**Szent István University**
**Doctoral School of Economic and Regional Sciences**

**Ph.D. Dissertation**

# ECONOMIC EFFICIENCY OF WATER USE IN KOSOVO WITH INTERNATIONAL COMPARISON

by

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## Abbreviations

| | |
|---|---|
| ADLI | agricultural demand led industrialization |
| AFI | agricultural factor income |
| AWU | annual work units |
| CAP | Common Agricultural Policy |
| CCI | Common Context Indicator |
| CIWA | Cooperation in international waters in Africa (Environment: Water) |
| DG | Regional and Urban Policy in EU |
| EAA | Economic Accounts for Agriculture |
| EC | European Commission |
| EEA | European Environment Agency |
| EECCA | Eastern Europe; Caucasus Region; Central Asia |
| EU | European Union |
| EUR | Euro |
| FADN | Farm Accountancy Data Network |
| FFI | Family Farm Income |
| FAO | Food and Agriculture Organization |
| AQUASTAT | Food and Agriculture Organization of the United Nations (FAO) global information system on water resources and agricultural water management |
| FNVA | Farm net value added |
| GDA | Global Development Agenda |
| GDP | Gross domestic product |
| GVA | Gross Value Added |
| HDI | Human Development Index |
| HDR | Human Development Report |
| HDRO | human development across regions |
| IPCC | International Panel of Climate Change |
| ISO | International Organisation for Standardization |
| JMP | Joint Monitoring Programme |
| IRWS | International Recommendations for Water Statistics |
| IWRM | Integrated Water Resources Management |
| KMO | Kaiser-Meyer-Olkin |
| LIMCOM | Limpopo Watercourse Commission |
| LSMS-ISA | ‘Improving Household Survey Instruments for Understanding Agricultural |

| | |
|---|---|
| | Household Adaptation to Climate Change: Water Stress and Variability’ |
| MDGs | Millennium Development Goals |
| MSA | Measures of Sampling Adequacy |
| OECD | Organisation for Economic Co-operation and Development |
| PPS | purchasing power standards |
| RAC | Revised African Convention, Limpopo River Awareness Kit |
| R&D | Research and Development |
| SAR | Specific absorption rate |
| SDG | Sustainable Development Goal |
| UK | United Kingdom |
| UN | United Nations |
| UNDP | UN Development Programme |
| UNICEF | UN Children’s Fund |
| UNEP | UN Environment Programme |
| UNSD | United Nations Statistics Division |
| WB | World Bank |
| WDR | World Development Report |
| WEI | Water Exploitation Index |
| WFD | Water Framework Directive |
| WHO | World Health Organization |
| WISE | Water Information System for Europe |
| WMO | World Meteorological Organization |
| WQIB | Water Quality Index for Biodiversity |
| SPSS | Statistical Program for Social Sciences |
| TAreaCult1 | % of total country area cultivated (%) |
| (Minus) GDPGrowth2 | Gross Domestic Product (GDP) (current US$) |
| AgrVaAd3 | Agriculture, gross value added (% GDP) (%) |
| HDIndex4 | Human Development Index (HDI) [highest = 1] (-) |
| InterWRCap5 | Total internal renewable water resources per capita (m3/inhab/year) |
| TRenewWRCap6 | Total renewable water resources per capita (m3/inhab/year) |
| DamCapita7 | Dam capacity per capita (m3/inhab) |

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# 1. INTRODUCTION

The study analyses the agricultural conditions of the selected countries of the world economy with Kosovo in fields of production efficiency, income conditions of farm households, and subsidies for farmers. The selected 15 countries in the scientific research are Albania, Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czechia, Finland, Greece, Hungary, Kosovo, Portugal, Romania, Serbia, Spain, and the UK. The EU-member states are 11 countries from these selected countries and during the research period, the UK was a member state of the EU. The selected countries belong to Europe.

The principles of selections of countries in this research were first, because some of them are closed to Kosovo and majority of these countries are EU member states, with which Kosovo wants to create strong economic cooperation. Also, in spite that all of these countries are within Europe, these countries have completely different economic and natural features, therefore, these geographical and economic differences can successfully make the analyses be interesting. Some of countries in Northern and Middle East parts of Europe –Austria, Czechia, Finland, Hungary, Romania, Serbia and the UK - have more water supply, while the other one in Southern Europe - Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Greece, Kosovo, Portugal, Spain, - have less favourable geographical and water conditions. This means that the farmers and agricultural policy of Kosovo can get wide-side experiences in field of water management from either humidity areas and sub-dray or more dray areas from one continent. In this case the water management has wide-side overview possibility.

Also, these countries have different qualified water irrigation systems, because some of them have highly developed system, for example Austria, Czechia, Finland, Hungary and UK but some of them, for example Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Greece, Kosovo, Portugal, Romania, Serbia and Spain, have less developed one. Naturally different water use efficiency results different income conditions for further water management and irrigation development.

The study focuses on the most important objectives, namely economic background for water management in several selected countries, mostly neighboured countries including Kosovo in Balkan regions and other EU regions and other important countries out of the EU. The international comparison is needed for analysing the possible future trends for improving the technological development in the agricultural industry emphasizing water management. The study of the dissertation overviews the above-mentioned objectives for the period of 2010 and 2018 based on analysing data coming from national statistical published materials and Eurostat accompanying with some data of FAO.

In the selected countries and Kosovo, employment in agriculture is at a very high level accompanying less developed machinery level, in spite that the inflation rate is at a low level with a high portion of the agricultural land of total land area compared to the cases of the other neighbouring countries. The international competitiveness of farmers is needed for developing the mechanization accompanying increasing subsidies for farmers.

My research focuses on analysing the efficiency of agricultural production in selected countries, using advanced technology for increasing the efficiency of inputs accompanying water use efficiency in the field of cost-income ratio using international experiences of the EU. The analyses encompass the agricultural production conditions in cases of farmers in Kosovo. In my dissertation, I focus on the international compare for profitable agricultural production with water use efficiency in selected countries including Kosovo.

The National Water Strategy Document 2017-2036 was prepared by the Assembly of the Republic of Kosovo and Government of the Republic of Kosovo to determine the Water Strategy for the country. The Directive seeks to prevent and reduce pollution, promote sustainable water use, ensure environmental protection, improve aquatic ecosystems, and mitigate the effects of floods and droughts. The core objective is to achieve "good ecological and chemical status". The Directive requires (Government of the Republic of Kosovo, 2017  2017):

- The designation of competent authorities in each river basin within its territory
- The preparation of river basin analyses including:
    - Analysis of the characteristics of each river basin district;
    - A review of the impact of human activity on the water;
    - Economic analysis of water use;
    - A register of areas requiring special protection;
    - A survey of all bodies of water used for abstracting water for human consumption and producing more than 10 m³ per day or serving more than 50 persons.
- On the basin of the analyses to prepare river basin management plans and programs of measures
- The establishment of international coordination mechanisms
- That river basin management plans and programs of measures are reviewed and updated every six years

The strategy emphasizes some main economic features of selected countries including Kosovo accompanying agricultural development conditions including agricultural production efficiency, agricultural gross value-added, income conditions, human resource with using water resource, and innovation of agricultural production to increase agricultural results in fields of yield and income. The agricultural results of Kosovo can be compared with one of some other EU member states in fields of production efficiency in agricultural production.

The main aims of the research are as follows:

1. Analysing the efficiency of the agricultural industry based on the agricultural value-added, the total country area cultivated, and renewable water resources accompanying with human development index in researched selected countries. Analysing the possible improvement for mechanization and logistic system of water supply and water use for agricultural production, thus analysing correlations of total renewable water resources per capita, total internal renewable water resources per capita, and dam water capacity per capita in selected countries.
2. How the improving technological development including water use efficiency may influence the production technology and production efficiency in the countries under the study emphasizing these conditions of Kosovo. Analysing the correlations between GDP growth and agricultural total areas cultivated in selected countries.
3. Analysing the adequate qualified agricultural lands are very few or the land natural resources are a scarcity in Kosovo, which is resulted in less favourable water supply and longer period drought. How do the qualified cultivated agricultural lands distribute into river bases?
4. Analysing the agricultural production efficiency at the farming system level in Kosovo. What are the parts of the family farms, which can acceptably be supplied by an advanced water channel system?

The actuality of the research can be emphasized because the drought weather based on global warming became more dangerous for the agricultural production and the living biological animal and plant materials, and therefore, the water issue became a central one. The water issue means at least two things, one is the drinking water and the second one is irrigating water for agricultural production, which mainly is producing the food stock. Both water and food are basics for human life. Global warming is very dangerous for the biological living world of the world's oceans, the living world of oceans can be ensuring the food capacity for mankind (BARRETT, 2002).

Also, global warming results in a more dangerous storm time by time, which causes large damages to human life. Sometimes the amount of water is scarce but sometimes is too much and dangerous for human life and society. Global warming and water scarcity mean a significant challenge for mankind. The food ensure is resulted by the agricultural production and agricultural industry, which strongly is dependent on the satisfactory amount of water either for indirect use for mankind by food production or direct use as drinking water consumed by people.

Because of the more difficult water issue, some international organizations try to strengthen international cooperation to keep the sustainability of enough amount of water and to set up the wide-side international water use by a water channel. The study and the researching analyses are based on the wide-side statistical databases, mostly from FAOSTAT and other national statistical resources. Some international printed materials and resources talk about the importance of the water issue. In line with the Paris Climate Change Agreement, EU Global Strategy and the New Consensus on Development, the EU recognises the need for concrete steps to enhance sound water policies, and better coordinate international efforts, interests and strategies. There are some examples of EU supported water projects, as the EU supports transboundary water management in different regions of the world. In Africa, the EU supports riparian governments and basin organizations, to enhance the potential for climate-resilient growth and the cooperative management of international waters. This includes support to the Cooperation in international waters in Africa (CIWA) program managed by the World Bank and to several regional initiatives targeting the Senegal River Basin and the Mekrou River Basin (EC, 2017; EC, 2018; UN, 2015; UN, 2016; UN, 2018; WORLD BANK, 2020).

Transboundary water cooperation actions exist for the Nile River Basin, Lake Tanganyika, and the Okavango River Basin. Asia, Central Asia, the Middle East, and the Mediterranean are also key areas for cooperation on water. We are increasingly taking a 'nexus based' approach by addressing simultaneously the links between water, food, and energy. Through its development cooperation, the EU is also funding projects to promote access to water and sanitation: since 2004 more than 70 million people have been connected to improved drinking water, and more the 24 million people are connected to sanitation facilities. The Conclusions include the EU’s commitment to consider the importance of water and sanitation in the programming of future financial and technical cooperation with partner countries (EEAS, 2019; UNDP, 2018; UNDP, 2019).

The other author declared that „In international law, cooperation is a general and fundamental principle designed to facilitate the fulfilment of more specific obligations. The purposes and concrete applications of cooperation have been identified in several instruments in the context of the law of international water resources. This chapter identifies the different forms and levels of cooperation related to water resources: from the minimum form of direct exchange of fundamental data and information to the establishment of joint development commissions or other institutional mechanisms for the integrated management of a river basin. It shows that the obligations to undertake specific cooperative actions in international law vary significantly. Furthermore, the significant role played by international institutional arrangements and international organizations in promoting cooperation on water resources is analysed." "Bilateral cooperation addresses the circumstances of the particular case, while multilateral cooperation evidence interdependence at the regional and global level" (FARRAJOTA, 2009; UN, 2003).

The EU focuses on "Strengthened water governance is essential for long-term stability". There are 263 transboundary river basins worldwide but around two-thirds of these do not have a cooperative management framework. A key objective of the EU water policy is fostering cooperative approaches to address the transboundary challenges of water. The EU supports transboundary water use efficiency, sustainable and integrated water governance at all levels. International cooperation can be strengthened in the field of improving water use for agricultural irrigation additionally to supply the water need of other economic sectors and populations. "Too much or too little water: Climate change creating floods and droughts" There is a fundamental link between climate change and water. Floods and droughts are becoming more frequent and damaging to lives, nature, and the economy due to climate change. Poor communities, who are the most vulnerable to threats to water supply, are likely to be worst affected. Less water availability impacts the water need for agriculture and food security. The implementation of the Paris Agreement is key to address the water global challenges linked to climate change (EEAS, 2019).

The Research Hypotheses in my dissertation are as following:

1. The correlations between renewable water resource use and dam capacity per capita are important in selected countries.

2. There is opposed correlation among the renewable water resources and the GDP growth, and between the agricultural value-added and the GDP growth rate at the level of the selected countries based on improving mechanization in agricultural production.

3. Human development index has weak influence on the development of the agricultural industry based on using more total country area cultivated in selected countries. There is not strong correlations between the two variances.

4. The total country area cultivated is highly influenced by the agricultural value added at the level of the selected countries. Adequate qualified agricultural lands are very few and scarcity in Kosovo, which also is resulted in a less favourable water supply and longer drought.

5. There is strong correlation among innovation knowledge, educated level, and skills of farmers and using advanced irrigation systems in Kosovo.

The water issue and water use are very important for the economic development and growth and the agricultural industry and also irrigating water consumption for the agriculture in EU and Kosovo with some compare with neighbouring countries of Kosovo. Thus, naturally the international cooperation should be realised to solve the very sensitivity water irrigation difficulty for agriculture. No country can withdraw itself from this very dangerous problem, therefore the international solution is needed. This is the reason for extending the objective of my study for the EU and Kosovo.

# 2. LITERATURE REVIEW

Quality assurance is a process ensuring that quality goals are consistently met throughout the whole system of data production. The major goal of a quality assurance framework for the census of agriculture is to prevent and minimize potential errors at the design stage and detect errors as soon as possible so that timely remedial actions can be taken even as the census operations continue. This chapter introduces various quality issues related to census-taking and outlines a quality assurance management framework, including comments on each dimension of quality as they relate to census phases. Finally, an overview of some quality control techniques is introduced, followed by a discussion of techniques and implementation for several specific activities in census taking (EU, 2017).

## 2.1. Experiences of the water efficiency and management at the international compare

In 2002, the International Programme for Technology and Research in Irrigation and Drainage (IPTRID) and the Water Resources Management Development Service began a joint survey on the modernization of irrigation. Eighteen case studies were prepared and analysed. Water is crucial for agriculture and food production. It is required to meet personal and household needs, for energy and industrial production, and to maintain important water-dependent ecosystems and ecosystem services.
FAO offers technical assistance to member countries in the design and implementation of on-farm irrigation systems, water-saving techniques, and the identification and adaptation of irrigation techniques. FAO also works with member countries on the adoption of water-harvesting techniques and the reuse of treated wastewater in agriculture. (FAO, 2020a)

One of the most important reforms within the irrigation sub-sector has been irrigation management transfer (IMT). It is the process of devolvement of authority and responsibility from government agencies managing irrigation systems to farmers' organizations and has been utilized as a tool for irrigation sector reform in more than 60 countries. FAO, IWMI, and other partners have made an effort to document and understand the implications of this reform process (FAO, 2020b; GARCES-RESTREPO C - MUÑOZ G (2007).

Participants of the IPCC declared that "Freshwater-related risks of climate change increase significantly with increasing greenhouse gas concentrations (robust evidence, high agreement).

The fraction of the global population experiencing water scarcity and the fraction affected by major river floods increase with the level of warming in the 21st century" IPCC, 2014, pp. 12.
Calling for immediate and concerted effort: The Global Framework for Action to Cope with Water Scarcity in Agriculture in the Context of Climate Change, water scarcity presents an immediate threat to people, the planet, and the path to inclusive and sustainable development. As the largest water user globally and a major source of water pollution, agriculture will play a key role in tackling the looming water crisis. What can agriculture do to address water scarcity in the context of climate change, while ensuring food and nutrition security? What responses can the agriculture and food sectors offer to alleviate the impacts – and reduce the risks – of water scarcity? To respond to these challenges in a coordinated and effective manner, FAO and a broad range of partners has developed the Global Framework for Action to Cope with Water Scarcity in Agriculture in the Context of Climate Change (abbreviated below to "the Global Framework for Action" and "the Global Framework"). It calls for urgent action to cope with water scarcity in agriculture in the context of climate change and growing competition for water resources (FAO 2016).

*Structure of the project given by FAO, which are as follows:*
Food security and sustainable development through effective adaptation of agriculture to increasing water scarcity and climate change Objective 2 Pillar action OBJECTIVES AND APPROACH Facilitation Partnership Knowledge & Innovation Action Diagnostics / Methods / Tools / Data / Technology / Practices:

1. Promotes knowledge, good practice and innovation
2. Mobilizes expertise in finding solutions
3. Publicizes successful actions and identifies ways for replication (FAO 2016, p. 11.)

The Global Framework on Water Scarcity in Agriculture (WASAG) declared that water withdrawals increased at almost twice the rate of the population in the twentieth century, and a 50 percent surge in food demand is expected by 2050. These matters most severely affect water-scarce regions, as well as areas where a lack of infrastructure or capacity prevents sufficient access to water. It is clear that there is an urgent need to address water scarcity (FAO, 2020c).

Objectives of (WASAG) Address the following work areas at international and country levels:

4. Advocating for political prioritization.
5. Cooperating on work programs.
6. Sharing and disseminating knowledge and experience.
7. Developing new or improved solutions.

8. Promoting sustainable and integrated water resources management.
9. Building capacity of partners and countries and other stakeholders.
10. Contributing to consistent monitoring systems. (FAO, 2020c).

Also, they declared importance of:

11. Innovative and new solutions
12. Support to stakeholder activities on the ground
13. Pilot projects
14. New methodologies, concepts, guidelines and tools
15. Technology development
16. Training and capacity building material
17. Conference, HL-Panel etc. (FAO, 2020c).

The Near East and North Africa Region (NENA) face the challenges of addressing a wide range of complex and intertwined issues associated with the management of natural resources, particularly land and water, and securing food supply for a growing population. To address these challenges, FAO has launched a Regional Initiative on Water Scarcity in the Near East. The overall goal of the initiative is to support member countries in identifying and streamlining policies and best practices in agriculture water management, and beyond, that can significantly contribute to boosting agriculture productivity, improving food security, and sustaining water resources. The initiative will identify critical areas that require action, assist in the formulation of a regional collaborative strategy, and build broad partnerships to support its implementation (FAO 2013).

A series of National Assessments will be performed, based on three pillars:

- A water accounting/water auditing that will review the country’s water resources, their use, and the potential for improvement in its efficient use for agriculture; combined with a review of the policy and institutional environment that sustain water resources management;
- The development of a water and food supply cost curve that will review and compare agricultural water management and food supply options in terms of costs and expected benefits.
- A knowledge gap analysis, focusing on evidence-based findings, of the causes of successes or failures of past policies, strategies, and programs dealing with water management for agriculture. Benchmarking will be used extensively to assess performance gaps and the potential for improvement.

Water scarcity is both a relative and dynamic concept and can occur at any level of supply or demand, but it is also a social construct: its causes are all related to human interference with the water cycle (FAO 2013).

*Strategic priorities and political commitment of government and donors*

This dimension illustrates the investment priorities and political commitments assigned by governments and donors to irrigation and hydropower investment in: a) national agricultural policy; b) national energy policy; and c) in the internationally agreed goals and targets.

The indicators developed under this dimension are used to produce an index that highlights the public and donor investment priorities and commitment to water management for agriculture and hydropower. The so-called "Institutional and Policy Index (IPoI)" is visually represented with a radar graph (see table below). IPoI is the geometric average of the value of the following six indicators: a) irrigation projects budget in the agricultural public budget (IPBA), b) hydropower projects budget in energy public budget (HPBE); c) irrigation projects budget in the total public budget (IPB); c) hydropower projects budget in the total public budget (HPB); e) irrigation projects budget in total donor budget (IDB), and f) hydropower projects budget in total donor budget (HDB).

The FAO set up the Efficiency of the public spending in the irrigation and hydropower sectors, which are consisting of several elements as are written below (FAO 2020d):

This dimension shows the level of decentralization and participation in both sectors, as well as the timely utilization of budgetary appropriations as a measure of the efficiency of governance and the credibility of the public budget.

Strategic priorities and political commitment of government and donors include Dimension, Sub-dimension and Indicators and Radar graphs and index, which are as follows:

- Irrigation projects budget in agricultural public budget (%)
- Hydropower projects budget in energy public budget (%)
- Irrigation projects budget in total public budget (%)
- Hydropower projects budget in total public budget (%)
- Irrigation projects budget in total donor budget (%)
- Hydropower projects budget in total donor budget (%)

The efficiency of public spending in the irrigation and hydropower sector (FAO 2020d), Decentralization, and participation

Share of public spending in irrigation by:

- Central government units (%)
- Regional government units (%)
- Local government units (%)

- Share of public spending in hydropower by:
  - Central government units (%)
  - Regional government units (%)
  - Local government units (%)

Timely utilization of budgetary appropriations

- Share of actual spending on planned public spending for irrigation projects (%)
- Share of actual spending on planned public spending for hydropower (%)

Authors declared the importance of the water management: Contributing to the growing debate on the need for sustainable water use and management, with concrete examples of new approaches, concepts, arguments, methods and findings which illustrate how this can be achieved, this book will be attractive for large groups of readers familiar with one or more of the themes it tackles, and to the general public. Within this context, the book makes use of many tables and graphics, which bring many messages together. This approach is intended not only for those working on water matters (e.g. bureaucrats, water managers, policymakers, journalists, etc.) and interested in water management issues and sustainability at large, but also for students of water management, water politics, environmental policy, water economics, water engineering, and sustainability studies. Located at the crossroads of two key phenomena: sustainability and water, this book brings forward academic research and discussions on water efficiency, new technologies, and the water-agriculture nexus. It also benefits readers by tackling matters related to transboundary cooperation on water (including rainwater) and river-basin management, pricing issues, participatory water management, and the role of women in sustainable water use, amongst others (WALTER LEAL FILHO VAKUR SÜMER, 2014; DAVIS, 2019).

The author GOBER (2018) has his book, which describes the existential threats facing the global water systems from population growth and economic development, unsustainable use, environmental change, and weak and fragmented governance. It argues that 'business-as-usual' water science and management cannot solve global water problems because today's water systems are increasingly complex and face uncertain future conditions. Instead, a more holistic, strategic, agile, and publically engaged process of water decision making is needed. Building Resilience for Uncertain Water Futures emphasizes the importance of adaptation through a series of case studies of cities, regions, and communities that have experimented with anticipatory policy-making, scenario development, and public engagement. By shifting perspective from an emphasis on management to one of adaptation, the book emphasizes the capacity to manage uncertainties, the need for cross-sector coordination, and mechanisms for engaging stakeholders with differing goals and conflict resolution. His book is a useful resource for students and academics seeking a better understanding of sustainable water use, water policy, and water resources management.

Also, other experts emphasized the water use and some experiences about this issue, as Hatfield and Dold (2019) declared that water use efficiency (WUE) is defined as the amount of carbon assimilated as biomass or grain produced per unit of water used by the crop. One of the primary questions being asked is how plants will respond to a changing climate with changes in temperature, precipitation, and carbon dioxide (CO2) that affect their WUE at the leaf level, increasing CO2 increases WUE until the leaf is exposed to temperatures exceeded the optimum for growth (i.e., heat stress) and then WUE begins to decline. Leaves subjected to water deficits (i.e., drought stress) show varying responses in WUE. The response of WUE at the leaf level is directly related to the physiological processes controlling the gradients of CO2 and H2O, e.g., leaf air vapor pressure deficits, between the leaf and air surrounding the leaf. There is a variety of methods available to screen genetic material for enhanced WUE under scenarios of climate change. When we extend from the leaf to the canopy, then the dynamics of crop water use and biomass accumulation have to consider soil water evaporation rate, transpiration from the leaves, and the growth pattern of the crop. Enhancing WUE at the canopy level can be achieved by adopting practices that reduce the soil water evaporation component and divert more water into transpiration which can be through crop residue management, mulching, row spacing, and irrigation. Climate change will affect plant growth, but we have opportunities to enhance WUE through crop selection and cultural practices to offset the impact of a changing climate (HATFIELD - DOLD 2019; ALI ET AL, 2018; AVRAMOVA ET AL, 2018).

The paper of Basso and Ritchie (2018) describes the results of analysis demonstrating that high yields in maize can be obtained without additional water under current and projected vapor pressure deficits. The objective of the study was to quantify evapotranspiration (ET) in high-yielding maize under current and projected vapor pressure deficits using the energy balance contrasted with the transpiration efficiency (TE) approach.

This study indicates a lack of accuracy and bias in the TE approach when future crop water requirements were estimated. High maize yields are achievable using on average 700 mm of water as demonstrated by the current record maize grain yield of 34 Mg $ha^{-1}$, which is ~23 Mg $ha^{-1}$ higher than the US average. These yields are achievable with approximately the same ET even under projected changes in vapor pressure deficit, through improved genetics and optimum agronomic management. Higher maize yields do not require more water. The transpiration efficiency approach results in biased estimates of ET in high-yielding maize production. Evapotranspiration does not change in higher plant populations if the water supply is adequate. Projected changes in vapor pressure deficit will not lead to greater water use in maize (BASSO–RITCHIE, 2018).

## 2.2. Effect of efficient irrigation in Agriculture

NAVADKAR D.S. ET AL., (2012) observed that in India, tremendous development has been witnessed through the successive Five-Year Plans by developing the irrigation potential. They have explained the pattern of the expenditure for irrigation in India with the help of the data provided by Economic Survey, 2008-2009. They outlined that during the first plan 15.82 per cent of the total outlay was spent on irrigation and flood control. After the First Plan the importance given to irrigation was slightly reduced. In the Second Plan the amount earmarked for irrigation and flood control was only 9.13 per cent and in the Third Plan it further reduced to 7.75 per cent and in the Annual Plan the government allotted only 7.11 per cent for irrigation and 17 flood controls. In the fourth and fifth plans the outlay has increased to 8.58 per cent and 9.83 per cent respectively. Their study can be concluded that there is need for effective financial support system for the adopted irrigation system for achieving the desired outcome.
NARASAIAH (2007) in his book on 'Irrigation and Economic Growth' pointed out that Farmer-Managed Irrigation Systems (FMIS) is also known as traditional, indigenous, communal or people' systems, are often classified 'minor' or small-scale irrigation systems, although they may be found in command areas of 15,000-20,000hectares. Research has revealed that FMIS contribute to the production of a significant portion of the subsistence food supply. The farmer managed groundwater irrigation farmer-managed tank irrigation systems cover about 8.5 million hectares in this country. Successful irrigation in the future will be that which supports much higher levels of agricultural productivity, enhances responsiveness to more diversified and dynamic crop markets, stimulates more profitable irrigated agriculture for wide numbers of rural poor, substantially improves water-use efficiency and 19 supports and sustainable use of scarce land, biomass and water resources and to meet the food needs of rapidly growing population.

PAL (2006) in his article on ‘Resource Use Efficiency, Particularly in Irrigated Area’ outlines that efficiency of water use has been increased over time but still remains less than 40 percent. He argued strong policy, strong incentives for growing rice and wheat coupled with diversification to other crops, which require less water and generate higher income is highly correlated to irrigation. They also felt that mere withdrawal of subsidy on electricity may not shift incentives in favour of diversification of the cropping system this will require several other measures like effective direct control on the use of water, the participation of farmer organizations in water management, and educating farmers about sustainable use of water resources. Kosovo can learn from the Australian experience where long-term farm planning based on suitability of land, pricing, and Control of water and farmers’ participation in water use, input supply, and R & D are Found to be very successful.

### 2.3. Impact of cropping pattern on efficient irrigation systems and outcomes

The effect of Cropping pattern yields and income under different sources of irrigation as outlined by SHEKADAR (2015) points out that farmers with private tube-wells had better control over water supply in terms of timely availability in adequate quantity. A clear indication of the importance of management in irrigation systems for effective and efficient production. He argued that there were high cropping intensity, yield, and crop income for high yielding crops depending on the farm flexibility in terms of time and presence in the farm.

HANGARAGI (2011) concluded that cropping pattern of the district has not changed significantly in spite of population growth. In the present scenario needs to strengthen the irrigation facilities, soil and moisture conservation, adoption of biotechnology, forestation, changing in the cropping pattern, agronomic practices, livestock development, rural communications, development of the medium, small and marginal farmers and agricultural laborers, and setting up agro-based industries. The dry land development program, sericulture, and small-scale industries at the village level should be setup through the various programs of agricultural development.

PATIL ET AL., (2012) in their study on the impact of water percolation tank on changing cropping pattern in help to attainment of sustainable irrigation water and improved production possibilities of sustainable agriculture.  They conclude that efficient irrigation can reduce the cost of production and help in mitigating food insecurity.

## 2.4. Crop diversification, Production Characteristics and Efficiency

Several studies on crop diversification have been conducted to determine the efficiency of irrigation systems and their relationship on the level of income or production output. Irrigation contributes immensely to diversification through enabling the environment for all-year-round production. MKHABELA (2005) concluded that crop diversification programs in South Africa were successful in geographic locations where access to irrigation was easy. They emphasized that current production practices were not adjusted to the existing climatic conditions.

## 2.5. Technology and Irrigation efficiency

At the dawn of the 4th industrial revolution, technological development in irrigated agriculture has not lagged behind. Climate change especially in Europe has led to the emergence of new practice known as Precision irrigation (PI). PI is a practice, rather than a technique, that can be applied to any type of irrigation method in any region of the world. According to BATTILANI (2012) it's a technique that offers means to support end users' decisions with regard to how much to irrigate, and when, through data acquisition from monitoring devices (sensors) and forecasting tools (weather predictions), data interpretation, system control, and evaluation mechanisms.

The paradigm of innovation for irrigation is shifting from technologies associated to the way to irrigate (i.e., from sprinkler irrigation to drip irrigation) to technologies related to the way to handle information for scheduling irrigation intervention (from hand-control irrigation systems to automated irrigation systems). The transition from traditional to modern irrigation technologies (MIT) appears to be affected by environmental, regulatory, and structural factors. As put forward by MORENO (2005), Climate conditions the quality of land, soil water holding capacity (WHC) are some of the important environmental Water factors conditioning the transition to MIT.

The adoption of PI may be expected to favor higher economic returns and higher environmental benefits, minimizing nutrient leaching losses and irrigation water wasted, with increased heterogeneity in field morphology. One of the most recent novelty in the field of PI is to combine crop growth models estimating yield responses to water uses with measures of crop evapotranspiration and soil water content and weather forecasting tools to precisely schedule irrigation in relatively homogeneous regions of a field, named management zones The management zone is a sub-region of the field that exhibits a relatively homogeneous combination of yield-limiting factors for which a single rate of specific crop input (in the present methodology and water) is appropriate CID-GARCIA ET AL., (2013)

### 2.6. Water use efficiency in field of irrigation of agriculture in EU and Kosovo

The study related to the selected 15 countries focuses on the correlations among the renewable water resources per capita, as a total internal one, the total one, and the dam capacity and also from the other side, namely the GDP growth rate. Therefore, the water resources have significant importance for the general economic growth, in spite that the majority of the water resources are used for irrigation and supplying the agricultural industries by possible enough amount of water resources. At the world side level, 80% of all of the renewable water resources adequate for drinking were used for agricultural irrigation. This water-use structure can also improve that the international or transboundary co-operations for using sustainable water resources should be demanded by all nations of the world economy.

Therefore, it is important to emphasize that based on the aims the EU documents and IPCC's (International Panel of Climate Change) Assessment Reports on Climate Change that at the international level, the Convention on the Protection and Use of Transboundary Watercourses and International Lakes requires that the parties introduce sustainable water management, including an ecosystem approach and the rational and fair use of transboundary waters. In the European Union, the Water Framework Directive obliges the Member States to promote sustainable use based on the long-term protection of available water resources and to ensure a balance between abstraction and recharge of groundwater, to achieve "good groundwater status" by 2015. Source of data Renewable freshwater (surface and groundwater) resources are replenished by precipitation (less evaporate-transpiration) falling on a country's territory that ends up as runoff to rivers and recharges to aquifers (internal flow) and by surface waters and groundwater flowing in from other countries (inflow). Climatic, ecological, economic, and other limitations on the availability of these resources for abstraction are reflected in the variable "regular freshwater resources 95 percent of the time". Data on renewable freshwater resources are usually collected at selected hydrological stations at both the national level and at the levels of main river basins. The values are calculated based on long-term measurements of levels, flow rates, and inflows/outflows carried out on rivers and lakes as well as groundwater horizons and countrywide precipitation. The indicator is the major one used to define the water balance of a country (EU, 2017; p. 227; EEA, 2018; EEAS, 2019).

Water is abstracted by public or private bodies whose main function is to provide water for various uses (the "public water supply"). It can also be directly abstracted from rivers, lakes, wells, or springs by industries, farmers, households, and others for their use (self-supply). The indicator incorporates data on the abstraction of freshwater, broken down according to the main activity of the water abstractor as defined by ISIC/NACE. The water abstraction indicator calculations are based on the data on the quantity of abstracted water reported by water users to the relevant authorities. The quantity of water abstracted is either measured or calculated based on energy consumption for pumps. In some cases, it is necessary to apply a calculation method using models for some water users (household and agriculture). The WEI (Water Exploitation Index; EEA, 2018) is the ratio of annual total water abstraction to long-term annual average renewable freshwater resources, expressed as a percentage. The WEI provides a good national-level overview of the pressures on resources in an easily understandable format, and it shows trends over time. Data and information concerning the use of WEI in African countries are available in the IPCC's Assessment Reports on Climate Change (EU, 2017; p. 227; IPCC, 2020).

According to the EU and international documents and decisions concerning environmental conservation and sustainability, the water use and irrigation system are emphasized by the national institutions for farming households and other households of the society. The household water use per capita can be determined based on the measured volume supplied mainly through the public water supply systems. The use of water by the population that is not supplied by public water supply systems needs to be calculated. Households' water use per capita is calculated by dividing total water consumption in the community by the respective number of inhabitants. The indicator is based on data submitted by associations, enterprises, and organizations supplying households with water and by local public administration bodies (VASA, 2009). In many countries around the world, data on household water use are still collected by the government branch dealing with housing and municipal services (EU, 2017; p. 227).

The WHO and UNICEF collect estimates of national average figures from governments as part of its Joint Monitoring Programme (JMP) for water supply and sanitation. The JMP indicators feed into the SDG indicators framework, informing Sustainable Development Goal 6 'Ensure Availability and Sustainable Management of Water and Sanitation for All' (see also section B.1.1 and section B.4.1). When working with water losses, the most important issue is to have data on the quantities of fresh water lost from water supply systems between a point of abstraction and a point of use due to leakage or evaporation. The indicator is estimated and defined as the absolute and relative difference between the amount of water abstracted and the amount delivered to users (households; agriculture, forestry and fishing; manufacturing, the electricity industry, and other economic activities) (EU, 2017; p. 227; WHO/UNICEF, 2020; HCSO 2020).

Additionally, to the above-mentioned international cooperation and national level for water use, the other international organizations declared the different cooperation forms for common water use. International Recommendations for Water Statistics (IRWS) were developed to assist countries to establish and strengthen information systems for water which in turn supports the design and evaluation of better water policies for Integrated Water Resources Management (IWRM). Additionally, these recommendations provide the necessary information for deriving coherent and consistent indicators, enabling comparisons over time and between countries from an agreed list of data items. The data received from countries, together with data from other sources, feed into UNSD's evolving environment statistics database. At the European level, the Water Information System for Europe – or more commonly known as WISE – is the European gateway to information on European water issues. It compiles several data and information collected at the EU level by various institutions and bodies (EU, 2017; pp. 227-229; UNSTATS, 2015). From this point of view, the importance of the information flow at the international level became significant issues in the cooperation of different countries in the fields of water use and water management.

There is the other kind of international co-operations among countries, for example, the Limpopo River basin is located in southern Africa, encompassing portions of Botswana, Mozambique, South Africa, and Zimbabwe. The Limpopo River basin faces some challenges, especially water scarcity. The Limpopo River Awareness Kit (RAK) is an information and knowledge management tool for the Limpopo River basin, to support capacity development and the sustainable management of the environment and resources within the basin. The Limpopo Watercourse Commission (LIMCOM), in line with the SADC Water Sector, is committed to the principles of Integrated Water Resources Management (IWRM) (EU, 2017; p. 228; in Box 14.5; WHO/UNICEF, 2020). The basin covers different climatic and topographic zones and land-use types, including protected areas. The four countries co-operate in managing their water resources through the Limpopo Water Course Commission (LIMCOM). An online tool, the Limpopo River Awareness Kit, has been designed to support capacity development in LIMCOM and raise awareness for transboundary water issues in southern Africa. As the river basin passes through various geographical regions and biomes and supports a wide array of water demands, there is a great need for Integrated Water Resources Management (IWRM). IWRM is challenging, even more so in a trans-boundary setting. At a basin or sub-basin scale, the priority is often on monitoring and management of water quantity. However, the monitoring and management of water quality are equally important. Maintaining water quality is critical for communities throughout the Limpopo River basin (The Limpopo River basin, 2017). Protection of water quality in the river system directly or indirectly contributes to the achievement of several Millennium Development Goals (MDGs) and their associated targets (EU, 2017; UN, 2016).

Furthermore, to the cooperation for using water resources and water management including the irrigation for agriculture to keep the adequate qualified water the monitoring plays a crucial role in determining sustainable abstraction volumes, the feasibility of developments, and strategy for efficient overall resource management. A key issue is a freshwater quality: While there is often a focus on water quantity (maintaining dam volumes, streamflow, water supply, etc.), less attention has been paid to water quality, especially to policy instruments to protect and manage this critical aspect of freshwater. River runoff comprises the most essential data for water use for irrigation of agriculture in Kosovo with some international experiences. The overall water quality situation is described as impacted. Land use management and developments within the river basins have generally altered water quality when compared with the baseline/un-impacted conditions (EU, 2017, p. 234):

- Mining and minerals processing. For example the Limpopo River basin and Drini i Bardhë, Ibri, Morava e Binçës and Lepenci river basins of Kosovo include numerous mines, active and abandoned, the environment is under significant threat from acid mine drainage; the metals and chemicals typically found in acid mine drainage can cause serious illnesses in humans and animals;
- Non-point impact from commercial or subsistence agriculture, irrigation, and redistribution of river waters;
- Erosion. Soil erosion, resulting from poor tillage and land use management can result in an increased sediment load in rivers, as soils and sediments wash away during heavy or sustained rainfall events;
- Uncontrolled and wild landfills and solid waste disposal sites;
- Disposal of liquid and effluent, fuel loss, and litter on roadways;
- Non-point domestic effluent via soak-a-ways in rural areas. Another issue is groundwater quality: The impacts of changes in surface water quality can often be seen directly and the causal chain is often clear. It is not always evident where impacts on groundwater quality originate. However, it is equally important as it is often used for drinking water and domestic consumption. One of the primary sources of human-caused groundwater pollution in urban areas is leakage from pit-latrines in areas with poor sanitation. Agriculture (irrigated cultivation and livestock) is another important source of groundwater contamination because of the pesticides, herbicides, and fertilizers used.

- Land Use corresponds to the description of areas in terms of their socio-economic purpose: areas used for residential, industrial, or commercial purposes, for farming or forestry, for recreational or conservation purposes, etc. Links with land cover are possible; it may be possible to infer land use from land cover and conversely. But situations are often complicated, and the link is not so evident. Contrary to land cover, land use is difficult to "observe". For example, it is difficult to decide if grasslands are "natural" (or semi-natural), so not used, or if they are used for agricultural purposes. The information coming from the source of the observation may be sufficient, e.g. indications on the presence or absence of cattle, or may require additional information, for example from the landowners or the farmers in the EU and Kosovo (EU, 2017, p. 234; EFSE, 2018).

International cooperation cannot be avoided to increase qualified water use and water management, because the common force can help nations to run over the technical and financial difficulties and to avoid increasing the pollutions of the water resources, as oceans, lakes, and rivers. Also, this international cooperation provides better solutions for the water using and supplying for households even at the national level.

