UNIVERSITY OF NATIONAL AND WORLD ECONOMY (UNWE)

DEPARTMENT ECONOMICS OF NATURAL RESOURCES

SOFIA, BULGARIA

PH.D. THESIS

THE EFFICIENCY OF SUBSECTORS IN AGRICULTURE OF KOSOVO: SPECIALIZED IN FIELD CROPS, MIXED CROPS AND LIVESTOCK

Co-Supervisors:

PROF. DR. DIANA KOPEVA

PROF. DR. EKREM GJOKAJ

PhD Candidate

NOL KRASNIQI

Sofia 2020

CONTENTS

1. INTRODUCTION

This PhD thesis is focused on the efficiency of subsectors in agriculture of Kosovo specialized in field crops, mixed crops and livestock". Kosovo's agriculture in general and its sub-sectors faces challenges in inefficiency and low productivity which make a large trade deficit and leads to depend on imported basic products although it has potential to compete in regional markets.

There is no specific research or concept framework on this with respect to Kosovo using the FADN data to measure sub-sectors of agriculture in Kosovo. One of the main indicators that is of particular interest to both farmers and other stakeholders is the profitability of farms. Based on results from FADN weighted average, shows that the agricultural area used is about 4 ha, and the livestock units about 3 LU[1]).

According to Green Reports 2019 from the latest FADN results the total output (production) value as average per farm in 2017 was € 7,834, the input value was € 5,732, and the ratio between them was 1.37. After we subtract the value of the intermediate farm consumption, depreciation, wages, etc. from the total output we get the household income on the farm where in 2017 the average per farm was € 2,457, which compared to other EU countries, are quite low. (Green Report, 2019).

The balance trade of Kosovo is negative; thus, Kosovo is highly depended on exports where farms struggle to access local and export market. Besides land fragmentation, one of the main reasons is low efficiency of farms in Kosovo.

To measure the technical efficiency of farms Data envelopment analysis (DEA) is used. DEA can be described as a nonparametric technique based on linear programming to evaluate the efficiency of organizations working in the same field. The largest number of farms in the sample of FADN are farms specialized in field crops and farms with mixed crops and livestock. For measuring the efficiency R studio is used, which is a programming language and software for statistical computing.

[1](Livestock Unit is a standard unit of measurement, which enables aggregation of different categories of animals, through the use of specific coefficients, based on EU regulations

Problem Statement.

Kosovo's economy shows one of the lowest GDP per capita and is one of the poorest countries in Europe. It is estimated that 60% of the population live in rural areas. The share of agriculture in gross domestic product in 2015 was 10.3%. According to results of Agriculture Census 2015, there are 130,775 agricultural households, employing 86.620 people with full-time jobs. The process of rural development in is structured within the National Development Plan, where agriculture usually represents the most dominant economic activity in the rural areas, contributing to the enhancement of production by providing goods for export.

The overall objectives of the agricultural and rural development strategy for Kosovo (ARDP) based on the Europe 2020 strategy and its long-term strategic objectives of contributing to: developing a competitive and innovation-based agri-food sector with increased production and productivity capable of producing high-quality products and meeting the requirements of the EU market, contributing to the security and safety of the food supply, pursuing economic, social/environmental goals by fostering employment, developing human and physical capital. These will be archiving by increasing farm efficiency of subsectors and this PhD thesis will demonstrate which of them are efficient based on FADN data. Furthermore, the results from this research are important to all stakeholders in the sector, from farmers to the policymakers.

The initial years of independence were focused more to strengthen newly found executive and legislative bodies. Besides other current duties, improving the national wealth and reducing migration especially from rural areas is one of the biggest challenges. Over the last years, there has been growing attention and support for the agriculture sector from Government of Kosovo and from donor community. The government budget for financial support for the agrifood sector has increased significantly and is expected to further increase in the coming years. Parallel with the increased state and donor support, there has been also increased interest to invest in agrifood sector by the private sector, to some extend stimulated by support schemes. In order to have effective support schemes from policy-makers and successful investment by private sector actors, it is necessary to have in-depth understanding of the agrifood value chain developments trends, challenges and perspectives.

One very important aspect that contributes to the formulation of effective agricultural policies is economic data at farm level. Over the last few years, the European Union has developed a range of instruments for assessing the agricultural sector. One of the sectors helping the EU in collecting information about revenue and economic performance is the FADN. These data enable relevant authorities to develop policies and standards that contribute to the establishment of conducive policies for the development of the agricultural sector.

The data collected through this instrument include but are not limited to: value of production of the different crops, stocks, sales and purchases, production costs, assets, liabilities, production quotas and subsidies.

Objectives of the thesis

The overall objective of this thesis is to analyze the efficiency and the performance of subsectors of agriculture in Kosovo and to assess the financial impact of national measures towards farm efficiency. This was done by investigating the level and factors that determine technical and scale efficiency of specialized in field crops, mixed crops and livestock sector.

The specific objectives are:

i. Estimate the efficiency of subsectors of Agriculture in Kosovo specialized in field crops, mixed crops and livestock
ii. Assess financial impact of different measures under the National Plan of Agriculture and Rural Development of Kosovo
iii. examine the challenges and prospect of subsectors
iv. Determine the level of budget spending on sub-measurers for these sub-sectors on national level and to derive recommendations for policy makers.

Research Questions

- How is the farm size (Total Utilized Agriculture Area (ha) and Total labour input (AWU) affecting the Efficiency?
- Why Farms specialized in field crops are more efficient?

Hypothesis.

- Large farm sizes have a positive impact on efficiency
- Specialized field crops farms are more efficient than mixed crops and livestock.

Inputs affect farm efficiency positively. Testing for non-parametric method such DEA with bootstrap test of H0 $\mu 1, \theta = \mu 2, \theta$ can be implemented by estimating a bootstrap confidence interval, and rejecting H0 if the resulting interval does not cover zero. (Simar & Wilson, 1998)

Research and information methods and sources

In order to collect the necessary data for the research, primary and secondary data were used. For the primary data, the author was personally involved in the team and serving as consultant at FADN team where the author was involved all stages of FADN from crating the questionnaire according to general EU rules and fitting to national system, hiring , training and controlling the data collectors, generating and analyzing data until the last stage of and finalizing and reporting about the FADN. For secondary data were used scientific books, articles, research papers on different schools and theories for assessment of efficiency, Data Envelope Analysis (DEA) using in Agriculture. An extended document analysis was done. Firstly, the Agriculture and Rural Development Plans 2010-2013 and 2014-2020 were studied which provide economic and social data for all subsectors of agriculture in Kosovo. General Information about Farm Structure, characteristics and activities of Farms, Past policy actions from 2010 to 2013 and 2014 to 2020. Moreover, report from international organizations

This research is new in Kosovo and is using reliable data from FADN. Many other scientific researches in Europe on the field of measuring efficiency in agriculture are done based on FADN data.

The important findings of the research can be useful for policy makers and all involved stakeholders, partners and key parties to improve the efficiency of farms in Kosovo in benefit of local farming to access the local and international market, reduce the negative trade balance and increasing the employment in rural areas, In addition, this research would be useful for other researchers to further explore the problems and improve them, leading to further relevant and useful results related to the topic.

Structure of Thesis

The entire thesis has been organized in Introduction, three chapters, conclusion and recommendations, references and annexes. Introduction highlights preface, problem statement, objective of the studies, research questions and hypothesis.

On the Chapter 1. Theoretical Background in detailed is analyzed, Indicators listed by different scholars to measure the efficiency and effectiveness.

Material and methods, objectives of the study, the method of data collection and data analysis are elaborated on the Chapter 2. Methodology of Research. Chapter 3. Analysis, state of art of agriculture in Kosovo is described with main indicators, defining efficiency and effectiveness of policy measures explores the results and discussions to accomplish the objectives, research questions and hypothesis implemented and determined through the methodology used in chapter 2.

Conclusions are described based on research outcomes and also some recommendations for policy makers. In annexes are presented results in details from R software, FADN questionnaire used for gathering Data, and FADN Kosovo Codes.

2. THEORETICAL BACKGROUND

The efficiency measurement begins to study and discussed with (Farrell, 1957) who analyzed the work of (Debreu, 1951) and Koopmans (1951) to define a simple measure of firm efficiency which could account for multiple inputs. (Coelli, 1995). As Coelli described the measurement of efficiency in his paper (Farrell, 1957) suggested that a company's efficiency consists of two components: technical efficiency, reflecting a company's ability to get maximum output from a given set of inputs, and allocative efficiency, reflecting a company's ability to use inputs in optimum proportions, given their respective prices. (Coelli, 1995)

Regarding the methods of measuring efficiency in Agriculture, (Fare, Grabowski, & Grosskopf, 1985) used the first research to use the idea of frontier to analyze the economics of agriculture. (Coelli, 1995) surveyed the literature on the estimation of frontier functions and efficiency measurement and proposed their potential applications in the economics of agriculture. Other research was made by (Sharma, Leung, & Zaleski, 1999) who used DEA and the stochastic frontier production function to measure the efficiency of the swine industry in Hawaii. They recommended that; DEA is more robust in measuring the efficiencies than the parametric approach.

2.1. Description of DEA

Data Envelope Analysis (DEA) can be described as a nonparametric technique based on linear programming to evaluate the efficiency of organizations working in the same field.

In research from (Liu, Lu, Lu, & Lin, 2013) and it is the first literature survey which was focused on DEA applications, covered DEA papers published in journals indexed by the Web of Science database from 1978 through August 2010. This study has identified the top five major applications addressed by using DEA are: banking, healthcare, agriculture and farm, transportation, and education. Linking with this founding our research has to do by using DEA for the sector of agriculture and farming.

(Fare, Grabowski, & Grosskopf, 1985) were among the first to apply the frontier concept to investigate agriculture economics. In the research paper they measured the technical efficiency of the Philippine agricultural sector, they meant by technical efficiency in period r is that maximum potential output is achieved by given the resources and technology available in period r.

It exists two approaches measuring efficiency and productivity, one is parametric which include (stochastic and deterministic) and the other one non-parametric (Data Envelope Analysis), in term of agriculture and farming each approach has its own advantages and disadvantages for measuring the performance of the farm.

