equity, annual work hours, hectares, and labour units (Fig.5). Those indicators reflect the ability to generate revenue and to use the assets efficiently. The rates of Return on Assets and Return on Equity are very similar. Return on Assets reflects the ability of the farm to use its assets in a profitable manner: the higher the value of the indicator is, the more efficiently the assets are used. However, neither the ROA nor the ROE is high.

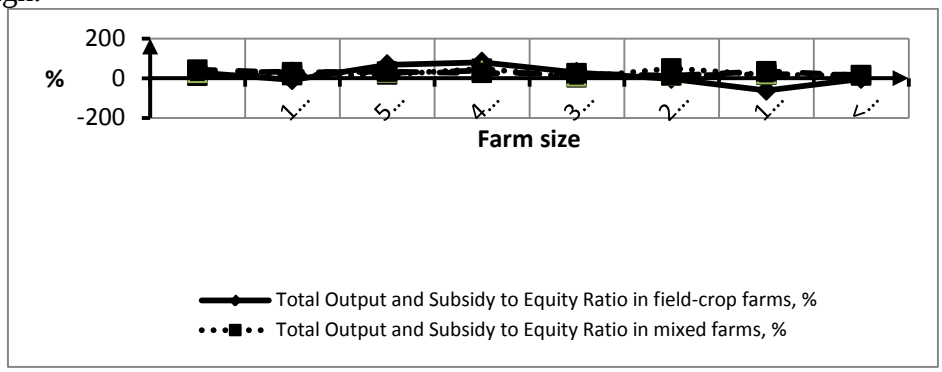

Fig. 5 Assessment of farm economic viability based on financial ratios by the example of Marijampole District family farms, 2009 (Argiles, 2001)

In agriculture, the indicator of working hours depends on the size of land owned by field-crop or mixed farms. The numbers of people employed by large farms range from 2 to 3, while in small farms the labour units stand at 1 to 1.33. Although it can be said that one worker works in a full-time job, the working hour indicator in agriculture is still low and it evidences insufficiently professional farming and farm management, which is very reluctantly recognised by the farmers. The State makes investments not only in expensive techniques but also in human resources. Human and physical capital are complementary as they are both essential in pursuance of profit in the long term.

Empiric research based on farm economic viability assessment methodologies brings to a conclusion that financial indicators can partially measure the economic viability of agricultural holdings. Most authors argue that debt indicators are highly important, however in the case of family farms in Marijampole District the calculation of those indicators is redundant since the levels of debt are low. That again reaffirms that different indicators for economic viability assessment are relevant in different countries. Therefore it is concluded that financial indicators are not the only ones to describe the economic viability of agricultural holdings. The authors believe that it is

essential to rely on the indicators of production costs and production performance, which help to achieve a more exhaustive assessment of economic viability.

The assessment of the economic viability of agricultural holdings relied on financial ratios to measure four economic instruments (Scott, 2001; Koleda, et al., 2009, 2010; Koleda, et al., 2010, Tillack, et al., 2000; EU Rules for measuring economic viability), however due to unavailable data some of them cannot be calculated and therefore it is difficult to assess the economic viability of agricultural holdings. Apart from financial ratios, J. H. Tobraegel (1998) and J. M. Argiles (2001) used the indicators of production costs and production performance to assess the economic viability of agricultural holdings. Those indicators make the farm economic viability assessment more comprehensive.

The research showed that there is no best methodology of the assessment of the economic viability of agricultural holdings. However a combination of methodologies by J. Scott, et al., (2008) and J. H. Tobraegel (1998) would result in a more efficient assessment of the economic viability of agricultural holdings, as that would include financial (Return on Equity, Material Investment, Cost, Subsidies, and Debt) and non-financial (Production Cost and Performance) indicators.

Conclusion:

1. Following the analysis and evaluation of the strengths and weaknesses of economic viability assessment methodologies suggested by scientists, it was found that

- farm economic viability assessment differs from country to country. That is determined by differences in the natural environment, a different support policy, labour productivity, land productivity, etc.;
- financial indicators are the most important as they are the fastest and easiest way to reveal the economic viability of agricultural holdings. Scientists also use non-financial indicators, which help to identify the possibilities of farm economic viability assessment;
- methodologies rely on 23 financial ratios and 10 non-financial indicators, including 5 recurring indicators, namely Return on Equity, Expense to Income Ratio, Debt Ratio, Net Return, and Output to Economic Size Unit Ratio;
- the indicators that can lead to the most efficient assessment of the economic viability of agricultural holdings have not been determined;

2. After an empiric comparative analysis of economic viability assessment methodologies was conducted, their applicability by the example of Lithuanian (Marijampole District) farms was assessed, the obtained results

were compared to similar results from farms in the EU states, and it was found that

- according to J. Scott's methodology, mixed farms are viable, while field-crop farms are viable if their size is at least 30ha, since their indicators are below the threshold;
- according to the methodology suggested by N. Koleda, N. Lace, G. Ciemleja, the results are the same as in J. Scott's methodology. However this methodology precludes calculations of all indicators since there are no available data for calculations of Interest Coverage and Debt ratios.
- The methodology by P. Tillack, D. B. Epstein is irrelevant since the levels of farmers' debts are low. The calculations of the Output to Short-term Liabilities and the Quick Ratio show that all farms by farm size and farming type are viable;
- if farms want to benefit from the EU support (2007-2013), their economic viability is measured using relevant indicators, since most methodologies (Scott, 2008; Koleda, et al. 2010; Tillack, et al., 2000) use those indicators to assess the economic viability of agricultural holdings;
- according to J. H. Tobraegel's methodology, ratios are classified into financial and non-financial, and they show that small field-crop farms can also be viable, as oposed to the methodologies by J. Scott, N. Koleda, N. Lace, G. Ciemleja;
- J. M. Argiles' methodology suggests a great variety of indicators, which are not appreciated by the EU. That again reaffirms that different indicators for economic viability assessment are relevant in different countries.
- The assessment of the economic viability of agricultural holdings under four methodologies relied on financial ratios, however due to unavailable data some of them cannot be calculated and therefore it is difficult to assess the economic viability of agricultural holdings. Apart from financial ratios, J. H. Tobraegel and J. M. Argiles used the indicators of production costs and production performance to assess the economic viability of agricultural holdings. Those indicators make the farm economic viability assessment more comprehensive;
- the obtained results were compared to similar results from farms in the EU states and it was found that there is a great difference among indicators (Return on Equity, Return on Assets, Production Subsidy to Income, Return on Sales, Expense to Debt Ratio) in different member states.

3. There is no best methodology of the assessment of the economic viability of agricultural holdings for Lithuania. However a combination of methodologies by J. Scott and J. H. Tobraegel would result in a more

efficient assessment of the economic viability of agricultural holdings, as that would include financial (Return on Equity, Material Investment, Cost, Subsidy, and Debt) and non-financial (Production Cost and Performance) indicators.

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