### 2.7. Agricultural development and its value-added

In my study, I focused on the main role of the agricultural development, because this sector provides basic products, as agricultural outputs for the manufacturing industries and market possibility for the producers of the agricultural inputs, while the sector provides jobs even for the rural -village populations in the selected 15 countries of the research. From this point of view, the results can be measured from the agricultural gross value added as output minus input. When the agricultural gross value added increased, the GDP growth decreased in cases of these selected 15 countries in this period.

But in spite that the agricultural gross value added is frequently fluctuating the importance of this sector remains a high level. Also, the agricultural development by increasing the gross value added of this sector can finally contribute to the whole value of the GDP, even that the GDP could decrease. This means that the other economic main sectors decreased therefore, their contribution decreased to the GDP and its growth, which finally lead to the decreasing trends of the GDP growth rate.

According to the importance of the agricultural sector, the EU focuses on improving this sector, as can be seen in the agricultural and rural development of the EU. The European Commission decides the aim of the action program and policy for the development that the agricultural and rural development as the integrating environmental concerns into the CAP (Common Agricultural Policy) aims to head off the risks of environmental degradation and enhancing the sustainability of agro-ecosystems. Around half the EU's land is farmed. Farming is important for the EU's natural environment. Farming and nature influence each other:

- Farming has contributed over the centuries to creating and maintaining a unique countryside.
- Agricultural land management has been a positive force for the development of the rich variety of landscapes and habitats, including a mosaic of woodlands, wetlands, and extensive tracts of open countryside.

Also, the EU connected the CAP with ecological conditions as the natural environmental conservation background of this sector, as the EU policy follows the ecological integrity and the scenic value of landscapes making rural areas attractive for the establishment of enterprises, for places to live, and for the tourist and recreation businesses. The links between the richness of the natural environment and farming practices are complex. Many valuable habitats in Europe are maintained by extensive farming, and a wide range of wild species rely on this for their survival. But inappropriate agricultural practices and land use can also harm natural resources, for example:

- pollution of soil, water, and air
- fragmentation of habitats
- loss of wildlife (EC, 2018; EEA, 2017).

Additionally, to less and mitigating damage caused by the human activities for nature the EU emphasized within the Common Agricultural Policy (CAP) that it has identified three priority areas for action to protect and enhance the EU's rural heritage:

- biodiversity and the preservation and development of 'natural' farming and forestry systems, and traditional agricultural landscapes
- water management and use
- dealing with climate change (EC, 2018; EEA, 2018).

The CAP ensures that its rules are compatible with environmental requirements and that CAP measures promote the development of agricultural practices preserving the environment and safeguarding the countryside. Farmers are encouraged to continue playing a positive role in the maintenance of the countryside and the environment (see more in LOAYZA – RADDATZ, 2010). This is achieved by targeting aid at rural development measures promoting environmentally sustainable farming practices, like agricultural-environment schemes enhancing compliance with environmental laws by sanctioning the non-respect for these laws by farmers through a reduction in support payments from the CAP (EC, 2018; OXFAM INTERNATIONAL, 2017).

The agricultural sector continues to play a crucial role in development, especially in low-income countries where the sector is large both in terms of aggregate income and total labour force (VASA-DÁVID, 2014). The World Bank‘s 2008 World Development Report, Agriculture for Development, explained why the decline in the support of agriculture by international donors was so damaging for the progress of growth, development, and poverty reduction in poor countries. The report was a landmark document that described masterfully the various dimensions of the challenge and helped rekindle interest in agricultural policy (EC, 2018; SWINNEN ET AL., 2010).

But some experts as DETHIER - EFFENBERGER (2011) started their ideas with the food, financial, and climate crises of the past years much has changed since the report was released in late 2007. A major concern has been increased exposure to shocks, worsening food insecurity, and vulnerability to poverty. It seems to be an appropriate time to review the economic literature on agriculture, focusing on the issues that are critical for agricultural productivity and poverty reduction.

Therefore, they declared that the role of agriculture in the development process and the interactions between agriculture and other economic sectors. Agriculture contributes to both income growth and poverty reduction in developing countries—by generating income and employment in rural areas and providing food at reasonable prices in urban areas. The developing strategy focuses on the Green Revolution and discusses the foundations of agricultural growth. In developing countries that have experienced sustained increases in yields, the model of agriculture has been intensive and has involved the adoption of new varieties by farmers, irrigation, and massive use of fertilizer—with predictable environmental consequences—which presupposes good institutions (DETHIER - EFFENBERGER, 2011).
To improve the agricultural inputs and water management, the President of the World Bank, Robert Zoellick, in an interview of his stated that the largest challenge facing most developing countries in 2011 is the risk of a big boost in food prices. He observed two challenges related to agriculture. First, the need to increase food productivity and production in developing countries, with small-holder farmers. To achieve this, several problems need to be addressed: property rights;

agricultural irrigation, and R&D for seeds and inputs; fertilizer; agricultural extension; credit; rural infrastructure; storage; and connection to markets. The second problem is the volatility of food prices, often because of events outside the control of poor countries. An interconnected combination of steps could help ensure that the most vulnerable countries and people get the nutrition they need. New approaches such as community-driven development can be successful in managing common resources and local projects (WORLD BANK, 2018). But the lesson from the past is that they fail in the absence of egalitarian preferences and social capital among community members. Balancing centralization and decentralization of program implementation—a difficult undertaking—is hence the key for successful rural development (DETHIER - EFFENBERGER, 2011).

From the point of view of the ecological and economic strategies, productivity is assumed to be lower in agriculture than in the modern sector. The canonical model was put forward by Cypher and Dietz (2008), or Barrett, Carter, and Timmer (2010). With lower productivity in agriculture, wages will be higher in the modern sector, which induces labour to move out of agriculture and into the modern sector, which in turn generates economic growth. This early view on the role of agriculture in economics also matched the empirical observation made by KUZNETS (1966) that the importance of the agricultural sector declines with economic development (JACK, 2009).

Some experts worked and analysed this model too. Improving on the Lewis model, Thirlwall (2015) accounts explicitly for agriculture as an active sector in the economy. In addition to labour and food supply, agriculture plays an active role in economic growth through important production and consumption linkages. These issues are strongly connecting with agricultural conditions and river basins of Kosovo (WORLD BANK, 2019b).

I emphasize the importance of the economic development concerning the economic conditions of Kosovo, because in this country the disguised unemployment appeared in the agricultural sector too, which could stimulate the outflow of workers-employees from this sector to the industrial sectors. These industrial sectors can provide more machines and chemicals like fertilisers and pesticides for the agricultural sector to be more industrialised in the possible near future. The future mechanization process in agricultural production can make this sector more mechanized, therefore, more efficient and productive. The mechanization process also requests more land-use concentration implemented by a smaller number of landowners and land users.

The EU overviewed the Output, input consumption, gross value added of the agricultural industry (EU 2017), which need to create the accountancy for the agricultural industry even in Kosovo, which is as follows:

Output composition

- In 2017, the agricultural industry of the EU-28 produced a total output value of 427 billion Euros (up from 400 billion Euros in 2016).
- Half of this output value came from crop production (led by vegetables and horticultural plants).
- Another 39.6% came from animals and animal products (with milk accounting for the greatest share of output value).
- Agricultural services and secondary activities contributed to 8.6% of the total output value. See also Eurostat's statistical book on Agriculture, forestry, and fishery statistics - 2017 edition for more details.

Gross Value Added (GVA)

- GVA is calculated as total output value minus intermediate consumption (variable inputs). It represents the part of the revenue that is left to pay for fixed production factors (land, labour, capital) and to serve as income for the farmer and non-salaried workers (usual members of the farmers' family).
- In real terms, GVA in agriculture suffered a drop in 2009 as a result of the sharp decline in agricultural prices following the financial crisis in 2007/2008. It has since then recovered to pre-crisis levels but has not shown any significant growth. However, estimates for 2017 look promising.
- GVA in current prices once again highlight the main agricultural producers in the EU (Italy, France, Spain, and Germany), in a slightly different order than for output value (EU, 2018; FADN, 2018). GVA can serve as an indicator of labour productivity when it is divided by the number of full-time annual work units (AWU).
- There are considerable differences across countries in absolute GVA per AWU (however, these figures have not been adjusted for purchasing power).
- Between 2010 and 2017, most EU countries have seen a growth in their GVA per AWU. For the EU as a whole, GVA/AWU increased by 2.8% per year (EU, 2018; EASTWOOD ET AL, 2010; FADN 2018; GONZALES ET AL, 2015).

Some experts summarized the above-mentioned conceptions as potentially lower food prices increase the purchasing power of poor consumers. The magnitude of these effects on poverty reduction depends on the specific circumstances of an economy. If, for example, technological progress in the agricultural sector is labour-saving, farm-employment might not necessarily increase (DETHIER-EFFENBERGER, 2011; HERRERO ET AL, 2010; HERRERO ET AL, 2012; SEE MORE IN IVANIC – WILL, 2008).

Trends in output value, input value, and gross value added (GVA)

- The value of agricultural output (in real terms) shows no clear trend over the last 12 years. The general picture is a slight increase in both output and input value, leading to stagnation in GVA.
- The impact of the financial crisis is visible in the dip in output value and GVA in 2009.
- Agricultural output value grew during the years 2010-2013 but declined again in the years 2014- 2016. Estimates for 2017 show a recovery of output value and GVA.
- Intermediate consumption value increased until 2013 (except for 2009) and then declined slightly.
- Overall output and input prices fluctuated over the last 12 years, with a clear dip in 2009 (the year following the financial crisis) followed by 4 years of increases and 3 years of decreases. 2016 figures were close to the levels of 2010. Estimates for 2017 show a recovery of output prices (EU, 2018; FADN 2018)

The CAP of the EU follows the difficulty and income conditions of farmers and AWU (annual working unit), which the last one summarized all of the employed workers and employees of the agricultural sector as full-time employee equivalent. The EU overviews their income positions from point of view of the Agricultural factor income, which is described below:

- In the EU-28, agricultural factor income (both total and per worker) recovered from the financial crisis of 2009 and reached a new peak in 2011. The following three years (2012-2014) saw relatively minor changes in real terms. Factor income was lower in 2015-2016, but estimates for 2017 look promising.
- Changes in factor income can be divided into volume effects (bad/good harvests, increased/reduced herd sizes, etc.) or value effects (higher or lower prices for inputs and/or outputs).

- In 2015, the income drop can be linked to the milk market crisis, with deteriorating milk prices leading to a decline in the overall value of milk output. Together with a decline in real pig prices, the overall real value of animal output decreased by 5.9%.
- In 2016, important changes at the level of the EU28 included a reduction in crop output value by 2.5% (mostly due to low cereal harvests) and a decline in animal output value by 2.1% (mainly linked to low milk prices).
- In 2017, the value of animal output increased, due to an overall price increase of 10%. In particular, prices for pigs (+12%), milk (+18%), and eggs (+14%) have increased considerably at the EU level compared to 2016. (EU, 2018; FADN 2018, p. 9)

The other expert, for example, Nathan (NATHAN ET AL, 2008), who suggested proposals that the relation between agricultural growth including water irrigation, and overall economic growth depends on the openness of a country to international trade. Whereas agricultural growth goes hand in hand with economic growth in small, closed economies—where gains in agricultural productivity based on water use efficiency will lead to the linkage effect described above—the relation might be reversed in the case of an open economy.

FOSTER AND ROSENZWEIG (2003; 2010a; 2010b) stress that the tradability of rural non-farm sector goods can have different implications. In a general equilibrium perspective, productivity gains in the agricultural sector harm the tradable non-farm sector. This is because agricultural products as well as rural non-farm non-tradable have a relatively inelastic demand for labour, whereas tradable goods have more elastic labour demand. If wages increase due to greater agricultural productivity, factories producing tradable goods, which are assumed to be operated by external producers, will move to escape the higher wages.

Given that developing countries differ concerning their economic environments, the role of agriculture and innovated water irrigation for development might be re-evaluated in each specific case. This is in line with the 2008 World Development Report‘s message (WORLD BANK 2008), which suggests that in agriculture-based economies, agriculture can be the main engine of growth, whereas, in transforming countries, agriculture is already less important as an economic activity but is still a major instrument to reduce rural poverty. In urban countries, by contrast, agriculture plays the same role as other tradable sectors and subsectors with a comparative advantage can help to generate economic growth concerning the irrigation for agriculture even in Kosovo.
Early contributions by Chan, and others focused on sector changes accompanying economic development. In 1966, Kuznets observed that as economies develop, the share of agriculture in

output and employment diminishes, which later empirical data have reconfirmed. Other important early contributions include (CHAN ET AL 2004), who combined cross-section and time-series data (CHATTERJEE, 2005).

A panel of 65 developing countries over 1960 – 1985 to show a positive correlation between growth in agricultural GDP and its lagged values and non-agricultural GDP growth (TIMMER, 2008). He suggests that this correlation can be explained by ―first-order effects of agricultural growth with innovating water irrigation system on lower food prices, labour migration and capital flows from agriculture, as well as ― second-order effects such as improved nutritional intake, which improves the productivity of workers. Gleick (GLEICK ET AL, 2013) concluded that agriculture does not seem to be a primary force behind the growth in national GDP per capita (GOLLIN, 2010).

At the country level, there are significant differences, with incomes in the old Member States generally higher than in the countries that joined the EU in or after 2004 (Portugal is an exception). The lowest factor income levels per full-time worker can be found in Romania, Slovenia, and Croatia (all below 6 000 EUR/AWU per year). At the other end of the scale, factor income per full-time worker in the Netherlands stands at EUR 59 657 or more than 3 times the EU average (EUR 17 846/AWU).

If differences in general price levels are taken into account, the picture changes significantly for individual countries. Many countries with high factor income per AWU have lower values in purchasing power standards (PPS), while those with low factor income per AWU have higher values in PPS (especially the Czech Republic, Slovakia, Hungary, and Bulgaria). The gap between highest and lowest values is reduced substantially – while a full-time farm worker in Romania generates about 8% of the nominal factor income that his/her counterpart in the Netherlands earns, this share increases to 17% once adjustments for price level differences have been made (EU, 2018; FADN 2018).

### 2.8. Agricultural income compared to wages in the rest of the economy

My opinion is that the factor income per AWU increased considerably in EU-28 between 2010 and 2016, to which the significant growth of productivity of input contributed mostly in cases of Bulgaria by 16% and Hungary by 15,7% and 12% in Czechia at the same time (Eurostat, 2018, Dataset aact_eaa01). Naturally, these growth trends of these mentioned countries could not change the lowest factor of incomes per AWU in the EU such as Bulgaria, Slovakia, Czechia, and Hungary. But it is important to emphasize their considerable economic growth in fields of productivity of input in these countries, therefore, these countries need more increasing subsidies on the consumption of fixed capitals and generally on the agricultural production.

The international literature overview the incomes and wages in the agricultural sector, which are as follows:

- Compared to average wages in the economy, the entrepreneurial income per family work unit came to around 46,5% in 2017 – the highest value over the last 12 years. During the economic crisis of 2009, this comparative value fell to 27,5%, reflecting the significant drop in overall agricultural income.
- The agricultural income aggregates do not represent the disposable income of farm households, because the latter, in addition to their purely agricultural incomes, may also have income from other sources (non-agricultural activities, remuneration, social benefits, income from property). See also Common Context Indicator 26: Agricultural entrepreneurial income.
- Comparing agricultural income to average wages in the economy nonetheless provides an estimate for the opportunity cost of agricultural family labour, i.e., the average income opportunities that a person would have outside of agriculture.
- The low share of agricultural income compared to average wage levels explains the need for agricultural income support on the one hand and (at least partly) the decline in farm numbers.
- Even the wages paid to agricultural employees are less than half of what employees receive on average in all sectors of the economy combined (EU, 2018; FADN, 2018).

*Agricultural income indices*

The evolution of agricultural income is measured using three indices in Eurostat's Economic Accounts for Agriculture, the main data source for agricultural income in the EU. These index values are useful to show changes concerning a base year (now: 2010). However, they do not provide information on the absolute level of income in a country.

- Indicator A represents the real net value added at factor cost of agriculture per total AWU, including both salaried and non-salaried workers in full-time equivalents.
- Indicator B stands for the real entrepreneurial income per unpaid (i.e., family) worker (in full-time equivalents).

- Indicator C shows the development of total entrepreneurial income (without dividing it by the number of workers).
- All three indices show the characteristic dip in 2009 and subsequent recovery. Indicator C continues to decline since 2013 – an indication that gains in the other two indices are due to the outflow of labour.
- For individual countries, these indicators show a dynamic that can be quite different from the absolute level of income. In particular, some of the countries with the lowest factor incomes per AWU in the EU (such as Bulgaria, Slovakia, and Hungary) exhibited a strong increase in 2017, while others with high levels of factor income per AWU (e.g., Belgium) observed their values decline compared to 2010. (EU, 2018; FADN, 2018).

*Farm income*

The two commonly used farm income indicators show the same characteristic dip in 2009 and subsequent recovery followed by stagnation as aggregate agricultural income figures. Farm income indicators mean that the Farm net value added (FNVA) per annual work unit (AWU) and Family Farm Income per family work unit (FWU). FFI is calculated only for those farms with family labour. Both farm income indicators are higher in the EU-15 than in the EU-13. Denmark, the Netherlands, and Luxemburg report the highest farm income per AWU. This may be due to the predominance of specialised granivore (pigs and poultry) production, as well as specialised horticulture and dairy farms in the three countries' agricultural sectors accompanying successful water use efficiency based on using the innovative technology of agricultural irrigation. At the other end of the spectrum, Poland, Croatia, Romania, and Slovenia have the lowest farm income per AWU, partly because their agriculture has remained largely oriented towards small-scale mixed farming. Disparities in overall price levels and purchasing power have not been taken into account in this and the following pages but can well contribute to different income levels across countries (EU, 2018; FADN, 2018). The agricultural development trend of Poland, Croatia, Romania, and Slovenia largely has to be oriented towards larger or large-scale mixed farming so that farmers of these countries can become competitive in the single market of the EU.

*Regional differences in farm income*

The ten regions with the highest average agricultural income per work unit are located in northern Italy (Lombardia, Emilia Romagna), Denmark, northern France (Champagne-Ardenne, Picardie, Ile de France, Haute - Normandie, Poitou - Charentes), northern Germany (Mecklenburg-Vorpommern, SachsenAnhalt, Schleswig-Holstein, Niedersachsen) in the Netherlands, Belgium (Vlanders) and southern Sweden (Slattbygdslan). Many of these regions have a high percentage of highly intensive granivore (pigs and poultry) and/or horticulture/wine production. Regions with very low farm income (below EUR10000 per year) are mostly situated in the eastern and south-eastern parts of the EU10. The lowest average income per work unit is in the Jadranska Hrvatska region in Croatia, followed by Slovenia, 6 regions in Romania, one region in Poland (Malopolska and Pogorze), and one region in Bulgaria (Yugozapaden). There is an almost 30 -fold difference between the highest income per AWU (Lombardia: 66 201 EUR) and the lowest (Jadranska Hrvatska: 2 249 EUR). (EU, 2018; FADN, 2018).

*Farm income by economic farm size*

The farm income per full-time work unit increases with the economic size of the farms. This implies that labour productivity is higher on (economically) bigger farms. This relationship holds in almost all Member States (except for the biggest farms in CZ, EE, HU, LT, PL, and FI). (EU, 2018; FADN, 2018).

In my opinion in this section, we notice that the experts focused on the importance of the agricultural sector based on the employment and income conditions by input productivity, labour productivity, calculation the gross value added of the agricultural industry with possible less input cost, and higher average AFI (Agricultural factor income) per AWU in EU-28, which can be increased by more water use efficiency in agricultural production. Also, they emphasized the dependence of the national economy include the agricultural sector on the openness of a country to international trade. The sustainability of the agricultural sector is based on the environmental conservation accompanying with less and mitigating damages burden on nature and as second one the competitiveness and income-able sector. Therefore, the price of output of agriculture can ensure enough possibility for the covering cost and the internationally accepted level of the price for agricultural output and products on the world market. The price system can help farmers to create enough level for demands of farmers and farming households, factor income for producers, to make products be accepted for selling even on the national, international, and local markets.

The difficulty of the agricultural sector in Kosovo, where the farmers cannot provide and create the horizontal or vertically integrated product channels. The first one, namely horizontal product channel is that the farmers create their strong production cooperation at the level of agricultural basic-product-material production, but this last one is absent in Kosovo. The other one, namely vertically integrated product channels, which means that the farmers created cooperation with different levels of the product channel from the agricultural basic-product-material production through the manufacturing industry for agricultural basic products to whole trades and retail trades level to the table of consumers as the end of the product channel.

The most successful solution is for the farmers if they keep control over all of the product channels based on their self-ownership. This last one is also absent in Kosovo. Therefore, the incomes coming from different levels of product channel mostly do not go to the incomes of farmers, but the other owners of the different levels of the product channel. The incomes of farmers are not enough to realise satisfactory investment to improve their agricultural basic production at the lowest level of the production channel. Therefore, even farmers can not have enough financial purchase power to buy and obtain ownership in fields of inputs at the other higher levels of the product channel.

Farmers of Kosovo should cooperate among themselves commonly purchase inputs for agricultural production and commonly sell their basic agricultural products. These common actions of farmers can provide more favourable market-conditions for them in cases of purchasing inputs and selling outputs.

### 2.9. Educational issues in agricultural sector

The educated level (Expected years of schooling, mean years of schooling), skill and production-practical experienced level of farmers mostly in the field of water use efficiency and increasing consumption of fixed capital, as advanced techniques in Kosovo. The difficulty of the agricultural production is the lack of knowledge of farmers in Kosovo, as World Bank Group and FAO declared. The human resource and labour forces of agriculture have an important role in the economic growth of Kosovo. Sustainable agriculture should avoid increasing gas emission, irrigation water pollution, for example, methane gas emission, which is also responsible for global warming. The factor income per AWU concerns purchases power parity (PPP), as the demand side of the market and the possible financial capacity for the next future possible investment for innovation of agricultural products including the water irrigation system of Kosovo even in fields of water management and agricultural irrigation. These last ones as an investment cannot be successfully improved at low levels of the factor income per AWU and decreasing rate of financial supports/subsidies given by Kosovo (EU HDI, 2019; FAO, 2018a; FAO, 2018b; FAO, 2018c; UNDP, 2018; UNDP, 2019;). Also, Kosovo has main difficulties in agriculture, namely low developed level of mechanization and low educated level of farmers (WORLD BANK GROUP, 2018, JUNE; EC, 2019).

In my opinion the farmers should extend more experience in fields of theoretical and practical knowledge to increase their skills to use the more improved techniques and technologies to be more closed to the international level of knowledge in fields of agricultural production. This increasing educated level of farmers can make farmers more closed to the level of international competitiveness. Therefore, I agree with the opinions of the authors mentioned below.

They declared that the economic growth paradigm was, thus, believed to have neglected important aspects of development, such as poverty, income inequalities, unemployment, and disparities in access to public goods and services like education, etc., and did not capture adequately the multi-dimensionality aspects of development. For economic growth to enhance human development, it should provide an opportunity to enhance workers' knowledge and skills along with opportunities for their efficient use, provide better job opportunities at all levels of decision-making (BERENGER AND VERDIER-CHOUCHANE, 2007; PURUSOTTAM NAYAK, 2013).

Also, the qualified, educated and skilled human resource in agricultural production and water irrigation system has an important role in the agricultural sector, the GDP growth, and the environmental conservation by three features of them in the agricultural sector. The improvement of the knowledge of the labour force of this agricultural sector strengthens the innovative development for increasing level of the competitiveness of the agricultural industry in Kosovo at the national and international markets. The standard of living can be strengthened by the increase of the AFI (agricultural factor income per AWU in Kosovo, which also contributes to the increasing measure of the domestic market and stimulates more price income for the farmers and their investments in the field of fixed capital (PURUSOTTAM NAYAK, 2013).

*Quality of education*

The quantity of schooling shows impressive progress. In 1990, the mean years of schooling for the global adult population was 5,8; by 2017 it had increased to 8,4. And today's school-age children can attend school for 3,4 more years compared to the ones in 1990. But many countries still need to ensure that the time in school is translated into improved capabilities. There are three times more primary school pupils per teacher in low human development countries than in very high human development countries (41 versus 14) and 11 more pupils per teacher in medium human development countries than in high human development countries. The training that teachers receive can also significantly affect the quality of education, even in the field of efficient agricultural production and irrigation. Most primary school teachers have had some form of training, and even the study for agricultural irrigation should be initiated from this level as earlier as. In low and medium human development countries an average of 76% of teachers are trained to teach, but there are wide variations. In four countries fewer than 30% of teachers are trained: Madagascar (15%), Kyrgyzstan (21%), Sao Tome and Principe (27%), and Vanuatu (28%). The availability of communications technologies has also implications for the quality of education. But modernizing schools require substantial investments, a challenge in most developing regions (HDRO, 2018; NATHAN ET AL, 2008).

The educated level of the human resources in the agricultural sector either in EU-28 or in EU-12 member-states should increase so that the farmers can be able to apply highly advanced production technologies accompanying with the increasing productivity of inputs.

The degradation of the environment and atmosphere and also agricultural lands, soils, coupled with significant declines in biodiversity, is linked to other development concerns ranging from declining food and water supplies for agricultural irrigation to losses of livelihood and losses of life from extreme weather events. This profoundly serious crisis threatens human development and farmers, agricultural full-time workers, part-time workers of current and future generations. Business-as-usual approaches must change, with countries at different levels of human development exposed to and contributing to environmental degradation in different ways in different economic sectors, even in the agricultural industry.

Very high human resources are the biggest contributors to climate change, with average carbon dioxide emissions per capita of 10,7 tonnes, compared with 0,3 tonne in low human development countries. These averages mask considerable variation: Qatar had the highest carbon dioxide emissions per capita in 2014, releasing more than 45 tonnes per person, while Uruguay, also a very high human resource released only 2 tonnes per person. The agricultural sector and even the animal husbandry result in gas emission, for example, the methane gas emission. Some conclusions were given, that this Update has shown a snapshot of conditions today as well as key trends in human development indices and indicators. Five key findings emerge from the analysis, which is as follows (HDRO, 2018; STANTON 2007):

- Most people today live longer, are more educated, and have more access to goods and services than ever before. Even in low human resource countries, people's educated development has improved significantly. But the quality of human resources reveals large deficits. Being in school longer does not automatically puts one into equivalent capabilities and skills. So, shifting the focus towards the quality of human resources will be important in monitoring future progress.

- Progress is not linear or guaranteed, and crises and challenges can reverse gains. Countries experiencing conflict show human resource losses, which can be felt for generations. Investment in human security to break cycles of vulnerability and conflict is essential to reduce vulnerabilities and sustain progress.
- Going beyond the average achievements and disaggregated assessments reveal large inequalities across human dimensions. Persistently high inequality is a fundamental challenge to sustaining future progress in the field of human resources.
- Progress in human resources cannot be sustained without addressing environmental degradation and climate change, in which the recent progress on human resources has exacerbated. For a human resource to become truly sustainable, the world needs to break with business-as-usual approaches and adopt sustainable production and consumption patterns.

Besides, data availability has been posing a major challenge to capturing important dimensions such as environmental sustainability, and the degree of people's self-respect. The UNDP encouraged critiques and research to help it fulfil its purpose. There have been many critiques after 1990- many of which have been incorporated into the UNDP. But the struggle is on for refinements in conceptual and methodological aspects of human resource and alternative labour force policy options to create a balance between economic growth and protection of the interest of human resources and agricultural workers with farmers. As a result, there have been a plethora of contributions in human resource literature, particularly on methodology over the years. The present paper is a humble attempt to compile and document all those important methodological changes and put in one place for a better understanding of the subject (PURUSOTTAM NAYAK 2013).

My opinion on the above-mentioned data is that the responsibility of mankind and human activities for the global warming and the role of governments to implement the economic actions to mitigate the gas emissions even in agricultural production. Therefore, education has an important role to lead governments and peoples including farmers in the direction to follow the sustainability of the natural background and environmental conservation for the survival of the society and the natural resources including water and soil (ANGELOSKA ET AL, 2018; SOKIL ET AL, 2018, VASA ET AL., 2018). This education should be included in the human development index too. Also, the education is important from basic BSc and MSc levels to increase actual levels demanded by the companies for the employed workers and employees to increase the human-labour and input productivity to remain at the market against the market competitive partners in Kosovo and its neighbouring countries. The quality of education and skill of them are important to keep the competitive level of the labour forces.

Also, I suggest that the agricultural policy and water use efficiency in Kosovo should be closer to the agricultural policy and agricultural production technology of the EU so that agricultural producers of Kosovo can become more competitive compared to the demands of the EU single market.

In the next chapters, the Material and methods and the researching analyses will come to an overview of the main results and finds of the research based on some scientific experiences coming from the international scientific literature.

# 3. MATERIAL AND METHODS

In my dissertation I would like to compare the dissimilarities and similarities among the selected economies in the field of the economic background of the productivity of agricultural production concerning water management. The general research methods consist of two main parts, namely the statistical analyses:

- The methodology focuses on the analyses of the efficiency of the agricultural industry based on the agricultural value-added, the total country area cultivated and renewable water resources accompanying with human development index in researched 15 selected countries including EU member states, Kosovo, and its neighbouring countries. The data were collected from different national data resources and international institutions.
- The analyses focus on the possible improving technological development and their influences on the production technology and production efficiency in countries researched in the study accompanying with comparing these data with the irrigation developing trend of Kosovo and its neighbouring countries.
- The analyse of the irrigation system and its developed level in Kosovo based on primary data coming questions for which farmers replied during the last 2019 year.

In the first case of analysing the efficiency of the agricultural industry based on the agricultural value-added, the statistical data at national levels in researched countries will be processed based on the SPSS (Statistical Program for Social Sciences) statistical analyses which include seven economic variances and selected 15 ones such as Albania, Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czechia, Finland, Greece, Hungary, Kosovo, Portugal, Romania, Serbia, Spain, and the UK coming from 11 EU-member states and other four countries.

Based on the factor analyses, principal component analyses, correlation matrix, rotated solution based on the varimax method, factor score based on the regression method within the SPSS statistical system seven economic variables are % of the total country area cultivated (%) by the short name TAreaCult1; Gross Domestic Product growth (GDP, in current US$) by the short name GDPGrowth2; Agriculture, value added (in % GDP) by the short name AgrVaAd3; Total internal renewable water resources per capita ($m^3$/inhab/year) by the short name InterWRCap5; Human development index (HDIndex4) is based on three features, namely educated and skilled level of farmers; purchase power parity (PPP) of farmers to buy input elements and covering the consumption of fixed capital on farms; working capacity of full-time and part-time workers on farms, life-length study of farmers and workers in the agricultural industry. The total renewable water resources per capita ($m^3$/inhab/year) by the short name TRenewWRCap6 and the last seventh economic variance is Dam capacity per capita ($m^3$/inhab) by the short name DamCapita7. I gave an ordering number for each economic variance at the end of the last letter-figure of each short name of the variances.

Also, there is a difference between the total renewable water resources and the total internal renewable water resources. This is a list of countries by total renewable water resources mostly based on (CIA 2015; CIA, 2019). This entry provides the long-term average water availability for a country in cubic kilometres from precipitation, groundwater recharge, and surface inflows from surrounding countries. Fresh and unpolluted water accounts for 0,003% of total water available globally (GLEICK ET AL, 2013).

This entry provides the long-term average water availability for a country in cubic kilometres of precipitation, recharged groundwater, and surface inflows from surrounding countries. The values have been adjusted to account for overlap resulting from surface flow recharge of groundwater sources. Total renewable water resources provide the water total available to a country but do not include water resource totals that have been reserved for upstream or downstream countries through international agreements. Note that these values are averages and do not accurately reflect the total available in any given year. Annual available resources can vary greatly due to short-term and long-term climatic and weather variations (THE WORLD FACTBOOK, 2015).

The definition is that the Total renewable internal freshwater resources flow refers to internal renewable resources (internal river flows and groundwater from rainfall) in the country. Renewable internal freshwater resources per capita are calculated using the World Bank's population estimates (FAO, 2018a; FAO 2018b).

Based on the references mentioned above the Total renewable freshwater resources includes renewable water resources, long-term average water availability for a country in cubic kilometres of precipitation, recharged groundwater, and surface inflows from surrounding countries. While the Total renewable internal freshwater resources include internal river flows and groundwater from rainfall. Naturally, this also includes lakes as surface water resources in any country, in spite that these are not flowing like rivers. Naturally, in my study, the Total renewable freshwater resources per capita in $m^3$ includes more amount of water than one of the Total renewable internal freshwater resources per capita in $m^3$, because the water coming from out of a country, this will add to the amount of water of the given country. Therefore, in most cases, the countries have considerably more amount of water as Total renewable freshwater resources per capita in $m^3$ then the amount of water as Total renewable internal freshwater resources per capita in $m^3$. Mostly only in cases of island-countries the amount of Total renewable freshwater resources per capita in $m^3$ can be the same amount of water as Total renewable internal freshwater resources per capita in $m^3$.

Based on the SPSS statistical analyses seven economic variances distribute into three main Components, as Component-1, which includes three variances namely InterWRCap5, TRenewWRCap6, DamCapita7, the Component-2 includes the (Minus) - GDPGrowth2, and AgrVaAd3, while the third one as Component-3: TAreaCult1.

Based on the SPSS statistical analyses seven economic variances distribute into three main Components, as Component-1, which includes three variances namely InterWRCap5, TRenewWRCap6, DamCapita7, the Component-2 includes the (Minus) - GDPGrowth2, and AgrVaAd3, while the third one as Component-3: TAreaCult1.

Also, some experts wrote about the SPSS statistical system that “the SPSS is a widely used program for statistical analysis in social science. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others. The original SPSS manual (NIE ET AL, 1970) has been described as one of "sociology's most influential books" for allowing ordinary researchers to do their statistical analysis. In addition to statistical analysis, data management (case selection, file reshaping, creating derived data) and data documentation (a metadata dictionary is stored in the datafile) are features of the base software” (see also more detailed in ARGYROUS, *2005;* LING-ROBER, 1975).

According to the analysing the profitability and production efficiency accompanying with income conditions based on the collected statistical data from individual farm households in Kosovo based on the questioners, I requested some questions for the farmers in Kosovo:

- Each kind of animal husbandry in value form all of the production.
- Irrigated lands, Arable land, Green grass area, and Forestry in hectare and their distributions in the agricultural industry on the farm.
- Subsidies on the agricultural industry in value and the fields of activities subsided.
- Factor income per annual working unit or each farm household in Kosovo.

The other main research questions form farmers in Kosovo for the survey were as following:

1. What are the irrigation types at the farm level?
2. What are the requirements of the crops for the water quantity?
3. The level of inputs used for irrigation, and what is the yield of agricultural production?
4. What are new irrigation technologies applied in your farm (crops), what is the level of investments for new irrigation technology, and what are the changes in yield before and after new irrigation technologies applied? How much was the price income of farmers per each water used in a cubic meter?

The research and analysis with a fast and powerful solution are based on the SPSS Statistical analyses Gain insights quickly from all your data sources with powerful predictive analytics, as IBM SPSS Modeler is a graphical data-science and predictive-analytics platform designed for users of all skill levels to deploy insights at-scale to improve their business. IBM SPSS Modeler supports the complete data-science cycle, from data understanding to deployment, with a wide range of algorithms and capabilities, such as text analytics, geospatial analysis, and optimization (see more detailed in IBM SPSS, 2019).

# 4. RESULTS AND DISCUSSION

During the research, the statistical data were collected mainly from the FAO international databases coming originally from the national statistical offices. The databases concern the selected 15 countries including eleven EU-member states and seven economic variances concerning the main characters of selected countries in the scientific research. The three economic variables of the Component-1 overview the supply and reserves of the renewable water resources per capita either in fields of total renewable or total internal renewable resources per capita and dam capacity per capita. This last one has the importance to supply renewable energy resources as environment-friendly technology for producing energy additionally to fossil energy production to avoid the more press on the natural environment by decreasing gas emission as responsible for global warming.

From this point of view, the scientific analysing research aims at overviewing the possibility to use more water energy by less using fossil energy resources, therefore the gas emission can be declining in order to keep the sustainability for the natural environment and human society. Additionally, to realise the main aims concerning environmental conservation the other importance of scientific research is to supply water resources for the agricultural industry and agricultural production by keeping and following the input productivity. The input productivity can ensure the adequate price income for the producers, as farmers, as farming households, and productive water resource use by less burden on the natural resources. Also, the productive agricultural industry can successfully contribute to economic growth, which can be measured by the GDP growth rate. All of these aims need for innovation and innovative development in the centre of which the human resource is standing; therefore, the Human Development Index is needed for analysing.

## 4.1. Correlations among the economic growth, agricultural production efficiency with using renewable water resources

Because of the agricultural industry and production are based on land use, therefore, the share of the total country area cultivated is important, by which the research should be extended. All of these aims of this research should be summarised in seven economic variances mentioned in the above chapters of my study and dissertation.

The Table 1 shows the trends of economic growth and the water use and supply in selected 15 countries of Europe in percent between 2008-2017 based on the FAO (2016) with AQUASTAT

Main Database. This table shows the economic variances belonging to each component and selected countries, which are distributed to five clusters within the SPSS statistical system.

Table 2 shows the correlations among the different seven economic variances and provides the measures of these correlations, which can be seen as an average measure of the correlations concerning the 15 selected countries. Essentially these measures are average ones among selected countries based on their economic variances as their economic characters. If the values of correlations among economic variances are over 0,800 by the other form in percent as 80% to 100%, the correlations are very strong. If the values of correlations among economic variances are over 0,600 by the other form in percent as 60% to 80%, the correlations are strong.
If the values of correlations among economic variances are between 0,500 and 0,600 by the other form in percent as 50% to 60%, the correlations are middle strong. But if the values of correlations among economic variances are under 0,500 by the other form in percent as 50% to 40%, the correlations are middle weak. Under the level of values of correlations is not important for the statistical calculations of the SPSS.

From point of view of these ranges in this table 2, the very strong correlation is by the value of 0,997 (99,7%) between Total renewable water resources per capita ($m^3$/inhab/year) by the short title as TRenewWRCap6 and Dam capacity per capita ($m^3$/inhab/year) by the short title as DamCapita7. Also, there is a very strong correlation by the value of 0,994 (99,4%) between Total internal renewable water resources per capita ($m^3$/inhab/year) by the short title as InterWRCap5 and Dam capacity per capita ($m^3$/inhab/year) by the short title as DamCapita7.

In the Table 2 at the same time, the very strong correlation is also by the value of 0,993 (99,3%) between Total internal renewable water resources per capita ($m^3$/inhab/year) by the short title as InterWRCap5 and Total renewable water resources per capita ($m^3$/inhab/year) by the short title as TRenewWRCap6. This strong correlation is very logical because the total internal renewable water resource (per capita) is coming from the total renewable water resource (per capita), because this last one as the amount of water has additional water amount coming abroad, from those water resources, which originally flows from neighbouring countries. These geographical closing positions should stimulate neighbouring countries to make agreements to use commonly renewable water resources within the international cooperation over borders.