In regards to these methods, there are disagreements between parametric and non-parametric existing studies comparing the two frontier approaches demonstrates, especially in agriculture. (Coelli, 1995) surveyed the literature on the estimation of frontier functions and the measurement of efficiency and proposed their potential applications in agriculture economics. Although Coelli suggested a stochastic frontier method for use in most agricultural applications, in instances where a production involves more than one product, and the construction of an aggregate measure of output is difficult, he recommended DEA as more attractive to use.

Further to this debate, (Sharma, Leung, & Zaleski, 1999) used DEA and the stochastic frontier production function to measure the productive efficiency of the swine industry in Hawaii. Although, because of its deterministic property, DEA is believed to be more sensitive to outliers and other noise in the data, comparing the results with and without the possible outliers. In the research of Sharma, they found out DEA results to be more robust in measuring the efficiencies than those obtained from the parametric approach. Following these facts, the production involves more than one product for the type of farms in field crops and farms mixed crops &livestock which we explained above, and we removed outliers to acquire more robust results, further we used bootstrapping method.

Among other contributions in measuring efficiency in agriculture, we highlighted the research of (Iráizoz, Rapún, & Zabaleta, 2003) who measured the technical efficiency of horticultural production in Spain. They used data from FADN, which refers to 46 horticultural farms. The objective of this paper was to compare two estimation methods, stochastic parametric frontier,

and DEA, for the technical efficiency of a sample of Spanish farms producing tomato and asparagus. As regard production function they stated that most important inputs in the horticultural sector are land and labor due to the fact that these inputs are with higher partial elasticity of output. As a result of considering the two methods, they found out strong similarities between two estimates for the technical efficiency of horticultural Spanish farms. From the results of the research regardless of the frontier either parametric or nonparametric the farms are relatively inefficient.

Under the presumption that there is some common underlying stochastic process generating the observed data, one could proceed from here by using bootstrapping to attempt to deduce the properties of the estimators (Fried, 2008)

There are two DEA bootstrapping approaches. The SW-algorithm is constructed from (Simar & Wilson, 1998) while LT- algorithm is based upon (Lothngeren & Tambour, 1999). (Zhu, 2014)

Simar and Wilson on their research on how to bootstrap in nonparametric frontier models stated that bootstrapping is a method based on the idea of repeatedly simulating the data generating process, usually through resampling.

(Cooper, Seiford, & M. Zhu, 2011) paraphrased the meaning of technical efficiency which they referred to as the "Farrell measure of efficiency," was regarded by Farrell as restricted to meaning "technical efficiency" or the amount of "waste" that can be eliminated without worsening any input or output.

According to (Iráizoz, Rapún, & Zabaleta, 2003) technical efficiency in a production unit refers to the accomplishment of the utmost potential output from given amounts of inputs, taking under consideration physical production relationships.

2.2. Farrell Performance Measurement Approach:

It was described in beginning that Farrell is considered the founder of modern methods of measuring company performance. It examines the relationship between inputs and outputs in the production system with many observations.

3. METHODOLOGY OF RESEARCH

The following table shows the analysis of research objectives which include: objective of the study, data requirements and method of data analysis.

Table 1: Analysis of research objectives

S/No	Objectives	Data requirements	Method of Data Analysis
1	To estimate the efficiency of subsectors of Agriculture in Kosovo specialized in field crops, mixed crops and livestock.	Primary and secondary data: General Information about subsectors in Kosovo, Structure, characteristics and activities of them. Farm Accountancy Data Network – Kosovo 2017.	Primary data, DEA analysis (technical efficiency, constant return to scale (CRS), variable return to scale (VRS)
2	To assess financial impact of different measures under the National Plan of Agriculture and Rural Development of Kosovo	Secondary data: ARDP 2007-2013, ARDP 2014-2020. Reports from ADA	Narratives, tables, figures
3	To examine the challenges and prospect of subsectors	Secondary data: FADN, FSS and research results from questionnaire	Narratives
4	Determine the level of budget spending on sub-measurers for these sub-sectors on national level and to derive recommendations for policy makers.	General Information about Farm Structure, characteristics and activities of Farms, Past policy actions from 2010 to 2013 and 2014 to 2020.	Descriptive statistics such as frequency tables

To identify and examine the farm efficiency of subsectors the FADN and FSS Data are used. The reason for choosing this methodology is because these data are recently and more reliable data. Over the last few years, certain efforts have been made to create a sustainable FADN system in Kosovo. The field of observation of 71,116 agricultural holdings in Kosovo is represented by a sample of 1,250 commercial farms. The data collected from a total of 1,250 farms found that

only 67 of them failed to pass the output standard of EUR 2,000, which was reported by the agriculture census data for 2014.Therefore, the FADN survey for 2015 and 2016 has been developed with a sample of 1,250 farms. This sample is quite representative and accounts for nearly 2 percent of target farms. The methodology developed in Kosovo is in line with Council Regulation (EC) No 1217/2012, although simplified to fit the country's context.

To analyze the data for subsectors by primary data, the DEA analysis (technical efficiency, allocative efficiency and overall efficiency) it is used.

All the data were analyzed using R statistical software. R Studio is an integrated development environment for R, a programming language for statistical computing and graphics.

Following the description in the chapter literature review of the non-parametric model DEA farms that are technically efficient will be located at the frontier with equal to 1 while other inefficient or less efficient farms their coefficient ranges from 0 to 1.

In the thesis research, the efficiency is estimated through an output-oriented model based on TE - CRS (constant returns to scale) and TE-VRS (variable returns to scale). The variables are from the FADN 2015, 2016, 2017 dataset explained in details in table number 2.

Cooper et al. used the term Decision-Making Unit (DMU) to refer to any entity that is to be evaluated in terms of its abilities to convert inputs into outputs. Following this term in our research DMUs are farms specialized field crops and farms mixed in crops and livestock. The first objective is to measure efficiency under the expectation that a DMU can generate a larger amount of output by using the same quantity of inputs which is the output-oriented model with the linear programming model used by (Zhu, 2014)

The output-oriented DEA linear programming model (Zhu, 2014):

$$\max \phi + \varepsilon \left(\sum_{i=1}^{m} s_i^- + \sum_{i=1}^{s} s_r^+ \right)$$

Subject to

$$\sum_{j=1}^{n} \lambda_j x_{ij} + s_i^- = x_{io} \quad i = 1,2 \ldots., m;$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} - s_r^+ = \phi y_{ro} \quad r = 1,2 \ldots., s;$$

$$\lambda_j \geq 0 \qquad j = 1,2, \ldots n.$$

.

where: 'n' number of DMUs; m – inputs; s - outputs; a DMUj consumes xij of input i and produces yrj of output r; λj - the weights assigned by the linear program, ϕ - the calculated efficiency; ε is a non-Archimedean element defined to be smaller than any positive real number.

The interpretation of the envelopment model results can be summarized as I. If $\theta^* = 1$ or $\phi^* = 1$, then the DMU under evaluation is a frontier point. i.e., there are no other DMUs that are operating more efficiently than this DMU. Otherwise, if $\theta^* < 1$ or $\phi^* > 1$, then the DMU under evaluation is inefficient. i.e., this DMU can either increase its output levels or decrease its input levels. (Zhu, 2014)

For the directional distance function, Chambers, Y. Chung, and R. Fare (1998) they presented a method which can be adopted as a measure of technical efficiency:

TE= $\vec{D}_T$ (x, y;g_x, g_y)

where $\vec{D}_T$ gives a direct measure of how far (x, y) must be projected along (g_x, g_y) to reach the frontier of T.

In the research it is used the model by Fare, Grosskopf, and Margaritis with g_x and g_y as the directional input and output vectors (the direction vector in which input are contracted and output expanded) then the DDF is described DEA model as below:

$\vec{D}_t(x^{k'} y^{k'}; g_x, g_y)$ = max {

$$\beta: \sum_{k=1}^{K} z_k\, x_{kn} \leq x_{k'n} - \beta g_{x_n}, \qquad n = 1, \ldots, N.$$

$$\beta: \sum_{k=1}^{K} z_k\, y_{km} \geq y_{k'm} + \beta g_{y_m}, \quad m = 1, \ldots, M$$

$$x_k \geq 0, \;\; k = 1, \ldots, K\}.$$

After the results from two models, I used bootstrapping in the nonparametric model to remove mistrust of using DEA in agriculture. Often non- parametric efficiency measures are criticized for lacking a statistical basis. Simar and Wilson (1998) indicated in their research with bootstrapping that in fact, nonparametric efficiency measures do have a statistical basis while they use the bootstrap method to analyze the sensitivity of nonparametric efficiency scores to sampling variation. To bootstrap efficiency scores, I used the algorithm proposed by Simar and Wilson (1998) in R studio which is a programming language and software for statistical computing.

The bootstrap estimates were produced using B = 2, 000 bootstrap replications. Bandwidth we used h= 0.014.

Based on empirical illustration Simar and Wilson found that small values of *h* give smooth density estimates which follow the empirical density function and place too much weight near the upper bound 1, while large values of *h* provide over smooth density estimates.

The algorithm SW was used to estimate smooth bootstrapping with following this linear

(1) For each (x_k, y_k) k=1,….n compute by a linear program (4)
(2) Using smoothing bootstrap of §4, generates a random sample of size *n* from θ_i, *i* = 1,…, *n* providing θ^*_{1b},…, θ^*_{nb}.
(3) Computing X^*_b= { (x^*_{ib}, y_i) *i*=1,…,*n)* where $x^*_{ib} = (\theta_i/\theta^*_{1b})x_i$,*i* = 1,…, *n.*
(4) Computing bootstrap estimate $\theta^*_{k,b}$ of θ_k for *k* = 1,…, *n* by solving

$\theta^*_{k,b}$ = min $\{\theta \backslash y_k \leq \sum_{k=1}^{n} y_i y_i\,, \theta x_k \geq \sum_{k=1}^{n} y_i x^*_{kb};\ \theta > 0; \sum_{k=1}^{n} y_i = 1;\ y_i \geq 0, i = 1, \ldots, n\}$.

(1) Repeating steps 2-4 B times to provide for k=1,…, *n a set pf estimates* $\{\theta^*_{k,b}, b = 1,\ldots,B\}$.

Table 2: Detailed information about chosen variables for Inputs and Outputs for measuring the technical efficiency.

Variables	symbol	Unit	Definition*
Input variables			
Total labor input (AWU)	(i1)	AWU	Total labor input of holding expressed in annual work units = full-time person equivalents.
Total Utilized Agriculture Area (ha)	(i2)	Hectare	Total utilized agricultural area of holding.
Average farm capital €	(i3)	Euro	Average value (= [opening + closing] / 2) of farm capital except land and quotas
Total intermediate consumption €	(i4)	Euro	Total specific costs (including inputs produced on the holding) and overheads arising from production in the accounting year. = Specific costs + Overheads (incl. machinery costs).
Output variables			
Total Output	(r1)	Euro	The total value of the output of crops and crop products, livestock and livestock products and of other output, including that of other gainful activities (OGA) of the farms. Sales and use of (crop and livestock) products and livestock + change in stocks of products (crop and livestock) + change in valuation of livestock - purchases of livestock + various non-exceptional products.

Author's composition / * RI/CC 1750 (FADN)

TE= TAWU+ TUUA+TIC

Total labor (SE010) input of holding expressed in annual work units equal to full-time person equivalents. An annual work unit, abbreviated as AWU, corresponds to the work performed by a person who is employed on a full-time farm. Full-time means the minimum hours required by the relevant national provisions governing employment contracts. In Kosovo, 1, 800 hours were taken to be the minimum annual working hours, equivalent to 225 workdays of eight hours each.

Total utilized agricultural area (SE025) of holding. It does not include areas used for mushrooms, land rented for less than one year on an occasional basis, woodland and other farm areas (roads, ponds, non-farmed areas, etc.). It consists of land in owner-occupation, rented land, land in share-cropping (remuneration linked to output from land made available). It includes agricultural land temporarily not under cultivation for agricultural reasons or being withdrawn from production as part of agricultural policy measures. It is expressed in hectares (10 000 m²).

Total intermediate consumption (SE275) includes total specific costs (including inputs produced on the holding) and overheads arising from production in the accounting year. Specific costs + Overheads (including machinery costs).

The specific costs are included: labor and machinery costs and inputs, wages and social security costs for paid labor, contract work, and machinery hire, current upkeep of machinery and equipment, motor fuels and lubricants, car expenses. Following by specific crop costs and inputs which consist on seeds and seedlings purchased or produced and used on the farm, fertilizers and soil improvers, quantity in quintals of N used in mineral fertilizers, quantity in quintals of P2O5 used in mineral fertilizers - quantity in quintals of K2O used in mineral fertilizers, purchased manure, crop protection products, other specific crop costs and specific costs for crop processing.

Farming overheads, current upkeep of land improvements and buildings, electricity, heating fuels, water, agricultural insurance, other farm insurance, other farming overheads expressed in euro.

Variable average farm capital (SE510) includes cash & equivalents, receivables, other current assets, inventories, biological assets – plants, land improvements, farm buildings, machinery and equipment and intangible assets, tradable.

Data envelopment analysis (DEA) is a linear programming-based technique for measuring the relative performance of organizational units where the presence of multiple inputs and outputs makes comparisons difficult. This tutorial paper introduces the technique and uses an example to show how relative efficiencies can be determined and targets for inefficient units set.

During the system analysis, statistical and econometric methods of analysis are widely used, namely: descriptive statistics (primary data processing) - variation and alternative analysis, graphical methods, descriptive statistics; Dependency study - a function of maximum probability; statistical evaluations - cluster analysis and others.

In the processing of information, the establishment of economic indicators and their graphical and tabular layout, the following software were used: Office Word, VBA in Excel, R Studio, Stata.

For the other objectives of the study to assess financial impact of different measures under the National Plan of Agriculture and Rural Development of Kosovo. The reason why these measures were chosen for analyzing under the national program for rural development stands because a large proportion of farms are subsistence that almost all of their production is consumed directly by the farm household. Therefore, there is a need to focus on investments in the physical assets of those farms that have a commercial focus and are capable of achieving a viable income.

Considering the existing small structures, it seems reasonable to give incentives to horizontal co-operation between farmers as well in the way of producer cooperation's which can build the foundations for later producer organizations or producer associations, but also to the vertical integration of farmers in market chains, e.g. with supply contracts.

For undertaking the research, it was identified data and information from possible sources. The evaluation of the Agriculture Rural Development Programme (2014-2020), the list of beneficiaries from Agricultural Development Agency from 2015 until the last update of beneficiaries list in 2018. In total 4 years' reports were elaborated in details. Further, the evaluation report of ARDP, Green Report of Ministry of Agriculture, Forestry and Rural Development, Kosovo Agency of Statistics and FADN Farm Accountancy Data Network, 2015-2018.

To achieve the four objectives of the study, secondary data were used, desk research was done, analyzing data and documents from different reports: strategies and reports, past policy actions from 2007 to 2013 and 2014 to 2020.

Based on the data collected, the calculation of the descriptive statistics (from 2015 to 2018) for all beneficiaries' projects of the measures the national plan of agriculture and rural development. The distribution of budged was calculated in two ways, approved amount and public support. In order to find the distribution among the whole country of Kosovo, we calculated the beneficiaries on seven regions of Kosovo, per year and in total from 2015 to 2018.

To analyze the data to achieve the objectives of the study, analytical tools used include descriptive statistics such as frequencies were calculated and the findings were demonstrated in graphs, tables. Which include the beneficiaries of grants under measures in different regions of Kosovo.

The study will try to make sure that the assessment of four objectives are balanced, observations are accurate and verifiable, and will present findings on each measure and the ARDP regarding the distribution of budget, region and the effect in the field, conclusions and recommendations.

In order to measure the efficiency, the data from FADN were used.

3.1. FADN Kosovo

The FADN concept was first launched in 1965. During this year, the Council Regulation 79/65 entered into force to establish the legal basis for the establishment of the Farm Accountancy Data Network. Since then, legislation has been constantly tailored in order to address new developments in EU member states. For many years, it is a routine for member states, and some non-member countries to collect FADN data on an annual basis.

Although there is a universal FADN methodology, each country tailors it to take into account the specifics of their country. That said, agricultural units becoming part of the network are selected on the basis of a sampling plan that is determined by the nature of the agricultural sector where the FADN is developed.

All agricultural holdings considered in the sample distribution for the FADN survey are farms which are considered as commercial farms, based on standard output. Commercial farms are

those farms that exceed the standard output of 2,000€. These farms represent about 90 percent of the utilized agriculture area and about 90 percent of livestock units. The data on these farms were obtained from the Agriculture census developed by KAS in November 2014. Farms that were not part of this census are not part of the FADN survey. Based on the criteria outlined above, particularly based on the standard output criterion, the target population for FADN surveys is 71,116.

In order to make an adequate selection of the sample, the FADN team applied the stratified simple random sampling. Sampling is done on the basis of three basic criteria: economic size, type of farm and region. These criteria are defined in accordance with the standardized FADN methodology. Intending to have a sample that is as representative as possible of the agricultural holdings, it was decided that approximately 2% of farms be considered as part of the FADN survey, or more precisely 1,250 farms in total. Given that a number of farms will refuse to be included on the network for various reasons, approximately 2 reserve holdings were also involved for each of the entities involved. (FADN 2016)

The section below presents the methodology applied for FADN data for 2016, ranging from sampling to reporting.

4. IMPLEMENTATION OF EFFICIENCY RESULTS

4.1. Type of farm specialized in field crops.

On basis of aggregate statistical data, the results of type of farm specialized in field crops, are presented below.

Type of farm 1 specialized farms in field crops (arable crops)

Table 3: descriptive statistics of variables for farms specialized in field crops

Variable	*Nr of observations*	*Unit*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Total labour input (AWU)	280	AWU	2.3	2.2	0.1	23.7
Total Utilized Agriculture Area (ha)	280	hectares	18.4	34.2	0.3	230
Total intermediate consumption €	280	€	13,557.3	22,748.3	140	207,560
Average farm capital	280	€	34,164.5	55,899.5	0	546,399
Total output	280	€	26,705.2	29,573.9	990	145,800

The descriptive statistics of variables used for processing data in R studio are described above. The total number of observations after removing the outliers are 280 DMUs (farms). The outliers include farms which have 0 output.

Figure 1: Efficiency distribution for the efficiency scores in field crops farms

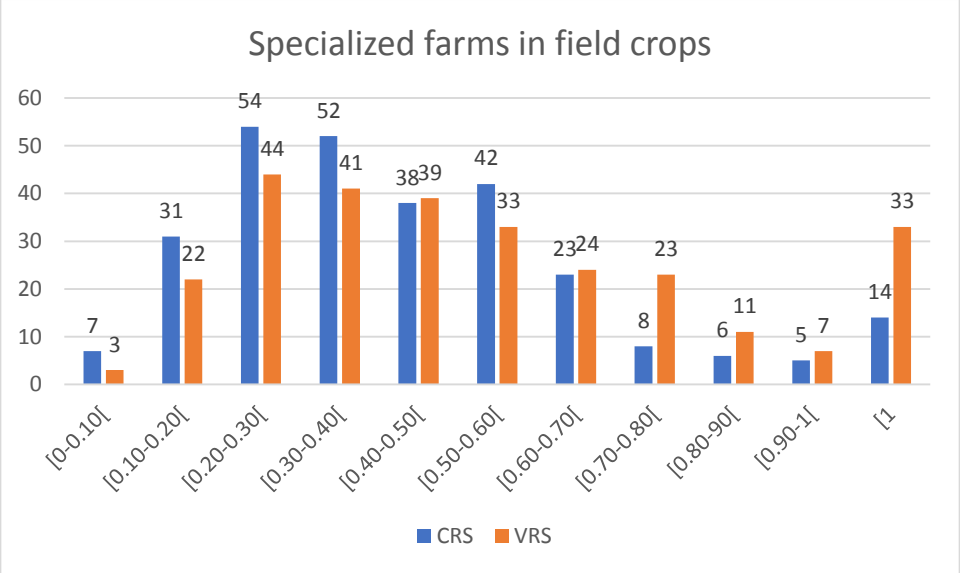


Table 4: Estimated technical efficiency (TE) for DEA analysis model

	Efficiency	
Indication	TE-CRS	TE-VRS
Mean	0.4347543	0.5186168
Standard Deviation	0.2301721	0.2674414
Minimum	0.0436753	0.0437814
Maximum	1.0000000	1.0000000
Median	0.3880229	0.4860076
Kurtosis	0.1804094	-0.8869968
Skewness	0.8292440	0.4591053
DMU n	280	280

Source: own results

The efficiency score is from 0-1, output orientation. In order to have the score from 0-1, the results were dived by 1.