**Table 1: The economic growth and the water use and supply in selected 15 countries in percent between 2008-2017**

| **Countries** | **HDI ndex 4** | **Inter WR Cap 5** | **TRene wWR Cap6** | **DamC apita7** | **TAreaCu lt1** | **GDPGro wth2** | **AgrVaAd 3** |
|---|---|---|---|---|---|---|---|
| **Line** | | **X** | | | **Y** | | **Y** |
| **Variances** | **4** | **5** | **6** | **7** | **1** | **2** | **3** |
| ***Albania-1*** | ***0,5*** | ***-0,3*** | ***-0,3*** | ***-0,4*** | ***0,8*** | ***-6,5*** | ***1,6*** |
| **Kosovo** | 0,6 | -0,5 | -0,5 | -0,5 | 1,4 | 3 | 6 |
| **UK** | 0,6 | -3 | -3 | -3 | 3 | 8,4 | -0,3 |
| ***Austria-2*** | *0,1* | *-2,5* | *-2,5* | *-2,5* | *-0,7* | *-8,1* | *-13* |
| **Finland** | 0,1 | -2 | -2 | -2 | -0,2 | -10 | -0,3 |
| ***Bosnia-He-3*** | ***0,8*** | ***3,1*** | ***3,9*** | ***4*** | ***2*** | ***-5,9*** | ***-5,4*** |
| **Bulgaria** | 0,5 | 3,2 | 3,2 | 3,2 | 4,8 | -8,6 | -3,4 |
| **Croatia** | 1,2 | 2,6 | 2,6 | 2,7 | -4,2 | -13,8 | -4 |
| **Romania** | 0,6 | 2,5 | 2,9 | 2,6 | -3 | 3,5 | -10,6 |
| **Serbia** | 1,2 | 2,2 | 2 | 2 | 1,4 | -10 | 5,3 |
| ***Czechia-4*** | ***0,3*** | ***0,3*** | ***0,3*** | ***0,3*** | ***-22*** | ***-11,7*** | ***-9,2*** |
| ***Greece-5*** | *0,1* | *2* | *2* | *2* | *-11* | *-20* | *10* |
| **Hungary** | 0,6 | 1,5 | 2 | 1,5 | -2 | -4,7 | -3 |
| **Portugal** | 0,4 | 2,5 | 2,5 | 2,5 | -6,4 | -8 | 8 |
| **Spain** | 0,3 | 1,1 | 1 | 1 | -3 | -10 | 1 |
| *Average* | *0,53* | *0,85* | *0,94* | *0,89* | *-2,6* | *-6,8* | *-1,15* |
| **Line** | | **X** | | | **Y** | | **Y** |
| **Variances** | **4** | **5** | **6** | **7** | **1** | **2** | **3** |

*Source*: Own calculation based on the SPSS statistical analyses from secondary data, based on FAO, 2018a.

15 countries: Albania, Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Czechia, Finland, Greece, Hungary, Kosovo, Portugal, Romania, Serbia, Spain, UK (EU-member states 11 countries and other 4 countries)

*Note for Table.1*

| | |
|---|---|
| TAreaCult1 | % of total country area cultivated (%) |
| GDPGrowth2 | Gross Domestic Product (GDP) (current US$) |
| AgrVaAd3 | Agriculture, gross value added (% GDP) (%) |
| HDIndex4 | Human Development Index (HDI) [highest = 1] (-), educated and skilled level of farmers; purchase power parity (PPP) of farmers to buy input elements and covering the consumption of fixed capital on farms; working capacity of full-time and part time workers on farms, life-length study of farmers and workers in agricultural industry. |
| InterWRCap5 | Total internal renewable water resources per capita (m3/inhab/year) |
| TRenewWRCap6 | Total renewable water resources per capita (m3/inhab/year) |
| DamCapita7 | Dam capacity per capita (m3/inhab) |

Component-1: HDIndex4, InterWRCap5, TRenewWRCap6, DamCapita7;

Component-2: TAreaCult1, GDPGrowth2;
Component-3: AgrVaAd3; Cluster-1: Albania, Kosovo, UK;
Cluster-2: Austria, Finland;
Cluster-3: Bosnia-Herzegovina, Bulgaria, Croatia, Romania, Serbia;
Cluster-4: Czechia; Cluster-5: Greece, Hungary, Portugal, Spain

Given that the above-mentioned three economic elements have a considerable impact on the amount of water per capita, they can also have strong influences on an increasing amount of water per small farmer in Kosovo. The higher water supply can decrease the price of water paid by farmers, because the increase of supply is more than the increase of demand in any case this market condition can decrease the price level of water use. Therefore, the cost of water use can decrease for small farmers. Also, the cost of water use for small farmers can depend on the amount of water coming from the self-supply of farmers on self- owned farms. The share of the amount of water coming out of farms partly from private companies supplying water for farmers, which is more expenditure or costly than the water supplied by the central support system.

Therefore, as the above-mentioned conceptions, it is difficult to estimate or decide how much cost of water use and cost of improved water management and irrigation system are in Kosovo on the small farmers. If the cost of water use and a considerable lack of water is so high level, these conditions press the farmers and governmental offices to improve water management and irrigation system. But if the cost of the water used for a longer time is less than the improvement cost of water management and irrigation system, farmers are not interested in improving the water irrigation. The main issue is how much the central government budget can or wants to finance the cost of improving water management and irrigation system by increasing investment in this branch or sector. Since global warming continuously results in more and more lack of water, the government should improve the water supply, which is needed for improving the general water supply and water irrigation development process over the scheme of the small farming system. This improvement system cannot be financed by small farmers, because these are very costly.

Small farmers can pay only the cost of water use as probably their contribution is to improve the water management and irrigation system. Finally, the answer to the question, namely as estimated cost of improving water management and water use is that small farmers cannot pay the cost for covering the improvement of water management and irrigation system, but simply the cost of water use. Naturally, this cost of water use paid by small farmers can be used by private companies or government either for improving the water management and irrigation system or keeping the former traditional technology of water supply. Also, farmers cannot improve water management and irrigation system even on their farms without central governmental support. The consequences of improved water management and irrigation system in Kosovo on the small farmers can be declared that if these improvements are achieved, the more water supply by the improved technology provides the possibility the more yields and the more price incomes and survival of farmer family in rural areas.

The development of the agricultural industry didn’t stimulate the GDPGrowth2 rate in the selected countries for this period, 2008-2017 (see also data of Table 1; FAO AQUASTAT, 2018b). In other cases, the GDPGrowth2 rate sharply increases, which was resulted in the development of the other economic sectors, while the agricultural industry decreased because the other sector didn’t have positive influences on the development of the agricultural industry. So, the agricultural industry decreased at the same time. The average GDPGrowth2 in selected 15 countries has decreased by 6,8%, while the Agricultural value-added (AgrVaAd3) little increased by 1,15% from 2008 to 2017 (FAO, 2018b, AQUASTAT).

The contradiction correlation can be seen between GDPGrowth2 with a considerable increase, while InterWRCap5, TRenewWRCap6, and DamCapita7 have averagely little increased by 0,85% and 0,94% in the 15 selected countries for 2008 and 2017. This contradiction correlation is proofed by statistical basic data of Table 1 (FAO AQUASTAT, 2018b).

The other correlation was middle weak, because this was 0,466 (46,6%) between TAreaCult1 (% of the total country area cultivated) and GDPGrowth2. When the economic variances have positive values in their correlations, this means that the development or increase of one variance stimulates the development of the other variance. In this case, the increase of TAreaCult1 makes influences on the increase of GDPGrowth2. There are naturally middle weak correlations when the increase of TAreaCult1 can make influences on the increase of GDPGrowth2. The increase of TAreaCult1 means that yield increases, and the farmers of the countries have more salaries based on the increasing price income and they have more willingness to more agricultural and food production, therefore the agricultural industry should increase its further yields even by extending methods to increase more cultivated areas in percent of the country area (TAreaCult1), which also contribute to increasing of GDPGrowth2 in selected countries.

Also, the HDIndex4 has a middle weak correlation with InterWRCap5 and TRenewWRCap6 and DamCapita7 (Total internal renewable water resources per capita, Total renewable water resources per capita, and Dam capacity per capita) between 0,441 and 0,448, because if the renewable water resource per capita is increasing, the dam capacity can also increase, in spite that the investment should be realised for creating dams producing renewable water-energy resource. If any country does not have enough water resources to produce water energy or because of a lack of water resources, this kind of energy production will miss. The increasing water supply can stimulate agricultural yields and price income of farmers, therefore their standard of life included in the HDIndex4 also increases accompanying possible increasing food consumption and standard of life of all populations in selected countries.

**Table 2: Correlation Matrix**

| | | TAreaCult1 | GDPGrowth2 | AgrVaAd3 | HDIndex4 | InterWRCap5 | TRenewWRCap6 | DamCapita7 |
|---|---|---|---|---|---|---|---|---|
| Correlation | TAreaCult1 | 1,000 | **,466** | ,072 | ,310 | -,100 | -,080 | -,082 |
| | GDPGrowth2 | ,466 | 1,000 | -,192 | ,164 | -,356 | -,308 | -,332 |
| | AgrVaAd3 | ,072 | -,192 | 1,000 | ,034 | ,133 | ,080 | ,094 |
| | HDIndex4 | ,310 | ,164 | ,034 | 1,000 | ,446 | ,441 | ,448 |
| | InterWRCap5 | -,100 | -,356 | ,133 | ,446 | 1,000 | **,993** | **,994** |
| | TRenewWRCap6 | -,080 | -,308 | ,080 | ,441 | ,993 | 1,000 | **,997** |
| | DamCapita7 | -,082 | -,332 | ,094 | ,448 | ,994 | ,997 | 1,000 |
| Sig. (1-tailed) | TAreaCult1 | | **,040** | ,399 | ,130 | ,362 | ,388 | ,386 |
| | GDPGrowth2 | ,040 | | ,247 | ,279 | ,097 | ,132 | ,114 |
| | AgrVaAd3 | ,399 | ,247 | | ,452 | ,319 | ,388 | ,369 |
| | HDIndex4 | ,130 | ,279 | ,452 | | **,048** | **,050** | **,047** |
| | InterWRCap5 | ,362 | ,097 | ,319 | ,048 | | **,000** | **,000** |
| | TRenewWRCap6 | ,388 | ,132 | ,388 | ,050 | ,000 | | **,000** |
| | DamCapita7 | ,386 | ,114 | ,369 | ,047 | ,000 | ,000 | |

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

In the Table 2 the significance as a statistical indicator can also provide proof for measures of the connections among different economic variances. In case of significance, the value for connection among economic variances should be very closed to “0” (zero) or it should be within 0,100 value or “0,100%”. From the point of view of significance, the connection is the same measured, as it was in cases of the correlations. This matrix can surely show the strong significance among variances as same as correlations.

Table 3 shows the Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be over the level of the value as 0,500 or 50%, while in this table the significance should also be zero levels at the last line. Bartlett's Test of Sphericity and Approx. Chi-Square should be 100,000 so that the SPSS statistical can be adequate for the real analyses.

**Table 3: KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | ,667 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 122,295 |
| | df | 15 |
| | Sig. | ,000 |

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

**Table 4: Anti-image Matrices**

| | | TAreaCult1 | GDPGrowth2 | AgrVaAd3 | HDIndex4 | InterWRCap5 | TRenewWRCap6 | DamCapita7 |
|---|---|---|---|---|---|---|---|---|
| Anti-image Covariance | TAreaCult1 | ,682 | -,187 | -,145 | -,161 | ,010 | ,001 | -,006 |
| | GDPGrowth2 | -,187 | ,469 | -,005 | -,179 | ,020 | -,019 | ,014 |
| | AgrVaAd3 | -,145 | -,005 | ,738 | ,080 | -,032 | ,015 | -,001 |
| | HDIndex4 | -,161 | -,179 | ,080 | ,577 | -,017 | ,012 | -,009 |
| | InterWRCap5 | ,010 | ,020 | -,032 | -,017 | ,007 | -,002 | -,001 |
| | TRenewWRCap6 | ,001 | -,019 | ,015 | ,012 | -,002 | ,003 | -,003 |
| | DamCapita7 | -,006 | ,014 | -,001 | -,009 | -,001 | -,003 | ,004 |
| Anti-image Correlation | TAreaCult1 | ,580[a] | -,330 | -,205 | -,257 | ,137 | ,015 | -,108 |
| | GDPGrowth2 | -,330 | ,476[a] | -,009 | -,344 | ,344 | -,478 | ,318 |
| | AgrVaAd3 | -,205 | -,009 | ,181[a] | ,123 | -,441 | ,304 | -,028 |
| | HDIndex4 | -,257 | -,344 | ,123 | ,652[a] | -,254 | ,291 | -,185 |
| | InterWRCap5 | ,137 | ,344 | -,441 | -,254 | ***,781[a]*** | -,477 | -,174 |
| | TRenewWRCap6 | ,015 | -,478 | ,304 | ,291 | -,477 | ,648[a] | -,780 |
| | DamCapita7 | -,108 | ,318 | -,028 | -,185 | -,174 | -,780 | ,746[a] |

a. Measures of Sampling Adequacy (MSA)

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

From Table 4, as Anti-image Matrices the down part of this table, namely Anti-image Correlation can be important for the SPSS statistical analyses because the anti-image correlations can show the measure of the importance of each economic variance. In the diagonal line of the down part in this table, the values are signed by “a” as Measures of Sampling Adequacy (MSA)”. This means that if the value of each economic variance is higher than the level of 0,500 (or 50%), in this case, the explanation for the economic variance is strong and logical. All of the other economic variances are strong of their explain, therefore the analyses can be realised by these economic variances. The variance, namely InterWRCap5 is strongest explained by a value of 0,781, as 78,1%, the other variances are less, but they also are strongly explained.

The Table 5 as its title, namely Communalities, which shows the measures of the changes for the economic variances. The initial value of economic variances was 1,000 in any case of variance, while the values of variances at the end of research should be closed to 1,000 (100%) so that the “Extraction” would be adequate for the results of the research. Given that all economic variances have their values over the level of 0,500 (50%), the measure of the importance of the variances is also wholly adequate for the research.

**Table 5: Communalities**

| | Initial | Extraction |
|---|---|---|
| TAreaCult1 | 1,000 | ,756 |
| GDPGrowth2 | 1,000 | ,742 |
| AgrVaAd3 | 1,000 | ,961 |
| HDIndex4 | 1,000 | ,672 |
| InterWRCap5 | 1,000 | ,981 |
| TRenewWRCap6 | 1,000 | ,973 |
| DamCapita7 | 1,000 | ,978 |

Extraction Method: Principal Component Analysis.

*Source*: Own calculation based on the SPSS statistical system from secondary data.

The Table 6, as its title Total Variance Explained also shows the measure of explanation of the economic variances for the interest of successful results of the research, wherein the Initial Eigenvalues the percent (%) of Variance was 86,606 as 86,6%, which was provided by the first three components. This means that the first three components including seven economic variances are very important for the statistical analyses for the objectives of my dissertation. Approximately, the demanded level or measures of the components should be more than 60,00% or 60,000 value.

**Table 6: Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 3,386 | 48,375 | 48,375 | 3,386 | 48,375 | 48,375 | 3,330 | 47,568 | 47,568 |
| 2 | 1,644 | 23,489 | 71,864 | 1,644 | 23,489 | 71,864 | 1,663 | 23,750 | 71,319 |
| 3 | 1,032 | 14,741 | **86,606** | 1,032 | 14,741 | 86,606 | 1,070 | 15,287 | 86,606 |

Extraction Method: Principal Component Analysis.

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

The Table 7, like its title, Rotated Component Matrixa shows the first three components including seven economic variances, where one variance can be selected to each component at the line of each economic variance, which economic variance has the highest value. One variance can be selected only to one component in its line. The TAreaCult1 (% of the total country area cultivated) has the highest value in the component-2 by 0,853, while the GDPGrowth2 (Gross Domestic Product growth GDP) has the highest value at the second component by 0,762. The AgrVaAd3 (Agriculture, value-added in % of GDP) variance has the highest value by 0,979 in the component-3.

The HDIndex4 (Human Development Index) has the highest value by 0,587 according to the component-1. Also, the InterWRCap5 (Total internal renewable water resources per capita) by 0,981, the TRenewWRCap6 (Total renewable water resources per capita) by 0,982 and the DamCapita7 (Dam capacity per capita) by 0,984 are also according to the component-1. All of the economic variances should be selected to one component by its highest value belonging to one of three components (Table 7; SPSS system).

**Table 7: Rotated Component Matrix[a]**

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| DamCapita7 | **,984** | -,091 | ,045 |
| TRenewWRCap6 | **,982** | -,082 | ,027 |
| InterWRCap5 | **,981** | -,110 | ,083 |
| HDIndex4 | **,587** | ,572 | -,004 |
| TAreaCult1 | -,036 | **,853** | ,166 |
| GDPGrowth2 | -,293 | **,762** | -,273 |
| AgrVaAd3 | ,047 | -,002 | **,979** |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

Component-1: HDIndex4, InterWRCap5, TRenewWRCap6, DamCapita7
Component-2: TAreaCult1, GDPGrowth2
Component-3: AgrVaAd3

Also, these three components are distributed in the coordinate system. The component-1 is at the principle line "X" in the coordinate system, as score, based on the statistical analyses, and the component-2 and component-3 are at principle line "Y" of the score.

The Table 8 under the title Descriptive Statistics provides a summary system, which is the minimum, as lowest and maximum, as the highest values of each economic variance from 15 countries.

**Table 8: Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| TAreaCult1 | 15 | -22,00 | 4,80 | -2,6067 | 6,68051 |
| GDPGrowth2 | 15 | -20,00 | 8,40 | -6,8267 | 7,18535 |
| AgrVaAd3 | 15 | -13,00 | 10,00 | -1,1533 | 6,78021 |
| HDIndex4 | 15 | ,10 | 1,20 | ,5267 | ,34531 |
| InterWRCap5 | 15 | -3,00 | 3,20 | ,8467 | 2,07601 |
| TRenewWRCap6 | 15 | -3,00 | 3,90 | ,9400 | 2,17610 |
| DamCapita7 | 15 | -3,00 | 4,00 | ,8933 | 2,16415 |
| Valid N (listwise) | 15 | | | | |

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

For example, the minimum value is -22,00 according to the TAreaCult1, which Czechia (Czech Republic) has this value, while the maximum value is 10,00 according to this economic variance, which Greece has this value. The minimum and maximum values can be read from the Table 1 (FAO AQUASTAT, 2018b). The "Mean" means the average value of each economic variance based on the statistical characters of the 15 countries in this research. The Std. Deviation (Standard) is the approximate average difference among values of 15 countries per each economic variance.

### 4.2. The correlations of economic variances in selected countries, among GDP growth, agricultural value-added growth with using renewable water resources

In this chapter, the 15 selected countries are distributed into four country groups within the coordinate system based on their economic characters. Four economic variances of component-1 are at the principle line "X", namely Component-1: HDIndex4, InterWRCap5, TRenewWRCap6, and DamCapita7. At the principal lines "Y" the Component-2 included two economic variances, namely TAreaCult1 and GDPGrowth2. The Component-3 includes AgrVaAd3.

In most cases, those countries are distributed together to one session or quarter of the score or coordinate system, of which economic characters are closed to each other. Their economic characters should be similar or not to be different. In the coordinate system, the principal line "X" from "Origo" as zero-point turn to the right side is positively valued and turns to the left side from "Origo" is negative valued. In the case of the principal line "Y" from "Origo" turn to the upside is positive valued and turn to the downside from "Origo" is negative valued.

In the first session of the score in Figure 1, the countries are Greece, Portugal. In this session in these countries, four economic variances of the component-1 at the line "X", namely HDIndex4 (Human development index), InterWRCap5 (Total internal renewable water resources per capita), TRenewWRCap6 (Total renewable water resources per capita) and DamCapita7 (Dam capacity per capita) increases or less decreased, therefore their developing trend is positive. This means that the total internal renewable water resources per capita, the total renewable water resources per capita, which this last one should be more quantity of water included water flowing from areas out of the national borders to the national areas, and dam capacity per capita have increased for the period of 2008 and 2017.

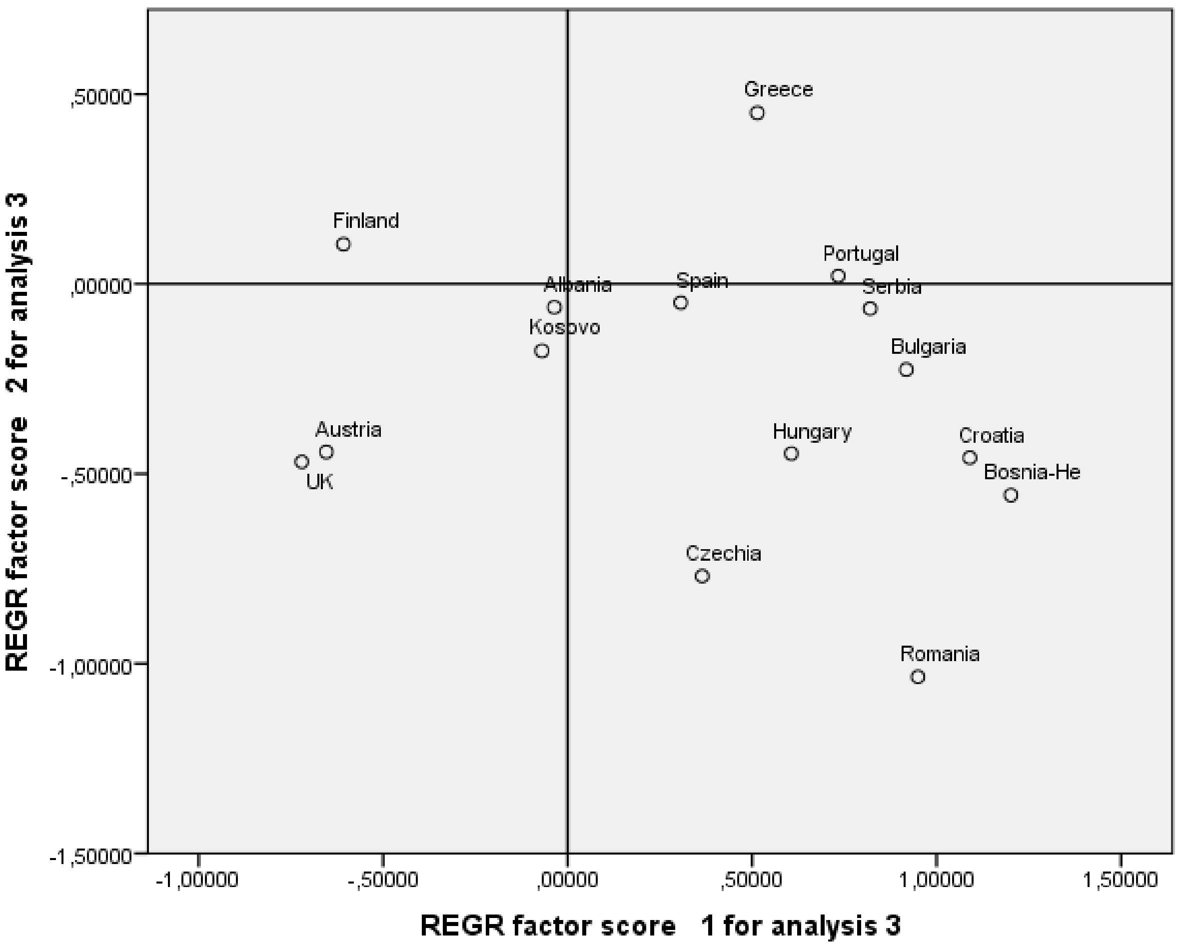


**Figure 1: Factor analyses for economic variables of Component-1 and Component-2 in the coordinate system**

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

At the principle line "X" = Component-1: HDIndex4, InterWRCap5, TRenewWRCap6, DamCapita7

At the principle line "Y" = Component-2: TAreaCult1, GDPGrowth2

Cluster-1: Albania, Kosovo, UK

Cluster-2: Austria, Finland

Cluster-3: Bosnia-Herzegovina, Bulgaria, Croatia, Romania, Serbia

Cluster-4: Czechia

Cluster-5: Greece, Hungary, Portugal, Spain

Two countries, namely Greece and Portugal have a similar increase in fields of three kinds of water resources, total internal renewable, total renewable one, and dam capacity per capita. In Greece, the increase was 2% in three cases, but in Portugal, this was a little more 2,5%, because the Atlantic

Ocean has humidity and rainfall influences on the water yield of rivers in Portugal. Two countries are similar to the water supply of Croatia and Serbia, as it can be seen in Table 1 and Figure 1 (FAO AQUASTAT, 2018b).

The increasing trends of agricultural value-added of Greece and Portugal were not bad, these were considerably better than the general average level of the 15 researched countries in the field of AgrVaAd3. But in spite that the agricultural value-added increased the GDP decreased by 20% in Greece, which was the worst within 15 countries. In Portugal, the GDP growth rate was less decreased by 8%, but this was closed to the decreasing average level of the 15 countries, namely by 6,8%. The agriculture, value-added could increase, which can be explained by the better water supply, but the GDP decrease was mostly resulted by the high level of unemployment rate in Portugal and Greece.

In the second session of the score in Figure 1, the country is Finland. In this session generally the economic variances of the principal line “X”, namely the Human development index, Total internal renewable water resources per capita., Total renewable water resources per capita and Dam capacity per capita have decreased or little increased for the researched period, as 2008-2017. In this session of the score, the general trends are that renewable water resources per capita decreased continuously.

Finland - this decrease was 2% in the field of three economic variances of the water resources. In Finland, renewable water resources decreased by 2%, as less than in the field of water capacity per capita, because of less increasing population trends and the humidity weather than in other both countries. In Finland, the GDP decrease was estimated by 10%, but the agricultural value-added did not decrease, only 0,3% did, because the strong manufacturing and light industry stimulated the increase of agricultural production and resulted in no more decrease of the industry than 10% decrease. This GDP fall was more than the average level of the GDP fall of the 15 countries, which was 6,8%.

In the third session of the score in Figure 1, the countries are Spain, Serbia, Bulgaria, Croatia, Bosnia-Herzegovina, Hungary, Czechia, Romania. In this session, the main three economic variances concerning the renewable water resources per capita increased or little decreased at the principal line “X”, while the other two economic variances as GDPGrowth2 and AgVaAd3 decreased or only little increased. Somehow Bosnia-Herzegovina had little moderately favourable economic conditions within this country-group of this session, by increasing three kinds of renewable water resources from 3,1% to 4%. This increase was better than the one of the other countries of this group. Bosnia-Herzegovina too was the first country in the 15 country-group, where the dam capacity per capita increased by 4%, as the biggest increase in this field compared to the others. The mountain areas could also make favourable possibilities for this increase. In addition, this country could increase its renewable water resources by 3,1%, over which only Bulgaria could implement better results by 3,2% compared to the result of Bosnia-Herzegovina. The water flow coming from the neighbouring countries increased by 3,9%, which was the top result within all of countries of this research. In spite that the favourable renewable water resources have been in this country, agriculture, value-added decreased considerably by 5,4%.

This shows that the increasing trend of the water supply is not enough for increasing agricultural results, because the favourable water resource cannot cover the other missing investment to develop mechanization and using developed technological improvement. The consumption of fixed capital is obligatory and needed for the future developing advanced production technology. Without this development, the international market competition possibility cannot be reached. Also, because the agricultural industry and production considerably contributed to the increasing GDPGrowth2 (economic variance) therefore the decline of the agriculture, value-added (AgrVaAd3) consequently led to a decrease in the GDPGrowth2, as it can be seen in Table 1 and Figure 1 (FAO AQUASTAT, 2018b).

After Bosnia-Herzegovina, Bulgaria also had considerable renewable water resources per capita development trends by 3,2% in three fields of water management within the researched 15 countries. This developing trend shows, how many measures can be important and significant for increasing renewable water resources. The InterWRCap5 (Total internal renewable water resources per capita) increase provides proof, that the country more efficiently wanted to use more water resources from the domestic-national water bases to increase the productivity of the agricultural industry. In the international comparison, these results of Bulgaria were favourable.

Also, the TRenewWRCap6 (Total renewable water resources per capita, m3/inhab/year) has favourably increased for the latest period. These favourable results could only be implemented by the wider international over bordering agreements for common using water resources. Positive examples of Bulgaria have well-shown measures of favourable international cooperation making successful influences on the water using. But the successful using renewable water resources is not enough for the developing agricultural industry, which is needed for advanced technology, mechanization, well-equipped water supply, and irrigation and water and entrepreneurship management. This last one means the importance of management in fields of either technical-technological or human one based on innovation. Because of the difficulty of Bulgaria that agriculture, value-added (AgrVaAd3) decreased by 3,4% and this agricultural industry had the main importance for decreasing the GDPGrowth2 by 8,6%, which little less than the average level of the 15 countries, namely by 6,8%.

Croatia had a little backwardness from the level of Bulgaria and Bosnia-Herzegovina because Croatia developed strongly its renewable water resources by increasing 2,6-2,7% comparably to the other countries of 15 one. But the difficulty was the same as it was in the cases of the countries mentioned above. Croatia had more serious difficulty in its economy by decreasing 13,8% in the field of GDPGrowth2. Mostly this was resulted in decreasing somehow the industry or the manufacturing and light industries in this country. Also, the tourism sector could not cover the luck of incomes that resulted from the backwardness of other industrial branches. Mostly it can be said that just because of the development of the tourism sector, it resulted in less decline of GDPGrowth2 than this was in this period.

Also, the agriculture, value-added (AgrVaAd3) decreased by 4% in spite that the water supply in fields of three kinds of renewable water resources increased adequately in the international comparison. The agricultural production and therefore the agricultural value-added have mostly decreased by the results of extending drought weather in this Balkan region for the latest one decade. The increase of water supply in the three fields could not cover and balance the negative influences of the unfavourable weather conditions on the decreasing trends in the amount of yield (see in Table 1, FAO, 2018a; 2018b).

In Romania, the agricultural production has similarly had the conditions of Croatia by decreasing trend namely 10,6% in the field of decrease of the agricultural value-added for the same period. The general economic conditions of Romania were more favourable than in Croatia because of consequently increasing GDPGrowth2. This increase has resulted in the positive prosperity trend of GDP growth rate by 3,5% based on the increasing trends of the more intensive FDI (Foreign direct investment) mostly coming from highly developed economies of EU-28 and the United States (US) for the latest period. Romania has also a positive favourable geographic condition to increase the total internal renewable water resources per capita by 2,5%, which was resulted in the more intensive extend the possible river basins. Also, the mountain areas make a relatively favourable possibility to extend the dam capacity per capita (DamCapita7). In spite that the water supply in Romania, as the water basin generally was satisfactory for developing the irrigation system for the agriculture, the agricultural production fully sharply declined, which emphasized missing financial capital and luck of consumption of fixed capital. The relative considerable backwardness of the agricultural industry in Romania cannot decrease from the level of highly developed EU member-states in the agricultural sector. Also, quite a large number of the farming households and the annual working units in the agricultural industry can ensure the considerable distribution of the agricultural inputs including the arable lands and industrial inputs, as machines, which don't let allow the development in direction to the measure economies and production-input productivity. The consequent unfavourable negative separation of farms and farming households leads to an increasing gap form the agricultural developed level needed by the international market demands and level of the international competitional possibility.

Czechia has similar economic conditions to Croatia in fields of decreasing GDPGrowth2 and agricultural value-added, which the last one decreased by 9,2%, as two times more than this was in Croatia. In spite that the drinking natural water reserves are the largest one in all of Europe, it seems that the dam capacity per capita reached the maximum top level for developing this capacity more, therefore the increase of this dam capacity was only by 0,3%. This means that the water reserves are considerable in the field of water supply for drinking and irrigating, but this adequate quietly water supply is not enough to ensure the increase of the agricultural production and agricultural value-added in Czechia.

Also, in Czechia, land distribution is the most favourable in all of the EU-28, because the amount of land is the largest per farming households. The decreasing trends of the agricultural valued-added were resulted by less mechanization level, and also the German agricultural and food manufacturing industry and manufacturing transnational companies considerably purchased the basic agricultural products from the Czech agricultural producers and farming households, which were not successful. Therefore, the German light industry sends back the original Czech agricultural basic materials in manufactured products to Czechia. The agricultural value-added produced in Germany instead of in Czechia, which was resulted in considerable financial damages for the Czech light industry and in sometimes for the Czech farms.

The solution should be achieved by increasing the local and national owned companies to develop the manufacturing industrial capacity. But the light industry stands in front of a large challenge as lack of capital, which could not balance just only by increasing credits, while the Czech light industry has a low level of price income, production capacity based on the less favourable measure-economies and input-productivity. Also, the interest of the credits financed by the bank sector is considerably at a high level.

In the case of Serbia, the total internal renewable water resource and the total renewable water resource and dam capacity per capita have adequately increased for the same period, as 2008 and 2017, but the GDP growth rate was also considerably decreasing by 10%, even by little less than in Croatia. While the agricultural value-added (AgrVaAd3) considerably increased by 5,3%, therefore the agricultural sector could increasable contribute to the less amount of the GDP.
In Hungary, the water supply was at an adequate level for the demands of the population and irrigation for the agricultural industry. Therefore, the total internal renewable water resource and the total renewable water resource and dam capacity per capita could increase to provide enough amount of water resources. But in spite that the water resources could be satisfactory, the agricultural value-added decreased considerably, little more than the averages level of decrease of selected 15 countries in the research. Additionally, to the decrease in the agricultural industry, the GDP growth rate has decreased by 4,7% from 2008 to 2017. The decrease in GDP growth rate sharply declined until the end of 2010, so the average decrease of GDP seems that it was decreased, in spite that the increase started in 2012. The GDP growth rate started its increase because of the ambition activity of the FDI (Foreign direct investment) in several economic sectors, for example, infrastructure, whole trade network, mechanization, car-factory, and light industry, as the food sector. The activity of the foreign large transnational corporations stimulated the mechanization of the agricultural industry and food-manufacturing industry in Hungary, which were accompanied by the modernization of the water channel and supply for irrigation and animal husbandry.

There is an important issue for the Hungarian water supply that the total internal renewable water resources per capita (InterWRCap5) have a very little share and portion comparably to the total renewable water resources, namely 5,8% from the total renewable water resources per capita ($m^3$/inhab/year) (TRenewWRCap6) as the second-lowest level per capita within 15 selected countries (FAO AQUASTAT, 2018a). But it should also be mentioned that the measure of the water in the field of the total internal renewable water resources per capita was 3,7 times more in Hungary than in Turkey, therefore the water supply per capita in Hungary was more favourable than in Turkey. Also, in Turkey, the population has increased by 8,2%, while in Hungary it decreased by 1,5%. This population number change stimulated to create an unfavourable condition in Turkey comparably to Hungarian one. In spite that Turkey is not a researched country in this study, but the FAO emphasized this example.

In several countries from the 15 one has a high level of share of total internal renewable water resources per capita (InterWRCap5) in the total renewable water resources (TRenewWRCap6), namely about 100% or very closed to 100%, which are as follows: Czechia, Spain, Finland, Bulgaria, and UK, between 95,3% - 99,6%. In cases of some other countries, for example, Portugal, Serbia, and Greece this share was more than 50% to 85%. The other countries like Romania and Croatia, this share was between 20% and 35% (FAO, 2018b. AQUASTAT). The share of the total internal renewable water resources per capita compared to the total one was completely different from each other, depending on the weather conditions and the measure of the water channel and water irrigation investments.

In Spain, because of the area of the country mostly are desert or sub-desert regions, so the water supply per capita could have increased at a very low level, namely about one percent since 2008. The total internal renewable water resources per capita increased by 1,1%, while the total renewable water resources per capita increased by 1%, mostly the same as the first one. The low-level increase of water resources led to the low-level increase in the field of the dam capacity per capita, which this last one essentially means that the water resources are reserved in a pond or lake form in the river bed behind the dam. This water amount can be accumulated from either total internal renewable water resources or total renewable water resources measured per capita.

In Spain, the drouth weather conditions created the situation for large areas to become desert one and made difficulty create water reserved opening to the sky because the opening water surface caused considerable water transpiration, which naturally can decrease the amount of the renewable water resources also in per capita. In this case, it would be better if in Spain and in different desert areas the water reserve should be covered and not open to the sky. Naturally this needs for more costly projects in order to keep more water in the reserves.

The drought-desert weather conditions naturally resulted in a less favourable yield of the agricultural industry, therefore the less agricultural value-added, and less contribution of this sector to the GDP, which also, can decrease, because of the weak production of the agricultural sector. The fewer water resources cannot ensure enough amount of its for-animal husbandry and irrigating croplands. The increase in agricultural value-added has been the same rate as 1% for 2008 and 2017, essentially for one decade. Naturally, the GDPGrowth2 has decreased by 10% for this period, which was resulted by less input productivity of the industry added to the agricultural industry, therefore the unemployment rate could increase and also, the unemployment rate could increase the furthermore decline of the GDP and generally the Spanish economy, also can be seen in Table 1.

The large distances and therefore the low-level density of the population, which also presses the transnational corporations not to increase their investments within the FDI scheme. This negative unfavourable economic condition also can accumulate the earlier economic difficulties, for example, the unemployment rate and emigration of the rural population to the urban areas, which also can increase the local unemployment, which even can be higher level than the national average level. The water reserves are very few ones, because of the unfavourable natural conditions, and therefore the agricultural value-added decreases and the GDP growth cannot increase based on the weak output of the economic sectors. Finally, the international competition of the Spanish producers and companies, even in the agricultural sector, can decrease, which led to a decrease in the price income and less accumulation of fixed capital and advanced technology. This means that the future output, results, and yields of the agricultural industry will continuously decrease. This negative circle is continuing by the time when the modernization can change these negative influences.

In the cases of these countries in this session, the decrease of the GDP growth rate and agricultural industry including the agricultural value-added, while the total internal water resources and total water resources accompanying dam capacity per capita little increased. But the geographic conditions don't make better conditions create a better background for agricultural production, which led to increasing the backwardness.

In the fourth session of the score in Figure 1, the countries are Albania, Kosovo, UK, and Austria. In this session, the InterWRCap5 (Total internal renewable water resources per capita, $m^3$/inhab/year), TRenewWRCap6 (Total renewable water resources per capita, $m^3$/inhab/year) and DamCapita7 (Dam capacity per capita, $m^3$/inhab/year) decreased or little increased, while also the AgrVaAd3 (Agriculture, value-added) decreased or little increased, but at the same time, the GDP growth can be increased or little decreased in these countries. This means that almost all of the economic variances decreased or sometimes these can little increase, while only one economic variance, namely the GDPGrowth2 can increase or little decrease. This shows the contradiction correlation of GDP growth with other economic variances, which can be followed in the coordinate system.

In this country-group in the case of Austria five economic variances of this coordinate system in Figure-1, all of these variances have decreased for the researched period from 2008 to 2017. The economic growth of Austria did not realise the increase. The renewable water resources, as total internal one and total one with dam capacity per capita decreased by 2,5%, which consequently led to a decrease in the agricultural value-added by 13%. Naturally, these decreasing trends of the agricultural industry were caused by a direct support system valid in the EU, of which some parts were given by the EU European Commission (EC 2017; EC 2018) so that farmers not to produce more or even decrease their agricultural production. This subsidy system was enforced in law so that the EU wanted to avoid agricultural production and also, to decrease agricultural export subsidies by production decrease. The food supply has become over the level of demands of the EU population and food consumers, therefore the subsidies for the increasing food production were not logical and economic. Essentially the reason for decreasing agricultural value-added was from this point of view. This decrease in agricultural value added was at the highest level in Austria within the 15 countries, which can be seen in Table 1.

The GDP growth has decreased by 8,1% in Austria, which was resulted by the general decline in economic conditions, namely market loose of the Austrian companies at the international and national levels. This one pressed the companies to decrease their production processes in other economic sectors additionally to the agricultural industry.

In the United Kingdom (UK), where the decrease of the InterWRCap5 (Total internal renewable water resources per) and TRenewWRCap6 (Total renewable water resources per capita) and DamCapita7 (Dam capacity per capita) have been the biggest large for the researched period. In spite that the population mostly increased in the researched 15 countries, which can lead to a decrease in the number of renewable water resources, but global warming also makes a considerable effect on the decreasing amount of water. In the case of the UK, the population has increased by 3% for the researched period, therefore decreasing the amount of water per capita could mostly be the result of global warming.

The expert declared that in the UK water-yield of rivers will decrease by about 40% by the end of 2050. This estimation was calculated based on experiences for water loss per capita during the last decades. In the UK the water-consuming population should economically use the water. Also, the increase of population in the UK was mostly resulted by immigration into the country or free flow of human resources among the EU-28 member states. These two kinds of inflows of human resources resulted that the foreign labour forces were established and stay for a permanent period and not a seasonal period (FAO AQUASTAT, 2018b).

The water loss can have also been experienced in the field of decreasing trends in agricultural value-added for the last decade, which was 0,3%, in spite that this has seemed as not so much.

Naturally, the subsidies structure of the EU-28 also made influences on the decreasing yield, agricultural value-added, and price incomes of the farming households. The decline of the agricultural profitability and a decrease in agricultural production did not make considerable influences on the GDP growth rate. The GDPGrowth2 has increased by 8,4%for the researched period until the end of 2017. But since the beginning of 2018, the GDP growth rate can be expected to decrease, because the FDI outflow has started to go out of UK and the largest foreign transnational corporations determined to discontinue their activities in this country because the British government started the withdrawal from the EU. These companies are afraid that the EU will increase the duties against products - even these are produced by these companies -, which makes their products very expensive in the EU, therefore the imported products from the UK in the EU will lose their competitiveness in its EU single market. This duty system makes imported products impossible for selling in the EU (EU, 2017).

So that these foreign companies avoid these high-level duties burdening on their products, they started their withdraw from the UK to establish their new centres and investments inside of the EU, mostly for example in France, Germany, and Belgium. This process started with the declaration of the British government at the beginning of 2017. After the beginning of the withdrawal of foreign companies from the UK, some economic crises started accompanying by an increasing unemployment rate. In this uncertain, doubtful, and unstable economic conditions only one thing is stable, namely the withdrawal of foreign transnational corporations from the UK.

In Albania, the economic conditions are little opposite the one in the UK. Successfully in Albania, three different kinds of renewable water resources have very slightly decreased by 0,3% and 0,4% for the researched period, therefore the agricultural value-added could increase somehow by 1,6%. But the economic growth falls by 6,5%, which at the international comparison could not be seemed as such unfavourable, because within 15 researched countries the average level of their GDP little changes had declined by 6,87%, more than one of Albania. But in Albania, this decline in the GDP growth was considerable, because the low level of the GDP growth rate can keep the unemployment rate at a high level. The GDP growth can be increasing by the development of the light industry including food and agricultural branches, increase of which these last ones could make an influence on the more increasing and technological development of the agricultural industry.

In Albania, there is an important difficulty for the agricultural industry, namely the backwardness in technological development and the international competitiveness of the country. These negative backgrounds of the agricultural industry and development can be balanced by improving the innovation including human knowledge and management at a firm level. Also, the economic policy should stimulate foreign large corporations to increase their investment within the FDI into the different industrial branches. These two sides, namely the economic policy at the national level and management at the firm level can make a dynamic and prosperous economic development in Albania.

Kosovo had somehow little more favourable conditions of the agricultural industry concerning the renewable water resources in fields of its three kinds, because in spite that the water resources little more decreased by 0,5% than in Albania but the agricultural value-added increased by 6% against the 1,6% in case of Albania. This difference could be resulted by more mechanized agricultural production in Kosovo and with more favourable arable land conditions with fewer mountain areas than in Albania. Also, in Kosovo, the GDP growth rate has increased by 3% for the researched period, which was more considerable than in Albania, where the GDP growth even decreased by 6,5%, because investments were realised in the agricultural sector more than in industry. Generally, the FDI of foreign transnational corporations had non-considerable activities in Albania, which could have been more active, if the government economic policy had been more opened for foreign investments. Probably the tax-policy of Albania in direction to the foreign transnational corporations was not enough flexible than this was needed or requested by the foreign companies.

In Kosovo, either the increasing GDP growth rate or the agricultural value-added were more considerable rather than the average levels of two economic variances of 15 selected countries in this study. Of course, the negative trends were mostly decided by the economic decline of Greece, Austria, and Finland in the field of GDP growth.

In four quarters of this coordinate system (Figure 1), the selected 15 countries show very different economic trends regarding the differences among countries from several continents and economic variances according to the water supply, as total renewable water resources and dam capacity per capita and also, the possible results of water resource use, as agricultural value-added in the researched period. Mostly in those countries, where the damages of the renewable water resources per capita were less the agricultural value-added could increase, or the damages were more the agricultural value-added could decrease or probably only a little increase could occur.

But the GDP growth rate and agricultural value-added all the time were opposite to each other. In any case, if the GDP growth increased, the agricultural value-added decreased, or if the GDP growth rate decreased, the agricultural value-added increased. This might have resulted by the different priorities of the national economic policies of the selected 15 countries for developing the agricultural sector or the other industrial sectors.

### 4.3. The correlations of economic variances in selected countries, among total area cultivated, educated level and income conditions of human resources with using renewable water resources

In this coordinate system in Figure 2 four economic variances of component-1 are the same as these are in Figure 1, at the principal lines “X”, namely Component-1: HDIndex4, InterWRCap5, TRenewWRCap6, and DamCapita7. The Component-3 including the other two economic variances, namely AgrVaAd3 (agricultural value-added). Also, as in Figure 1, in this Figure 2 in the coordinate system the principal line “X” from “Origo” as zero-point turns to the right side is positively valued and turns to the left side from “Origo” is negative valued. In the case of the principal line “Y” from “Origo” turn to the upside is positive valued and turn to the downside from “Origo” is negative valued. All of the economic variances are a straight line in their correlations and there are not opposite correlations among the economic variances.

In the first session of the score in Figure 2, there are Serbia, Croatia, Bosnia-Herzegovina, and Bulgaria. In cases of these countries, where the economic variances of the Component-1, namely the renewable water resources and dam capacity per capita have increased for the researched period the other economic variances namely TAreaCult1 (% of the total country area cultivated) increased in this country group. This is logical because if the renewable water resource and dam capacity per capita increase or less decrease the country area cultivated can increase, there is a normal correlation generally between the two sides. Without increasing water resources even per capita, the cultivated areas could not easily increase.

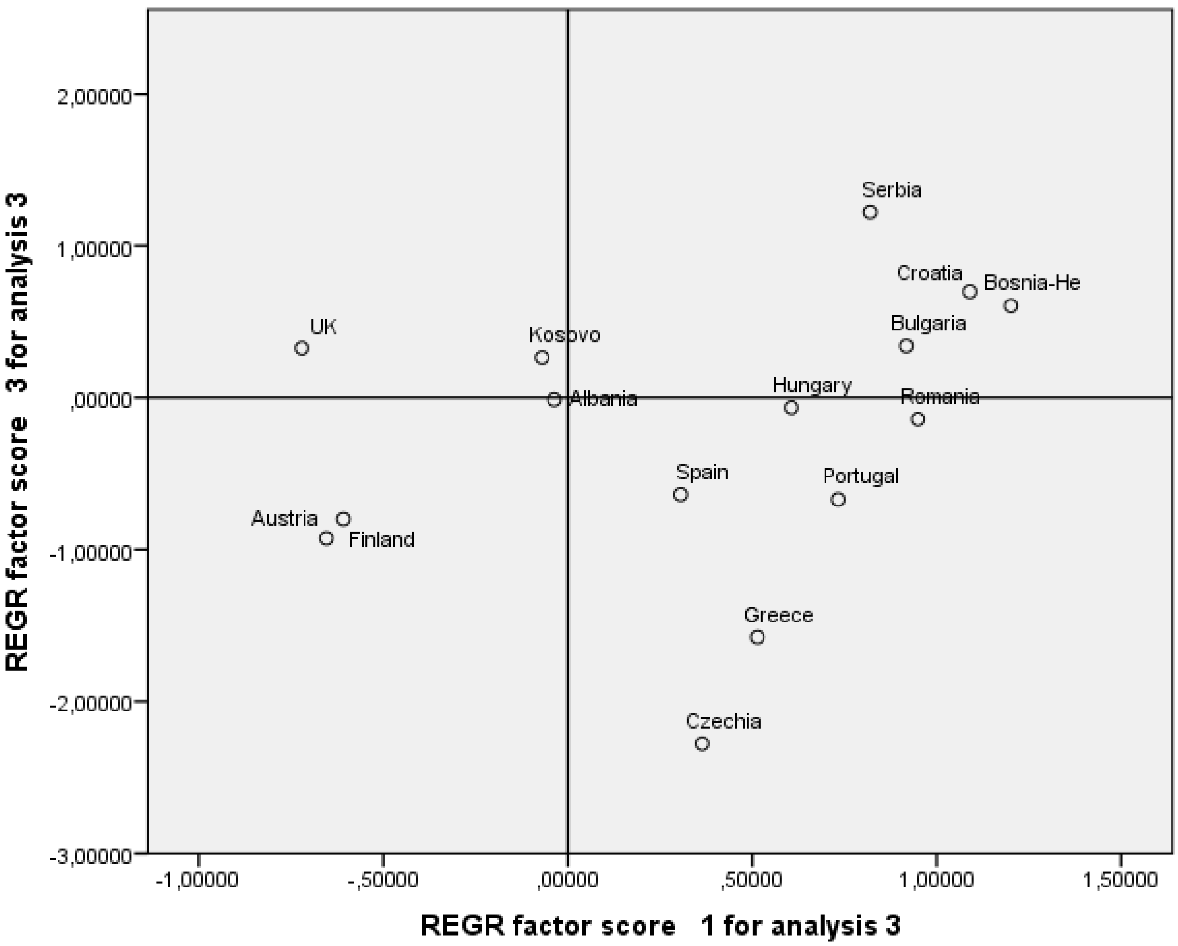


**Figure 2: Factor analyses for economic variables of Component-1 and Component-3 in the coordinate system**

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

At the principle line "X" = Component-1: HDIndex4, InterWRCap5, TRenewWRCap6, DamCapita7

At the principle line "Y" = Component-3: AgrVaAd3

Cluster-1: Albania, Kosovo, UK

Cluster-2: Austria, Finland

Cluster-3: Bosnia-Herzegovina, Bulgaria, Croatia, Romania, Serbia

Cluster-4: Czechia

Cluster-5: Greece, Hungary, Portugal, Spain

The increase of water use can be an extensive method for the increasing agricultural production so that the cultivated areas can increase and also an intensive method for the increasing agricultural production in order that the yields per hectare can increase, even the amount of the cultivated areas remains and not increase. But in my research, strong or middle strong correlations are between the increase of the total cultivated areas and Human Development Index and correlations of the total cultivated areas are very weak and not important with changes in the number of renewable water resources, as it can be seen in Table 1 and 2 (FAO AQUASTAT, 2018b; EU HDI, 2019).

Human resources mean as was mentioned before, is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. Based on the meaning of the HDI, the middle strong can be with increasing cultivated areas, because if the human resources as farmers and members of the farming households are healthful, they are ready to continue or extend their performance on more cultivated areas. If the knowledge is wider for the farmers, they also can extend their agricultural performance for more areas accompanying other agricultural branches, as new kinds of animal pieces or crops for production. If the standard of living for farmers is satisfactorily good and their power purchase parity increases, they will be readier to buy or rent or by themselves extend the cultivated areas for those which were not cultivated before. This last one means that the cultivated areas extend at the national economic level. Probably when the farmer buys any cultivated lands from others the whole amount of the cultivated lands does not change at the national level.

Generally speaking, the farmers can buy and extend their agricultural performance on the earlier not used lands, when they have enough purchase power parity for buying and enough knowledge for extending their activity in the agricultural sector or additional activity concerning the agricultural production. Therefore, middle strong correlations can be between the total country area cultivated in percent and Human Development Index. In spite that the extending of the cultivated areas in percentage of the country area is needed for increasing renewable water resources, this extension is depending on the number of water resources, but sometimes this last one is not enough alone for the increase of the cultivated areas. The HDI may be needed for this cultivated area extension. Alone one economic variance cannot be enough for completing the development process in the agricultural industry. These three economic variances concerning the water resources, basically these three is one, just the general origins of three variances can be different, which separate distributes the water resources into three branches.

In Serbia, the cultivated areas in percentage have increased by 1,4% for the researched period, which was considerable compared to the average level of 15 countries by their decreasing of 2,6%. The increase of cultivated areas in Serbia could be possible from point of view of the geographical conditions based on the increasing renewable water resources. But the HDIndex4, as economic variance has increased by the top-level, as 1,2% from the human social-economic point of view, which was the second-biggest increase after the same level by 1,2% in Croatia.

Human resources, mainly farmers increased in Serbia were mostly two times more than the average level of 15 countries of the study, which was 0,53 increase. But also, the geographic positions of Serbia have generally favourable, because the country has adequate arable areas for the crop production and animal husbandry with rivers supplying enough measure of the renewable water resources accompanying less hot or warm weather during the all of the year. In spite that the GDP growth rate decreased very sharply by 10%, the country could have survived and somehow compensated this decline by the considerable increase of the agricultural value-added for the researched period from 2008 to 2017.

The negative example poses Croatia because its water supply was by 2,6% - 2,7% better increase rate than the case of Serbia, but the GDP growth decreased by 13,8% on higher rate than the average level of the 15 countries by 6,8% decreasing rate additionally to decreasing rate as 4% in Croatia in the field of agricultural value-added, while this was average decreasing rate by 1,15% in 15 selected countries. The correlation between the total country area cultivated in percentage and HDIndex4 was the opposite example for that the considerable increase of HDI does not affect positively always on the increase of the cultivated areas. Given that the considerable areas of Croatia are Mediterranean drought weather, the actual increase of the renewable water resources does not lead to the consequent and continuous increase of the cultivated areas.

Also, in Croatia, the knowledgeable can mostly connect with other sectors and not only agricultural one, which other sectors can concern the tourist sector or somehow light industry or light industry with less costly investments, which can be adequate to the less agricultural - mostly fruit and vegetable – products. Also, the concentration process of agricultural production into less amount of farming households led to the decreasing trends of the cultivated areas.

In this country, the GDPGrowth2 and the agricultural value-added have considerably declined. This means that the knowledge of farmers is based on the improving education level comparably to the international standard alone cannot impact enough the increase of the GDP growth and the agricultural value-added. Therefore, economic growth and development also can be determined by the power purchase parity, which shows the measure of the consumers to be ready for buying more products. This last one shows the measure of the domestic single market of Croatia for extending the production and therefore the growth of the economy. The measure of the domestic single market can stimulate the companies to increase their production, which added to the economic growth and improvement. This basic essence is for free market conditions. These economic conditions show that probably in Croatia the standard of life and power purchase parity were weak for successful developing trends in economic growth. The tourism sector cannot alone make enough influence on the whole economic growth.

In Bosnia-Herzegovina, the more favourable supply in fields of water resources has increased between by 3,1 % and 4% for the researched period, which stimulated an increase by 2% in the field of total country area cultivated, which was opposite to the average level of 15 selected countries, where the water supply little increased between 0,85% and 0,94%, and cultivated areas decreased by 2,6%. Also, the GDPGrowth2 and agricultural value-added mostly the same decreased by 5,9% and 5,4%, while the agricultural value-added of 15 countries averagely decreased by 1,15%. The GDPGrowth2 rate considerably decreased for the researched period, which shows that the GDP growth rate decrease led to a lower level of the standard of living accompanied by the decrease of power purchase parity. The other two elements of the HDIndex4, as knowledgeable of farmers, could independently increase from the GDPGrowth2, also it can be seen the Table 2 (FAO, 2018b; FAO, 2018c; AQUASTAT 2019).

In Bulgaria compared to Bosnia-Herzegovina, the total internal renewable water resources, the total renewable water resources, and the dam capacity per capita have considerably increased by 3,2% and the GDPGrowth2 rate decreased by 8,6% similarly to the average decreasing level of the 15 countries by 6,8% for the researched period. The total country area cultivated increased by 4,8%, even more than the water resources per capita in Bulgaria. The area cultivated increased considerably in Bulgaria in inverse ratio to decreasing trend 2,6% as the average level of the 15 countries. This means that Bulgaria focused on the extensive methods for agricultural production increase. But Bulgaria also emphasized some parts of the extension methods for the agricultural production increase by improving the renewable water resources per capita, which can be used for irrigation.

In Bulgaria, the total area cultivated increase has a middle strong impact because when the first one increased, the decrease of the agricultural value-added has decreased by 3,4% for the researched period, while the average level of decrease was 1,15% in 15 selected countries.

In this quarter of the coordinate system, the countries could achieve an increase in their renewable water resources per capita and increase the total area cultivated and the level of the HDIndex4 in the researched period.

UK (United Kingdom), where the total renewable water resources considerably decreased by 3% and the other two kinds of water resources also decreased by the same rate within the selected 15 countries of the world economy. In the UK, the total country area cultivated could increase by 3%, which could not lead to the increased agricultural value-added because of the considerable decreasing trend of the total renewable water resources and dam capacity per capita. Therefore, the value-added decreased by 0,3%, which opposed to the considerable increasing trends of the GDPGrowth4, namely by 8,4%. The UK is a highly developed economy, which could be proofed by an increase in the GDP and not a considerable decrease in the agricultural value-added. Before the British excite process from EU-28, the foreign direct investments and performance of the large multinational corporations were very consequently to develop the economic development, even as a continuous process.

The GDPGrowth2 rate made the possibility to create the value of the HDIndex4 at the level of 0,6, which can be seen as adequate accepted by international demands. The adequate level of skilled demands and experiences based on education for farmers in the UK, which is accompanying the developed and innovative knowledge for the prosperity of national economic performance and agriculture in the UK. Therefore, the measure of the human development index cannot increase and the actual level of the value of HDIndex4 cannot be at a high level, because the previously developed level of HDI was quietly at a high level. Also, it can be declared that the keeping of long-life study, knowledgeable and standard of purchase power parity and educated level of farmers at the continuous high level could be very costly in the UK, which could increase even the negative balance of payment and central government debt (state debt) for the future.

In Kosovo the developing trend and opposed correlation between the GDPGrowth2 and agricultural value-added, as the other economic variance the GDP growth rate increased by 3%, while the agricultural value-added increased more by 6%. This last one could be realised because the amount of total renewable water resources per capita only decreased by 0,5% at the lower level. Therefore, the yield-trend of agricultural production could increase more than the average level of the selected 15 economies. In spite that he GDPGrowth2 was quietly considerable because this increase could ensure enough economic background for increasing the agricultural industry including the agricultural gross value added (GVA). This last one is equal with the difference of the agricultural output and input, as intermediate consumption.

In this statistical analyse the total area cultivated increase could make influences on the increase of the HDIndx4 and mutually this last one also can make influences on the increase of the total area cultivated. The total area cultivated increase by 1,4% and also the HDI increased to the level of the value of 0,6 and GDPgrowth2 was increasing by 3%. The middle strong correlation as its value of 0,466 between total area cultivated and GDP growth at the level of 15 countries, which means that generally the increase of total country area cultivated could contribute to increasing GDP growth. The total country area cultivated could accompany with an increase of the agricultural yields by increasing price income for the farming household, which could lead to an increase in the standard of purchase power parity. This last one could naturally increase the purchase power parity and consumption of farmers and annual working units in the agricultural industry, as parts of the consuming population in Kosovo.

In this quarter of the coordinate system in cases of the countries, the economic variances at “Y” line can develop, while the economic variances at “X” line decreased. This contradiction can be solved by increasing the water yield in fields of the total renewable water resources and dam capacity per capita.

In the third session of the score in Figure-2, there are Hungary, Romania, Portugal, Spain, Greece, Czechia.  In the case of this country-group, some countries have decreased rates in fields of some economic variances, namely HDIndex4, InterWRCap5, TRenewWRCap6, and DamCapita7 at the line “X”, while other economic variance, as AgrVaAd3 decreases or little increases.

In Hungary, the GDPGrowth2 rate decreased by 4,7%, but after 2015 the GDP started to increase, while the decreasing trend of the agricultural value-added also decreased but less rate, as 3% The decreasing rate of the agricultural industry could be explained by the decreasing rate of the total country area cultivated by 2%. In spite that this decreasing rate was not so big, this could contribute to the negative result of agricultural production. Also, in spite that the increase was not so at the highest level, this negative trend of the area cultivated could lead to the decreasing trends of the highly developed economies. The GDPGrowth2 rate was going on the negative trend and also it was the same for the agricultural production and value-added, but despite these negative trends, the HDIndex4 value could reach the level of 0,6. This last one as HDI increase mainly could not mention as at a low level, because this value was at a level of over half.
The little increase of the total renewable water resources and dam capacity per capita could have increased by about 1,5% and 2% for the researched period, which could make the possibility for less decrease of the total area cultivated. The total renewable water resources per capita could

increase because the water-yield of the rivers coming from the neighbouring countries of Hungary provided more amount of water. Also, the “domestic-national” or internal water resources per capita could increase based on the more efficient Hungarian water management at the national level. Hungary faced a large number of soil damages resulted from considerable water and wind degradation. Also, Hungary, because this country is the transit country, has to crate to reserve a system for keeping back a large amount of water coming from neighbouring countries and not to go away from Hungary.

Also, in spite that the decreasing trends of the GDP growth rate and agricultural value-added, the level of value of HDIndex4 could be at an adequate middle level, which was a fixed middle continuous level of knowledge and standard of living. The level of the healthy-life should be improved because the deceases are extending.

In Romania, the increase of the total renewable water resource and dam capacity per capita has increased considerably from point of view of the international comparison by about 2,5% and 2,9%. But this considerable increase was not enough for agricultural development, therefore, the agricultural value-added decreased by 10,6%, which was the worst result in the 15 countries. Also, this decrease was partly implemented by the decreasing trends of the total country area cultivated by 3%. The GDPGrowth2 rate was increasing by 3,5% resulted by increasing trends of the foreign direct investments (FDI) from highly developed economies in the industrial sectors, which could also lead to creating an adequate highly or middle level of the value of the HDIndex4 as this was 0,6 by the end of the researched period.
Within the HDIndex4 the standard of living can be titled as at a very low level in the international comparison, but the knowledge became more developed in Romania, which was resulted by partly EU membership and improved management level of firms generally in the country wide side. The most economic difficulty of Romania is the separation of land ownership and land-use, which both of them are strongly correlating with each other. The separation of the total land cultivated into many small plots makes large and considerable obstacles for introducing important investments realised by the foreign transnational corporations. Therefore, the lack of capital appeared in the agricultural industry and the missing investments resulted in the low level of the input-productivity of the agricultural industry in Romania.

In Spain, the total renewable water resources and dam capacity per capita could have increased by little rate, as about 1%-1,1% accompanying the decreasing trends in the field of the total area cultivated by 3% by the end of the researched period. In spite that the decrease of area cultivated

- the agricultural value-added could increase by 1% because probably the increase in the water resources per capita could provide enough amount of water for irrigation. The considerable decrease of the GDPGrowth2 by 10% resulted in the decline of the HDIndex4 level to the level of the value of 0,3. This value shows the increasing level of poverty at the wide side national level. Probably the knowledge could increase based on the developing trends of some parts of industrial sectors mostly in the Catalan region, but the other two elements, as purchase power parity and standard of living of the HDI have been very poor in Spain for the researched period between 2008 and 2017.

In Portugal, the economic and geographic conditions could be similar, because the total renewable water resources per capita increased by 2,5%, mostly two and half times more than in Spain in three fields of water resources, which could lead to the increase of agricultural value-added by 8%, like eight times more than in Spain. The increase of agricultural value-added in Portugal was very considerably if we see that the total country area cultivated decrease by 6,4%, more than two times more than the Spanish case. But the GDPGrowth2 rate decreased by 8% little less than one of Spain, this less decrease could probably help for increasing the agricultural value-added in Portugal, which was favourable agricultural conditions in case of a decreasing rate of the total country area cultivated. In Portugal, the 8% decrease in GDPGrowth2 rate resulted in a more considerable economic decline accompanying a decrease in the total areas cultivated.

Also, the 8% decrease of GDPGrowth2 rate in Portugal less by two percent than the level of 10% GDPGrowth2 in Spain could probably enough for eight times more increase of agricultural value-added in Portugal than in Spain. The increase of the total renewable water resources and agricultural value-added opposite to the decrease of the total country area cultivated shows that the land use concentrated should be realised to keep the high-level increase of value-added at the considerable level of the decreasing of the total area cultivated in Portugal. Additionally, to the land use concentration, the mechanization and irrigation improvement should be needed for the favourable value added in the agricultural industry.

Probably two times more increase in the total renewable water resources in Portugal has resulted in more investments concerning water management, which lead to less GDPGrwoth2 decline in Portugal than in Spain. The decline of the GDPGrowth2 rate could have been less than a 10% decline in Spain if this country had developed more its water management investments. The GDP growth decline provided proof that the investments even in the industrial sectors were missing in both countries. Finally, the general declining trend of the economic development in Portugal

resulted in the low level of the HDIndex4 by the value of 0,4, which can be titled as unfavourable conditions for the future possible economic-social prosperity. Mostly the rural poverty could be extending in the wide side of Portugal and because the industrial development trend was not strong in Portugal therefore, the real deep economic prosperity would be late or later future period.
In this country group of the 15 selected countries, Greece also provided a negative example of the economic prosperity within the selected countries. In Greece the GDPGrowth2 rate decreased by 20%, which was the largest decrease in the 15 selected countries, and also its GDP decrease was higher by about three and half times more than the average level of the 15 selected countries. The drastic decline of GDP growth by 20% in Greece and the global warming effect could not increase the total renewable water resources per capita more than the increasing 2% in fields of three water resources, therefore the total country area cultivated sharply decreased by 11%. So, the increase of the agricultural value-added could only increase by land-use concentration in order to keep the high level of the agricultural value-added. But the decline of GDP shows that the industrial background was not enough strong to ensure an adequate internationally competitive mechanized agricultural production and agricultural industry by extending the irrigation system for increasing area cultivated.

All of these unfavourable economic conditions led to the decreasing line of HDIndex4 to the very lowest level as 0,1, which was the same in cases of Austria and Finland. Other countries of the 15 selected one was higher than these three above mentioned economies. In Greece, the HDI was at this very low level, because of three elements of the HDI were unfavourable. The general poverty of Greece was considerable in either rural and urban areas, therefore the standard of living of the population and farmers was not adequate for increasing the purchase power parity. The educated level issue also was not successful for survival the economic and political difficulties based on the highest level of the unemployment rate, mostly in young people as between 18 and 25-year-old one. The land use and ownership concentration has not solved the economic difficulties yet. Because the land-use concentration stimulated the decrease of the employed people and the annual working unit in the agricultural sector. After their withdrawal from this sector, they could not find a job in other industries out of the agricultural sector. The flow of human resources was not enough and successful among economic sectors. Also, this economic decline in Greece resulted that the knowledgeable, as one element of the HDI became at a very low level, which could be resulted in a decrease in the foreign direct investments provided by the international transnational corporations. Because of the economic difficulties at the level of the economic crisis, the Greek government started to make fewer subsidies for the population and made more tax burden for inhabitants, which were not enough as these were requested by the EU and Brussels Committee.

But in these economic conditions creating more poverty for more inhabitants, the Greek government was afraid of increasing the more cut income of most of the population. The income cut against the majority of the population could not solve the economic difficulties reaching sometimes the level of economic crisis but took this one to be later on. Therefore, the more ambitious economic-political action should be implemented from the side of the Government in order to increase the employment issue either in the industrial sector or in the agricultural industry and to develop the prosperity of the national economic performance.

In this session of the coordinate system Czechia had mostly unfavourable economic conditions, because the GDPGrowth2 and agricultural value-added and the last one namely total country area cultivated has considerably decreased since 2008. The serious difficulty for the performance of Czechia was, that at the same time both GDP growth and agricultural value-added decreased very much. The just small increase of the different renewable water resources and dam capacity per capita increased by 0,3%, which means that these did not decrease, which could result in the serious and the biggest decrease in field of total country area cultivated by 22%, as a top decrease in the 15 selected countries.

This little increase of the water resources can be a special natural catastrophe – even in all Europe -, because the Czech Republic, by the other name Czech has the biggest natural water resources-reserves in all of Europe, which could have a favourable natural condition in mostly forestry areas. The considerable forestry cut also contributed to only a small increase of water resources.  The global warming could make this natural decrease of the renewable water resources per capita because the population change was not in the direction to the increasing.

The land-use is quietly well-concentrated even the most concentrated in all of the EU-28, which could have made the most or more efficient the Czech agricultural industry based on the input productivity by increasing price incomes and factor incomes for farming households if the industrial development and the mechanization processes had helped the increase of the agricultural value-added. This last one also decreased by 9%, while the total areas cultivated decreased by 22% based on the GDPGrowth2 rate decreasing by 11,7%. It is clear that the less amount of water reserves and renewable water resources per capita led to a decrease the irrigation capacity and a decrease in the field of the total area cultivated. The decreasing trends of the GDP growth rate resulted in the decline of the modernization and improvement of the agricultural industry and therefore agricultural value-added accompanying with fewer water resources per capita resulted in mostly natural changes. Both of two sides, namely economic and natural one, all together contributed to creating the unfavourable economic and agricultural conditions.

Czechia with Romania has implemented the worst results mostly in the field of agricultural value-added in the counties of the third session of the coordinate system in Figure 2. The events and changes in economic and natural conditions of Czechia can also emphasize that how many measures of the natural conditions can make difficulties for one economy accompanying the wronging economic conditions, in spite that this country has wide-side natural resources in fields of lands, grasses, water resources and trees provided by the forestry. But the total area cultivated sharply decreased by 22%, while the average decreasing rate was 2,6% of 15 countries.

In the fourth session of the score in Figure 2, there are Finland, Austria, and Albania.
In this session, the countries have mostly worst favourable economic conditions of agricultural value-added, because most of the economic variances or even all of the economic variances decreased, but sometimes these considerably decreased. Also, the considerable decreasing GDP growth rate could make enough negative effects on the development of the agricultural industry, which was shown by the decreasing level of agricultural value-added.

In this fourth session of this coordinate system, the other interesting country is Finland, which is one of the most famous and developed economies in the world economy and the EU-28. But Finland could not also avoid of the decreasing trends in the fields of the total renewable water resources and dam capacity per capita by 2%, which was caused by mostly global warming effects, which led to the decrease, not considerable total area cultivated by 0,2%, therefore the agricultural value-added has not also considerably decreased, just only by 0,3%. The GDP growth decreasing trend, which was by 10%, did not stimulate the more prosperity of the agricultural development and more increase in income condition. Also, Finland has a value of HDIndex4 at the level of 0,1. This does not mean that Finland could have backwardness in this field, but the country originally stands at a higher level of this field, therefore any more development should need for more plus financial resources in order to develop even little more towards. Generally, any highly developed economy could not easily realise a more developing trend than the other one from the level of economic backwardness.
The other highly developed economy is Austria, which has decreasing trends in fields of all economic variances except the HDIndex4, which mostly negative by 0,1 value, just only over zero lines. All of the total renewable water resources and dam capacity per capita have decreased by 2,5% since 2008. The less amount of water resources per capita consequently led to the decreasing

trend of the total country area cultivated by 0,7%. In cases of the highly developed economies, including Austria, the number of populations generally doesn't increase therefore, the global warming effect can make more negative influences on the decreasing trends of the total renewable water resources per capita instead of changing the number of populations.

In case of the decreasing trend in the field of the agricultural value added by 13%, the decrease of the water resources, the total area cultivated and decrease of the GDPGrowth2 rate by 8,1% stimulated to decrease the trends of the agricultural industry and agricultural value-added at the lowest level in spite that the decrease of the total cultivated area was very moderate. This last one has been the biggest decrease in agricultural production at the lowest level within the selected 15 countries of this research since 2008. Additionally, to the above-mentioned results for the decreasing trend in the agricultural sector, the other reason should be for its decrease, namely the overproduction issue of agriculture and therefore the decrease or less increase in the subsidies provided by the EU for the farmers and agricultural producers including the farming households. The fewer subsidies for farmers resulted in a less competitive possibility for them either on the world market or single market of the EU. The market demands accompanying rules of the common agricultural policy pressed the farmers to decrease their production as market supply.

The considerable decreasing trend of the GDPGrowth2 has been 8,1% in Austria, which was mainly the same level of the GDP decline by 8,47% in the EU. In Finland, this GDP decrease was more by 10%. This also shows that the economic decline was general in selected 15 countries by 6,8% and at the level of the world economy and highly developed economies. Also, the low-level value as 0,1 in the field of the HDIndex4 in Austria, which means that the value is at a low level, but this could be developed, therefore, the increase even by little measure needs for more financial resources because this index economic variance is at highly developed. It is similar to the one of Finland, but this is quietly different from the level of the developing economies, where the highest level of figure value even could be higher than the level of the highly developed economies. The general increase trend is not equal to the developed level.

Either in Austria or Finland the same level of the HDIndex4 is a value 0,1 means that three elements of this index changed based on the economic decline, therefore, one element namely the standard of living has decreased considerably since 2008. The reason that the price incomes at a firm-level decreased, so, the salaries paid by the firms should also decrease for direction to the employees as consumers at a single market of EU including the national market in Austria and Finland. The employees or consumers lost their purchase power parity (PPP) therefore, the kinds of products sold by consumers decreased, so their standard of living decreased. Comparably fewer products could be bought by consumers than earlier. This means that the lifestyle of the populations of both countries has not changed, but the PPP, as well as the standard of living, declined. This explains is for the low level of the HDIndex4, as economic variance in highly developed economies even in the selected 15 countries.

Naturally, the educated level and the knowledgeable can be fixed or constant elements, because these of the populations can remain at a continuous level. Even the employees became unemployed, so they were sent by the companies for post-graduating studies to obtain a high or higher level of knowledge to become more skilled workers after the crisis period when they would start the work again.

The other country of the fourth quarter of the coordinate system in Albania, which is very close to "Origo" or "zero", means that the economic variances of this country and their values are very closed to the average level of the selected 15 countries. The total renewable water resources moderately decreased by 0,3% and 0,4%, which did not result so either an unfavourable decrease or favourable increase for the total country area cultivated, which has been little increase by 0,8% since 2008. This little increase could lead to double times more increase by 1,6% in the field of the agricultural value-added than the increase of area cultivated. The GDPGrowt2 increasing rate did not allow the improvement for the agricultural value-added, because the agribusiness including several sectors producing input for agricultural production and manufacturing output of the agricultural sector could not have enough financial resources and capital powerful. The missing capital and financial resources were basic difficulties for any agricultural industrial improvement in Albania.

Albania has several difficulties based on two main issues that either industrial or agricultural development became at a level of backwardness at the same time without any raw materials from industry or serious capacity for export from basic materials of the agricultural industry. In recent Albania one element of the HDIndex4, namely the knowledgeable somehow developed by little trend and from time to time the standard of living was varying-fluctuating changed between marginal levels. Therefore, the HDIndex4 remained at the middle level of value, as 0,5, which can be titled or qualified as a middle weakness.

This country-group of the fourth session or quarter of the coordinate system provided somehow less favourable economic conditions, which are mostly based on the industrial decline leading to the decreasing trend of the GDP concerning the relatively narrowing market positions and purchase power parity of the consuming populations and farmers in these countries. The less favourable financial resources made an obstacle for more prosperity of investments in this researched period. The decreasing level of the investments reflects the less incomes and salaries for the next capital accumulation in industry and purchase power parity of consumers will also decrease. The geographical positions of the agricultural industry mostly based on the decreasing renewable water resources per capita resulted partly by global warming led to a decrease in the output and the agricultural value-added during the period of the research.

Additionally, to the above-mentioned Figure 1 and Figure 2, the other Table 9 shows some main data concerning the clustering system for the selected 15 countries based on their economic features by the economic variances. The countries are clustered into five groups based on the Figure 3 and Figure 4, which are as follows:

Cluster-1: Albania, Kosovo, UK
Cluster-2: Austria, Finland
Cluster-3: Bosnia-Herzegovina, Bulgaria, Croatia, Romania, Serbia
Cluster-4: Czechia
Cluster-5: Greece, Hungary, Portugal, Spain

There are 11 countries from the EU-member states in the selected 15 countries in scientific research. The Table 9, as its title is Cluster Membership, which shows in each column the figure of each selected country in this research in case of the number of clusters. Czechia is one country group based on its economic features comparably to one of the other countries.