From the table above it can be seen the calculated technical efficiency scores for 2017. The results for type of farm 1 field crops are below 50%. Technical efficiency score specifies that on average a farm produced 43.5% of the maximum output. This low level of efficiency means that the rest of the potential output, 56.5%, was lost due to technical inefficiency.

The efficiency score range shows the level of efficiency of the field crops farm. Majority of farms efficiency score range between 0 and 0.5 which make 80 % of the total. (table 22.)

As input in this research is used Total labor input (AWU), Total Utilized Agriculture Area (ha). Average farm capital and Total intermediate consumption while single output the total output.

Table 5: Frequency distribution of technical efficiencies from DEA (CRS) and (VRS)

	CRS		VRS	
Efficiency score	Number of farms in range	Percentage	Number of farms in range	Percentage
[0-0.10[	7	2.5%	3	1.1%
[0.10-0.20[	31	11.1%	22	7.9%
[0.20-0.30[	54	19.3%	44	15.7%
[0.30-0.40[	52	18.6%	41	14.6%
[0.40-0.50[	38	13.6%	39	13.9%
[0.50-0.60[	42	15.0%	33	11.8%
[0.60-0.70[	23	8.2%	24	8.6%
[0.70-0.80[	8	2.9%	23	8.2%
[0.80-90[	6	2.1%	11	3.9%
[0.90-1[	5	1.8%	7	2.5%
[1	14	5.0%	33	11.8%
Total	280	100.0%	280	100.0%

Source: own results

As it is described in the Chapter 2. Methodology, the process and the model used for bootstrapping the results for Bootstrapping of efficiency of type of farms specialized in field crops are attached in Annexes 1.

4.2. Results from type of farms, mixed crops and livestock

The descriptive statistics of variables used for processing data in R studio are described below table 23. The total number of observations after removing the outliers are 298 DMUs (farms). The outliers include farms which have 0 output.

Table 6: descriptive statistics of variables for farms specialized in field crops

Variable	*Nr of observations*	*Unit*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Total labour input (AWU)	298	AWU	1.5	1.1	0.1	7.2
Total Utilized Agriculture Area (ha)	298	hectares	9.9	22.6	0.0	242
Total intermediate consumption €	298	€	11,050.8	21,720.3	255	251,047
Average farm capital	298	€	29,692.1	56,164.7	375	617,788
Total output	298	€	17,977.8	32,734.7	1,070	308,823

Source: own results based on FADN data.

The table nr.24below presents the calculated technical efficiency scores for 2017. The results for type of farm 8 mixed crops and livestock are below 50%. Technical efficiency score specifies that on average a farm produced 36.9% of the maximum output. This low level of efficiency means that the rest of the potential output, 63.1%was lost due to technical inefficiency. The results show that type of farms mixed crops and livestock are less efficient compare to farms specialized in field crops, which are more efficient.

Table 7: Estimated technical efficiency (TE) for DEA analysis model

	Efficiency	
Indication	TE-CRS	TE- VRS
Mean	0.36892655	0.4059474
Standard Deviation	0.22759306	0.2516607
Minimum	0.07113043	0.0722069
Maximum	1.0000000	1.0000000
Median	0.29337509	0.3205647
Kurtosis	1.09538885	0.2690851
Skewness	1.29637891	1.0974749
DMU n	298	298

Source: own results

On the table nr.25the efficiency score range shows the level of efficiency of the field crops farm. Majority of farms efficiency score range between 0 and 0.5 which make 85.6 % of the total.

Similar to type of farm 1, also for the farms categorized in type 8 mixed crops and livestock is used same variable to measure efficiency as input in this research is used Total labor input (AWU), Total Utilized Agriculture Area (ha). Average farm capital and Total intermediate consumption while single output the total output. Only 13 farms (DMUs) are equal to 1 which means efficient in total 4.4% in CRS, while 22 farms are efficient in VRS in total 7.4%.

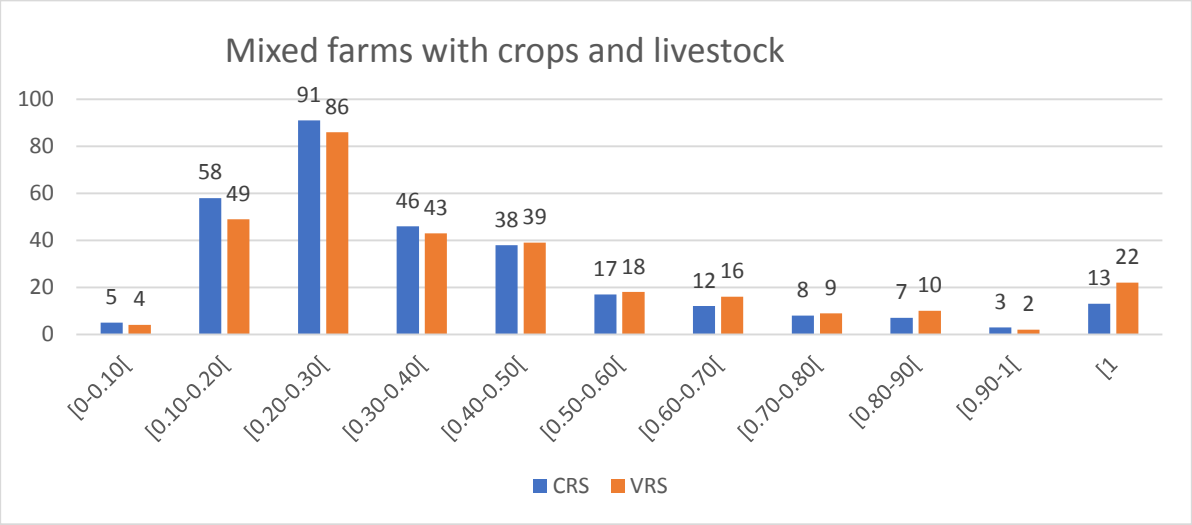
Table 8. Frequency distribution of technical efficiencies from DEA (CRS) and (VRS)

Table 8: Frequency distribution of technical efficiencies from DEA (CRS) and (VRS)

	CRS		VRS	
Efficiency score	Number of farms in range	Percentage	Number of farms in range	Percentage
[0-0.10[	5	1.7%	4	1.3%
[0.10-0.20[	58	19.5%	49	16.4%
[0.20-0.30[	91	30.5%	86	28.9%
[0.30-0.40[	46	15.4%	43	14.4%
[0.40-0.50[	38	12.8%	39	13.1%
[0.50-0.60[	17	5.7%	18	6.0%
[0.60-0.70[	12	4.0%	16	5.4%
[0.70-0.80[	8	2.7%	9	3.0%
[0.80-90[	7	2.3%	10	3.4%
[0.90-1[	3	1.0%	2	0.7%
[1	13	4.4%	22	7.4%
Total	298	100.0%	298	100.0%

Source: own results

Figure 2: Efficiency distribution for the efficiency scores in mixed crops farms and livestock.



Source: own results

The figure represents the distribution of efficiency scores for farms (mixed crops and livestock) as it is described for the table nr.25.

The detailed results for Bootstrapping of efficiency of type of farms mixed crops & Livestock are attached in Annexes 2

4.3. The assessment of financial impact of different measures under the National Plan of Agriculture and Rural Development of Kosovo

The results from objective two are presented below.

4.3.1. "Investments in Physical Assets in Agricultural Holdings" fruit sector, grape sector

The objective of measure": Support to farms for investing in the improvement of farm conditions to meet EU sanitary, veterinary and hygiene requirements is very important for ensuring the future sustainability of the farms receiving support from the AE measure.

The analysis of the competitiveness of Kosovo's agriculture shows that currently only a very small proportion of farms could compete and capture a larger share of the EU and international market. The main structural causes of this low competitiveness are the small scale of most farm businesses, the fragmentation of their land, the outdated nature of their buildings and equipment, their lack of financial means for investment and the low level of knowledge concerning modern production technology. In addition, most farms do not meet EU standards on food safety and hygiene, animal welfare and the environment. (Agriculture and Rural Development Programme, 2014)

According to the available data, the age structure of farm owners is very unfavorable: more than 50% are above the age of 65. Therefore, encouragement will be given to young farmers aged 18 to 40 years, who represent the basis of a modern, innovative agricultural sector.

Based on this consideration, but also on the comparative advantage that Kosovo has in some sectors, the contribution of the sectors to the farm economy and the need in the sectors for alignment with EU standards, the measure will focus on supporting investments in the following sectors: fruit, vegetables (incl. potatoes), milk and meat as well as cereals, grapes, and eggs.

Indicative eligible investments per priority sector

- Investments in the establishment of new orchards with quality
- Investments in the establishment or upgrading of on-farm irrigation systems based on water-efficient practices
- Investments in energy-efficient equipment and/or on-farm energy production from renewable sources
- Investments in *agricultural machinery and equipment for plant production, plant protection, fertilization, harvesting, and post-harvesting;*
- Investments in the construction and improvement of the immovable property concerning facilities for post-harvesting activities, storing agriculture machinery and equipment
- Investments in the construction and modernization of permanent greenhouses and/or glasshouses and glasshouse equipment
- Construction/reconstruction of farm buildings for animal housing as well as auxiliary facilities and buildings for fattening and breeding animals, production of day-old chicks,

fattening and service facilities, including the provision of connected on-farm infrastructure and animal housing equipment

- Construction of an improvement in immovable property concerning fodder storage, silage, hay and grain barns/silos, including equipment for fodder preparation, handling, packing and storage
- Investments in the modernization of milking and cooling equipment such as equipment for milking, milk storage incl. milking room facilities, milk delivery tanks;
- Investments in the establishment/modernization of vineyard plantations
- Investments in chicken cages only if they meet EU standards;

Support can be granted to agricultural holdings only when they meet the requirements as laid down in and when they exceed the following thresholds in the relevant field of investment:

Table 9: Requirements for measure 101

Fruit Sector	at least 0,5 ha fruits and/or at least 0,25 ha of berries
Vegetable incl. potatoes	• At least 2 ha of open fields for vegetables and/or at least 4 ha of potatoes • Construction of new greenhouses/glasshouses: agricultural land of at least 0,1 ha.
Meat Sector	At least 20 cattle or 5000 broilers before the final payment
Milk Sector	At least 15 cows,150 sheep or 100 goats
Cereal Sector	At least 15 ha for grain and/or 6 ha for corn
Grape Sector	At least 0,5 ha of table grapes and / or 1 ha of wine grapes At least 10 years of registration in the vine register
Egg Sector	At least 6000 up to 50000 laying hens registered in the farm register Farms with more than 50000 can only apply for mechanization or equipment

Source: Agency for Agricultural Development, 2015

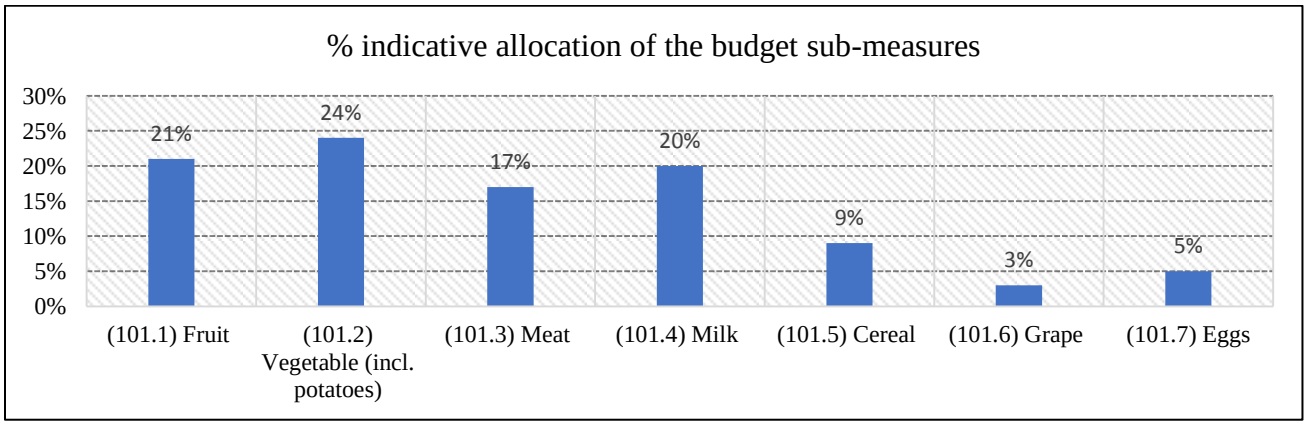
It must be noted that beneficiaries under the measures have to follow EU standards, which are:

1. When concluded, the investment projects have to meet the relevant EU standards as regards environmental protection and animal welfare.

2. The submitted projects must be assessed by national veterinary and environmental authorities to ascertain whether they are in compliance with the EU standards relevant to the investment (before project submission).

3. Before the investment is submitted to the Agriculture Development Agency/Paying Agency for final payment, the beneficiary shall provide, as an obligatory part of the payment claim, a certificate from the national veterinary and/or environmental authorities confirming that the investment is compliant with the relevant EU standards.

Figure 3: Distribution of budget amongst the subsector of measure 101



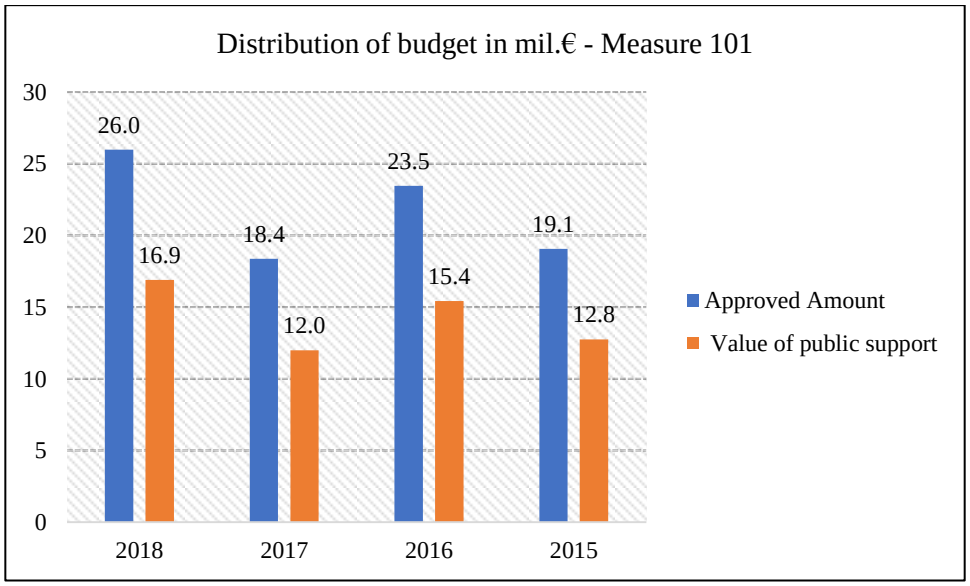
Source: Agency for Agricultural Development, 2015

From the graph above it can be seen that the largest % indicative of the budget is allocated to the sub-measure-101.2 vegetable (incl. potatoes) with 24% followed by sub-measure (101.1) fruit sector and the last one is a grape sector with 3% of the allocated budget.

The figure below shows the total budget spending from the year 2015 until 2018 to measure 101. The total approved amount for the year 2018 is 26 million euros on projects for investments in physical assets in agricultural holdings, while the value of public support is 16.9 million euros,

which means that beneficiaries should contribute apart from other funding. It can be noted that the budget for the year 2017 was less compared to other years.

Figure 4: The total budget (2015-2018) to measure 101



Source: Agency for Agricultural Development (author's own calculation), 2019

Table 10: Distribution of beneficiaries in 7 regions of Kosovo - Measure 101

Region	2018	2017	2016	2015	Total
Prizreni	101	73	108	67	349
Prishtina	87	78	90	65	320
Mitrovica	67	63	53	44	227
Gjilani	53	34	34	27	148
Peja	46	31	25	29	131
Ferizaji	20	11	19	24	74
Gjakova	9	11	16	12	48
Total	383	301	345	268	/

Source: Agency for Agricultural Development (author's own calculation), 2019

To better clarify the distribution, the table above presents a summary number and distribution of beneficiaries among the seven regions of Kosovo. The largest number of beneficiaries is from Prizren with a total of 349, followed by the Prishtina region with a total 320. In addition, the

Gjakova region has the lowest number only 48 beneficiaries. It can be argued that Prizren is well known for agricultural activities including the food processing industry however other indicators are important for instance willingness to apply and meet the required criteria.

4.3.2. Investments in physical assets concerning the processing and marketing of agricultural and fishery products

The measure is linked to "Investments in physical assets of agricultural holdings", which ensures the provision of raw materials. The measure is also linked to "Diversification of economic activities in rural areas", which supports the on-farm processing of agricultural products which is not eligible under agri-food processing measure.

Support under the measure focuses on investments in physical assets in order to increase the competitiveness of the agri-food sector to substitute food imports with high-quality domestic production and improved productivity.

The measure targets support via investments in five sub-sectors of the food processing industry: milk processing, meat processing, fruit and vegetable processing, and wine production. It is designed to complement the interventions under Investments in physical assets of agricultural holdings, aimed at increasing the supply of safe and environmentally friendly farm products.

To compete successfully on an increasingly open market, the food processing industry needs to modernize technologies and to improve safety management systems. The food industry has to establish the safe collection, transport, and storage of raw materials to reduce waste and ensure food safety.

The general objectives of the measure:

- To increase the ability of the agri-food sector to cope with competitive pressure by increasing productivity and by introducing new technologies and innovative products;
- Fulfillment of EU standards and targeted improvements regarding environmental protection, food safety and quality products, animal welfare and traceability of the food chain and waste management;
- Strengthening links with primary production;
- To help address the challenge of climate change by promoting renewable energy.

- Specific objectives and eligible investments for each sector
- To improve compliance with national and EU standards
- To modernize the production techniques and technologies in food processing units
- To introduce new products
- To improve waste management and energy efficiency
- To improve the marketing of food products (Agriculture and Rural Development Programme, 2014)

Only micro, small and medium-sized enterprises (defined according to Commission Recommendation 2003/361/EC) may be supported. The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding € 50 million and/or an annual balance sheet not exceeding € 43 million in total, and which registered according to national legislation as food processors/consolidators.

Common eligibility has to be fulfilled. Only micro, small and medium-sized enterprises (defined according to Commission Recommendation 2003/361/EC) may be supported. The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding € 50 million and/or an annual balance sheet not exceeding € 43 million in total, and which registered according to national legislation as food processors/consolidators. Maximum eligible costs per project shall be as follows:

- Milk processing – € 400,000, but no more than € 200,000 as public support;

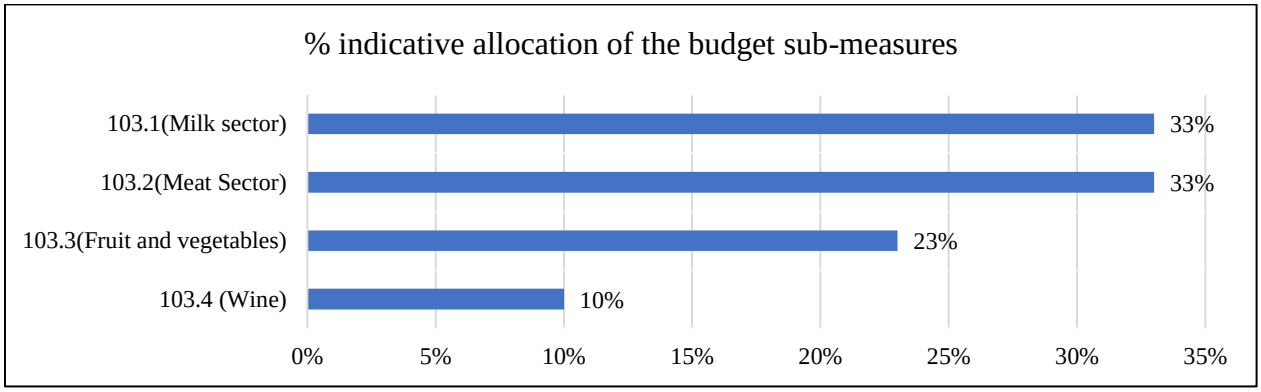
- Meat – € 400,000, but no more than € 200,000 as public support;

- Fruit and vegetables – € 400,000, but no more than € 200,000 as public support;

- Wine – € 300,000, but no more than € 150,000 as public support;

- The minimum investment costs per project shall be € 30,000.

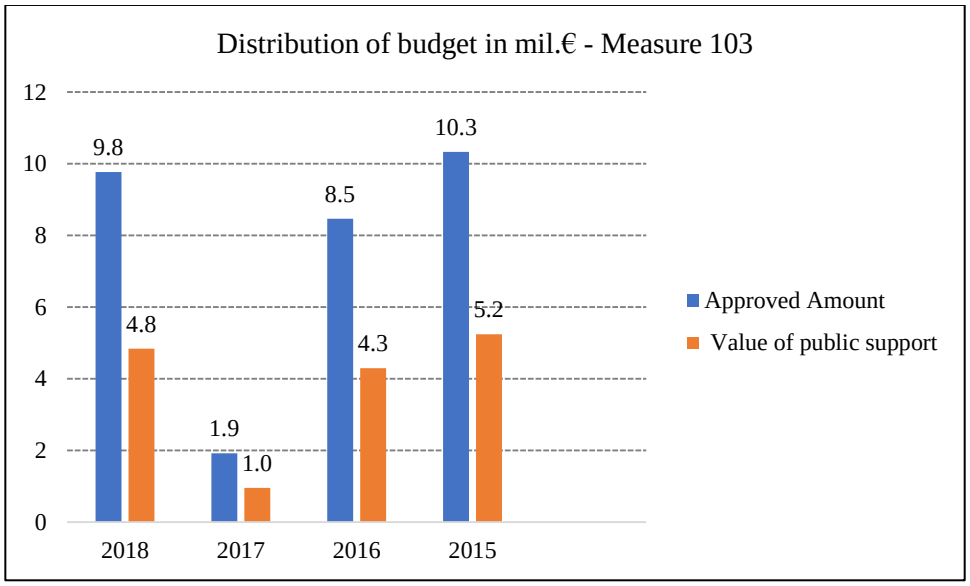
Figure 5: Distribution of budget amongst the subsector of measure 101



Source: Agency for Agricultural Development, 2015

From the figure above it can been seen that largest % indicative of the budget is allocated with the largest proportion shared between two sub-measures 103.1 (milk sector) with 33 % and 103.2 (meat sector) with 33%, followed by sub-measure 103.3 fruit and vegetables) with 23% along with 130.4 (wine) with 10% of the total budget.

Figure 6: The total budget (2015-2018) to measure 103



Source: Agency for Agricultural Development (author's own calculation), 2019

The figure above presents the total budget spending from the year 2015 until 2018 to measure 103 for the processing sector. The total approved amount for the year 2018 is 9.8 million euros on projects concerning the processing and marketing of agricultural and fishery products, while the value of public support is 4.8 million euros. The largest spending budget for measure 103 is in the year 2015 with a total 10.3 million euros approved while 5 million euro the value of the public sector. Similar to the measure 101, again the year 2017 shows the lowest budget spending on measure 103 with only 1.9million euro of approved amount and 1 million from public support.

Table 11: Distribution of beneficiaries in 7 regions of Kosovo - measure 103

Region	2018	2017	2016	2015	Total
Prizreni	8	3	5	13	29
Prishtina	9	-	9	6	24
Mitrovica	4	1	3	6	14
Peja	3	-	6	-	9
Gjilani	1	1	1	4	7
Gjakova	2	-	-	3	5
Ferizaji	-	-	1	-	1
Total	27	5	25	32	/

Source: Agency for Agricultural Development (author's own calculation), 2019

Table 11 summarizes the total number of beneficiaries of grants year/region in Kosovo under the measure 103. Prizren region leads with 29 beneficiaries followed by Prishtina while Ferizaji is the last one with only one granted holding in four years. The total number of enterprises supported is 89.

4.3.3. Farm Diversification and Business Development

Rural areas have multifunctional importance for the general development of the country and these areas present a great potential to diversify economic activities by creating new jobs and generating income.

The Kosovo economy suffers from very low levels of employment. About 45% of the labor force is unemployed, especially women and the large numbers of young people. This results in the decreasing attractiveness of rural areas as places to work and live and increases the disparities between urban and rural areas. With the decline in quality of life and job opportunities, the rural areas have witnessed the economic decline and related employability of the rural population.

The interventions under the measure aimed at improving job opportunities in the rural areas of Kosovo. They address the major problems of rural areas identified, namely:

- Lack of job opportunities due to weak economic development initiatives;
- Outmigration, especially of young people from rural areas;

- High dependency on agricultural employment;
- Lack of services in rural areas.

The measure will target the creation of new jobs and the maintenance of existing ones. The support of new economic activities should lead to poverty reduction in rural areas and to improve living conditions. The measure will target the creation of new jobs and the maintenance of existing ones. The support of new economic activities should lead to poverty reduction in rural areas and to improve living conditions. (Agriculture and Rural Development Programme, 2014)

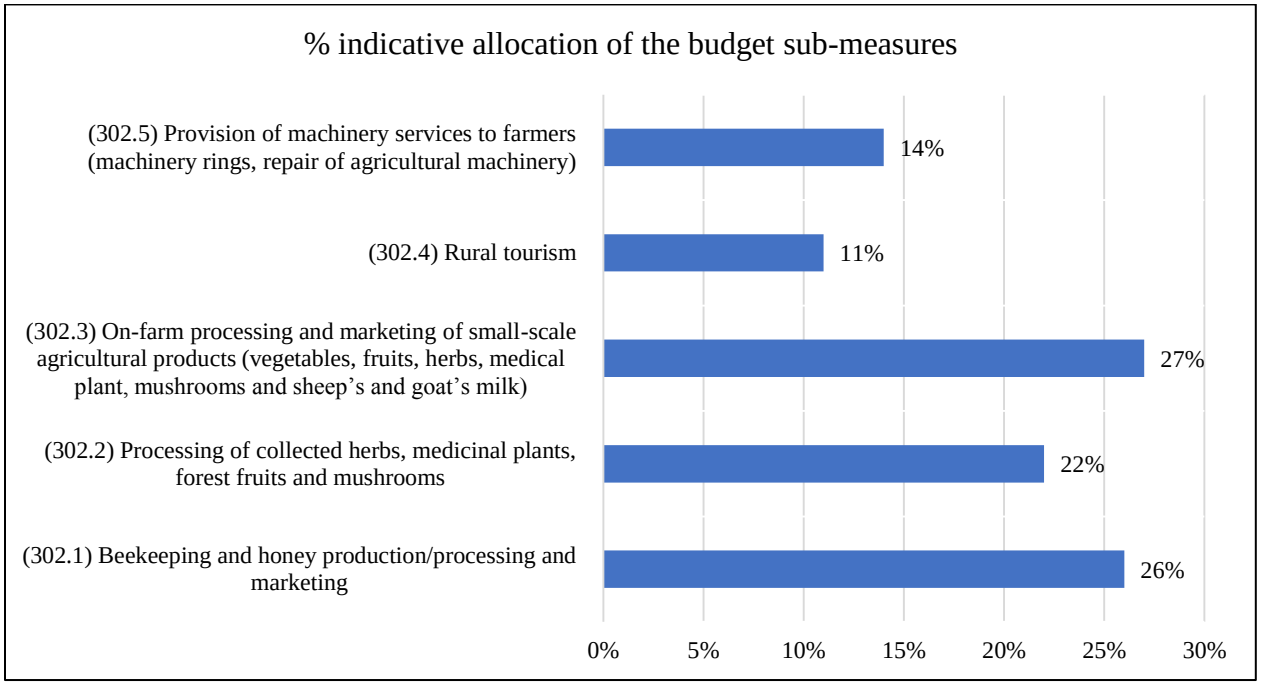
In line with the conclusions of the sector analysis for the diversification of the rural economy in Kosovo, the diversification of economic activities in rural areas is foreseen as a long-term perspective for developing the rural economy and a favorable way to create self-sustaining employment in rural areas.

This measure aims to create, diversify and develop rural activities through support for investments in farm diversification and the development of non-agricultural activities.

The measure is divided into 5 sub-measures:

- Beekeeping and honey production/processing and marketing
- Processing of collected herbs, medicinal plants, forest fruits and mushrooms
- On-farm processing and marketing of small-scale agricultural products (vegetables, fruits, herbs, spices, medicinal plants, mushrooms and sheep's and goat's milk)
- Rural tourism
- Provision of machinery services to farmers (machinery rings, repair of agricultural machinery, farm mechanization services)

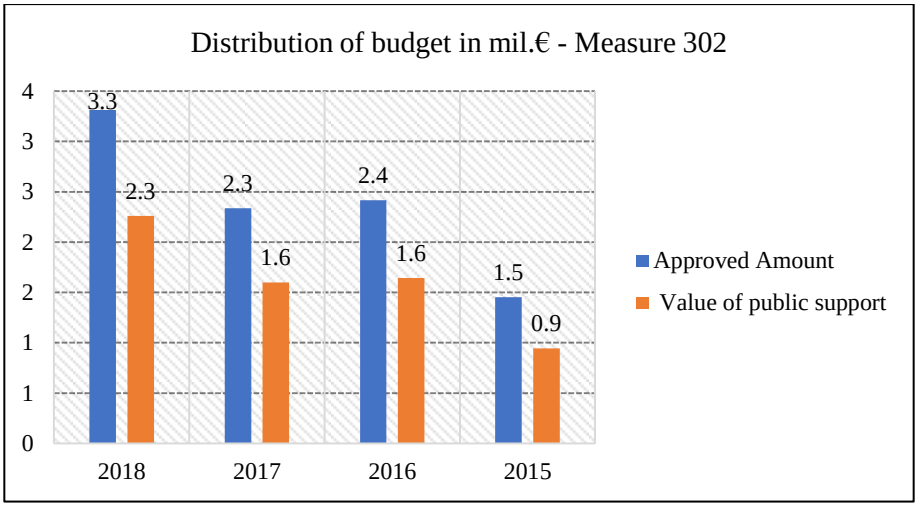
Figure 7: The indicative budget allocation between the sectors – Measure 302



Source: Agriculture and Rural Development programme 2014-2020

Figure 7 presents the allocation of budget between sub measures based on a national plan for agriculture and rural development. The largest share of the budget is between sub-measure 302.3 on-farm processing and marketing of small-scale agricultural products (vegetables, fruits, herbs, medical plant, mushrooms and sheep's and goat's milk) 27% and sub-measure 302.1 beekeeping and honey production/processing and marketing with 26%, followed by sub-measure 302.2 processing of collected herbs, medicinal plants, forest fruits and mushrooms.