**Table 9: Cluster Membership**

| Case<br>1 Cluster | 5 Clusters | 4 Clusters | 3 Clusters | 2 Clusters |
|---|---|---|---|---|
| 1:Albania | 1 | 1 | 1 | 1 |
| 2:Austria | 2 | 1 | 1 | 1 |
| 3:Bosnia-He | 3 | 2 | 2 | 2 |
| 4:Bulgaria | 3 | 2 | 2 | 2 |
| 5:Croatia | 3 | 2 | 2 | 2 |
| 6:Czechia | 4 | 3 | 3 | 2 |
| 7:Finland | 2 | 1 | 1 | 1 |
| 8:Greece | 5 | 4 | 3 | 2 |
| 9:Hungary | 5 | 4 | 3 | 2 |
| 10:Kosovo | 1 | 1 | 1 | 1 |
| 11:Portugal | 5 | 4 | 3 | 2 |
| 12:Romania | 3 | 2 | 2 | 2 |
| 13:Serbia | 3 | 2 | 2 | 2 |
| 14:Spain | 5 | 4 | 3 | 2 |
| 15:UK | 1 | 1 | 1 | 1 |

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

Cluster-1: Albania, Kosovo, UK

Cluster-2: Austria, Finland

Cluster-3: Bosnia-Herzegovina, Bulgaria, Croatia, Romania, Serbia

Cluster-4: Czechia

Cluster-5: Greece, Hungary, Portugal, Spain

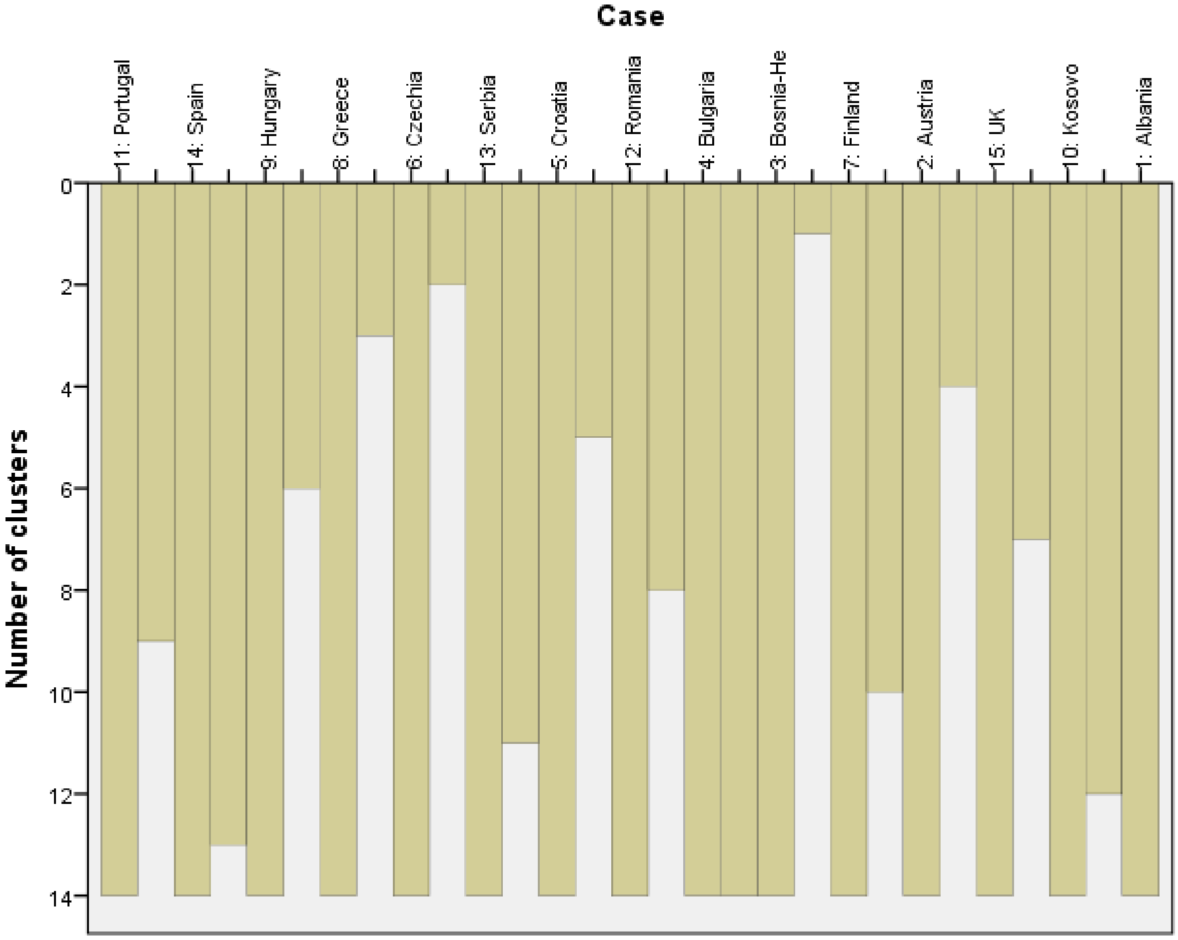


**Figure 3: Number of clusters in cases of 15 selected countries**

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

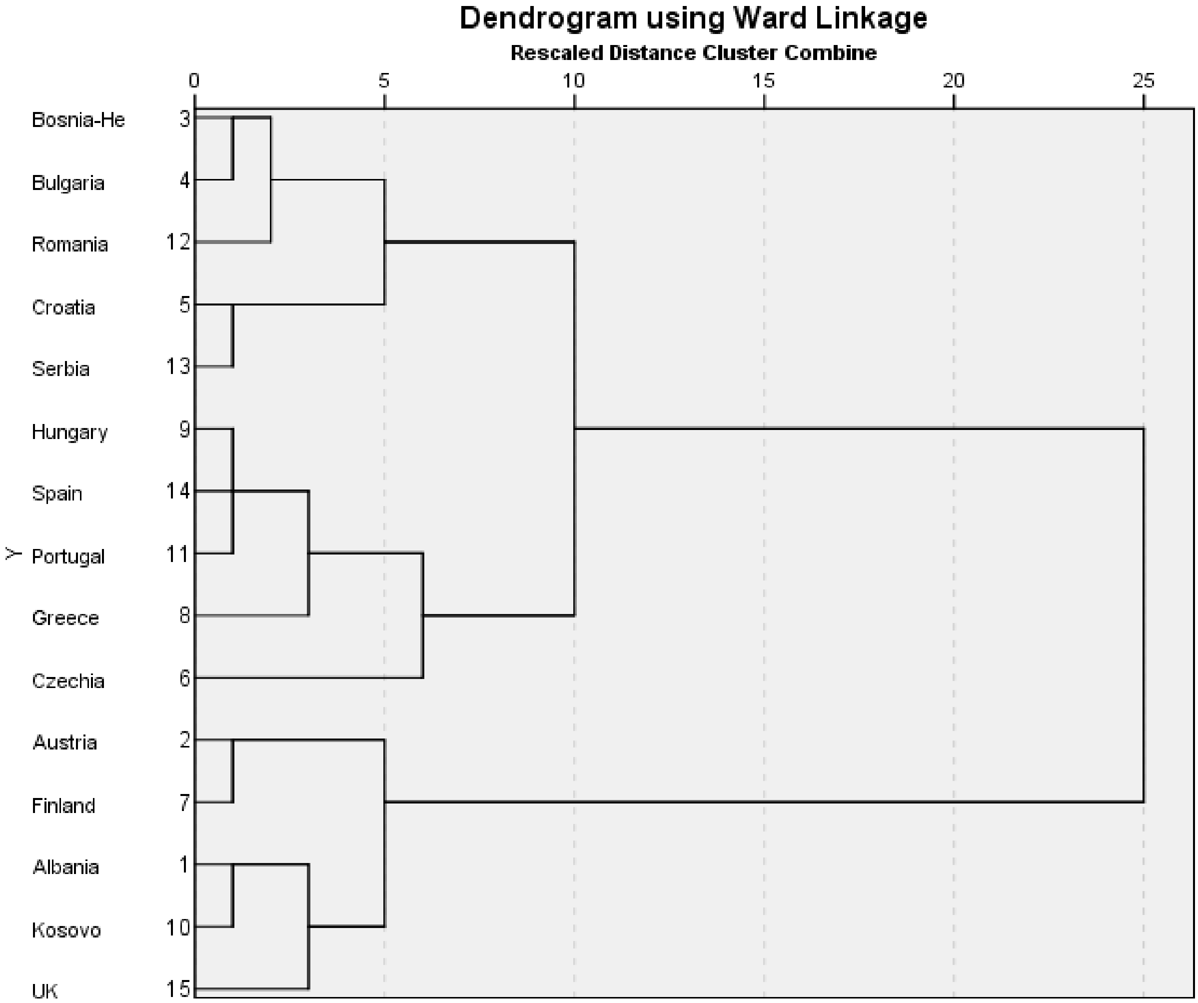


**Figure 4: Clusters of 15 selected countries in Dendrogram using Ward Linkage**

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

Table 10, Case Processing Summary shows three cases as Included, Excluded, and Total in the columns for all selected 15 countries in case of each economic variance based on the Ward Method. This table also shows that all variances of all selected countries are included in the analyses, therefore no country is out of this research, therefore, the Total of countries are included in the research.

Table 11 as Case Processing Summary provides basic data in more detailed for each country group and each economic variance, which can be similar to the Table 8.

**Table 10: Case Processing Summary (short)**

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Included | | Excluded | | Total | |
| | N | Percent | N | Percent | N | Percent |
| TAreaCult1 * Ward Method * Countries | 15 | 88,2% | 2 | 11,8% | 17 | 100,0% |
| GDPGrowth2 * Ward Method * Countries | 15 | 88,2% | 2 | 11,8% | 17 | 100,0% |
| AgrVaAd3 * Ward Method * Countries | 15 | 88,2% | 2 | 11,8% | 17 | 100,0% |
| HDIndex4 * Ward Method * Countries | 15 | 88,2% | 2 | 11,8% | 17 | 100,0% |
| InterWRCap5 * Ward Method * Countries | 15 | 88,2% | 2 | 11,8% | 17 | 100,0% |
| TRenewWRCap6 * Ward Method * Countries | 15 | 88,2% | 2 | 11,8% | 17 | 100,0% |
| DamCapita7 * Ward Method * Countries | 15 | 88,2% | 2 | 11,8% | 17 | 100,0% |

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

**Table 11: Case Processing Summary (in detailed)**

| Ward Method | | | TAreaCult1 | GDPGrowth2 | AgrVaAd3 | HDIndex4 | InterWRCap5 | TRenewWRCap6 | DamCapita7 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Total Albania Austria Finland Kosov UK | N | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | | Mean | ,8600 | -2,6400 | -1,2000 | ,3800 | -1,6600 | -1,6600 | -1,6800 |
| | | Median | ,8000 | -6,5000 | -,3000 | ,5000 | -2,0000 | -2,0000 | -2,0000 |
| | | Minimum | -,70 | -10,00 | -13,00 | ,10 | -3,00 | -3,00 | -3,00 |
| | | Maximum | 3,00 | 8,40 | 6,00 | ,60 | -,30 | -,30 | -,40 |
| | | Std. Deviation | 1,45190 | 7,94626 | 7,08061 | ,25884 | 1,20540 | 1,20540 | 1,17771 |
| 2 | Total Bosnia-He Bulgaria Croatia Hungary Romania Serbia | N | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| | | Mean | -,1667 | -6,5833 | -3,5167 | ,8167 | 2,5167 | 2,7667 | 2,6667 |
| | | Median | -,3000 | -7,2500 | -3,7000 | ,7000 | 2,5500 | 2,7500 | 2,6500 |
| | | Minimum | -4,20 | -13,80 | -10,60 | ,50 | 1,50 | 2,00 | 1,50 |
| | | Maximum | 4,80 | 3,50 | 5,30 | 1,20 | 3,20 | 3,90 | 4,00 |
| | | Std. Deviation | 3,44886 | 5,89081 | 5,13748 | ,31252 | ,62423 | ,73394 | ,88015 |
| 3 | Total Czechia Greece Portugal Spain | N | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| | | Mean | -10,6000 | -12,4250 | 2,4500 | ,2750 | 1,4750 | 1,4500 | 1,4500 |
| | | Median | -8,7000 | -10,8500 | 4,5000 | ,3000 | 1,5500 | 1,5000 | 1,5000 |
| | | Minimum | -22,00 | -20,00 | -9,20 | ,10 | ,30 | ,30 | ,30 |
| | | Maximum | -3,00 | -8,00 | 10,00 | ,40 | 2,50 | 2,50 | 2,50 |
| | | Std. Deviation | 8,27688 | 5,27154 | 8,67237 | ,12583 | ,97425 | ,98826 | ,98826 |
| | **Total** | **N** | **15** | **15** | **15** | **15** | **15** | **15** | **15** |
| | | Mean | -2,6067 | -6,8267 | -1,1533 | ,5267 | ,8467 | ,9400 | ,8933 |
| | | Median | -,7000 | -8,1000 | -,3000 | ,5000 | 1,5000 | 2,0000 | 1,5000 |
| | | Minimum | -22,00 | -20,00 | -13,00 | ,10 | -3,00 | -3,00 | -3,00 |
| | | Maximum | 4,80 | 8,40 | 10,00 | 1,20 | 3,20 | 3,90 | 4,00 |
| | | Std. Deviation | 6,68051 | 7,18535 | 6,78021 | ,34531 | 2,07601 | 2,17610 | 2,16415 |

*Source*: Own calculation based on the SPSS statistical analyses from secondary data.

Cluster-1: Albania, Austria, Finland, Kosovo, UK

Cluster-2: Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Romania, Serbia

Cluster-3: Czechia, Greece, Portugal, Spain

In this chapter, the study overviewed the main correlations and significance among the selected 15 countries, of which are 11 EU-member states. The analyse has shown the difference among the countries from point of view of their features by economic variances emphasizing some geographical features and some direct features for the performance of each country from the 15 researched countries. Also, the statistical coordinate – as the score – demonstrated the difference among countries based on their economic-geographic characters in the coordinate system.

Generally, the data show a difference in the amount of the quantitative overview among countries, while the coordinate system shows the possible real position or place in space based on the increasing or decreasing developing process of the countries in the scientific research. The cluster analysing, as a figure of the dendrogram, demonstrated the classification of countries into different classes or clusters, in order to see how the difference can wide-side or closed among countries by their features based on the economic variances characterizing each country. This classification or clustering also provided the role and order for countries within clusters.

The next chapters provide a scientific overview for general analysing results about the correlation, significance, clustering, and summarized features of the selected 15 countries. The study also tries to provide some statistical-scientific analyses about Kosovo accompanying international comparison in fields of economic features of Kosovo with one of the selected countries.

### 4.4. Some main ideas and overviews for the economic and agricultural efficiency growth with human resources and water use efficiency

From point of view of these ranges in this Table 2, the very strong correlation is by the value of 0,997 (99,7%) between Total renewable water resources per capita ($m^3$/inhab/year) by the short title as TRenewWRCap6 and Dam capacity per capita ($m^3$/inhab/year) by the short title as DamCapita7. Also, there is a very strong correlation by the value of 0,994 (0,994%) between Total internal renewable water resources per capita (m3/inhab/year) by the short title as InterWRCap5 and Dam capacity per capita ($m^3$/inhab/year) by the short title as DamCapita7.
The very strong correlation is by the value of 0,993 (99,3%) between Total internal renewable water resources per capita ($m^3$/inhab/year) by the short title as InterWRCap5 and Total renewable water resources per capita ($m^3$/inhab/year) by the short title as TRenewWRCap6. This strong correlation is very logical because the total internal renewable water resource (per capita) is coming from the total renewable water resource (per capita), because this last one as the amount of water has additional water amount coming abroad, from those water resources, which originally

flows from the neighbouring countries. These geographical closing positions should stimulate neighbouring countries to make agreements to use commonly renewable water resources within the international cooperation over borders.

The other considerable correlation is by 0,466 (46,6%) between the Gross Domestic Product growth (GDPGrowth2) (current US$) and total country area cultivated (in %; TAreaCult1), which means that if the total country area cultivated increases, this can increase the contribution of the agricultural industry to increase of the GDP. But if the total country area cultivated decreases, this can make unfavourable influences on the decreasing of the GDP within the economic conditions of the researched 15 countries for the period of 2008 and 2017.

Also, the are the other considerable correlations among economic variances, namely the Human Development Index (HDIndex4) has considerable correlations by the value of 0,466 (44,6%) with Total internal renewable water resources per capita ($m^3$/inhab/year) (InterWRCap5), by the value of 0,441 (44,1%) with total renewable water resources per capita ($m^3$/inhab/year) (TRenewWRCap6) and by the value of 0,448 (44,8%) with dam capacity per capita (m3/inhab) (DamCapita7). This means that if the HDIndex4 increases, namely the educated level (BSc, MSc) and purchase power parity and life-length study period of farmers and population at the national level, the supply of renewable water resources can increase better technology of water withdraw, keeping more water and river running over from the country even if the country is transit for the water flow, like Hungary. These water use technologies can lead to more efficient water use in the researched 15 countries. Dam capacity is a kind of efficient water use in any country by using the dam for agricultural water irrigation and producing electric power energy, as a renewable energy resource. If one country has the more scientific and technological capacity to realise such water using investment, this country also has to have the human resources to realising such investment. Farmers have to have such an educated level to apply more water-use efficiency for agricultural production.

In some international cases, the GDPGrowth2 can have an opposite correlation with the other economic variances, for example with the agriculture, value-added (in % of GDP), as AgrVaAd3. In this case, the Minus for the GDPGrowth2 means that this is in inverse ratio to the economic variance as AgrVaAd3. This means that if the GDPGrowth2 increases in any country, the agricultural value-added (AgrVaAd3) decreases in % of GDP, or opposite to these conditions. If the GDPGrowth2 decreases the agricultural value-added of countries can mostly increase in % of GDP. If the agricultural value-added increases in % of GDP, because of increasing yields based on the more using water resources and increasing the investment and consumption of fixed capital, therefore, the other economic sectors provide fewer results, which can lead to a decreasing trend or less increasing trend of the GDPGrowth2, because the other industrial sectors have less development trend. The development of the agricultural industry has been accompanying by less share in the GDP of other economic sectors for this period of 2008-2017, therefore the GDP growth decreases (FAO AQUASTAT, 2018b). In the case of the researched 15 countries, this contradicts correlation is not important by the value of minus 0,192, but the wider international experiences can provide other examples for this correlation.

In the case of 15 countries the increase of agriculture, value-added, as AgrVaAd3 doesn't contribute to increasing GDP growth, because other economic sectors don't develop enough or in some cases, these can decrease. Also, other economic sectors of some countries from 15 countries are not enough developed to increase agricultural value-added. This correlation can also provide proof of some backwardness of economic background for the agricultural industry based on the agri-business in some countries of 15 one.

In Bosnia-Herzegovina, the Total internal renewable water resources per capita considerably increased by 3,9% comparably to the other selected countries, but the agriculture, value-added decreased by 5,4%, which was about four times less than the average level of 15 selected countries, but mostly less than half of this result of Romania. In Bosnia-Herzegovina, the more favourable supply in fields of water resources has increased between by 3,1 % and 4% for the researched period, which stimulated an increase by 2% in the field of total country area cultivated, which was opposite to the average level of 15 selected countries, where the water supply little decreased between 0,15% and 0,38%, and cultivated areas decreased by 0,66%.

In Bosnia-Herzegovina, the total internal renewable water resource per capita was at the top level in the 15 countries, which could result in an increase of total area cultivated by 2%, as second after Bulgaria and the UK.

In spite that the agricultural value-added decreased in Bosnia-Herzegovina the GDPGrowth2 rate also decreased by 5,9%, which was a little less than the average level of 6,8% in 15 countries. This economic fall was accompanied by a decrease in the agricultural value-added in Bosnia-Herzegovina. This shows that in this country the economic growth has decreased and sharply declined for the researched period.

In the same period, HDIndex4 increases at the level of value 0,8 at the same time within the 15 countries, which also provides proof that these two economic variances have a considerable correlation with each other (Table 2; FAO, 2018b, AQUASTAT). This means that in Bosnia-Herzegovina the extending the total area cultivated connected with more extensive methods for

agricultural production and agricultural value-added (AgrVaAd3), while the HDIndex4 was at a relatively high level.
Mainly less use of mechanization and mechanical equipment was in Bosnia-Herzegovina and some other selected countries, which can be followed in different data in the field of decreasing rate of agricultural value-added. Naturally, the total area cultivated can also increase by increasing irrigation, and the total internal renewable water resources per capita increased, while the GDP decreased. But the total renewable water resources per capita also little increased, because the rivers of neighbouring countries could bring little more water to Bosnia-Herzegovina. In spite that the water yield of rivers coming from these countries is not so much comparably to the total internal renewable water resources per capita.

Also, the GDPGrowth4 and agricultural value-added mostly the same decreased by 5,9% and 5,4%, while the agricultural value-added of 15 countries averagely decreased by 1,15%. The HDIndex4 has little increased to the level of 0,8 value, while the GDPGrowth2 rate considerably decreased for the researched period, which shows that the GDP growth rate decrease led to the lower level of the standard of living accompanied with the decrease of power purchase parity. The other two elements of the HDIndex4, as healthy-life and knowledgeable, could independently increase from the GDPGrowth2 (also, see the Table 2; FAO, 2018b. AQUASTAT). Generally, the HDIndex4 can be accepted as an adequate level, if the value of the HDIndex4 is more than 0,5 and also mostly the HDIndex4 can be calculated within the value of "1". Sometimes the value may become over the level of the "1" if the development trends of the HDI extremely were resulted. The countries, namely Serbia, Croatia, Bosnia-Herzegovina, Bulgaria could achieve an increase in their renewable water resources per capita and increase total area cultivated and level of the HDIndex4 with decreasing or less increase in the researched period.

Bulgaria also had considerable renewable water resources per capita development trends by 3,2% in three fields of water management within the researched 15 countries. This developing trend shows, how many measures can be important and significant for increasing renewable water resources. The InterWRCap5 (Total internal renewable water resources per capita) increase provides proof, that the country more efficiently wanted to use more water resources from the domestic-national water bases to increase the productivity of the agricultural industry. At the international comparison, these results of Bulgaria were favourable.

Also, the total renewable water resources per capita have favourably increased for the latest period. These favourable results could only be implemented by the wider international over bordering agreements for common using water resources. Positive examples of Bulgaria have well-shown measures of favourable international cooperation making successful influences on the water using. But the successful using renewable water resources is not enough for the developing agricultural industry, which is needed for the advanced technology, mechanization, well-equipped water supply, and irrigation and water and entrepreneurship management.

This last one means the importance of management in fields of either technical-technological or human one based on innovation. Given that the difficulty of Bulgaria was that agriculture, value-added (AgrVaAd3) decreased by 3,4% and this agricultural industry had the main importance for more decreasing the GDPGrowth2 by 8,6%, which is little more than the average level of the 15 countries, namely by 6,8%.

The total country area cultivated increased by 4,8%, even more than the water resources per capita in Bulgaria, while the HDIndex4 was at the middle level, so this did not increase really. The average level of the HDIndex4 of the selected 15 countries was more than the one in Bulgaria.

The total area cultivated increased was considerably increasing by 4,8% in Bulgaria, which was inverse ratio to the decreasing trend by 2,6% of the average level of the 15 countries, and also, only this one increased by 3% in the UK by 2% in Bosnia-Herzegovina. This means that Bulgaria focused on the extensive methods for the agricultural production increase added to the above mentioned both of countries. But Bulgaria also emphasized some parts of the extension methods for the agricultural production increase by improving the renewable water resources per capita, which can be used for irrigation.

In Romania, agricultural production has similarly had to the conditions of Croatia by decreasing trend namely 10,6% in the field of decrease of the agricultural value-added for the same period. The general economic conditions of Romania were more favourable than in Croatia because of consequently increasing GDPGrowth2. This increase has resulted in the positive prosperity trend of GDP growth rate by 3,5% based on the increasing trends of the more intensive FDI (Foreign direct investment) mostly coming from highly developed economies of EU-28 and the United States (US) for the latest period. Romania has also a positive favourable geographic condition to increase the total internal renewable water resources per capita by 2,5%, which was resulted in the more intensive extending the possible river basins. Also, the mountain areas make a relatively favourable possibility to extend the dam capacity per capita (DamCapita7). In spite that the water supply in Romania, as the water basin generally was satisfactory for developing the irrigation system for the agriculture, the agricultural production fully sharply declined, which emphasized missing financial capital and luck of consumption of fixed capital. The relative considerable backwardness of the agricultural industry in Romania cannot decrease the distance from the level of highly developed EU member-states in the agricultural sector. Also, quite a large number of the farming households and the annual working units in the agricultural industry can ensure the considerable distribution of the agricultural inputs including the arable lands and industrial inputs, as machines, which don't let allow the development in direction to the measure economies and production-input productivity. The consequent unfavourable negative separation of farms and farming households leads to an increasing gap form the agricultural developed level needed by the international market demands and level of the international competitional possibility.

In Hungary, the GDPGrowth2 rate decreased by 4,7%, while the decreasing trend of the agricultural value-added little decreased but less rate, like 3%, mostly until 2010, but after that, the increasing trend of the GDP growth started, which was about 4% in 2019 (HCSO, 2020). The decreasing rate of the agricultural industry could be explained by the decreasing rate of the total country area cultivated by 2%. In spite that this decreasing rate was not so big, this could contribute to the negative result of agricultural production. Also, in spite that the increase was not so at the highest level, this negative trend of the area cultivated could lead to the decreasing trends of the highly developed economies. The GDPGrowth2 rate was going on the negative trend and also it was the same for the agricultural production and value-added. The decrease in GDP growth rate sharply declined until the end of 2010, so the average decrease of GDP seems that it was decreased, in spite that the increase started in 2012. The GDP growth rate has started its increase because of the ambition activity of the FDI (Foreign direct investment) in several economic sectors, for example, infrastructure, whole trade network, mechanization, car-factory, and light industry, as the food sector. The activity of the foreign large transnational corporations stimulated the mechanization of the agricultural industry and food-manufacturing industry in Hungary, which were accompanied by the modernization of the water channel and supply for irrigation and animal husbandry.

In Hungary, the little increase of the total renewable water resources and dam capacity per capita could have increased by about 1,5% and 2% for the researched period, which could make the possibility for less decrease of the total area cultivated. The total renewable water resources per capita could increase because the water-yield of the rivers coming from the neighbouring countries of Hungary provided more amount of water. Also, the "domestic-national" or internal water resources per capita could increase based on the more efficient Hungarian water management at

the national level. Hungary faced a large number of soil damages resulted from considerable water and wind degradation. Also, Hungary, because this country is the transit country, has to create a reserve system for keeping back a large amount of water coming from neighbouring countries and not to go away from Hungary.
Despite this negative trend of GDP and the decreasing rate of the total country, the area cultivated the HDIndex4 value could reach the level of 0,6. This last one as HDI increase mainly could not mention as at a low level, because this value was at a level of over half.

There is an important issue for the Hungarian water supply that the total internal renewable water resources per capita have a very little share and portion comparably to the total renewable water resources, namely 5,8% as the second-lowest level per capita within 15 selected countries. In the international compare for example in Egypt, this share was only 1,7% based on the dessert weather, while in Turkey this share was the highest level, namely 107% per capita. But also, it should be mentioned that the measure of the water in the field of the total internal renewable water resources per capita was 3,7 times more in Hungary than in Turkey, therefore the water supply per capita in Hungary was more favourable than in Turkey. Also, in Turkey, the population has increased by 8,2%, while in Hungary it decreased by 1,5%. This population number change stimulated to create an unfavourable condition in Turkey comparably to Hungarian one.
In several countries from the 15, one has a high level of share of total internal renewable water resources per capita in the total renewable water resources, namely about 100% or very closed to 100%, which are as follows: Czechia, Spain, Finland, Bulgaria, UK, and Bulgaria, between 95,3% - 99,6%. In cases of some other countries, for example, Portugal, Serbia, and Greece this share was more than 50% to 85%. To the other countries like Romania and Croatia, this share was between 20% and 35%. The share of the total internal renewable water resources per capita compared to the total one was completely different from each other, depending on the weather conditions and the measure of the water channel and water irrigation investments.

In Spain, because of the area of the country mostly are desert or sub-desert regions, the water supply per capita could have increased at a very low level, namely about one percent since 2008. The total internal renewable water resources per capita increased by 1,1%, while the total renewable water resources per capita increased by 1%, mostly the same as the first one. The low-level increase of water resources led to the low-level increase in the field of the dam capacity per capita, which this last one essentially means that the water resources are reserved in a pond or lake form in the riverbed behind the dam. The drought-desert weather conditions naturally resulted in a less favourable yield of the agricultural industry, therefore the less agricultural value-added, and less contribution of this sector to the GDP, which also, can decrease, because of the weak production of the agricultural sector. Naturally, the GDPGrowth2 has decreased by 10% for this period, which was resulted in less input productivity of the industry added to the agricultural industry, therefore the unemployment rate could increase and also, the unemployment rate could increase the furthermore decline of the GDP and generally the Spanish economy.

The large distances and therefore the low-level density of the population, which also presses the transnational corporations not to increase their investments within the FDI scheme. This negative unfavourable economic condition also can accumulate the earlier economic difficulties, for example, the unemployment rate and emigration of the rural population to the urban areas, which also can increase the local unemployment, which even can be higher level than the national average level.

In Spain, Bulgaria, Croatia, Bosnia-Herzegovina, Serbia, Hungary, Czechia, Romania, in n cases of these countries in this session the decrease of the GDP growth rate and agricultural industry including the agricultural value-added, while the total internal water resources and total water resources accompanying with dam capacity per capita little increased. But the geographical conditions neither make better conditions nor create a better background for agricultural production, which led to increasing the backwardness.

The UK (United Kingdom), where the total renewable water resources considerably decreased by 3% and the other two kinds of water resources also decreased by the same rate within the selected 15 countries of the world economy. In the UK, the total country area cultivated could increase by 3%, which could not lead to the increased agricultural value-added because of the considerable decreasing trend of the total renewable water resources and dam capacity per capita. Therefore, the value-added decreased by 0,3%, which opposed to the considerable increasing trends of the GDPGrowth4, namely by 8,4%.

In the case of the UK, water loss might have been experienced in the field of decreasing trends in agricultural value-added for the last decade. Naturally, the subsidies structure of the EU-28 also made influences on the decreasing yield, agricultural value-added, and price incomes of the farming households. The decline of the agricultural profitability and a decrease in agricultural production did not make considerable influences on the GDP growth rate.

The UK is a highly developed economy, which could be proofed by an increase in the GDP and not a considerable decrease in the agricultural value-added. Before the British excite process from EU-28, the foreign direct investments and performance of the large multinational corporations were very consequently to develop the economic development, even as a continuous process.

In the UK since the beginning of 2018, the GDP growth rate was expected to decrease because the FDI outflow has started to go out of UK and the largest foreign transnational corporations determined to discontinue their activities in this country because the British government started the withdrawal from the EU. These companies are afraid that the EU will increase the duties against products - even these are produced by these companies -, which makes their products very expensive in the EU, therefore the imported products from the UK in the EU will lose their competitiveness in its EU single market. This duty system makes imported products to be impossible for selling in the EU.

The GDPGrowth2 rate made the possibility to create the value of the HDIndex4 at the level of 0,6, which can be seen as adequate accepted by the international demands, while the total country area increased. The healthy-life was at an adequate level accompanying the developed and innovative knowledge for the prosperity of national economic performance in the UK. The standard of living in the UK was accepted by the population of this country. Therefore, the measure of the human development index cannot increase and the actual level of the value of HDIndex4 cannot be at a high level, because the previously developed level of HDI was quietly at a high level. Also, it can be said that the keeping of healthy-life, knowledgeable, and standard of living at the continuous high level could be very costly, which could increase even the negative balance of payment and central government debt (state debt) for the future.

In Albania, Kosovo, UK, and Austria the InterWRCap5 (Total internal renewable water resources per capita, m3/inhab/year), TRenewWRCap6 (Total renewable water resources per capita, m3/inhab/year) and DamCapita7 (Dam capacity per capita, m3/inhab/year) decreased or little increased, while also the AgrVaAd3 (Agriculture, value-added) decreased or little increased, but in the same time, the GDP growth can be increased or little decreased in these countries. This means that almost all of the economic variances decreased or sometimes little increased, while only one economic variance, namely the GDPGrowth2 can increase or little decrease. This shows the contradiction correlation of GDP growth with other economic variances, which can be followed in the Table-1 and the coordinate systems.

The selected 15 countries show very different economic trends concerning the differences among countries from several continents and economic variances according to the water supply, as total renewable water resources and dam capacity per capita and also, the possible results of water resource use, as agricultural value-added in the researched period. Mostly in those countries, where the damages of the renewable water resources per capita were less the agricultural value-added could increase, or the damages were more, the agricultural value-added could decrease or probably only a little increase could occur. But the GDP growth rate and agricultural value-added in all the time were opposite to each other. Because in any case if the GDP growth increased, the agricultural value-added decreased, or if the GDP growth rate decreased, the agricultural value-added increased, as it can be seen in Figure 1.

The Human Development Index (HDIndex4) means as was mentioned before, is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. Based on the meaning of the HDI, the middle strong can be with increasing cultivated areas, because of if the human resources as farmers and members of the farming households are ready to continue or extend their performance on more cultivated areas. If the knowledge is wider for the farmers, they can extend their agricultural performance for more areas accompanying other agricultural branches, as new kinds of animal pieces or crops for production. If the standard of living for farmers is satisfactory good, their power purchase parity increases, they will be readier to buy or rent or by their selves extend the cultivated areas for those which were not cultivated before. This last one means that the cultivated areas extend at the national economic level. But probably when the farmer buys any cultivated lands from others the whole amount of the cultivated lands does not change at the national level, which can be seen in Figure 2.

It can be said that in Croatia in spite that the HDIndex4 very sharply increased by 1,2 value more than the average rate of 15 selected countries by 0,53 value, in this country the GDPGrowth2 considerably declined and the agricultural value-added less decreased than the GDP growth rate. This means that the elements of the HDIndex4, namely long-healthy life and the knowledge-based on improving education level comparably to the international standard alone cannot enough impact the increase of the GDP growth and the agricultural value-added. Therefore, the economic growth and development also can be determined by the standard of living, as the third element of HDIndex4 including the power purchase parity, which shows the measure of the consumers to be ready for buying more products. This last one shows the measure of the domestic single market of Croatia for extending the production and therefore the growth of the economy. The measure of the domestic single market can stimulate the companies to increase their production, which added to the economic growth and improvement. This basic essence is for free market conditions. These economic conditions show that probably in Croatia the standard of life and power purchase parity were weak for successful developing trends in economic growth. The tourism sector cannot make alone enough influence on the whole economic growth.

Also, the 8% decrease of GDPGrowth2 rate in Portugal is less by two percent than the level of 10% GDPGrowth2 in Spain could probably enough for eight times more increase of agricultural value-added in Portugal than in Spain. The increase of the total renewable water resources and agricultural value-added opposite to the decrease of the total country area cultivated shows that the land use concentrated should be realised in order to keep the high-level increase of value-added at the considerable level of the decreasing of the total area cultivated in Portugal.

Additionally, to the land use concentration, the mechanization and irrigation improvement should be needed for the favourable value added in the agricultural industry. Finally, the general declining trend of the economic development in Portugal resulted in the low level of the HDIndex4 by the value of 0,4, which can be titled as unfavourable conditions for the future possible economic-social prosperity. In fact, mostly the rural poverty could be extending in the wide-side of Portugal, and since the industrial development trend was not strong in Portugal, the real deep economic prosperity would be late or later future period.

In this country group of the 15 selected countries, Greece provided a negative example of the economic prosperity within the selected countries. In Greece, the GDPGrowth2 rate decreased by 20%, which was the largest decrease within 15 selected countries, and also, its GDP decrease was bigger by about three times more than the average level of the 15 selected countries. The drastic decline of GDP growth by 20% in Greece and the global warming effect could not increase the total renewable water resources per capita more than the increasing 2% in fields of three water resources, therefore the total country area cultivated sharply decreased by 11%. So, the increase of the agricultural value-added could only increase by land-use concentration in order to keep the highest level of agriculture value-added. But the decline of GDP shows that the industrial background was not enough strong to ensure an adequate internationally competitive mechanized agricultural production and agricultural industry by extending the irrigation system for increasing area cultivated. All of these unfavourable economic conditions led to the decreasing line of HDIndex4 to the very lowest level as 0,1, which was the same in cases of Austria and Finland.

In Greece, the HDI was at this very low-level increase, because of three elements of the HDI were unfavourable, while the total area cultivated sharply decreased by 10%. Also, this economic decline in Greece resulted that the knowledgeable, as one element of the HDI became at a very low level, which could be resulted by decreasing of the foreign direct investments provided by the international transnational corporations. Because of the economic difficulties at the level of the economic crisis, the Greek government started to make less subsidies for the population and made more tax burden for inhabitants, which were not enough as these were requested by the EU and Brussels Committee.

The land-use is quietly well-concentrated even the most concentrated in all of the EU-28, which could have made the most or more efficient the Czech agricultural industry based on the input productivity by increasing price incomes and factor incomes for farming households if the industrial development and the mechanization processes had helped the increase of the agricultural value-added. This last one also decreased by 9%, while the total areas cultivated decreased by 22% based on the GDPGrowth2 rate decreasing by 11,7%. It is clear that the less amount of water reserves and renewable water resources per capita led to a decrease the irrigation capacity and a decrease in the field of the total area cultivated, while the HDIndex4 was at a moderately level low. The decreasing trends of the GDP growth rate resulted in the decline of the modernization and improvement of the agricultural industry and therefore agricultural value-added accompanying with less water resources per capita resulted in mostly natural changes. Both of two sides, namely economic and natural one, all together contributed to creating the unfavourable economic and agricultural conditions.

Austria, which has decreasing trends in fields of all economic variances except the HDIndex4, which is mostly negative by 0,1 value, just only over zero line. All of the total renewable water resources and dam capacity per capita have decreased by 2,5% since 2008. The less amount of water resources per capita consequently led to the decreasing trend of the total country area cultivated by 0,7%, which was a little decrease. In cases of the highly developed economies, including Austria, the number of populations generally doesn't increase, therefore the global warming effect can make influences on the decreasing trends of the total renewable water resources per capita instead of changing the number of populations. In case of the decreasing trend in the field of the agricultural value added by 13%, the less decrease of the water resources and total area cultivated, more decrease of the GDPGrowth2 rate by 8,1% stimulated to decrease the trends of the agricultural industry and agricultural value-added. This last one has been the biggest decrease in the agricultural production and agricultural value-added at the top level, more than the decrease of GDP growth rate within the selected 15 countries of this research since 2008.

Additionally, to the above-mentioned results for the decreasing trend in the agricultural sector, the other reason should be for its decrease, namely the over-production issue of agriculture and therefore the decrease or less increase in the subsidies provided by the EU for the farmers and agricultural producers including the farming households. The less subsidies for farmers resulted in a less competitive possibility for them either on the world market or single market of the EU.

It is similar to the one of Finland, but this is quietly different from the level of the developing economies, where the highest level of figure value even could be higher than the level of the highly developed economies. The general increase trend is not equal to the developed level.
Either in Austria or Finland, the same level of the HDIndex4 is a value 0,1, while the total area cultivated also decreased. According to the HDIndex4 three elements of this index changed based on the economic decline, therefore, one element namely the standard of living has decreased considerably since 2008. The reason that the price incomes at a firm-level decreased is that the salaries payed by the firms should also decrease for direction to the employees as consumers in a single market of EU including the national market in Austria and Finland. The employees or consumers lost their purchase power parity (PPP), therefore the kinds of products sold by consumers decreased, so their standard of living decreased. Comparably less products could be bought by consumers compared to earlier periods. This means that the lifestyle of the populations of both countries has not changed, but the PPP, as well as the standard of living, declined. This explains the low level of the HDIndex4, as economic variance in highly developed economies even in the selected 15 countries.

This country-group of the fourth session or quarter of the coordinate system (Figure 2), the countries, namely Finland, Austria, and Albania provided somehow weak economic conditions, which are mostly based on the industrial decline leading to the decreasing trend of the GDP concerning the relatively narrowing market positions and purchase power parity of the consuming populations in these countries. The loose of the capital and missing the financial resources made an obstacle to the prosperity of investments. The low level of the investments reflects to the less incomes and salaries for the next capital accumulation in industry and the power parity of consumers will weak. Also, the geographical positions of the agricultural industry mostly based on the decreasing renewable water resources per capita resulted partly by global warming led to the moderately less decrease of the output and the agricultural value-added than the GDP growth rate during the period of the research. Also, the total area cultivated has decreased accompanying by the low level of value of the HDIndex4 for the same period.

### 4.5. Efficiency of the agricultural production in Kosovo

Kosovo had somehow little more unfavourable conditions of the agricultural industry concerning the renewable water resources in fields of its three kinds, because in spite that the water resources little more decreased by 0,5% less than the increasing average of the selected economies, which was between 0,85% and 0,94%, but better than the decreasing trend of Austria, which was 2,5%, or one of Finland by 2,0%. But the agricultural value-added increased by 6% in Kosovo against a decreasing trend of 1,15% in the case of the average level of the 15 selected countries. This difference could be resulted by more extending agricultural production in Kosovo and with more favourable increased total arable land cultivated than the average level of selected 15 countries in this field. Also, in Kosovo, the GDP growth rate has increased by 3% for the researched period, which was in the inverse ratio to the average level of the selected countries by a declining trend of 6,8%. Therefore, Kosovo could implement more considerable results in the above-mentioned fields than the average level of 15 countries. My opinion is that in spite that he GDPGrowth2 was not quietly considerable, but this increase could ensure enough economic background to increase the agricultural industry including the agricultural gross value added (AgrVaAd3) based on the increasing total area cultivated, which can be seen also in Figure 1 and Table 1 and Table 2 (FAO, 2018b, AQUASTAT 2019).

In Kosovo in this statistical analyse the total area cultivated increase by 1,4% could make influences on the increase of the HDIndx4 to the level of the value of 0,6 and mutually this last one also can make influences on the increase of the total area cultivated. This last one can lead to increase price income of the farming household, which could lead to the increase of the healthy-life and standard of living included in HDIndex4 based on the increasing trend in the field of the purchase power parity of the consumption of farmers and annual working units.
Increasing the water yield in fields of the total renewable water resources and dam capacity per capita can ensure more water capacity for the agricultural and economic development (Figure 2). With the above-mentioned positive trends of economic growth including GDP and GVA increases, there are some important economic unfavourable conditions in Kosovo. Mostly the lack of capital and skills of farmers, and the less investment in the field of the consumption of fixed capital.

### *4.5.1. Agricultural Land Classification by River Basins in Kosovo*

In Kosovo, the Administrative Instruction No. 02/2012 on Classification of Suitability of Agriculture Land signed by Minister of the Ministry of Agriculture, Forestry and Rural Development, Pursuant to Article 145 (point 2) of the Constitution of Republic of Kosovo, Official Gazette of Republic of Kosovo No. 13/01/06/2007, declared the agricultural land classification by river basins (MAFRD, 2007)

This land classification is very important for the agricultural producers and the governmental offices in order to follow the qualified levels of land in different areas of the river basins, therefore the future possible yields and production results even including the possible price income of producers can be calculated. Therefore, the developing trends of the future possible agricultural production can be determined. Additionally, to the classification of the agricultural lands and their possible yields, the subsidies can be calculated for farmers, who have less favourable lands needed for the production to ensure the food and agricultural products to supply food consumption demands of the national market. Also, the adequate qualified agricultural lands are very few or the land natural resources are a scarcity in Kosovo, which also is resulted in less favourable water supply and longer period drought.

The National Water Strategy Document 2017-2036 was prepared by the Assembly of the Republic of Kosovo and Government of the Republic of Kosovo to determine the Water Strategy for the country. The Directive seeks to prevent and reduce pollution, promote sustainable water use, ensure environmental protection, improve aquatic ecosystems, and mitigate the effects of floods and droughts. The core objective is to achieve "good ecological and chemical status". The Directive requires (GOVERNMENT OF THE REPUBLIC OF KOSOVO, 2017):

- The designation of competent authorities in each river basin within its territory
- The preparation of river basin analyses including:
    - An analysis of the characteristics of each river basin district;
    - A review of the impact of human activity on the water;
    - An economic analysis of water use;
    - A register of areas requiring special protection;
    - A survey of all bodies of water used for abstracting water for human consumption and producing more than 10 $m^3$ per day or serving more than 50 persons.

- On the basin of the analyses to prepare river basin management plans and programs of measures
- The establishment of international coordination mechanisms
- That river basin management plans and programs of measures are reviewed and updated every six years

The Directive also has a number of other provisions of importance, including obligations to:

- Encourage participation by all stakeholders in the implementation
- Ensure that water pricing policies provide adequate incentives for users to use water resources efficiently and that the various economic sectors contribute to the recovery of the costs of water services, including those relating to the environment and resources.

There are some international experts, who declared some main scientific experiences about the agricultural land classification. Based on the procedure so specified, the soil data of the test database were categorized into a water management category system - with 5-digit water management category codes - and further land classification processing (MAKÓ ET AL, 2007A AND MAKÓ ET AL, 2007B; TÓTH, 2014;). ALSO, NO. 47/2017. (IX. 29.). Ministry of Agriculture on detailed rules for land certification in Budapest, Hungary provided the classification of the agricultural rends.

***Classification***

Section 3 §:

1) The quality of land shall be determined by class. Classification shall be by on-site inspection.
2) On-the-spot checks under paragraph (1) may be omitted only if the quality of the land, as defined in this Regulation, can be ascertained from the contents of the map database.
3) When classifying, the boundary and the area of the quality class within the land shall also be determined.

Section 4 §:

1) In order to determine the quality class of the land, the characteristic soil and natural characteristics of the land under investigation as defined in paragraph (3) shall be determined.

2) The soil shall be examined on the spot by a simple soil test up to a depth of one hundred centimetres. It is only necessary to open an excavated section if the soil cannot be safely tested by drilling.
3) The soil shall be determined during the test referred to in paragraph (2):
   a) colour, mechanical composition (physical soil), structure of the upper level,
   b) the characteristics of its further levels, as defined in (a), which are clearly identifiable; and
   c) its organic matter content, water management properties, terrain.
4) The properties determined in accordance with paragraph (3) shall be compared with the characteristics indicated in the descriptions of the district sample plots in the case of land belonging to the respective cultivated area - reed cultivation area.
5) The examined land shall be classified based on the established characteristics into the quality class of the arable land which corresponds most closely to the description of the parish area of the municipality - in the case of the reed cultivation branch.
6) Within a given crop, quality classes are distinguished by a number from one to eight, with the lower number being the better and the higher number being the inferior land quality.
7) The patch area of the quality class shall be not less than 5000 $m^2$.

Section 5 §:

1) If the area under investigation belongs to a single cultivated field but may be classified into several quality classes based on visible characteristics, or the size of the area under investigation justifies it, the examination under Section 4 (2) and (3) need to be done at multiple points on land.
2) If, as a result of the examination under paragraph (1) and the comparison under §4 (4), the land under investigation is to be classified into several quality classes, the natural location of the quality classes, their boundaries, and the area of each quality class is to be established. If the area under investigation is located on more than one continent, this demarcation shall also be carried out on each parcel.
3) For the purpose of demarcating the area of the quality classes within a continent, the subdivision rules of the legislation implementing the Land Registration Act shall apply, with the meaning of the quality class being used for the purposes of these rules.
4) As a result of the classification, the quality class and the cadastral net income of the land entered in the land register may be changed only if there are at least two quality classes or the cadastral difference between the land register data and the result of the classification. a difference of at least 8 crowns per hectare in net income.

5) Classification of the whole of the periphery of the settlement and the metropolitan area (hereinafter referred to as "settlement") and, in the case referred to in Article 17 (4), the provisions of paragraph (4) shall not apply.

Section 6 §:

1) The cadastral net income of land shall be determined based on the estimation established based on the settlement location of the land, including the cultivated area and quality class as a result of land classification and its cadastral net income and quality class. calculated. If the area under investigation is located on more than one continent, the calculation shall also be carried out on each parcel.
2) The list of quality estimations and classification areas established in the country is given in Annex 1, the classification of settlements according to estimation procedures and classification areas is given in Annex 2, the quality classes established for each type of cultivation in the estimation procedures and classification areas, and the related cadastral net income values per 1 hectare are included in Annex 3.

The above-mentioned rule for classification overviews some main issues for the methods of classification. The rule determined that the classification should concern the features of the agricultural lands including water and organic material contaminations.

From other points of view in Kosovo so that the agricultural sector and production can be developed, within the central governmental strategy, the Classification of Agricultural Land was realised in eight (8) classes as are presented based on the suitability of agricultural land below (GOVERNMENT OF THE REPUBLIC OF KOSOVO, 2017):

| | | |
|---|---|---|
| Kept particularly for agricultural production | | |
| 1/ Points: | 85-100 | Very good |
| 2/ Points: | 76-85 | Good |
| 3/ Points: | 66-75 | Above average |
| 4/ Points: | 56-65 | Average |
| Decisions to protect agriculture must be taken based on the value | | |
| 5/ Points: | 46-55 | Under average |
| Weak land: mainly forestry zone and meadows; it is not reasonable to be kept for agriculture | | |
| 6/ Points: | 36-45 | Weak |
| 7/ Points: | 1-35 | Very weak |
| Mechanised agriculture ploughing is not possible | | |
| 8/ Point: | 0 | |

The first four categories were enough for developing agricultural production, namely, the kept particularly for agricultural production from a qualified level of very good to the level of the average level, by the point value from 56% to 100%. The other 5. and 6. lower qualified levels, namely Decisions to protect agriculture must be taken based on the value from the value of 46 to 55, as under average, and the last sixth one is weak land: mainly forestry zone and meadows and it is not reasonable to be kept for agriculture from point of 36 to 45 points.

In this classifying the “Weak land: mainly forestry zone and meadows; it is not reasonable to be kept for agriculture” consisting of two parts, namely the 6th class with its Points from 36-45, while the 7th class weak with 7th category with points from 1 to 35, as a very weak category.

The above mentioned eight classes were reduced by two 7. and 8. classes from 1 point to 35 point and the last one is 0 point, which two one was not successful for developing the agricultural sectors in the river basins, because these two categories were weak land: mainly forestry zone and meadows; it is not reasonable to be kept for agriculture and also the eighth, the mechanised agriculture ploughing is not possible. Therefore, these kinds of land classes became unfavourable for production.
Table 12 overviews Agricultural Land Classification by River Basins 2017, in percentage, km2, which are six classes of the agricultural lands and which can be considered for developing agricultural production concerning the feature of the different kinds of the soil. Table-1 shows the order of the classes of the lands based on the SPSS statistical system according to classes accompanying with each river basin by the end of 2017 in percent based on the measure of their territory calculated in km2. The calculation and the positions of the river basins are realised in the coordinate system, where the component-1 consists of Class II, Class IV, and Class V at principal line “X”, while the component-2 consists of Class I, Class III, and Class VI at principle line “Y”.

The best qualified agricultural land class is the first and the lowest qualified level of the agricultural land is the sixth, which can be cultivated by the satisfactory level. In Table 12 the percentage shows the share of each kind of land class in $km^2$, but also, concerning the qualified features of the lands. The table also shows the agricultural lands are classified into six categories accompanying with a measure of each kind of land according to each river basin. This means that the first four classes of land for agricultural production are very good, good, above averaged level or at the averaged level and mostly the lands are irrigated from the water coming from the river basins. The fifth class is under averaged level, but it could be useful for agricultural production or probably sometimes this can be efficient, therefore it must be taken based on the value. The sixth class of the agricultural land is qualified at a weak level for agricultural production, but this can be useful for forestry and meadows at the sector or national economic level.

**Table 12: Agricultural Land Classification by River Basins 2017, in percent, km²**

| River Basins | **Class II** | **Class IV** | **Class V** | **Class I** | **Class III** | **Class VI** | **Km²** |
|---|---|---|---|---|---|---|---|
| Components | Component-1 | | | Component-2 | | | |
| ***Principle lines*** | ***"X"*** | | | ***"Y"*** | | | |
| Drini I Bardhë-1 | 54 | 72 | 71 | 32 | 40 | 22 | 1339 |
| Ibri -2 | 23 | 20 | 22 | 59 | 38 | 66 | 1114 |
| Morava e Binçës-3 | 8 | 6 | 6,9 | 8,5 | 16 | 11,9 | 246 |
| Lepenci-3 | 15 | 2 | 0,1 | 0,5 | 6 | 0,1 | 134 |
| **TOTAL/Kosovo** | **100** | **100** | **100** | **100** | **100** | **100** | **-----** |
| ***Kosovo km²*** | ***579*** | ***661*** | ***68*** | ***1098*** | ***325*** | ***102*** | ***2833*** |
| ***Kosovo in %*** | ***20,4*** | ***23,3*** | ***2,4*** | ***38,8*** | ***11,5*** | ***3,6*** | ***100*** |

*Source:* Own calculation based on the SPSS statistical analyses from secondary data. , Government of the Republic of Kosovo, 2017 p. 100

*Note:* Administrative Instruction No. 02/2012 on Classification of Suitability of Agriculture Land. Minister of the Ministry of Agriculture, Forestry and Rural Development. Pursuant to Article 145 (point 2) of the Constitution of Republic of Kosovo, Official Gazette of Republic of Kosovo No. 13/01/06/2007 (p. 11):

Kept particularly for agricultural production
Class I - 1/ Points: 85-100 Very good
Class II - 2/ Points: 76-85 Good
Class III - 3/ Points: 66-75 Above average
Class IV - 4/ Points: 56-65 Average
Decisions to protect agriculture must be taken based on the value
Class V - 5/ Points: 46-55 Under average
Weak land: mainly forestry zone and meadows; it is not reasonable to be kept for agriculture
Class VI - 6/ Points: 36-45 Weak

These six land classes are extending at land measured as 2833 km² according to four river basins, from which only 6% is according to the 5. and 6. Classes and the other first four classes of the lands are covering 94% of the whole land in this table, which is at an average level or higher. The first class of the lands from 85 to 100 points is covering 38,8% of agricultural lands of four river basins, namely Drini i Bardhë-1, Ibri -2, Morava e Binçës-3, and Lepenci-3. The number with the names of the river basins mean the number order of each river basin calculated by the Clustering Dendrogram of SPSS based on the features and measure in km² of the agricultural land concerning the classes given by the rule of the Ministry of Agriculture in Kosovo.

The first cluster Dendrogram of SPSS is the Drini i Bardhë-1, as the best and highest level qualified by the Ministry, the second cluster is Ibri -2, and the third cluster of Dendrogram of SPSS contents two river basins, namely Morava e Binçës-3 and Lepenci-3. The last third cluster including two river basins 380 $km^2$, which 13,4% of all four river basins' lands, therefore these are not considerable. The other two river basins get 86,6% of all four river basins' lands (GOVERNMENT OF THE REPUBLIC OF KOSOVO, 2017). In spite that the first and second river basins have a considerable share of the four river basins, all lands of four basins as 2833 $km^2$ can be titled not so considerable comparably to all cultivated lands in Kosovo.

10887 $km^2$ is the land area of Kosovo, of which agricultural land is 52,36%, namely 5700 $km^2$ and 2833 $km^2$ is according to the six classes of the agricultural land according to the four river basins, as 26% of all land area of Kosovo, mostly half of the all agricultural land. The first and second river basins as Drini i Bardhë-1 and Ibri -2 have 22,5% of the land area of Kosovo. From this point of view, the first and second river basins have considerable measure lands of Kosovo.

Agricultural land refers to the share of land area that is arable, under permanent crops, and under permanent pastures. Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. Land under permanent crops is land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee, and rubber. This category includes land under flowering shrubs, fruit trees, nut trees, and vines, but excludes land under trees grown for wood or timber. Permanent pasture is land used for five or more years for forage, including natural and cultivated crops (MINISTRY OF AGRICULTURE IN KOSOVO, 2019).

According to the Table 12 also, the economic variances Class2, Class3, Class4 and Class5 increase in Drini i Bardhë river basin based on the data of Table 12, which can prove for these strong correlations. The highest strongest level of the correlations is between Class4 and Class5, when these variances increase in cases of Drini i Bardhë and decrease in cases of the other three river basins, Ibri, Morava e Binces and Lepenci. According to the statistical classifying the different kinds of agricultural lands, the Class I is the highest-level land, and the Class VI is the lowest level one, which can be cultivable land for the agricultural production.

**Table 13: Correlation Matrix[a]**

| | | Class1 | Class2 | Class3 | Class4 | Class5 | Class6 |
|---|---|---|---|---|---|---|---|
| Correlation | Class1 | 1,000 | ,413 | **,881** | ,407 | ,447 | **,969** |
| | Class2 | ,413 | 1,000 | **,740** | **,981** | **,974** | ,173 |
| | Class3 | ,881 | ,740 | 1,000 | **,772** | **,803** | **,749** |
| | Class4 | ,407 | ,981 | ,772 | 1,000 | **,999** | ,171 |
| | Class5 | ,447 | ,974 | ,803 | ,999 | 1,000 | ,216 |
| | Class6 | ,969 | ,173 | ,749 | ,171 | ,216 | 1,000 |

a. This matrix is not positive definite.

*Source:* Own calculation based on the SPSS statistical analyses from secondary data. Government of the Republic of Kosovo, 2017, p. 100

The Table 13 shows the correlations among the qualified classes of the agricultural lands by their measure, which means that Class1 has a very strong correlation with Class3 by 0,881 and with Class6 by 0,969. The Class2 has strong correlation with Class3 by 0,740 and it has very strong correlation with Class4 by 0,981 and with Class5 by 0,974. The very strong correlation can be when the values of economic variances more than 0,800. The strong correlations can be when the values of economic variances are between 0,800 and 0,700 values based on the data of the Table 13 (SPSS based the National Water Strategy Document 2017-2036). According to the Table 13 either three economic variances increase in cases of Class1, Class3 and Class6 in Ibri river basin or these variances decrease in cases of Class1, Class3 and Class6 in Drini i Bardhë, Class2, Class3, Class4 and Class5 in Morava e Binces river basins at first line of the Table-13, which can proof for these strong correlations.

**Table 14: Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 4,301 | 71,681 | 71,681 | 4,301 | 71,681 | 71,681 | 3,390 | 56,495 | 56,495 |
| 2 | 1,652 | 27,526 | **99,207** | 1,652 | 27,526 | 99,207 | 2,563 | 42,712 | 99,207 |

Extraction Method: Principal Component Analysis.

*Source:* Own calculation based on the SPSS statistical analyses from secondary data. Government of the Republic of Kosovo, 2017, p. 100

The Table 14 shows the Cumulative value of initial eigenvalues by 99,2%, which means that the two components strengthen the correlations among economic variances by 99,2% mostly 100%. Therefore, the results of this research are very correct and valuable. The Table-15 shows the structure of two components as component-1 and component-2 set up by economic variances. The component-1 consists of Class2, Class4, Class5 and the component-2 consists of Class1, Class3 and Class6. In the coordinate system the component-1 accords to the Principal line “X” and the component-2 accords to the Principal line “Y”. The Table 12 contents the original statistical data and the Table 13 and Table 15 transferred these original one into the setting up based on the SPSS method. All of these kinds of agricultural lands are belonging to the different rivers of Kosovo.

**Table 15: Rotated Component Matrix[a]**

| | Component | |
|---|---|---|
| | 1 | 2 |
| Class1 | ,263 | **,963** |
| Class2 | **,975** | ,153 |
| Class3 | ,662 | **,741** |
| Class4 | **,987** | ,155 |
| Class5 | **,978** | ,201 |
| Class6 | ,017 | **1,000** |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

*Source:* Own calculation based on the SPSS statistical analyses from secondary data.
National Water Strategy Document 2017-2036, Kosovo Water Strategy. Assembly of the Republic of Kosovo, Government of the Republic of Kosovo, p. 100

The Table 16 essentially strengthens the correlations among economic variances from the approach of significant relations among the economic variances. The values of significance should be closed to zero, even less than 0,100 value. Therefore, the significant relations are strongest among Class1 and Class6 by 0,031, Class2, Class4 and Class5 by 0,019 and 0,026. The significance means that the difference among economic variances mostly in “zero” or closed to this one. Therefore, there is no difference or only a little among economic variances. This means that if one variance increases and the other one also increases, the strong correlation or significant relation is among them, and also opposite to this condition if the variance decreases and the other one also decreases the strong correlation or significant relation are among them.

**Table 16: Correlations**

| | | Class1 | Class2 | Class3 | Class4 | Class5 | Class6 |
|---|---|---|---|---|---|---|---|
| Class1 | Pearson Correlation | 1 | ,413 | ,881 | ,407 | ,447 | ,969* |
| | Sig. (2-tailed) | | ,587 | ,119 | ,593 | ,553 | ,031 |
| | N | 4 | 4 | 4 | 4 | 4 | 4 |
| Class2 | Pearson Correlation | ,413 | 1 | ,740 | ,981* | ,974* | ,173 |
| | Sig. (2-tailed) | ,587 | | ,260 | ,019 | ,026 | ,827 |
| | N | 4 | 4 | 4 | 4 | 4 | 4 |
| Class3 | Pearson Correlation | ,881 | ,740 | 1 | ,772 | ,803 | ,749 |
| | Sig. (2-tailed) | ,119 | ,260 | | ,228 | ,197 | ,251 |
| | N | 4 | 4 | 4 | 4 | 4 | 4 |
| Class4 | Pearson Correlation | ,407 | ,981* | ,772 | 1 | ,999** | ,171 |
| | Sig. (2-tailed) | ,593 | ,019 | ,228 | | ,001 | ,829 |
| | N | 4 | 4 | 4 | 4 | 4 | 4 |
| Class5 | Pearson Correlation | ,447 | ,974* | ,803 | ,999** | 1 | ,216 |
| | Sig. (2-tailed) | ,553 | ,026 | ,197 | ,001 | | ,784 |
| | N | 4 | 4 | 4 | 4 | 4 | 4 |
| Class6 | Pearson Correlation | ,969* | ,173 | ,749 | ,171 | ,216 | 1 |
| | Sig. (2-tailed) | ,031 | ,827 | ,251 | ,829 | ,784 | |
| | N | 4 | 4 | 4 | 4 | 4 | 4 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

*Source:* Own calculation based on the SPSS statistical analyses from secondary data. Government of the Republic of Kosovo, 2017, p. 100

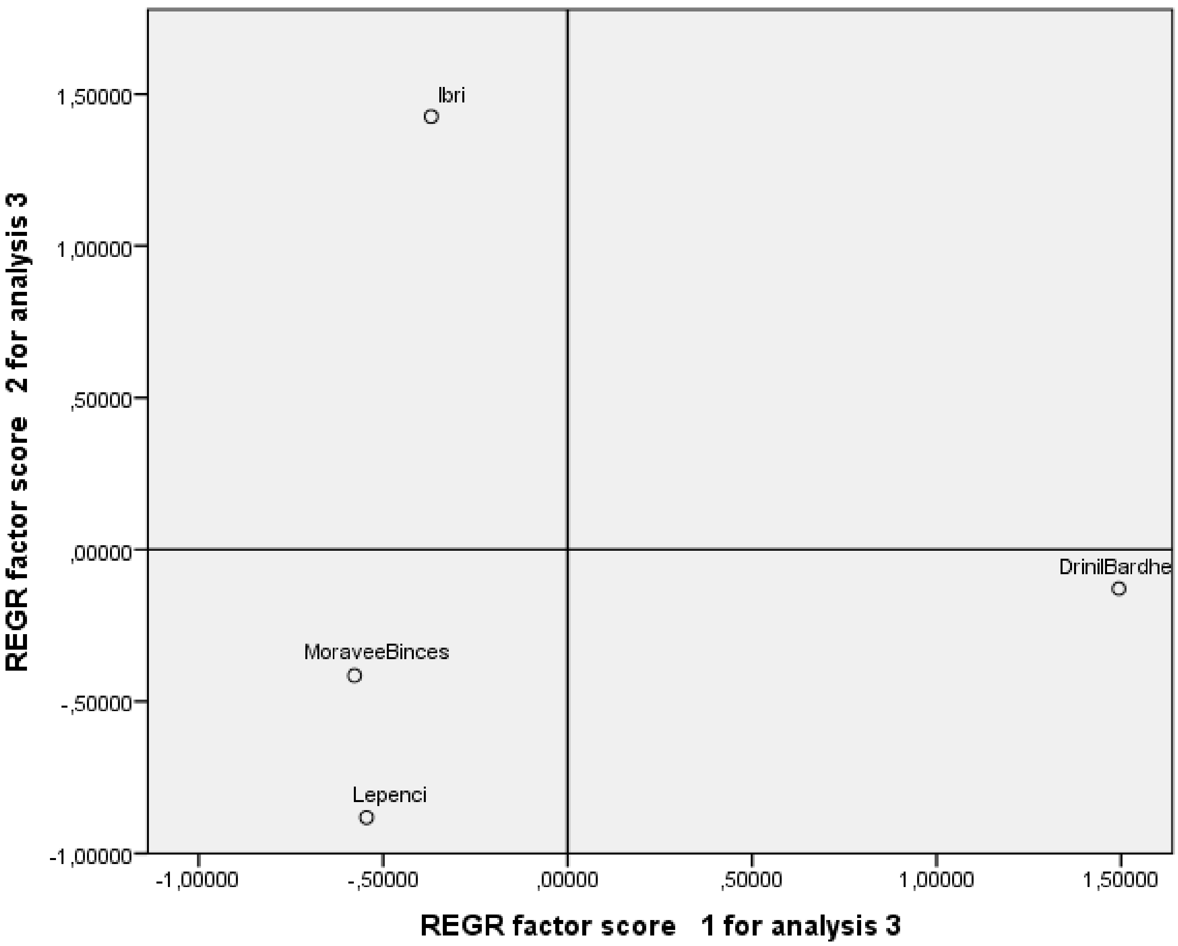


**Figure 5: Factor analyses among the economic variances of Compenent-1 and Component-2 at Principal lines**

*Source*: Own calculation based on the SPSS statistical analyses from secondary data. Government of the Republic of Kosovo, 2017. p. 100)

Principle line "X" = Class2, Class4, Class5

Kept particularly for agricultural production

Decisions to protect agriculture must be taken based on the value

Principle line "Y" = Class1, Class3, Class6

Kept particularly for agricultural production

Weak land: mainly forestry zone and meadows; it is not reasonable to be kept for agriculture

The Figure 5 shows the coordinate system, in which the factor analyses are calculated based on among the economic variances, of which the Class2 (76-85, Good), Class4 (56-65, Average), Class5 (46-55, Under average) are according to the component-1 at Principal line "X", and Class1 (85-100, Very good), Class3 (66-75, Above average), Class6 (36-45, Weak) are according to component-1 at the Principal line "Y".

In the third quarter of the coordinate system – the first quarter is empty -, when economic variances as a measure of Class2 (76-85, Good), Class4 (56-65, Average), Class5 (46-55, Under average) in $km^2$ of Drini i Bardhë river basin at line "X" considerable increase in the same time the measured in $km^2$ of Class1 (85-100, Very good), Class3 (66-75, Above average), Class6 (36-45, Weak) of Drini i Bardhë decreases little at the line "Y", and not considerably comparably to economic variances of the line "X", as it can be seen in Table 13 and Figure 5 (GOVERNMENT OF THE REPUBLIC OF KOSOVO, 2017).

But in the second quarter of the coordinate system at the line "X" the measure of Class2 (76-85, Good), Class4 (56-65, Average), Class5 (46-55, Under average) in $km^2$ of Ibri river basin decreases little, but the measured in $km^2$ of Class1 (85-100, Very good), Class3 (66-75, Above average), Class6 (36-45, Weak) of Ibri increases considerably at the line "Y".

In the fourth quarter of coordinate system when economic variances as a measure of Class2 (76-85, Good), Class4 (56-65, Average), Class5 (46-55, Under average) in $km^2$ of Morava e Binçës-3 and Lepenci river basins at line "X" little decrease, but in the same time the measured in $km^2$ of Class1 (85-100, Very good), Class3 (66-75, Above average), Class6 (36-45, Weak) of Morava e Binçës little decreases, but these variances of the Lepenci more decrease considerably at the line "Y", which can be seen in Table 12 and Figure 5 (GOVERNMENT OF THE REPUBLIC OF KOSOVO, 2017).

The Figure 6 shows the clusters consisting of the river basins, namely the Cluster-1: Drini i Bardhe, Cluster-2: Ibri, and Cluster-3: Lepenci, Morave e Binces. The Drini i Bardhe river basin has the top favourable measure land in $km^2$ with adequate water supply, the second cluster is the Ibri river basin with less but considerably more water supply. Therefore, these two river basins are independent clusters from each-others and also, from the other two river basins, as Morava e Binces and Lepenci, because these two are similar to each-others, which are in one cluster in this statistical system.

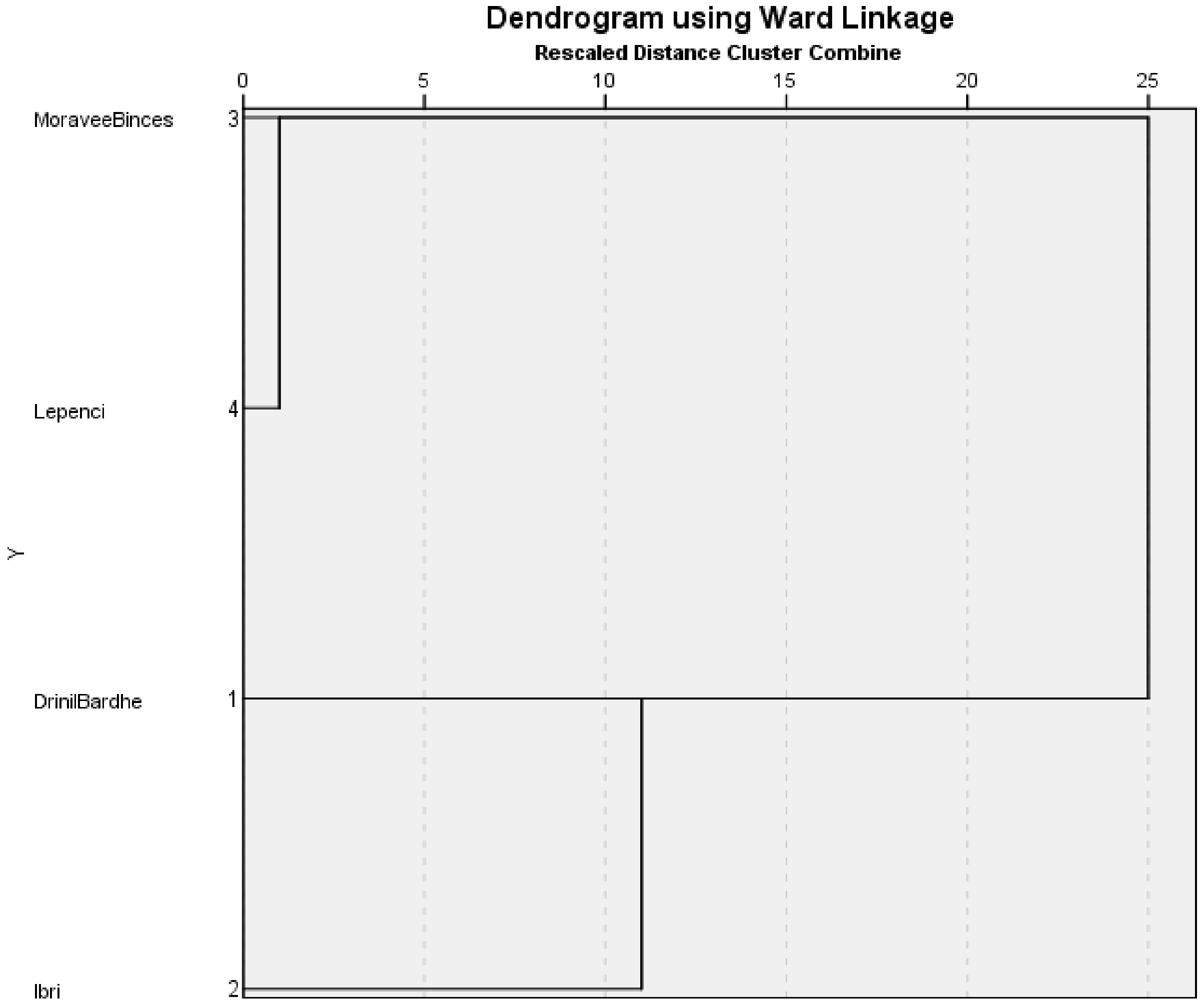


**Figure 6: Dendrogram using Ward Linkage for clustering the river basins of Kosovo**

*Source:* Own calculation based on the SPSS statistical analyses from secondary data. Government of the Republic of Kosovo, 2017, p. 100

Cluster-1: Drini I Bardhe

Cluster-2: Ibri

Cluster-3: Lepenci, Morave e Binces

In conclusions, this means that the measures of the Class2 (76-85, Good), Class4 (56-65, Average), Class5 (46-55, Under average) in $km^2$ of Drini i Bardhë river basin increased by the top level in shares of the total areas of the six classes of this river basin, mostly by the end of 2017, but in the following years also, the measured fields in $km^2$ could not increase more or no considerable change. In other words, the Drini i Bardhë river basin has the biggest share of the Class2, Class4, and Class5 qualified agricultural lands.

Also, the Class1 agricultural land qualified by the more favourable water supply than the other classes agricultural land qualified. The main strategic aim for the agricultural irrigation system should be the best way to increase the irrigating water supply in Drini i Bardhë and Ibri river

basins, because here originally the irrigating water supply is at the top level at present comparably with other two less favourable river basins Morava e Binces and Lepenci river basins. Therefore, the measure of the Class1 in $km^2$ should be to increase from 38,8% of 2833 $km^2$.
Also, the other aim can be realised, namely Class4 and Class5 can be increased to the higher or highest qualified level of Class1, because Drini i Bardhë has a considerable share of these qualified agricultural lands, namely by 72% and 71% in these two Classes4-5.

By realising the above-mentioned aims, the irrigating water capacity of river basins, mostly in cases of Drini i Bardhë and Ibri can stimulate to increase the yields or results and price-incomes for farmers and more favourable food supply for the domestic market in Kosovo.
Class6 is important for keeping forestry and meadows instead of more using arable land in this land category. But these lands also need more irrigation and water supply.

### *4.5.2. Efficiency of the agricultural production in Kosovo*

The chapter of the study focuses on the efficiency issues of the agricultural sector in Kosovo accompanying unfavourable economic difficulties of this sector based on some compares with the EU-28 and neighbouring countries, for example, Albania, Bosnia-Herzegovina, North-Macedon and Serbia. The study focuses on comparing the economic features of the EU-28 and agricultural industry of Kosovo and also economic and agricultural conditions of Kosovo with some neighbouring countries based on the Statistical program for social sciences in 2012 and 2016.

Generally speaking, it can be stated that in Kosovo the employment in agriculture is a very high level accompanying less developed machinery level, in spite that the inflation rate is at a low level with a high portion of the agricultural land of total land area than the cases of the other neighbouring countries. The international competitiveness of farmers needs for developing the mechanization accompanying increasing subsidies for farmers.

The lack of capital, the less educated, and skilled employees in the agricultural industry result in some economic difficulties for the further prosperity of the sector in Kosovo. The possible solutions for the agricultural industry in Kosovo, for example, to develop the mechanization, common selling-purchasing of farmers, more activities in agricultural services, secondary activities, increasing the subsidies for farmers, obtaining of farmers in food manufacturing industries, extent the maintenance-network for the agricultural machines, extending the agricultural advisory network and also, create the better credit conditions for farmers.

The study focuses on the efficiency issues of the agricultural sector in Kosovo accompanying unfavourable economic difficulties of this sector based on some compares with the EU-28 and neighbouring countries, for example, Albania, Bosnia-Herzegovina, North-Macedon and Serbia. The database is from the international sources, as EU European Commission (EC 2019), FAO, World Bank, and nationally published materials in Kosovo.

Some international and national organizations (EFSE, 2018) declared the main economic difficulties of the agricultural industry of Kosovo, which are needed for their improvement, which are as follows in Kosovo:

- about 30-40% of landowners are estimated to be absent; they either migrated to urban areas or abroad;
- rationalize and consolidate physically separated parcels of land requiring reallocation between landholders, but the process is slow and burdensome;
- collaboration among farmers in Kosovo is weak;
- level of co-operation among farmers (horizontal integration) and between farmers and processors or traders (vertical integration) is still minimal in Kosovo.
- effective farmers' co-operatives are currently rather low, only some co-operatives and associations in crops and areas of Kosovo, they represent only a small percentage of farmers;
- the capacity of existing co-operatives is weak;
- considerably more experience in agricultural and rural lending, and better knowledge of and response to small farmers' needs.
- high-interest rates and requirement of banks against the interests of farmers;
- insufficient technical skills, business administration, and financial literacy of the agricultural clients make it difficult for financial institutions to finance them (ability constraint).
- there is a strong need for long-term loans to finance more agricultural machinery, storage facilities, greenhouses, and planting new orchards, as well as equipment for agricultural processing.
- the specifics of agriculture and the various risks of agricultural production;
- by tailoring financial products and services with innovative features and increasing efficiency, the cost of delivery can be lowered;
- to be more profitable agricultural producers can improve their financial literacy and agricultural knowledge to better identify opportunities;

- agricultural finance needs to be built in the right business model that addresses the key issues of service, product, and marketing – better understand farmers' needs; risk management – improve risk assessment; operational efficiency – lower delivery cost (EFSE, 2018).

HAUSER ET AL, (2016) with some other experts could declare and describe the macroeconomic conditions of Kosovo, which are as follows:

- the unemployment rate is a very high level;
- GDP per capita is about EUR 3,000 and just over a quarter of the population employed, therefore Kosovo has a major need for SME (Small and Medium Enterprises) development in order to provide jobs and increase local production to correct its –35.3% trade deficit. SMEs;
- though Kosovo's SME sector consists of traditional, non-innovative enterprises, it has performed well in terms of its ability to generate jobs, with over 80% of employment provided by SMEs;
- business planning, financial record keeping, and growth management, on the other hand, is lacking, creating a barrier for lending with lower collateral requirements and equity finance;
- most of Kosovo's SMEs wish to retain their family-owned business structures, demand for equity finance is low.

Kosovo's high unemployment makes the SME sector very important for job creation:

- GDP growth has largely been driven by remittances, donor funding, and public spending rather than private-sector activity;
- Trade and services account for almost 65% of private sector activity, with relatively low contributions from manufacturing and agriculture;
- Because large enterprises are very few (less than 50), the structure of the SME sector mirrors that of the private sector overall;
- Kosovo is heavily reliant on imports, including food imports, and SME development is important for eventual import substitution;
- The August 2015 signing of a series of landmark agreements with Serbia has paved the way for Kosovo's EU accession negotiations. (HAUSER ET AL, 2016).

Finally, the above-mentioned experts proposed that following the launch of the new national credit guarantee fund, investigate the need for additional capital for the existing fund in order to further reduce the collateral requirement burden for SME borrowers (MAFRD, 2007; HAUSER ET AL, 2016).

Also, the farmers in Kosovo need adequate financial subsidies and credit possibilities for improving their agricultural production, which the last one also needs for setting up the well operating bank system for realising this aim. This bank system is operating under internal control (LENTNER ET AL, 2019A; LENTNER ET AL, 2019b). Surely, the convergence in central banking regulation is requested by the EU to create an internationally unified bank system in Europe (LENTNER, 2018).

Additionally, to the financial background of farming so that the farmers can decrease the cost of production and their transaction cost, they are stimulated to strengthen their cooperation for accessing cheaper inputs (AKER, 2010A; AKER, 2010B) and improving the agricultural productivity even in Kosovo (SHAQIRI – TRENDOV, 2018). The new technology should be used even in the field of digital development trends for improving the agricultural sector (TRENDOV ET AL, 2019).

In the next chapter, the comparisons will be analysed in detail between EU-28 and Kosovo in their economic fields and also some compares among Kosovo and its neighbouring countries and to solve the considerable economic difficulties.

The study focuses on comparing the economic features of the EU-28 and agricultural industry of Kosovo and also economic and agricultural conditions of Kosovo with some neighbouring countries based on the SPSS (Statistical program for social sciences) in 2012 and 2016. This SPSS statistical system was worked out by IBM SPSS (2019) based on the IBM SPSS Statistics and IBM SPSS Modeler and also, ARGYROUS (2005). The SPSS system provides the similarities and differences as measures of correlations among economic features of countries and also this system can provide clustering for neighbouring countries of Kosovo (AKSOY, 2010; ALDERMAN, 2007).

*The comparison of the agricultural industry with conditions of the EU*

In order to compare the agricultural industry with the conditions of the EU, it is important to summarize some agricultural issues in the EU (EU, 2018; FADN 2018). Trends in output value, input value, and gross value added (GVA) in the EU between 2010-2017 have been important for the development of the agricultural industry for this period. This correlation among these economic agricultural factors shows the structure of the agricultural performance and the increase. Also, the agricultural gross value added is a good and successful initiating point from the basic agricultural production in direction to calculate the possible income conditions for farmers by the factor income. This income condition can keep the farmers continue their economic activities in the agricultural sector and not to give up this once and not to leave their original places from rural and village areas to the urban areas.