Figure 8: The total budget (2015-2018) for the measure 302



Source: Agency for Agricultural Development (author's own calculation), 2019

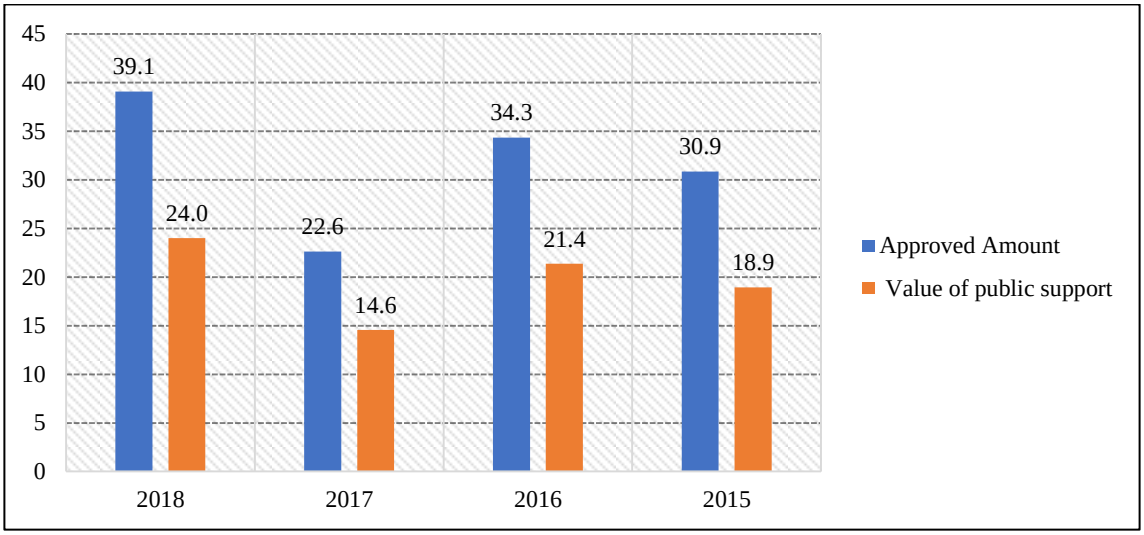
The figure above shows the total budget spending from the year 2015 until 2018 for measure 203. The total approved amount for the year 2018 is 3.3 million euros, while the value of public support is 2.3 million euros. The largest spending budget for measure 203 is the year 2018. In addition, the lowest spending for this measure is the year 2015 with only 1.5 million for 81 approved projects. The largest number of projects are in 2018 while the Peja region has the largest number of beneficiaries in total 88, further, the Gjakova region has the lowest number of beneficiaries with only 17.

Table 12: Distribution of beneficiaries in 7 regions of Kosovo - measure 302

Regions	2018	2017	2016	2015	Total
Peja	30	23	22	13	88
Prishtina	24	19	18	15	76
Prizreni	26	14	13	17	70
Gjilani	22	18	15	11	66
Mitrovica	19	10	17	8	54
Ferizaji	8	6	8	8	30
Gjakova	1		7	9	17
Total	130	90	100	81	/

Source: Agency for Agricultural Development (author's own calculation), 2019

Figure 9: Total Budget for the three measures 2015-18



Source: Agency for Agricultural Development (author's own calculation), 2019

Figure 9 represents the total budget spent on three measures from 2015-2018. The total amount of 39.1 million is dedicated to the year 2008. It is notable that in 2017 was a lower budget spending on the three measures.

5. CONCLUSION AND RECOMMENDATIONS

The farm average technical efficiency in two subsectors of agriculture of Kosovo is low. Farms are inefficient and les then 10% are efficient. The results for type of farm 8 mixed crops and livestock are below 50%. Technical efficiency score specifies that on average a farm produced 36.9% of the maximum output. This low level of efficiency means that the rest of the potential output, 63.1%was lost due to technical inefficiency. The results show that type of farms mixed crops and livestock are less efficient compare to farms specialized in field crops, which are more efficient. The policymakers should assist farmers to provide technical assistance, to promote and create a measure under the grant plan for cooperatives, which will lead farmers to better management on efficient way of inputs. After the collection of data for FADN, based on the results, it can be concluded that production is quite low compared to the EU countries. According to farmers' statements, the reason for low production is the lack of irrigation system and the drought that reigns during the summer months, access to market.

A challenge encountered during the collection of data for the farm accounting data network is related to the fact that farmers in certain cases have had difficulty to recall accurate data regarding the operation of their farm. Also, many of them have been reluctant to disclose information regarding their current financial funds or debts.

As far as the implementation of the national plan of agriculture and rural development is concerned, the most important measure in terms of budget allocation and number of projects implemented was “Investments in Physical Assets in Agricultural Holdings” fruit sector, grape sector.

Measure on investments in physical assets of agricultural holdings provides grant aid toward investments in buildings, machinery, equipment, plantations and infrastructure that will add value by increasing yields and product quality, reducing product loss and production costs.

Furthermore, this measure has been very effective in meeting its input and output targets. Grant aid of EUR 57.1 million EUR million, 5% over budget, was offered to 1,297 projects that were selected from the 4,912 applications received, from year 2015-2018.

At this stage in implementation, Measure on investments in physical assets of agricultural holdings has contributed substantially to economic growth. It is estimated that the net

contribution to Gross Value Added in the farming sector is EUR 6,680,000 net and the EUR 9,401,000 gross. The implementation of the measure has made a significant contribution to the creation of employment. The total net increase created by the implementation of the measure to date has been 1.18x1,106 = 1306 jobs. The gross effect is 1438

In the aspect of the region distribution in Kosovo, the largest number of beneficiaries from measure on investments in physical assets of agricultural holdings is from Prizren with a total of 349, followed by the Prishtina region with a total 320. In addition, the Gjakova region has the lowest number only 48 beneficiaries.

The findings from different reports demonstrate that the following chain of results is being achieved:

- The targeted improvements in physical assets are happening.
- Production capacity has been increased on supported farms in all sectors.
- Manure treatment facilities have been improved on supported farms
- Capacity for the production of renewable energy has been increased on supported farms.
- The volume of production has increased
- There is evidence that the quality of fruit production has improved.
- The level of producer participation in the processing and marketing of their produce has increased.

Recommendation for this measure should be some research and further investigation to explain why the supported investments work so well in some farms but less so in others.

Measure “Investments in physical assets concerning the processing and marketing of agricultural and fishery products” provides grant aid toward investments in buildings and storage facilities, value chain machinery and equipment (including for laboratory testing), food safety systems and waste management, production of renewable energy, specialist trucks for product transport, and IT hardware and software Implementation has been effective toward achievement of the target expenditure for the fruit and vegetable sub-sector, but less effective for the expenditure targets for milk (69%), and wine (58%). None of the sub-sector targets for the number of contracted projects were achieved, with an overall deficit of 29%. Total funds contracted accounted for 85% of the budget.

Grant aid of EUR 15.3 million was was offered to 89 projects that were selected from the years 2015-2018.

The total approved amount for the year 2018 is 9.8 million euros on projects concerning the processing and marketing of agricultural and fishery products, while the value of public support is 4.8 million euros. The largest spending budget for measure "Investments in physical assets concerning the processing and marketing of agricultural and fishery products" is in the year 2015 with a total 10.3 million euros approved while 5 million euro the value of the public sector

In terms of region distribution of beneficiaries, Prizren leads with 29 beneficiaries followed by Prishtina while Ferizaji is the last one with only one granted holding in four years.

A recommendation for the measure "Investments in physical assets concerning the processing and marketing of agricultural and fishery products" is to have better survey on market needs and consumer behaviour so there will be more robust data in order to have ideas on consumer priorities and preferences by achieving a consolidation of a domestic market and decreasing import products.

Measure on Farm Diversification and Business Development provides support for more diverse income sources and helps to increase employment in the rural areas where unemployment is rampant.

The results show the total approved amount for the years 2015-2018 is EUR 9.5 million, while the grant aid for this measure is EUR 6.4 million. Regarding the region distribution of beneficiaries, Peja region has the largest number of beneficiaries in total 88, further, the Gjakova region has the lowest number of beneficiaries with only 17. In total 401 projects were selected for this measure (2015-2018). From the research results there is no clear evidence that the measure has been effective towards achievement of its objectives, including job creation and support of small enterprises.

Recommendation for this measure an analysis of jobs, earnings and sales generated by the supported non-agricultural activities should be made. Also, from the results it can be a better planning for the next programming period, as well as for the simplification of criteria and requirements. In addition, suitable training for employees should be done to gain new skills, and better marketing for their enterprisers.

The Agricultural Rural Development Programme 2014-2020 strategic approach continues to be relevant and coherent. According to expert's report on Evaluation of ARDP, despite the positive results from Measures on physical assets and agri-food processing and marketing within Priority 1 it was important to implement the measures under Priorities 2, 3 and 4 as planned in order to achieve all the expected outcomes and complementarities within the programme. They state that the improvement in farm viability, competitiveness and job creation in farming and in the food processing businesses requires simultaneous and coordinated actions on the overall production system, on the agricultural services, input and output markets and on the introduction and dissemination of knowledge and innovation.

Investment support to farmers is an important tool towards the development of competitive agriculture and the introduction of hygienic standards and animal welfare requirements

In order to stimulate the change from currently traditional farm practices to more modern farm technology and market orientation, there is a great need is to hand over farms from the older generation to young farmers/successors, who should be specifically supported. This is the reason to include a special scheme for young farming compatible with CAP which means It is granted for a maximum of five years from the moment a young farmer takes over as the head of a farm holding. Another important is innovation and precision agriculture which should be supported. Precision farming can improve time management, reduce water and chemical use, and produce healthier crops and higher yields all of which benefit farmers' bottom lines and conserve natural resources.

6. MORE SIGNIFICANT CONTRIBUTIONS DEVELOPED IN THE PhD DISSERTATION

1. The essence of the concept of economic efficiency from the point of view of the theory of general market equilibrium, economics of welfare and the theory of the company is revealed. The terms “technical efficiency”, “allocative efficiency”, “economic efficiency” are specified on the basis of theoretical scientific developments in Albanian and English. Methods for determining and measuring efficiency and productivity are analyzed, and a comparative analysis of the advantages and disadvantages of their use is conducted.

2. A methodology for determining and evaluating the economic efficiency of agricultural holdings specializing in field crops, mixed crops and livestock production has been developed. The approach used in the study includes economic, financial and stochastic performance analysis. The economic one includes an analysis of the security of agricultural holdings with fixed assets and their use in the production process, the financial one - examines the final economic results of the production activity through the indicators - efficiency and profitability, and the stochastic border analysis allows to establish how the changes in the main production factors invested in production affect the overall economic efficiency of agricultural holdings, while allowing to model and analyze the effects of "unbalanced" factors.

3. The economic efficiency of farms specializing in field crops, mixed crops and livestock production was determined using a model based on stochastic boundary analysis. The model includes the identification of the main factors influencing the production systems and the compilation of an inefficient model, including random factors having a negative impact on them. Based on a cluster analysis of the variables in the model and the most plausible assessments of the economic efficiency of the farms in the three sub-sectors, the trends in the development of the most efficient of them are derived.

4. Proposals and measures have been developed to increase the efficiency of agricultural holdings in six areas: determining the optimal size of the surveyed agricultural holdings, attracting permanent and seasonal labor, professional training in farm management and turning agriculture into an attractive sector for young managers, modernization of agricultural holdings,

participation in producer organizations and strengthening the role of state support for agricultural holdings.

REFERENCES

Aigner, D., Lovell, C., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, 21-37.

Battese, G., Coelli, T., & Colby, T. (1989). Estimation of Frontier Production Functions and the Efficiencies of Indian Farms Using Panel Data from ICRISTAT's Village Level Studies. *Journal of Quantitative Economics* , 327-348.

Bhalla, S. a. (1988). Mis-specification in farm productivity analysis: The role of land quality. *Oxford Economic Papers*,, 55-73.

Bojnec, S., & Latruffe, L. (2009). Farm technical efficiency in pre- and post-accession Slovenia: the importance of size and subsidies. *IAMO Forum 2009 : 20 years of transition in agriculture*, 23.

Brümmer, B. (2001). Estimating confidence intervals for technical efficiency: The case of private farms in Slovenia. . *European Review of Agricultural Economics*, 285-306.

Chamberlin, E. (1933). *The Theory of Monopolistic Competition.* Cambridge, Harvard University Press.

Coase, R. (1937). The Nature of Firms and Their Costs. *Economica*, Vulume 8, Number 3 .

Coelli, T. J. (1995). Recent Developments in Frontier Modelling and Efficiency Measurement. *Australian Journal ofAgricultura1 Economics*, 219-245.

Cooper, W. W., Seiford, L., & M. Zhu, J. (2011). Data Envelopment Analysis, History Models and Interpretations. In W. W. Cooper, *Handbook on Data Envelope Analysis - Secon Edition* (pp. 1-39). London: Springer.

Curtiss, J. (2000). Technical Efficiency and Competitiveness of the Czech Agricultural Sector in Late Transition – The Case of Crop Production. *KATO Symposium*, (pp. 2-4). Berlin .

Debreu, G. (1951). 'The Coefficient of Resource Utilisation. *Econometrica 19*, 273-292.

Fare, R., Grabowski, R., & Grosskopf, S. (1985). Technical Efficiency of Philippine Agriculture'. *Applied Economics*, 205-214.

Farrell, M. J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society* , A CXX, Part 3,253-290.

Fried, H. (2008). Measurement of productive efficiency and productivity. In *Measurement of productive efficiency and productivity* (pp. 522-638). New York: Oxfiord University Press.

Gjokaj, E., Leeds, S., & Halimi, K. (2018). The impact of fi nancial support program in creation on farm jobs, Kosovo's case. *Bulgarian Journal of Agricultural Science, 24 (No 6)*, 933–941.

Hall, B., & LeVeen, P. (1978). Farm size and economic efficiency: The case of California. *American Journal of Agricultural Economics*, 589-600.

Iráizoz, B., Rapún, M., & Zabaleta, I. (2003). Assessing the technical efficiency of horticultural production in Navarra, Spain. *Agricultural Systems*, 387-403.

Kopeva, D., & Noev, N. (2001). Efficiency and Competitiveness of Bulgarian Cereal Farms. *Bulgarian Journal of Agricultural Science*, 229-242.

Kumbhakar, S., & Lovell, C. A. (2000). *Stochastic frontier analysis.* . Cambridge university press.

Leibenstein, H. (1966). Allocative Efficiency vs. "X-Efficiency. *The American Economic Review*, 392-415.

Liu, J. S., Lu, L. Y., Lu, W.-M., & Lin, B. J. (2013). A survey of DEA applications. *Omega*, 893-902.

Lothngeren, M., & Tambour, M. (1999). Bootstraping the data envelopment analysis Malmquist productivity index. *Applied economics*, 417-425.

Madau, F. A. (2007). Technical Efficiency in Organic and Conventional Farming: Evidence from Italian Cereal Farms. *Agricultural Economics Review Greek Association of Agricultural Economists, vol. 8(1)*, 1-17,.

Marshall, A. (1920). *Principles of Economics.* London: Prometheus Books.

Mathijs, E., & Vranken, L. (2000). Farm Restructuring and Efficiency in Transition: Evidence from Bulgaria and Hungary. *American Agricultural Economics Association Annual Meeting*.

Mathijs, E., Dries, T., Doucha, & Swinnen, M. .. (1999). Production Efficiency and Organization of Czech Agriculture. *The Review of Economics and Statistics* , 100-107.

Morrison, J. (2000). Resource Use Efficiency in an Economy in Transition: An Investigation into the Persistence of the Co-operative in Slovakian Agriculture. *PhD Thesis, Wye College, University of London*.

Munroe, D. (2001). Economic efficiency in Polish peasant farming: An international perspective. *REgional studies* , 461-471.

Pitt, M. M., & Lee, L.-F. (1981). The measurement and sources of technical inefficiency in the Indonesian weaving industry. *Journal of Development Economics*, 43-64.

Reifschneider, D., & Stevenson, R. (1991). Systematic Departures from the Frontier: A Framework for the Analysis of Firm Inefficiency. *International Economic Review,*, 715-23.

Robinson, J. (1933). *The Economics of Imperfect Competition.* London: MacMillan.

Schumpeter, J. A. (2011). *The Theory of Economic Development An Inquiry Into Profits, Capital, Credit, Interest, and the Business Cycle.* United States: Transaction Publishers.

Sharma, K. R., Leung, P., & Zaleski, H. M. (1999). Technical, allocative and economic efficiencies in swine production in Hawaii: a comparison of parametric and nonparametric approaches. *Agricultural Economics*, 23-35.

Simar, & Wilson. (1998). Sensitivity Analysis of Efficiency Scores: How to Bootstrap in Nonparametric Frontier Models. *Management Science*, 49-61.

Smith, A. (1776). *The Wealth of Nations.* Scotland : W. Strahan and T. Cadell, London.

Williamson, O. E. (1979). Transaction-Cost Economics: The Governance of Contractual Relations. *Journal of Law and Economics*, 233-261.

Zhu, J. (2014). Quantitative Models for Performance Evaluation and Benchmarking - Data Envelopment Analysis with Spreadsheets. In J. Zhu. Switzerland: Springer.

Agency for Agriculture Development. (2019) *Grants and Direct Payment 2009-2018.* Prishtine, Statistical report by Agency for Agriculture Development.

Agriculture and Rural Development Programme 2014-2020. (2014, Prishtinë, Ministry of Agriculture, Forestry and Rural Development.

European Commission (2011) Agricultural Policy Perspectives Briefs - The future of rural development policy [Report].

European Commission (2014) EU 10 and the CAP, Ten years of success. European Union.

European Commission (2015) *Instrument for pre-accession assistance (IPA II) 2014-2020* - Further Support to Kosovo's Development of the Agri-Rural Sector and Food Safety [Report]. - European Union Office in Kosovo (EUO): [s.n.], 2015.

Gjokaj, E., Leeds, S. &Halimi, K., (2018). The impact of financial support program in creation on farm jobs, Kosovo's case. *Bulgarian Journal of Agricultural Science, 24 (No 6),* p. 933–941.

Gjokaj, E., Leeds, S., Gjonbalaj M. &Halimi, K., (2017). Agricultural Finance in Kosovo-*Economic Alternative*s, 2017, Issue 1, pp. 79-88

KAS (2018). *Economic Accounts for Agriculture, 2018*. Yearly Report. Prishtine, Kosovo Agency for Statistics.

KAS (2019). *Results of the Agricultural Holdings Survey*, 2017. Prishtine, Kosovo Agency for Statistics

MAFRD (2014). *Green Report, Kosovo 2014*. Yearly Report. Prishtine, Ministry of Agriculture, Forestry and Rural Development.

MAFRD (2016). *Green Report, Kosovo 2017*. Yearly Report. Prishtine, Ministry of Agriculture, Forestry and Rural Development.

MAFRD (2017). *Green Report, Kosovo 2017*. Yearly Report. Prishtine, Ministry of Agriculture, Forestry and Rural Development.

MAFRD (2018). *Green Report, Kosovo 2018*. Yearly Report. Prishtine, Ministry of Agriculture, Forestry and Rural Development.

Monitoring of agricultural policy developments in the Western Balkan countries (2017). JRC Technical Report (European Commission)

Mid-Term Evaluation. (2014). Report of the Agriculture and Rural Development Program 2007-2013, Kosovo.

Sallahu, S.; Gjokaj, (2017). The Potential of Agriculture in Developing Kosovo's Economy.; Kosovo; pp. 1–10.

Support to the Ministry of Agriculture, Forestry and Rural Development (MAFRD) to evaluate the Agriculture and Rural Development Programme 2014-2020, Kosovo – Revised Report

The impact of the Common Agricultural Policy on developing countries, Study (EP/EXPO/B/DEVE/FWC/2013-08/Lot5/19 EN February 2018 -PE603.862)

World Bank (2016). Country Snapshot: An overview of the World Bank's work in Kosovo. Pristina, World Bank.