Some experiences and events for the developing processes of the agricultural gross value added, which are as follows:

- The value of agricultural output (in real terms) shows no clear trend over the last 12 years. The general picture is a slight increase in both output and input value, leading to stagnation in GVA.
- The impact of the financial crisis is visible in the dip in output value and GVA in 2009.
- Agricultural output value grew during the years 2010-2013 but declined again in the years 2014- 2016. Estimates for 2017 show a recovery of output value and GVA.
- Intermediate consumption value increased until 2013 (except for 2009) and then declined slightly.
- Overall output and input prices fluctuated over the last 12 years, with a clear dip in 2009 (the year following the financial crisis) followed by 4 years of increases and 3 years of decreases. 2016 figures were close to the levels of 2010. Estimates for 2017 show a recovery of output prices (EU, 2018; FADN, 2018)

The CAP of the EU follows the difficulty and income conditions of farmers and AWU (annual working unit), which the last one summarized all of the employed workers and employees of the agricultural sector as full-time employee equivalent. The EU overviews their income positions from point of view of the Agricultural factor income, which is described below:

- In the EU-28, agricultural factor income (both total and per worker) recovered from the financial crisis of 2009 and reached a new peak in 2011. The following three years (2012-2014) revealed relatively minor changes in real terms. Factor income was lower in 2015-2016, but estimates for 2017 look promising.
- Changes in factor income can be divided into volume effects (bad/good harvests, increased/reduced herd sizes, etc.) or value effects (higher or lower prices for inputs and/or outputs).
- In 2015, the income drop can be linked to the milk market crisis, with deteriorating milk prices leading to a decline in the overall value of milk output. Along with a decline in real pig prices, the overall real value of animal output decreased by 5.9%.
- In 2016, important changes at the level of the EU28 include a reduction in crop output value by 2.5% (mostly due to low cereal harvests) and a decline in animal output value by 2.1% (mainly linked to low milk prices).
- In 2017, the value of animal output increased, due to an overall price increase of 10%. In particular, prices for pigs (+12%), milk (+18%), and eggs (+14%) have increased considerably at the EU level compared to 2016 (EU, 2018; FADN, 2018, p. 9)
- If differences in general price levels are taken into account, the picture changes significantly for individual countries. Many countries with high factor income per AWU have lower values in purchasing power standards (PPS), while those with low factor income per AWU have higher values in PPS (especially the Czech Republic, Slovakia, Hungary, and Bulgaria). The gap between highest and lowest values is reduced substantially – while a full-time farm worker in Romania generates about 8% of the nominal factor income that his/her counterpart in the Netherlands earns, this share increases to 17% once adjustments for price level differences have been made (EU, 2018; FADN, 2018)

There are indicator consists of two sub-indicators in EU-28:

- Index of the real income of factors in agriculture per annual work unit 111,96% by 2016 and 125,56% by the end of 2017 (2010= 100) in EU-28;

Net entrepreneurial income of agriculture 103,54% by 2016 and 120,74% by the end of 2017 (2010= 100) in EU-28.

Price of output and input in EU-28 between 2016-2018, namely price indices of the means of agricultural production, input (2015 = 100) (- annual data[apri_pi15_ina] Last update: 18-12-2019):

- Goods and services currently consumed in agriculture (Input 1) 2015= 100, 2016= 97,2; 2017= 99,2 and 2018= 103,27.

Price indices of agricultural products, output in EU-28 (2015 = 100) - annual data[apri_pi15_outa], Last update: 18-12-2019, Cereal, Nominal index, 2015= 100, as follows: 2016= 91,94; 2017= 97,06 and 2018= 106,92. The output has increased by mostly 7% since 2016, which could ensure more increase of price income for output of farmers in EU, because the price of input increased only by 3,27% from 2016. The EU ensured considerable subsidies for farmers, of which measure was 86,5 % as a share of the subsidies on production comparably in all of the consumption of the fixed capital in 2016 in EU-28. The increase of the agricultural gross value added in the EU was by 6,5%, while the subsidies increased by 3,4% in the inverse ratio of the decreasing rate of consumption of fixed capital and tax on production by 5,4%. All of these changes in the payments contributed to increasing the factor income for AWU (annual working unit). Therefore, the measure of subsidies has remained a considerable ratio comparably to the measure of consumption belonging to the fixed capital for 2010 and 2016. These subsidies can ensure the modernization and improvement of agricultural mechanization for farmers mostly independent from their actual possible financial difficulties, which can occur sometimes, it can be also seen in Table 17 (EUROSTAT, 2018) (aact_ali01) (aact_eaa01).

**Table 17: Main components of agricultural industry in EU-28, 2010–2016**

| Titles | 2010 (million EUR) | 2015 (million EUR) | 2016 (million EUR) | Change 2010–2016 (%), 2010 = 100% | Share in output value of the agricultural industry, 2016 (%) |
|---|---|---|---|---|---|
| **Output of agricultural industry** | **372 902** | **416 719** | **405 008** | **8.6** | **100.0** |
| Crop output | 188 875 | 215 686 | 210 282 | 11.3 | 51.9 |
| Animal output | 142 345 | 164 342 | 158 873 | 11.6 | 39.2 |
| Agricultural services | 17 693 | 20 317 | 20 104 | 13.6 | 5.0 |
| Secondary activities | 23 989 | 16 373 | 15 750 | –34.3 | 3.9 |
| **– intermediate consumption (input)** | **217 309** | **247 658** | **239 355** | **10.1** | **59.1** |
| **Gross value added** | **155 593** | **169 060** | **165 654** | **6.5** | **40.9** |
| – consumption of fixed capital | 69 401 | 61 141 | 60 803 | –5.4 | – |
| – tax on production | | 5 601 | 4 877 | | – |
| + subsidies on production | 50 917 | 50 477 | 52 628 | 3.4 | – |
| **= factor income (**2010 =100%) | **137 109** | **152 796** | **152 603** | **11.3** | **–** |
| **Growth rate (%)** | **100.0** | **11,4** | **11.3** | **–** | **–** |

Output of the agricultural industry - basic and producer prices [TAG00102]

Production value at basic price [PROD_BP] Million euro [MIO_EUR]

*Source:* Own calculation based on the SPSS statistical analyses from secondary data. Eurostat, 2018. EAA (Economic Account for Agriculture, 2018) – dataset aact_ali01 and aact_eaa01

Production value at basic price, 2010= 100%; volume index for labour costs – change in total labour input measured in 1 000 AWU (annual working unit) (Eurostat 2018); correction of the weight for labour costs to cover the family labour costs – the compensation of employees is divided by the share of paid labour also directly available from the EAA (Eurostat 2018); the Farm Accountancy Data Network to estimate the national average depreciation rate; TFP index is defined as the ratio between an output index (i.e. the change in production volumes over a considered period) and an input index (the corresponding change in inputs/factors used to produce them), the four considered production factors (intermediate inputs, land, labour, capital).

Agricultural factor income measures the remuneration of all factors of production (land, capital, labour) regardless of whether they are owned or borrowed/rented and represents all the value generated by a unit engaged in an agricultural production activity. It corresponds to the net value added at factor cost.

**Table 18: Economics accounts for agriculture at current prices in Kosovo between 2012-2017 in Million Euro**

| Sectors | 2012 | 2016 | 2017 | 2017/2012 2010=100 |
|---|---|---|---|---|
| Total plant products | 327,6 | 412,3 | 402,5 | 22,8 |
| Total livestock products | 266,6 | 302,4 | 298,4 | 12,0 |
| **Total livestock and plant products** | **594,2** | **714,7** | **700,9** | **18,0** |
| Agricultural services | 14,5 | 22,1 (3%) | 22,3 (3%) | 53,8 |
| **Total agricultural products** | **608,7** | **736,8 (100%)** | **732,2 (100%)** | **20,3** |
| - Total intermediate consumption | 218,3 | 247,4 (33,6%) | 259,5 **(35,4%)** | 20,5 |
| **Gross value added at base price** | **390,3** | **489,3 (66,4%)** | **463,7 (64,6%)** | **18,8** |
| - Consumption of fixed capital | 84,5 | 102,6 | 105,4 | 24,7 |
| - Tax | 4,2 | 2,1 | 3,0 | -28,6 |
| + Compensation of employees | 4,2 | 3,0 | 3,0 | -28,6 |
| **Net value added at base price** | **305,8** | **387,6** | **358,3** | **17,2** |
| **Factor revenue** | **305,8** | **387,6** | **358,3** | **17,2** |

*Source:* Own calculation based on the SPSS statistical analyses from secondary data.
KAS (Kosovo agency of statistics) 2018: MAFRD (Ministry of Agriculture, Forestry and Rural Development, 2018): Economic Accounts for Agriculture, developed by DEAAS-MAFRD p. 50. Green Report.Pristina, Kosovo

**Table 19: Main Component of agricultural industry in EU-28, in 2010-2017**

| **Titles** | **2010** | **2016** | **2017** | **Change 2010-2017 (%) 2010=100 %** | **Share in output value of the agricultural industry, 2016 (%)** |
|---|---|---|---|---|---|
| | **Million Euro** | | | | |
| **Output of agricultural industry** | **372 902** | **405 008** | **430 816** | **15,5** | **100,0** |
| *- Intermediate consumption (input)* | *217 309* | *239 355* | *242 872* | *11,8* | *56,4* |
| **Gross value added** | **155 593** | **165 654** | **187 944** | **20,8** | **43,6** |
| *Growth rate of Factor Income per AWU 2010=100* | *100,0* | *11,3* | *25,2* | --- | --- |

Source: Own calculation based on the SPSS statistical analyses from secondary data. Eurostat, 2018.

*There are not data for factor income of each EU member state for 2010 - 2016*

*Note:*

- Volume index for labour costs: Change in Total labour input measured in 1000 AWU (aact_ali01)
- Correction of the weight for labour costs to cover the family labour costs: the compensation of employees is divided by the share of paid labour also directly available from the EAA (aact_ali01)
- the Farm Accountancy Data Network to estimate the national average depreciation rate.
- TFP index is defined as the ratio between an Output Index (i.e. the change in production volumes over a considered period) and an Input Index (the corresponding change in inputs/factors used to produce them). The four considered production factors (intermediate inputs, land, labour, capital).

Agricultural factor income measures the remuneration of all factors of production (land, capital, labour) regardless of whether they are owned or borrowed/rented and represents all the value generated by a unit engaged in an agricultural production activity.

It corresponds to the net value added at factor cost.

The indicator consists of two sub indicators:

A. Agricultural factor income per annual work unit (AWU). An AWU in agriculture corresponds to the work performed by one person who is occupied on an agricultural holding on a full-time basis. For this indicator, total (paid and unpaid) AWU are used.
B. The index of agricultural factor income per AWU is already available in Eurostat's Economic Accounts for Agriculture as Indicator A. This index is particularly suited for showing developments over time.

Total factor productivity (TFP) compares total outputs relative to the total inputs used in production of the output. As both output and inputs are expressed in term of volume indices, the indicator measures TFP growth. EUROSTAT, 2018



With the above-mentioned positive trends of economic growth including GDP and GVA increases, there are some important economic unfavourable conditions in Kosovo. From point of view of the agricultural industry of Kosovo, the total intermediate consumption has only 33,6% in 2016 and 35,4% share from all total agricultural products in 2017, while in the case of EU-28 this share was 59,1% in 2016 from all total agricultural products, mostly double than once in Kosovo. Also, in Kosovo, the agricultural production is very extensive, because the developed level of the mechanization is at a low level because of its backwardness is considerable in international comparisons. The maintenance of materials was 3,3% in the intermediate consumption in Kosovo in 2016-2017, while in EU-28 this was 6,1%.

In spite that farmers of Kosovo used fertilizers and soil improvers in 12,2% of fertilizers in the intermediate consumption, while in EU-28 this share was 7,3% at the same time. But farmers of Kosovo used less advanced agricultural machines and investments in their basic production, in spite that the measure of the consumption of the fixed capital was 41,5%, as 102,6 million euro comparably to the intermediate consumption, as 100%= 247,4 million euro in 2016 in Kosovo, while in EU-28 measure of the consumption of the fixed capital was 25,4%, as 60 803 million euro comparably to the intermediate consumption, as 100%= 239 355 million euro in 2016 (Table 18) (KAS, 2018). This means that the less advanced machines used by farmers of Kosovo are more costly than the highly advanced machines used by farmers in EU-28.

In Kosovo this less advanced technology resulted in the decreasing wheat production value by 51,2 million euros in 2017 comparably it was less by 17,7%, as 11 million euros than in 2016 mostly by the same price (KAS, 2018). This means that the price income damage could be about 11 million euros from the difference in the field of value of wheat between 2016 and 2017 within one year by the end of 2017 for farmers of Kosovo. The decreasing yield in the value of wheat production was partly resulted by the decreasing production area of the wheat. It would be useful for the farmers in Kosovo, that the central government can provide financial subsidies for the farmers of Kosovo to cover partly the price income damages of them, which happened in the 2016-2017, as it can be seen in Table 18 (KAS, 2018). These subsidies could also be to stimulate the farmers to invest and use more advanced technologies and machines in their agricultural production in EU-28. Generally, the subsidies were equal to the taxes paid by farmers, which could not aim at developing agricultural technology in Kosovo.

The production area of the cereals has decreased by 12 % for 2012-2017, but the production of total cereal production increased by 9% in the period because the yield of cereals in ton per hectare increased by 18,8%. The area of cereals has resulted in increasing the production of vegetables and fruits. This increased total plant production and with the increase of total livestock production, which led to an increase in the gross and net value-added, increase of factor revenue by 17% by the end of 2017. Therefore, the subsidies for agriculture decreased by mostly 30% did not result in a decrease in the factor revenue of annual working units (AWUs) in Kosovo. The decrease of the subsidies for farmers in Kosovo resulted and remained the further less advanced level of the agricultural machines and agricultural technology, which will result in the less competitiveness of farmers in Kosovo either in the international market or even in the domestic market. In EU-28 the subsidies for farmers aim at developing the more advanced technology in order that the farmers can obtain more competitiveness in the international market and national – single market of the EU-28, which can be seen in in Table 17 and Table 18 (KAS, 2018).

In EU-28 the agricultural services contributed a 5,0% share of the output of the agricultural industry and additionally to this once also secondary activities had a 3,9% share in the output of the agricultural industry. In the inverse ratio of this once in Kosovo, the agricultural services had only 3% in 2016 and 2017 years in spite that these services have increased by 53,8% since 2010 till the end of 2017. But there were not any other secondary activities of farmers, which show that the activities are not diversified, therefore they could not obtain any plus incomes over the agricultural basic production in Kosovo. Less diversified activities resulted in less incomes for farmers, which can be seen in Table 17 and 18.

The average annual prices of retail (€/kg) of agricultural products have decreased by 9,0%, while the annual average wholesale prices (€/kg) of agricultural products has decreased by 5% from 2012 to 2017 (KAS, 2018, pp. 110-111). This means that the prices were very pressed for the selling price of the farmers, which could decrease the adequate price income of farmers. This situation could occur because the farmers did not commonly set up the product channel for the common selling products in order to keep higher prices and common purchasing inputs in order to keep lower price levels for their interest. The selling channels of the agricultural products were kept by the wholesale and partly by the retail traders. The less favourable income conditions of the farmers led to less investment in their agricultural production.

According to Table 19, Table 20 and Table 21, the population has strong correlations with the changes of the GDP growth, personal remittances received fertilizer consumption and arable land measure in the share of the land area. If the population increases the above-mentioned economic variances also increase. But if the population increases the agricultural land measure in the share of the land area decreases in cases of five countries, there is an inverse ratio between both of them. If the GDP growth increases the Personal remittances received, Fertilizer consumption increases, but Agriculture, value-added in the share of GDP, Employment in agriculture in the share of total employment, and the agricultural land in the share of land area decrease. The correlations among the economic variances can be analysed if the values of the variances more than 0,500, under this value the correlations cannot be considerable.

**Table 20: Comparison of Kosovo and its peers (selected indicators) 2016-2019**

| Indicator | Albania | Bosnia and Herzegovina | Kosovo | North-Macedonia | Serbia |
|---|---|---|---|---|---|
| Population (Thousands) 2018 (PoPul1) | 2 866 | 3 324 | 1 845 | 2 083 | 6 982 |
| GDP per capita (at constant 2010 US Dollar) 2018(GDP2) | 5 075 | 6 056 | 4 194 | 5 394 | 6 880 |
| Inflation, 2018 (Inflation3) | 0,8 | 1,4 | 0,2 | 4,3 | 2,0 |
| Personal remittances received (current USD bln) 2018 (Remittance4) | 1,46 | 2,12 | 1,24 | 0,34 | 4,32 |
| Agricultural machinery, tractors per 100 sq. km of arable land (Machinery5) | 121,9 (2008) | 322 (1996) | cc. 25 (2019) | 1243 (2007) | 22 (2008) |
| Fertilizer consumption (kilograms per hectare of arable land) 2016 (Fertilizer6) | 126 | 132 | cc. 80 | 79 | 245 |
| Agriculture, value added (% of GDP) (AGVA7) | 18 | 8 | 12 | 11 | 9 |
| Employment in agriculture (% of total employment), 2019 (Employment8) | 38 | 16 | 35 | 16 | 17 |
| Agricultural land (% of land area), 2016 (AgrLand9) | 43,1 | 43,1 | 52 | 50,2 | 39,3 |
| Arable land (% of land area) 2016 (ArableLand10) | 22,6 | 20,0 | 27,6 | 16,5 | 29,7 |

Note: * Includes only those formally employed. If subsistence farming is added, employment in agriculture is estimated to reach 35% of labour force.

*Source:* Own calculation based on the SPSS statistical analyses from secondary data.
World Bank, 2019a. World Bank, 2019b.

When the inflation increases the agricultural machinery, tractors per 100 sq. km of arable land increases but the employment in agriculture and the arable land measure decreased. This means that the cost of machines is at a high level, and the farmers purchase expensive machines, the selling price of agricultural products can increase, which increases the inflation rate. Also, if the inflation increases by the increasing purchasing the agricultural machines, the mechanization process decreases the level of the employment in the agricultural sector and also the arable land measures, because the fruit and vegetable production will increase.

**Table 21: Correlation Matrix[a]**

| | | PoPul1 | GDP2 | Inflation3 | Remittance4 | Machinery5 | Fertilizer6 | AGVA7 | Employment8 | AgrLand9 | ArableLand10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Correlation | PoPul1 | 1,000 | ,866 | ,036 | ,962 | -,402 | ,995 | -,378 | -,417 | -,834 | ,575 |
| | GDP2 | ,866 | 1,000 | ,360 | ,771 | -,021 | ,844 | -,554 | -,747 | -,824 | ,111 |
| | Inflation3 | ,036 | ,360 | 1,000 | -,212 | ,897 | -,040 | -,308 | -,708 | ,103 | -,602 |
| | Remittance4 | ,962 | ,771 | -,212 | 1,000 | -,608 | ,970 | -,394 | -,295 | -,815 | ,705 |
| | Machinery5 | -,402 | -,021 | ,897 | -,608 | 1,000 | -,469 | -,145 | -,497 | ,429 | -,835 |
| | Fertilizer6 | ,995 | ,844 | -,040 | ,970 | -,469 | 1,000 | -,308 | -,344 | -,871 | ,597 |
| | AGVA7 | -,378 | -,554 | -,308 | -,394 | -,145 | -,308 | 1,000 | ,839 | ,110 | -,041 |
| | Employment8 | -,417 | -,747 | -,708 | -,295 | -,497 | -,344 | ,839 | 1,000 | ,265 | ,306 |
| | AgrLand9 | -,834 | -,824 | ,103 | -,815 | ,429 | -,871 | ,110 | ,265 | 1,000 | -,295 |
| | ArableLand10 | ,575 | ,111 | -,602 | ,705 | -,835 | ,597 | -,041 | ,306 | -,295 | 1,000 |

*Source:* Own calculation based on the SPSS statistical analyses from secondary data.
World Bank, 2019a; World Bank, 2019b.

If the personal remittances received increases, this means that the fertilizer consumption (kilograms per hectare of arable land) and arable land (% of land area) increase, but the agricultural machinery, tractors per 100 sq. km of arable land, and agricultural land (% of land area) decrease.

If the agricultural machinery, tractors per 100 sq. km of arable land increases the fertilizer consumption, the employment in agriculture and arable land (% of land area) decrease, but somehow the agricultural land (% of land area) can little increase.

If the fertilizer consumption increases the agricultural land (% of land area) decreases but the arable land (% of land area) can increase.

If the employment in agriculture (% of total employment) increases agriculture, the value added (% of GDP) as well as can increase.

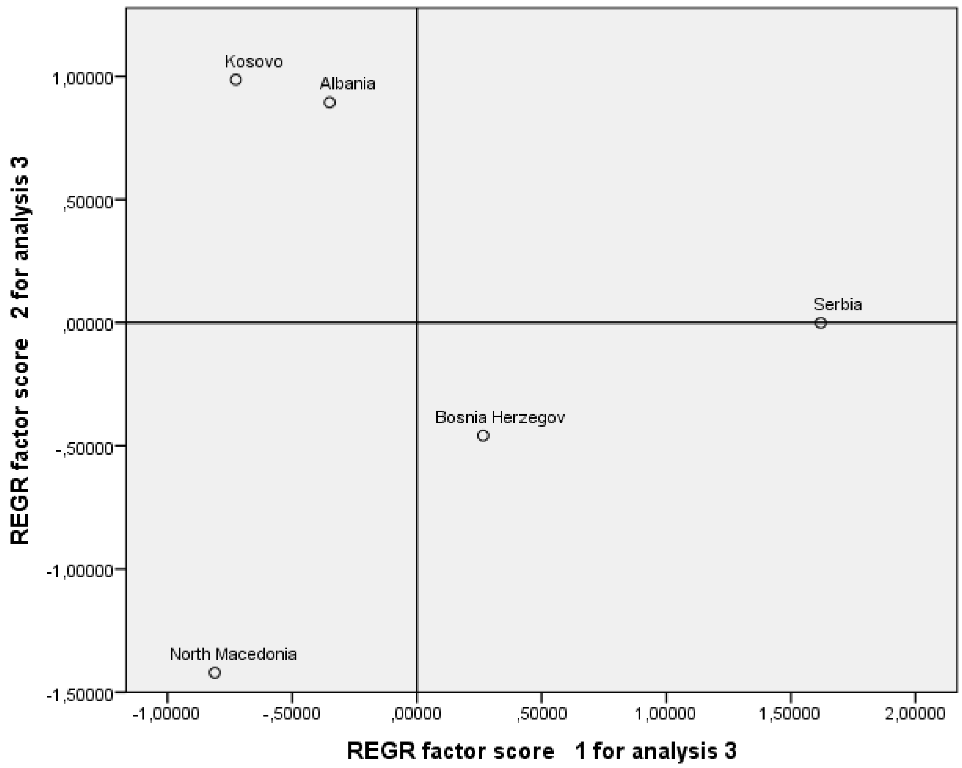


**Figure 7: Factor analyses for economic variables of Component-1 and Component-2 in the coordinate system**

*Source*: Own calculation based on the SPSS statistical analyses from secondary data. World Bank, 2019a; World Bank, 2019b

**Table 22: Rotated Component Matrix[a]**

| | Component | |
|---|---|---|
| | 1 | 2 |
| PoPul1 | ,982 | -,012 |
| GDP2 | ,880 | -,437 |
| Inflation3 | -,047 | -,924 |
| Remittance4 | ,981 | ,179 |
| Machinery5 | -,459 | -,863 |
| Fertilizer6 | ,981 | ,065 |
| AGVA7 | -,461 | ,551 |
| Employment8 | -,447 | ,865 |
| AgrLand9 | -,859 | -,061 |
| ArableLand10 | ,560 | ,683 |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

*source:* Own calculation based on the SPSS statistical analyses from secondary data. World Bank, 2019a.World Bank, 2019b

**Indicators = Economic variances**

PoPul1 = Population (Thousands) 2018
GDP2 = GDP per capita (at constant 2010 US Dollar) 2018
Inflation3 = Inflation, 2018
Remittance4 = Personal remittances received (current USD bln) 2018
Machinery5 = Agricultural machinery, tractors per 100 sq. km of arable land
Fertilizer6 = Fertilizer consumption (kilograms per hectare of arable land) 2016
AGVA7 = Agriculture, value added (% of GDP)
Employment8 = Employment in agriculture (% of total employment), 2019
AgrLand9 = Agricultural land (% of land area), 2016
ArableLand10 = Arable land (% of land area) 2016

The Table 22 shows two components set up by economic variances, where the component-1 consists of Population, GDP per capita, Personal remittances received, Fertilizer consumption, (Minus) Agricultural land (% of land area), which variances at principal line "X" in the coordinate system in Figure-7. The component-2 consists of (Minus) inflation, (Minus) agricultural machinery, agriculture, value added (% of GDP), employment in agriculture, and Arable land measure at principal line "Y". The (Minus) sign with economic variances means that these economic variances are in inverse ratio to the other variances, which are positive and not negative valued variances.

In the coordinate system in the first quarter and the third quarter the economic variances of component -1 at the line "X", as Population, GDP per capita, Personal remittances received, Fertilizer consumption, increase and (Minus) Agricultural land (% of land area) decreases or only little increase in Serbia and Bosnia-Herzegovina. But at principal line "Y" in the first quarter, the component-2 consists of agriculture, value added (% of GDP), employment in agriculture and Arable land measure, which increase or little decrease but the (Minus) inflation, (Minus) agricultural machinery decrease or little increase in Serbia.
But in the third quarter at principal line "Y" in the first quarter, the component-2 in Bosnia-Herzegovina the agriculture, value added (% of GDP), employment in agriculture and Arable land measure decrease or little increase, but the (Minus) inflation, (Minus) agricultural machinery increase or little decrease, because the line "Y" under the Zero point is minus, but the economic variances are minus, therefore in this session, these variances became positive valued once.
In the coordinate system in the second quarter and the fourth quarter the economic variances of component -1 at the line "X", as Population, GDP per capita, Personal remittances received,

Fertilizer consumption decrease and (Minus) Agricultural land (% of land area) increases or only little decrease in Kosovo, Albania, and North Macedonia. But at principal line "Y" in the second quarter, the component-2 consists of agriculture, value added (% of GDP), employment in agriculture and Arable land measure, which increase or little decrease but the (Minus) inflation, (Minus) agricultural machinery decrease or little increase in Kosovo and Albania.
But in the fourth quarter at principal line "Y", the component-2 in North Macedonia the agriculture, value added (% of GDP), employment in agriculture and Arable land measure decrease or little increase, but the (Minus) inflation, (Minus) agricultural machinery increase or little decrease, because the line "Y" under the Zero point is minus, but the economic variances are minus, therefore in this session, these variances became positive valued once.
The Figure 8 shows the clustering of five countries into three clusters, namely cluster-1 includes Kosovo and Albania, cluster-2 includes Bosnia-Herzegovina and North Macedonia, and cluster-3 includes Serbia because its economic variances as features are better and different from the other countries.

In the case of Kosovo, the Population, GDP per capita, Personal remittances received, Fertilizer consumption decrease and (Minus) Agricultural land (% of land area) increases comparably to the economic variances of the other neighbouring countries. But in Kosovo agriculture, value added (% of GDP), employment in agriculture and Arable land measure, which increase but the (Minus) inflation, (Minus) agricultural machinery decrease.
Generally, it can be declared that in Kosovo the employment in agriculture is a very high level accompanying with less developed machinery level, in spite that the inflation rate is at a low level with a high portion of the agricultural land of total land area than the cases of the other neighbouring countries. The international competitiveness of farmers needs for developing the mechanization accompanying increasing subsidies for farmers. The advanced machinery level can decrease the level of employment in the agricultural sector in Kosovo, which needs for the development of the other industrial sectors.

In some conclusions, generally, in Kosovo, the GDP - per capita in purchase power parity (PPP) has increased by 6,9% for the period of 2015-2017 in 2016 US dollars. Definition: This entry shows GDP on a purchasing power parity basis divided by population as of 1 July for the same year. (CIA World Factbook, 2019). The difficulty for the farmers was that the GDP in PPP per capita was mostly favourable for the traders and not for farmers, because of prices pressed by traders against the interest of farmers. The pressed price level does not ensure enough price income for improving agricultural production. Also, the subsidies provided for farmers has decreased by 29% for the period between 2012 and 2017.

Additionally, to the above-mentioned difficulties the farmers of Kosovo have other unfavourable conditions concerning the decreasing subsidies by mostly 30% between 2012 and 2017, also, considerable backwardness of mechanization level, decreasing the yield of cereal production by its amount of 51 million euro within one last year, only a few fertilizers and pesticides used by farmers. In the neighbouring countries closed to Kosovo, the agricultural conditions could be a little more favourable for example in Albania and Bosnia-Herzegovina than in Kosovo.

The lack of capital, the less educated, and skilled employees in the agricultural industry result in some economic difficulties for the further prosperity of the sector in Kosovo. The possible solutions for the agricultural industry in Kosovo, for example, to develop the mechanization, common selling-purchasing of farmers, more activities in agricultural services, secondary activities, increasing the subsidies for farmers, obtaining of farmers in food manufacturing industries, extent the maintenance-network for the agricultural machines, extending the agricultural advisory network and also, create the better credit conditions for farmers. The more international subsidies provided by the EU-28 are needed for the agricultural industry of Kosovo. The ratio of employed people is a very high level in agriculture, which should be decreased by industrializations in other economic sectors to withdraw more employees of agriculture to the other industrial sectors.

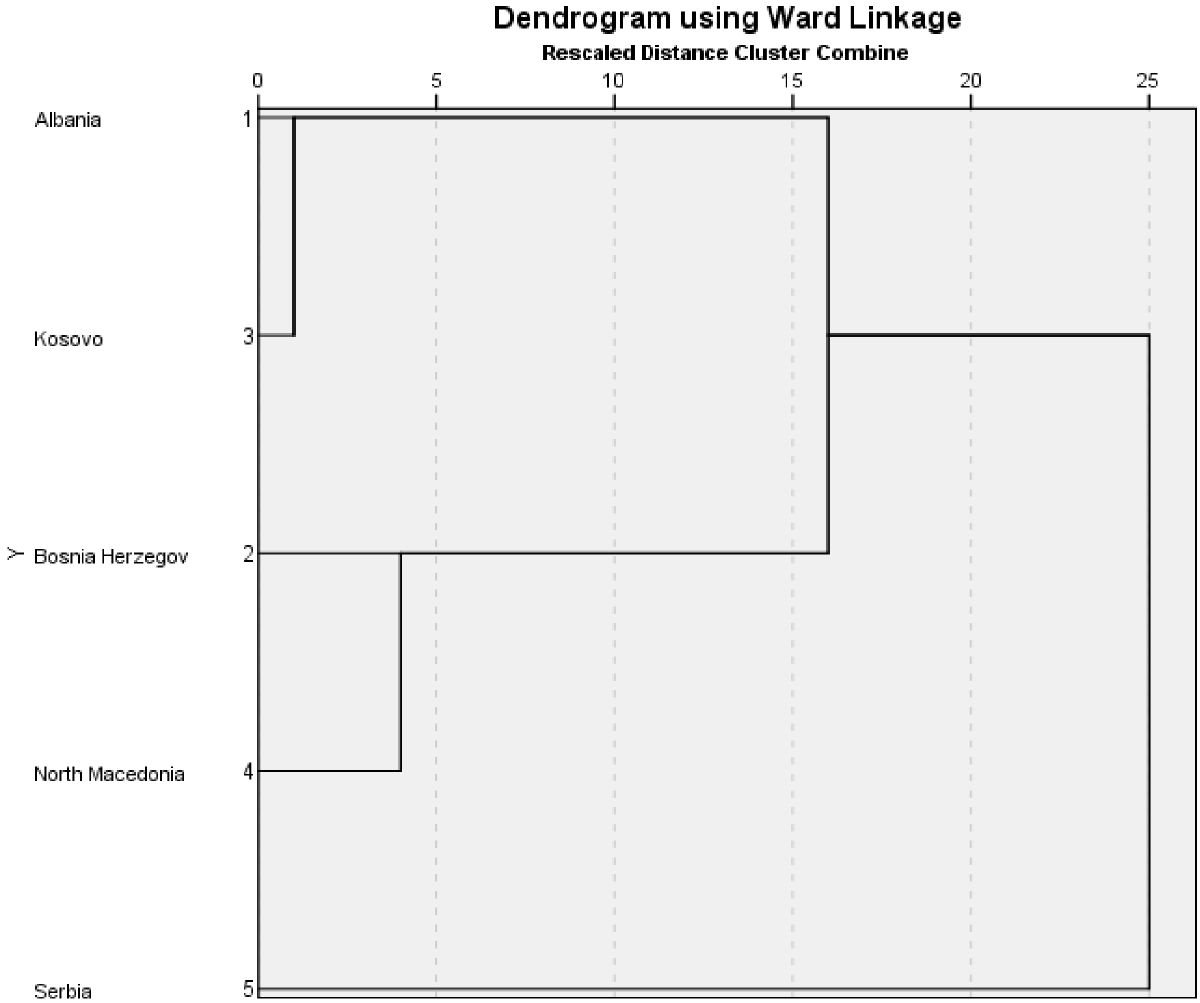


**Figure 8: Clustering for Kosovo and its neighbour countries based on the dendrogram using Ward Linkage**

*Source:* Own calculation based on the SPSS statistical analyses from secondary data. World Bank, 2019a; World Bank, 2019b

*4.5.3. Analysis of the economic features of farmers in Kosovo*

For the latest several years, 2018-2019 some main data have been collected based on the questions from farmers of Kosovo, mainly some different regions and riverbeds. The data mostly covered economic and social conditions of the farmers and their farming households emphasizing their ages, farm measures, owners, full-time workers, part-time workers, number of agricultural machines concerning the mechanization level on farms, and several water issues concerning the water supply and some investments for water irrigation. The summarised data focus on fourteen farms, which were the biggest ones in the samples of my scientific research program including nine important questions transferring to nine economic variances in the analysing study.

The summarised data are analysed by SPSS statistical program, as it was used in the earlier chapters of the study, where nine variances as (Minus)Age1 (Age of farmers, year), FarmSi2 (Farm size in hectare including owned and rented lands, hectare), IrSyst3 (1, 2, 3,4 advanced systems used by farmers (1 drip system; 2 spray system - raining system; 3 surface system; 4 typhoon system), FullTW4 (Full time workers, number), ParTWo5 (Part time workers, number), WoExtrac6 (Time length in minutes or hours for water extraction take during an irrigation in hour per hectare), NuoMach7 (Number of agricultural machines between 1970-2017), AgeOMach8 (Age of machines used on the farms 1970-2017, year), InveIr9 (Investment in irrigation project in euro in thousand) and WUF10 (water use efficiency in price income of farmer per $m^3$ water use annually in percent 2016-2019, 2016= 100) and WUF10 (water use efficiency in price income of farmer per m3 water use annually in percent) (see in detailed in Table 23). In this study, fifty-one farmers are signed by ordering. The economic variances were selected into three components, of which the first one becomes lying at the principal line "X" and the other two variances are lying at the principle line "Y" in the coordinate system. The component-1 includes FarmSi2, FullTW4, NuoMach7, (Minus)AgeOMach8, InveIr9, the component-2 includes IrSyst3, ParTWo5, WUF10 and the component-3 includes (Minus)Age1, WoExtrac6. All of the economic variances included in the component-2 and 3 are lying at the principle line "Y" in the coordinate systems (see the Figure 9 and Figure 10).

**Table 23: Data base for selected farmers in Kosovo in 2016-2019 in percent**

| Economic Variances Farmers | Age1 | FarmSi 2 | IrSyst 3 | FullT W4 | ParT Wo5 | WoEx trac6 | Nuo Mach 7 | AgeO Mach 8 | InveIr 9 | WU F10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Farmer-1 | 24 | 160 | 12 | 5 | 10 | 5 | 6 | 10 | 55 | 20 |
| Farmer-2 | 54 | 103 | 2 | 4 | 6 | 3 | 4 | 6 | 180 | 35 |
| Farmer-3 | 40 | 93 | 3 | 3 | 8 | 4 | 7 | 28 | 1 | 15 |
| Farmer-4 | 49 | 58 | 12 | 2 | 1 | 2 | 7 | 20 | 5 | 12 |
| Farmer-5 | 37 | 50 | 12,34 | 1 | 25 | 2,5 | 2 | 25 | 12 | 14 |
| Farmer-6 | 33 | 44 | 1 | 4 | 10 | 10 | 1 | 25 | 30 | 6 |
| Farmer-7 | 22 | 32 | 1 | 15 | 20 | 20 | 3 | 20 | 70 | 8 |
| Farmer-8 | 28 | 30 | 2,34 | 1 | 5 | 6 | 6 | 30 | 8 | 2 |
| Farmer-9 | 50 | 20 | 1 | 2 | 3 | 1 | 1 | 20 | 1 | 4 |
| *Farmer10* | *54* | *15* | *2* | *1* | *1* | *1* | *4* | *17* | *1* | *4* |
| Farmer11 | 30 | 25 | 12 | 1 | 4 | 8 | 1 | 25 | 10 | 34 |
| Farmer12 | 48 | 30 | 12 | 2 | 3 | 2 | 1 | 24 | 1 | 14 |
| Farmer13 | 40 | 16,2 | 12,3 | 1 | 3 | 3 | 1 | 25 | 2 | 16 |
| Farmer14 | 46 | 22 | 2,3 | 1 | 4 | 2 | 1 | 20 | 5 | 20 |
| Farmer15 | 36 | 20 | 2 | 1 | 1 | 8 | 4 | 30 | 1 | 15 |
| Farmer16 | 42 | 10 | 1 | 2 | 6 | 4 | 1 | 35 | 12 | 18 |
| Farmer17 | 29 | 10 | 1 | 2 | 6 | 6 | 2 | 20 | 15 | 20 |
| Farmer18 | 46 | 13 | 2,34 | 1 | 3 | 2 | 3 | 35 | 5 | 22 |
| Farmer19 | 69 | 20 | 2,3 | 1 | 2 | 1 | 4 | 25 | 7 | 25 |
| *Farmer20* | *64* | *19* | *2,3* | *1* | *1* | *7* | *1* | *35* | *1* | *14* |
| Farmer21 | 59 | 22 | 1 | 1 | 1 | 2 | 1 | 40 | 1 | 12 |
| Farmer22 | 40 | 8 | 2,34 | 1 | 1 | 10 | 2 | 40 | 2,5 | 35 |
| Farmer23 | 44 | 8 | 12,34 | 1 | 1 | 3 | 4 | 35 | 4,5 | 32 |
| **Economic Variances Farmers** | **Age1** | **FarmSi 2** | **IrSyst 3** | **FullT W4** | **ParT Wo5** | **WoEx trac6** | **Nuo Mach 7** | **AgeO Mach 8** | **InveIr 9** | **WU F10** |

**Table 23: Data base for selected farmers in Kosovo in 2016-2019 in percent (continued)**

| Economic Variances Farmers | Age1 | FarmSi 2 | IrSyst 3 | FullT W4 | ParT Wo5 | WoEx trac6 | Nuo Mach 7 | AgeO Mach 8 | InveIr 9 | WUF 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Farmer24 | 55 | 9,2 | 12,34 | 24 | 3 | 2 | 6 | 35 | 5 | 15 |
| Farmer25 | 42 | 11 | 12,3 | 1 | 4 | 3 | 3 | 30 | 5 | 25 |
| Farmer26 | 52 | 22 | 2,3 | 1 | 1 | 8 | 1 | 30 | 1 | 15 |
| Farmer27 | 63 | 19 | 3 | 1 | 1 | 4 | 3 | 30 | 1 | 10 |
| Farmer28 | 53 | 43 | 2,34 | 10 | 30 | 10 | 6 | 40 | 25 | 40 |
| Farmer29 | 28 | 6 | 12,34 | 2 | 10 | 2 | 2 | 30 | 1,5 | 30 |
| *Farmer30* | *29* | *7* | *1,2* | *1* | *7* | *3* | *2* | *25* | *4* | *18* |
| Farmer31 | 38 | 7 | 1 | 1 | 1 | 4 | 2 | 18 | 1 | 10 |
| Farmer32 | 31 | 5 | 1 | 1 | 2 | 5 | 2 | 10 | 3 | 8 |
| Farmer33 | 56 | 15 | 2 | 1 | 40 | 2,5 | 4 | 25 | 1 | 12 |
| Farmer34 | 55 | 8 | 2 | 1 | 35 | 4 | 4 | 25 | 1 | 8 |
| Farmer35 | 45 | 105 | 12,3 | 50 | 20 | 2 | 6 | 5 | 100 | 40 |
| Farmer36 | 26 | 5 | 1 | 6 | 25 | 2 | 1 | 30 | 10 | 35 |
| Farmer37 | 35 | 7 | 1 | 1 | 3 | 6 | 2 | 35 | 1 | 25 |
| Farmer38 | 51 | 6 | 3 | 2 | 1 | 4 | 1 | 30 | 1 | 6 |
| Farmer39 | 51 | 6 | 3 | 1 | 1 | 4 | 1 | 30 | 1 | 5 |
| *Farmer40* | *35* | *7* | *1* | *1* | *3* | *2* | *2* | *30* | *1* | *5* |
| Farmer41 | 67 | 12 | 2 | 1 | 2 | 1 | 3 | 20 | 1 | 12 |
| Farmer42 | 50 | 8 | 2 | 1 | 2 | 1 | 2 | 20 | 1 | 25 |
| Farmer43 | 49 | 6 | 12 | 1 | 43 | 2 | 4 | 25 | 3 | 30 |
| Farmer44 | 43 | 4,5 | 3 | 1 | 3 | 2 | 1 | 20 | 1 | 12 |
| Farmer45 | 42 | 4,5 | 3 | 1 | 3 | 2 | 1 | 25 | 1 | 14 |
| Farmer46 | 24 | 6 | 1 | 1 | 4 | 3 | 3 | 25 | 5 | 15 |
| Farmer47 | 34 | 4 | 1 | 1 | 3 | 2 | 1 | 25 | 1 | 8 |
| Farmer48 | 52 | 4 | 12 | 1 | 25 | 3 | 1 | 25 | 1 | 12 |
| Farmer49 | 35 | 15 | 1 | 1 | 1 | 1,5 | 5 | 35 | 3,5 | 15 |
| *Farmer50* | *29* | *15* | *1,03* | *1* | *4* | *2* | *2* | *35* | *8* | *42* |
| Farmer51 | 31 | 15 | 1,03 | 1 | 10 | 1,5 | 2 | 25 | 8 | 43 |
| **Economic Variances Farmers** | **Age1** | **FarmSi 2** | **IrSyst 3** | **FullT W4** | **ParT Wo5** | **WoEx trac6** | **Nuo Mach 7** | **AgeO Mach 8** | **InveIr 9** | **WUF 10** |

*Source*: Own calculation based on the SPSS statistical system. From primary data in Kosovo in period of 2016 and 2019

*Economic variables*

Age1= Age of farmers, year

FarmSi2= Farm size in hectare including owned and rented lands, hectare

IrSyst3= 1, 2, 3,4 advanced systems used by farmers (1 drip system; 2 spray system - raining system; 3 surface system; 4 typhoon system)

FullTW4= Full time workers, number

ParTWo5= Part time workers, number

WoExtrac6= Time length in minutes or hours for water extraction take during an irrigation in hour per hectare

NuoMach7= Number of agricultural machines between 1970-2017

AgeOMach8= Age of machines used on the farms 1970-2017, year

InveIr9= Investment in irrigation project in euro in thousand

WUF10= water use efficiency in price income of farmer per $m^3$ water use annually in percent 2016-2019, 2016= 100

*Components:*

Line”X”= Component-1: FarmSi2, FullTW4, NuoMach7, (Minus)AgeOMach8, InveIr9

Line”Y”= Component-2: IrSyst3, ParTWo5, WUF10

Line”Y”= Component-3: (Minus)Age1, WoExtrac6

*Clusters:*

Cluster-1 (3): Farmer-1, Farmer-2, Farmer-35,

Cluster-2 (11): Farmer-3, Farmer-4, Farmer-5, Farmer11, Farmer12, Farmer13, Farmer23, Farmer24, Farmer25, Farmer29, Farmer48

Cluster-3 (32): Farmer-6, Farmer-8, Farmer-9, Farmer10, Farmer14, Farmer15, Farmer16, Farmer17, Farmer18, Farmer19,
Farmer20, Farmer21, Farmer22, Farmer26, Farmer27,
Farmer30, Farmer31, Farmer32, Farmer36, Farmer37, Farmer38,
Farmer39, Farmer40, Farmer41, Farmer42 Farmer44, Farmer45,
Farmer46, Farmer47, Farmer49, Farmer50, Farmer51

Cluster-4 (1): Farmer7

Cluster-5 (4): Farmer28, Farmer33, Farmer34, Farmer43

**Table 24: Correlation Matrix**

| | | Age1 | FarmSi2 | IrSyst3 | FullTW4 | ParTWo5 | WoExtrac6 | NooMach7 | AgeOMach8 | InveIr9 | WUF10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Correlation | Age1 | 1,000 | -,076 | ,018 | ,004 | ,006 | -,294 | ,071 | ,086 | -,056 | -,143 |
| | FarmSi2 | -,076 | 1,000 | ,279 | ,406 | ,108 | ,110 | **,543** | **-,477** | **,666** | ,176 |
| | IrSyst3 | ,018 | ,279 | 1,000 | ,282 | ,187 | -,165 | ,230 | -,125 | ,060 | ,219 |
| | FullTW4 | ,004 | ,406 | ,282 | 1,000 | ,216 | ,110 | ,389 | -,287 | **,488** | ,260 |
| | ParTWo5 | ,006 | ,108 | ,187 | ,216 | 1,000 | ,108 | ,213 | -,084 | ,147 | ,196 |
| | WoExtrac6 | -,294 | ,110 | -,165 | ,110 | ,108 | 1,000 | ,002 | ,121 | ,213 | -,043 |
| | NooMach7 | ,071 | ,543 | ,230 | ,389 | ,213 | ,002 | 1,000 | -,127 | ,274 | ,122 |
| | AgeOMach8 | ,086 | -,477 | -,125 | -,287 | -,084 | ,121 | -,127 | 1,000 | **-,537** | ,087 |
| | InveIr9 | -,056 | ,666 | ,060 | ,488 | ,147 | ,213 | ,274 | -,537 | 1,000 | ,317 |
| | WUF10 | -,143 | ,176 | ,219 | ,260 | ,196 | -,043 | ,122 | ,087 | ,317 | 1,000 |
| Sig. (1-tailed) | Age1 | | ,298 | ,450 | ,488 | ,484 | ,018 | ,311 | ,273 | ,347 | ,159 |
| | FarmSi2 | ,298 | | **,024** | **,002** | ,225 | ,222 | **,000** | **,000** | **,000** | ,108 |
| | IrSyst3 | ,450 | ,024 | | **,023** | ,094 | ,124 | ,053 | ,191 | ,338 | ,062 |
| | FullTW4 | ,488 | ,002 | ,023 | | ,064 | ,221 | **,002** | **,020** | **,000** | **,033** |
| | ParTWo5 | ,484 | ,225 | ,094 | ,064 | | ,226 | ,067 | ,279 | ,152 | ,084 |
| | WoExtrac6 | ,018 | ,222 | ,124 | ,221 | ,226 | | ,493 | ,198 | ,066 | ,382 |
| | NooMach7 | ,311 | ,000 | ,053 | ,002 | ,067 | ,493 | | ,187 | ,026 | ,198 |
| | AgeOMach8 | ,273 | ,000 | ,191 | ,020 | ,279 | ,198 | ,187 | | **,000** | ,272 |
| | InveIr9 | ,347 | ,000 | ,338 | ,000 | ,152 | ,066 | ,026 | ,000 | | **,012** |
| | WUF10 | ,159 | ,108 | ,062 | ,033 | ,084 | ,382 | ,198 | ,272 | ,012 | |

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

In the case of (Minus)Age1, the Minus means that this economic variance has been in inverse ratio to the other economic variances. This is very clear, because if the farmer is young aged, the farm-size can be bigger, the number of agricultural machines is bigger, the number of full-time and part-time workers can be more. These data are average in all the time. Also, if the farmers are old-aged people, the farm-size can be less, the number of agricultural machines is less, the number of full-time and part-time workers can be less. In these cases, the number of ages and the number of other variances is opposite to each other.

The Table 24 shows the correlations among economic variances based on the primary data collected from 51 farmers. The measure of correlations among the farmers can be selected into four branches or groups. If the value of correlations among the economic variances over 0,800 and till 1,000, the correlations are very strong, but if the value of correlations among the economic variances between 0,600 till the 0,800, the correlations are strong, and between 0,500 and 0,600, or close to the level of 0,500 the correlations is middle strong. Under the level 0,500 until the level of 0,400 the results can be weak, but under the level of 0,400 the values of correlations are not important. In Table 24 the numbers of the table are up-right from diagonal signed as 1,000 are the same as numbers of this table down-left from diagonal. Therefore, the numbers of Table 24 up-right from the diagonal can only be seen.

The FarmSi2 (Farm size) has strong correlations with InveIr9 (Investment in irrigation project) by 0,666 and has middle strong correlations with NooMach7 (Number of agricultural machines), also with (Minus)AgeOMach8 (Age of machines used on the farms), because it is closed to the level of the 0,500. But its middle strong correlation is negative with (Minus)AgeOMach8, which means that this last one economic variance is in inverse ratio to the other variances. If the farm size is large or big or increasing the age of machines used is less, or the farm size is small or decreasing the age of machines used is old or older. This means that the farmers have small-sized farms they cannot buy new machines, because of less price incomes from their economic activities, therefore, the age of their machines is old. The backwardness of these farms is considerable. This correlation is valid within these cases of 51 farms. Those farmers can realise the advanced mechanization and modernization, which have large or larger farms with a higher level of the price incomes (see Table 24 and also Table 28).

Also, there is a contradictive correlation, when the AgeOMach8 has a negative middle strong correlation with InveIr9 (Investment in irrigation project) by the value of -0,537. This means that if the age of machines is at a high level, the investment in irrigation project is at a low level, or if the age of machines is at a low level -which means that they are modern or advanced -, the amount of investment in irrigation project is at a high level, as these are modern.

Also, the FullTW4 (Full time workers, number) has a middle strong correlation with InveIr9 (Investment in irrigation project), which means that the increasing trends in the field of investment in irrigation projects are accompanying by an increasing number of full-time workers. The increasing investment in irrigation means better or more favourable economic conditions and financial issues to use more full-time workers on farms. Also, the significance relations are similar to the correlations among the economic variances. The significance relations are strong if the values of significance are closed to zero or less than 0,050 value.

The FarmSi2 has very strong significance relations with IrSyst3, FullTW4, NooMach7, AgeOMach8, and InveIr9. Also, IrSyst3 (1, 2, 3,4 advanced systems used by farmers, as 1 drip system; 2 spray system - raining system; 3 surface system; 4 typhoon system) has very strong significant correlations with FullTW4.

Also, the FullTW4 has very strong significance relations with NooMach7, AgeOMach8, InveIr9, and WUF10 (water use efficiency in price income of farmer per m3 water use annually). This last one means that if the number of full-time workers increases, the NooMach7 (Number of agricultural machines), AgeOMach8 (Age of machines used on the farms 1970-2017, year), the InveIr9 (Investment in irrigation project in euro in thousand) and WUF10 (water use efficiency in price income of farmer per m3 water use annually in percent) also increase. In the case of significance relation, there are not negative and positive values, because the value of significance should be closed to "zero". If the significance value is far from the "zero" there is no significant relation among economic variances. The significance means that there is no difference among economic variances, which means that the difference is "zero" or not important.

Also, there is a strong significance between AgeOMach8 and InveIr9. Also, there is strong significance between InveIr9 (Investment in irrigation project) and WUF10 (water use efficiency in price income of farmer per m3 water use annually in percent). This last one means that if the investment in irrigation project increases naturally the water use efficiency increases. But if the investment in irrigation project decreases naturally the water use efficiency cannot increases.
Table-25 shows that the value of KMO, as Kaiser-Meyer-Olkin Measure of Sampling Adequacy, is more than 0,500, therefore the SPSS statistical analyses are valid for analysing the economic-social conditions of 51 farmers in Kosovo. Also Approx. Chi-Square should better if its value is over 100,000 and the value of significance should be at the "zero" level. This Table 25 is an economic and social control for proofing the possibility of using SPSS in this researching field of 51 farmers.

**Table 25: KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | ,550 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 127,431 |
| | df | 45 |
| | Sig. | ,000 |

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

**Table 26: Anti-image Matrices**

| | | Age1 | FarmSi2 | IrSyst3 | FullTW4 | ParTWo5 | WoExtrac6 | NooMach7 | AgeOMach8 | InveIr9 | WUF10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Anti-image Covariance | Age1 | ,811 | ,043 | -,017 | -,039 | -,059 | ,275 | -,051 | -,150 | -,099 | ,198 |
| | FarmSi2 | ,043 | ,356 | -,143 | ,045 | ,071 | -,035 | -,233 | ,078 | -,160 | ,019 |
| | IrSyst3 | -,017 | -,143 | ,751 | -,155 | -,110 | ,093 | ,020 | ,039 | ,131 | -,127 |
| | FullTW4 | -,039 | ,045 | -,155 | ,629 | -,033 | -,072 | -,161 | ,055 | -,117 | -,065 |
| | ParTWo5 | -,059 | ,071 | -,110 | -,033 | ,863 | -,134 | -,129 | ,081 | ,001 | -,124 |
| | WoExtrac6 | ,275 | -,035 | ,093 | -,072 | -,134 | ,675 | ,058 | -,233 | -,140 | ,200 |
| | NooMach7 | -,051 | -,233 | ,020 | -,161 | -,129 | ,058 | ,591 | -,089 | ,056 | ,025 |
| | AgeOMach8 | -,150 | ,078 | ,039 | ,055 | ,081 | -,233 | -,089 | ,487 | ,177 | -,242 |
| | InveIr9 | -,099 | -,160 | ,131 | -,117 | ,001 | -,140 | ,056 | ,177 | ,319 | -,191 |
| | WUF10 | ,198 | ,019 | -,127 | -,065 | -,124 | ,200 | ,025 | -,242 | -,191 | ,642 |
| Anti-image Correlation | Age1 | ,281[a] | ,080 | -,021 | -,054 | -,070 | ,372 | -,074 | -,239 | -,194 | ,274 |
| | FarmSi2 | ,080 | ,666[a] | -,276 | ,096 | ,128 | -,072 | -,508 | ,188 | -,476 | ,040 |
| | IrSyst3 | -,021 | -,276 | ,554[a] | -,226 | -,137 | ,130 | ,030 | ,064 | ,268 | -,183 |
| | FullTW4 | -,054 | ,096 | -,226 | ,782[a] | -,044 | -,111 | -,264 | ,099 | -,262 | -,102 |
| | ParTWo5 | -,070 | ,128 | -,137 | -,044 | ,593[a] | -,175 | -,180 | ,126 | ,002 | -,167 |
| | WoExtrac6 | ,372 | -,072 | ,130 | -,111 | -,175 | ,274[a] | ,092 | -,407 | -,302 | ,303 |
| | NooMach7 | -,074 | -,508 | ,030 | -,264 | -,180 | ,092 | ,609[a] | -,166 | ,129 | ,040 |
| | AgeOMach8 | -,239 | ,188 | ,064 | ,099 | ,126 | -,407 | -,166 | ,487[a] | ,449 | -,433 |
| | InveIr9 | -,194 | -,476 | ,268 | -,262 | ,002 | -,302 | ,129 | ,449 | ,577[a] | -,422 |
| | WUF10 | ,274 | ,040 | -,183 | -,102 | -,167 | ,303 | ,040 | -,433 | -,422 | ,352[a] |

a. Measures of Sampling Adequacy (MSA) at diagonal line

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

The down-part of Table 26 shows the anti-image correlations of economic variances. The values signed by "a" in the diagonal show the measure of the importance of economic variances in this research. If the value of each economic variance is more than the level of 0,500, this means that the given economic variance is important for the statistical analyses. In this case the FarmSi2, IrSyst3, FullTW4, ParTWo5, NuoMach7 and InveIr9. This does not mean that the other economic variances are not important, but their importance less than the other, of which values are over the level of 0,500.

**Table 27: Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 3,009 | 30,090 | 30,090 | 3,009 | 30,090 | 30,090 | 2,562 | 25,617 | 25,617 |
| 2 | 1,410 | 14,096 | 44,186 | 1,410 | 14,096 | 44,186 | 1,720 | 17,203 | 42,819 |
| 3 | 1,269 | 12,693 | **56,879** | 1,269 | 12,693 | 56,879 | 1,406 | 14,060 | 56,879 |

Extraction Method: Principal Component Analysis.

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

Table 27 shows the total variance explained by initial eigenvalues based on the cumulative of three components including ten economic variances. If this value as cumulative of three components is over 60% or closed to 60%, the statistical analyses are valid in this case of 51 farmers. In this case the cumulative of three components is closed to 60%, therefore the analyses are accepted by this statistical system.

**Table 28: Rotated Component Matrix[a]**

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Age1 | -,027 | -,044 | **-,699** |
| FarmSi2 | **,833** | ,220 | ,044 |
| IrSyst3 | ,164 | **,585** | -,353 |
| FullTW4 | **,556** | ,465 | ,035 |
| ParTWo5 | ,053 | **,597** | ,082 |
| WoExtrac6 | ,062 | ,027 | **,811** |
| NooMach7 | **,474** | ,430 | -,166 |
| AgeOMach8 | **-,797** | ,214 | ,096 |
| InveIr9 | **,815** | ,158 | ,248 |
| WUF10 | ,023 | **,707** | ,164 |

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

Line”X”= Component-1: FarmSi2, FullTW4, NooMach7, (Minus)AgeOMach8, InveIr9

Line”Y”= Component-2: IrSyst3, ParTWo5, WUF10

Line”Y”= Component-3: (Minus)Age1, WoExtrac6

Table 28 shows three components with their structure included economic variances. Each component consists of economic variances, where the economic variances of the first component are lying at the principle line “X”, but the other two components including their economic variances at the principle line “Y”. The economic variances are economic features of the fifty-one farms in the analyses.

The first component-1 includes FarmSi2, FullTW4, NooMach7, (Minus)AgeOMach8, InveIr9 lying line “X”, while the component-2 includes IrSyst3, ParTWo5, WUF10, and the component-3 includes (Minus)Age1, WoExtrac6, of which economic variances of the last two components are lying at the line “Y”. The economic variances are having relations with each- others in the coordinate system, which can be followed in Figure 9 and Figure 10.

**Table 29: Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Age1 | 51 | 22,00 | 69,00 | 42,8431 | 11,92874 |
| FarmSi2 | 51 | 4,00 | 160,00 | 23,7333 | 30,49221 |
| IrSyst3 | 51 | 1,00 | 12,34 | 4,4329 | 4,62038 |
| FullTW4 | 51 | 1,00 | 50,00 | 3,3333 | 7,74511 |
| ParTWo5 | 51 | 1,00 | 43,00 | 8,0784 | 10,73842 |
| WoExtrac6 | 51 | 1,00 | 20,00 | 3,9412 | 3,35805 |
| NooMach7 | 51 | 1,00 | 7,00 | 2,7451 | 1,82036 |
| AgeOMach8 | 51 | 5,00 | 40,00 | 26,0392 | 8,00490 |
| InveIr9 | 51 | 1,00 | 180,00 | 12,2745 | 30,12346 |
| WUF10 | 51 | 2,00 | 43,00 | 18,2745 | 11,07805 |
| Valid N (listwise) | 51 | | | | |

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

Table 29 is important in demonstrating the features of farms in comparison with each other by their minimum values and maximum values relevant to the economic variances. These values of farms can also be followed in the first table. The “Mean” and “Standard Deviation” mean that the “Mean” is the average of values of each economic variance and the “Standard Deviation” is the distance among the averaged values of the economic variances. Naturally, these two calculations were implemented by the SPSS statistical system based on the primary data from farms.

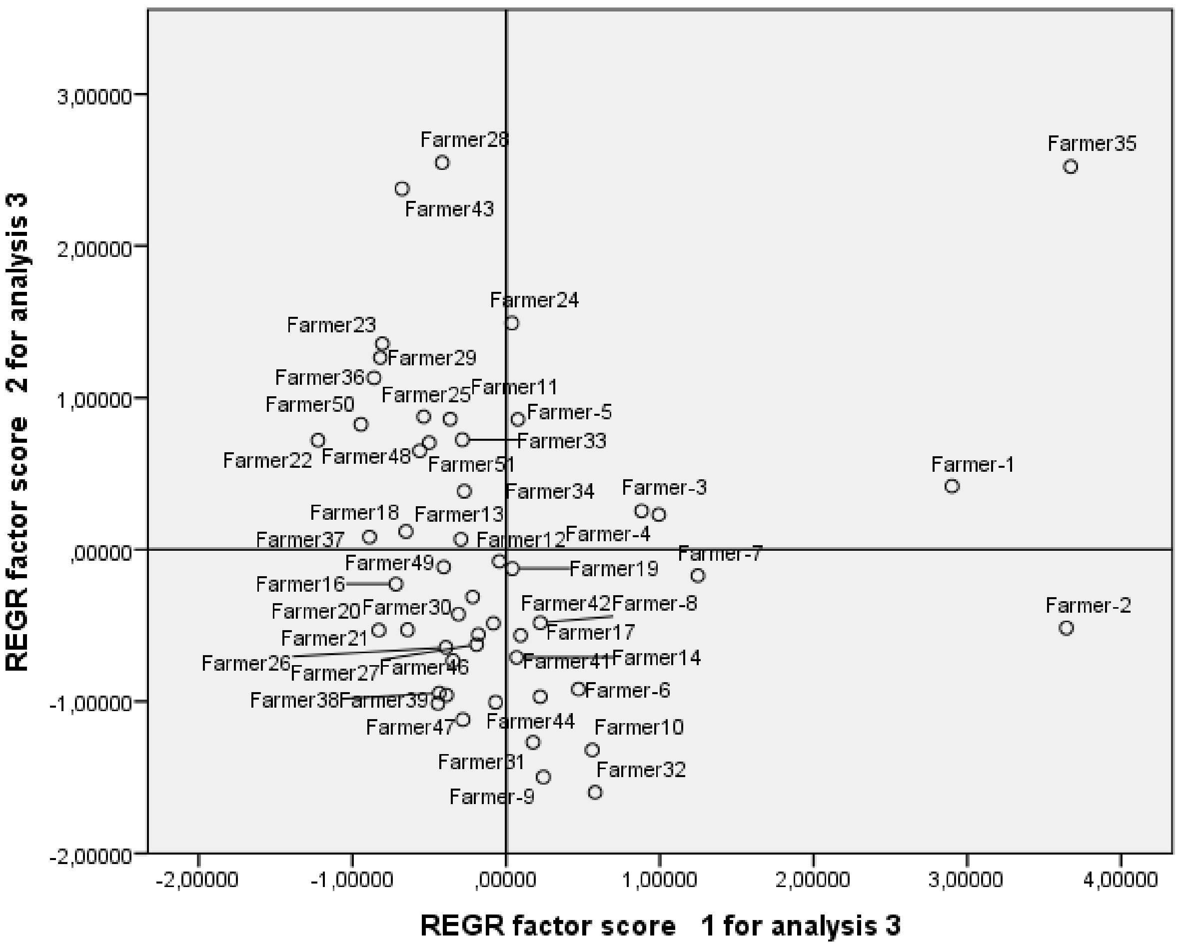


**Figure 9: Factor analyses for economic variances of component-1 and component-2**

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

Line”X”= Component-1: FarmSi2, FullTW4, NooMach7, (Minus)AgeOMach8, InveIr9

Line”Y”= Component-2: IrSyst3, ParTWo5, WUF10

*Economic variables*

Age1= Age of farmers, year

FarmSi2= Farm size in hectare including owned and rented lands, hectare

IrSyst3= 1, 2, 3,4 advanced systems used by farmers (1 drip system; 2 spray system - raining system; 3 surface system; 4 typhoon system)

FullTW4= Full time workers, number

ParTWo5= Part time workers, number

WoExtrac6= Time length in minutes or hours for water extraction take during an irrigation in hour per hectare

NuoMach7= Number of agricultural machines between 1970-2017

AgeOMach8= Age of machines used on the farms 1970-2017, year

InveIr9= Investment in irrigation project in euro in thousand

WUF10= water use efficiency in price income of farmer per $m^3$ water use annually in percent 2016-2019, 2016= 100

The coordinate system shows the relations among the economic variances, as economic features of the farms by the components including their economic variances. This means that the correlations among the economic variances show not only the differences and similarities in cases of the economic variances, but they also show this one as an economic feature of the farms, therefore the coordinate system provides differences and similarities of farms. Therefore, this coordinate system can be important to determine the economic features, similarities, and differences among farms. The economic activities, production processes, investment, and water use efficiency can be followed by the analysing statistical system.

In this coordinate system of Figure 9 is shown that at Line"X" the component-1 including FarmSi2, FullTW4, NooMach7, (Minus)AgeOMach8 and InveIr9, and at Line"Y" the component-2 including IrSyst3, ParTWo5, and WUF10.

In the first quarter of the coordinate system (from "origo" to turn upright) if the FarmSi2, FullTW4, NooMach7, and InveIr9 of the component-1 are increasing or less decreasing, the IrSyst3, ParTWo5, WUF10 of the component-2 are also increasing or little decreasing.

Also, when (Minus)AgeOMach8 is decreasing or little increasing the other economic variances either lying at the "X" line or the "Y" line in this quarter are increasing or little decreasing, in spite that this session of the coordinate is a positive position. The negative economic variance namely as (Minus)AgeOMach8is in inverse ratio to the other positive, increasing ratio economic variances.

In the first quarter of the coordinate of the coordinate system this means, that the farmers have farms, which mostly have large farms in a hectare, increasing number of full-time workers, a large number of machines, less aged – "decreasing" large age – agricultural machines and considerable increasing investment for improving irrigation system accompanying at the line "X", with irrigation system including the 1 drip system; 2 spray system - raining system; 3 surface system, and increasing number of the part-time workers also with water use efficiency at adequately highly level. This is valid for cases of Farmer-1, Farmer-3, Farmer-4, Farmer-5, Farmer24, Farmer34, and Farmer35. This means that only seven farms and farmers from 51 farms, which have adequately enough favourable economic conditions mostly from point of view of water use efficiency, investment irrigation, and irrigation system with full-time or part-time workers employed on the farms.

In the second quarter of the coordinate of the coordinate system, this means, that the farmers have farms, which mostly have less farms in a hectare, decreasing number of full-time workers, less number of machines, increased aged – "increasing" large age – agricultural machines and considerable decreasing investment for improving irrigation system accompanying at the line "X", with increasing irrigation system including the 1 drip system; 2 spray system - raining system; 3 surface system, increasing number of part-time workers, and also with water use efficiency at a low level. These economic variances are at the line "Y". This is valid for cases of Farmer11, 13, 18, 22, 23, 25, 28, 29, 33, 36,37, 43, 48, 50, 51 farms.
This means that some farms and farmers from 51 farms, which have adequately enough favourable economic conditions mostly from point of view of water use efficiency, using an irrigation system with more part-time workers employed on the farms. Economic variances at line "Y" mostly are increasing in the second quarter.

In the third quarter of the coordinate of the coordinate system this means, that the farmers have farms, which mostly have large farms in a hectare, increasing number of full-time workers, a large number of machines, less aged – "decreasing" large age – agricultural machines and considerable increasing investment for improving irrigation system at line "X" accompanying with decreasing irrigation system including the 1 drip system; 2 spray system - raining system; 3 surface system, which is missing in cases of some farms. But also, the water use efficiency was decreasing as well the number of part-time workers decreased at a less developed level. This is valid for cases of Farmer 2, 6, 7, 8, 9,10, 14, 17,19, 31, 32, 41, 42. This means that only this group of farms and farmers from 51 farms, which have weak less favourable economic conditions mostly from point of view of water use efficiency, irrigation system with part-time workers employed on the farms.

Mostly it can be declared that in the fourth quarter of the coordinate system (from "origo" to turn down left) if the FarmSi2, FullTW4, NooMach7, and InveIr9 of the component-1 at the line "X" are decreasing or less increasing, the IrSyst3, ParTWo5, WUF10 of the component-2 at the line "Y" are also decreasing or little increasing.
Also, when (Minus)AgeOMach8 is increasing or little decreasing the other economic variances either lying at "X" line or at "Y" line in this quarter are decreasing or little increasing, in spite that this session of the coordinate is the negative position. The negative economic variance namely as (Minus)AgeOMach8 of the line "X" is in inverse ratio to the other positive, increasing ratio economic variances.

In this session of the coordinate system the farmers have farms, which mostly have small or smaller sized farms in a hectare, decreasing number of full-time workers, less number of machines, higher aged – “increasing” age – agricultural machines and considerable decreasing investment for improving irrigation system accompanying with irrigation system including only one or two systems and also with less water use efficiency at lower level accompanying with less number of part-time farmers. This is valid for cases of Farmer12, 16, 20,21, 26,27, 30, 38, 39, 44, 46,47, 49. This means that these farms and farmers from 51 farms, which have less enough favourable economic conditions mostly from point of view of less water use efficiency and irrigation system with less part-time workers employed on the farms.

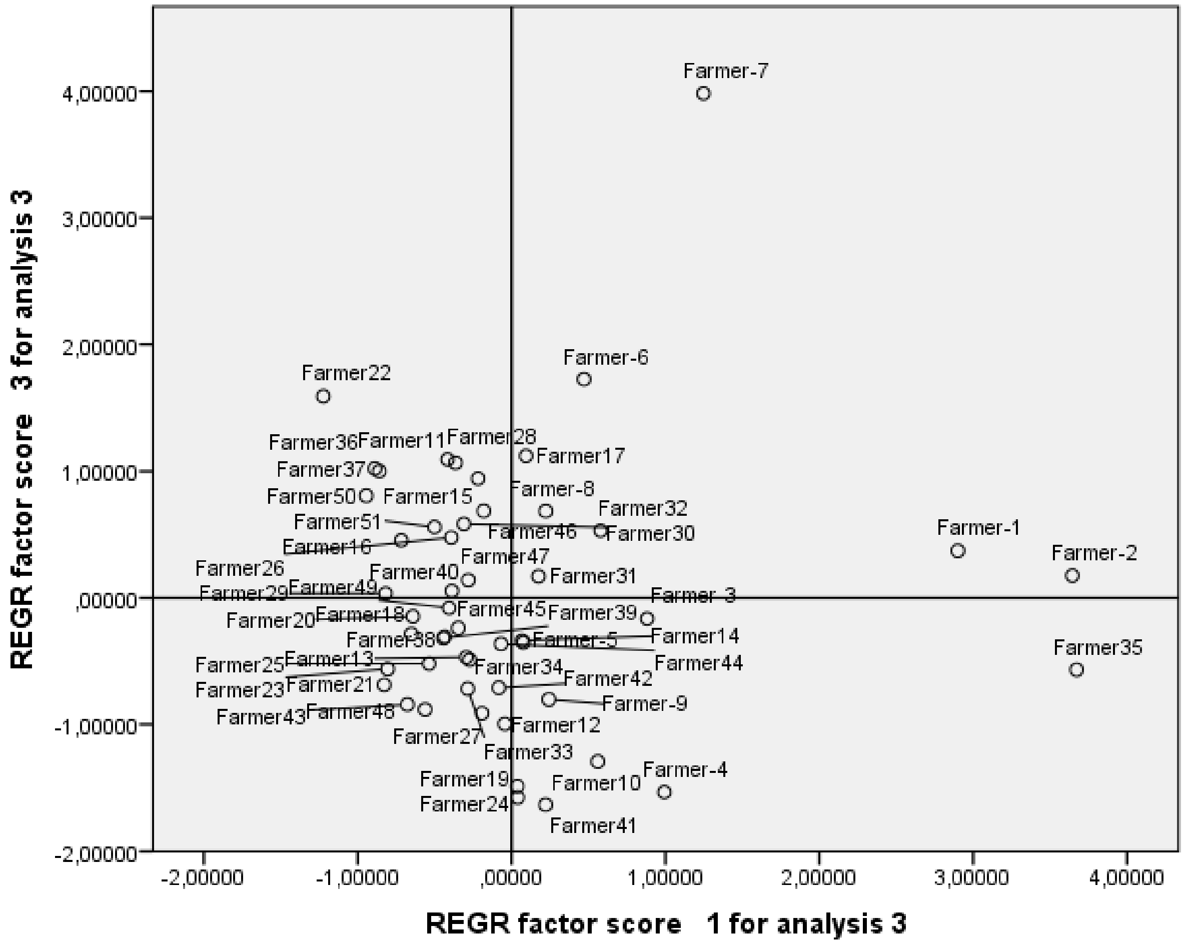


**Figure 10: Factor analyses for economic variances of component-1 and component-3**

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

Line”X”= Component-1: FarmSi2, FullTW4, NooMach7, (Minus)AgeOMach8, InveIr9

Line”Y”= Component-3: (Minus)Age1, WoExtrac6

*Economic variables*

Age1= Age of farmers, year

FarmSi2= Farm size in hectare including owned and rented lands, hectare

IrSyst3= Irrigation systems: 1, 2, 3,4 advanced systems used by farmers (1 drip system; 2 spray system - raining system; 3 surface system; 4 typhoon system)

FullTW4= Full time workers, number

ParTWo5= Part time workers, number

WoExtrac6= Time length in minutes or hours for water extraction take during an irrigation in hour per hectare

NooMach7= Number of agricultural machines between 1970-2017

AgeOMach8= Age of machines used on the farms 1970-2017, year

InveIr9= Investment in irrigation project in euro in thousand

WUF10= water use efficiency in price income of farmer per $m^3$ water use annually in percent 2016-2019, 2016= 100

In the first quarter of the coordinate of the coordinate system, this means, that when the farmers have farms, which mostly have large farms in a hectare, increasing number of full-time workers, a large number of machines, less aged – “decreasing” large age – agricultural machines and considerable increasing investment for improving irrigation system accompanying at the line “X”, but at line “Y” the WoExtrac6 (Time length in minutes or hours for water extraction take during an irrigation in hour per hectare) increases or little decreases, while the (Minus)Age1 as the age of farmers decreases or little increases.

These conditions are valid for cases of Farmer-1, 2, 6, 7, 8, 17, 31, 32. This means that several farms and farmers from 51 farms, which have adequately enough favourable economic conditions mostly from point of view of increasing time length in minutes or hours for water extraction take during an irrigation with less old, les older-aged farmers, and also young farmers could start their economic activities.

In the second quarter of the coordinate of the coordinate system, this means, that the farmers have farms, which mostly have less farms in a hectare, decreasing number of full-time workers, less number of machines, increased aged – “increasing” large age – agricultural machines and considerable decreasing investment for improving irrigation system accompanying at the line “X”, with also decreasing age of farmers and increasing trends of the water extraction take during an irrigation.

This is valid for cases of Farmer 11, 19, 22, 24, 28, 29, 30, 33, 36,37, 40, 46, 47, 50, 51 farms. This means that some farms and farmers from 51 farms, which have less enough favourable economic conditions mostly from point of view of farm-size, les number of FullTW4 (full-time workers), NooMach7 (number of machines) and decreasing age of farmers less irrigation investment.

In the third quarter of the coordinate of the coordinate system this means, that the farmers have farms, which mostly have large farms in a hectare, increasing number of full-time workers, a large number of machines, less aged – "decreasing" large age – agricultural machines and considerable increasing investment for improving irrigation system at line "X" accompanying with increasing age of farmers and decreasing trends of the water extraction take during an irrigation. This is valid for cases of Farmer-3, 4, 5, 9,10, 14, 19, 24, 35, 41, This means that only this group of farms and farmers from 51 farms, which have less favourable economic conditions mostly from point of view of decreasing trends of the water extraction with increasing age of farmers, they become older.

In the fourth quarter of the coordinate system this means, that the farmers have farms, which mostly have less farms in a hectare, decreasing number of full-time workers, a smaller number of machines, more aged – "increasing" large age "older" – agricultural machines and considerable decreasing investment for improving irrigation system at the line "X" accompanying with increasing age of farmers and decreasing trends of the water extraction take during an irrigation. This is valid for cases of Farmer 12, 13, 18, 20, 21, 23, 25, 27, 33, 34, 38, 42, 43, 44, 45, 48, 49.

This means that only this group of farms and farmers from 51 farms, which have less favourable economic conditions mostly from point of view of decreasing trends of the water extraction with increasing age of farmers, they become older.
In this session of the coordinate system is similar to the fourth session of the coordinate of the Figure-10, namely the farmers have farms, which mostly have small or smaller sized farms in a hectare, decreasing number of full-time workers, a smaller number of machines, higher aged – "increasing" age – agricultural machines and considerable decreasing investment for improving irrigation system.

**Table 30: Cluster Membership**

| Case<br>1 Cluster | 5 Clusters | 4 Clusters | 3 Clusters | 2 Clusters |
|---|---|---|---|---|
| 1:Farmer-1 | 1 | 1 | 1 | 1 |
| 2:Farmer-2 | 1 | 1 | 1 | 1 |
| 3:Farmer-3 | 2 | 2 | 2 | 2 |
| 4:Farmer-4 | 2 | 2 | 2 | 2 |
| 5:Farmer-5 | 2 | 2 | 2 | 2 |
| 6:Farmer-6 | 3 | 3 | 3 | 2 |
| 7:Farmer-7 | 4 | 4 | 3 | 2 |
| 8:Farmer-8 | 3 | 3 | 3 | 2 |
| 9:Farmer-9 | 3 | 3 | 3 | 2 |
| 10:Farmer10 | 3 | 3 | 3 | 2 |
| 11:Farmer11 | 2 | 2 | 2 | 2 |
| 12:Farmer12 | 2 | 2 | 2 | 2 |
| 13:Farmer13 | 2 | 2 | 2 | 2 |
| 14:Farmer14 | 3 | 3 | 3 | 2 |
| 15:Farmer15 | 3 | 3 | 3 | 2 |
| 16:Farmer16 | 3 | 3 | 3 | 2 |
| 17:Farmer17 | 3 | 3 | 3 | 2 |
| 18:Farmer18 | 3 | 3 | 3 | 2 |
| 19:Farmer19 | 3 | 3 | 3 | 2 |
| 20:Farmer20 | 3 | 3 | 3 | 2 |
| 21:Farmer21 | 3 | 3 | 3 | 2 |
| 22:Farmer22 | 3 | 3 | 3 | 2 |
| 23:Farmer23 | 2 | 2 | 2 | 2 |
| 24:Farmer24 | 2 | 2 | 2 | 2 |
| 25:Farmer25 | 2 | 2 | 2 | 2 |
| 26:Farmer26 | 3 | 3 | 3 | 2 |
| 27:Farmer27 | 3 | 3 | 3 | 2 |
| 28:Farmer28 | 5 | 2 | 2 | 2 |
| 29:Farmer29 | 2 | 2 | 2 | 2 |
| 30:Farmer30 | 3 | 3 | 3 | 2 |
| 31:Farmer31 | 3 | 3 | 3 | 2 |
| 32:Farmer32 | 3 | 3 | 3 | 2 |
| 33:Farmer33 | 5 | 2 | 2 | 2 |
| 34:Farmer34 | 5 | 2 | 2 | 2 |
| 35:Farmer35 | 1 | 1 | 1 | 1 |
| 36:Farmer36 | 3 | 3 | 3 | 2 |
| 37:Farmer37 | 3 | 3 | 3 | 2 |
| 38:Farmer38 | 3 | 3 | 3 | 2 |
| 39:Farmer39 | 3 | 3 | 3 | 2 |
| 40:Farmer40 | 3 | 3 | 3 | 2 |
| 41:Farmer41 | 3 | 3 | 3 | 2 |
| 42:Farmer42 | 3 | 3 | 3 | 2 |
| 43:Farmer43 | 5 | 2 | 2 | 2 |
| 44:Farmer44 | 3 | 3 | 3 | 2 |
| 45:Farmer45 | 3 | 3 | 3 | 2 |
| 46:Farmer46 | 3 | 3 | 3 | 2 |
| 47:Farmer47 | 3 | 3 | 3 | 2 |
| 48:Farmer48 | 2 | 2 | 2 | 2 |
| 49:Farmer49 | 3 | 3 | 3 | 2 |
| 50:Farmer50 | 3 | 3 | 3 | 2 |
| 51:Farmer51 | 3 | 3 | 3 | 2 |

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

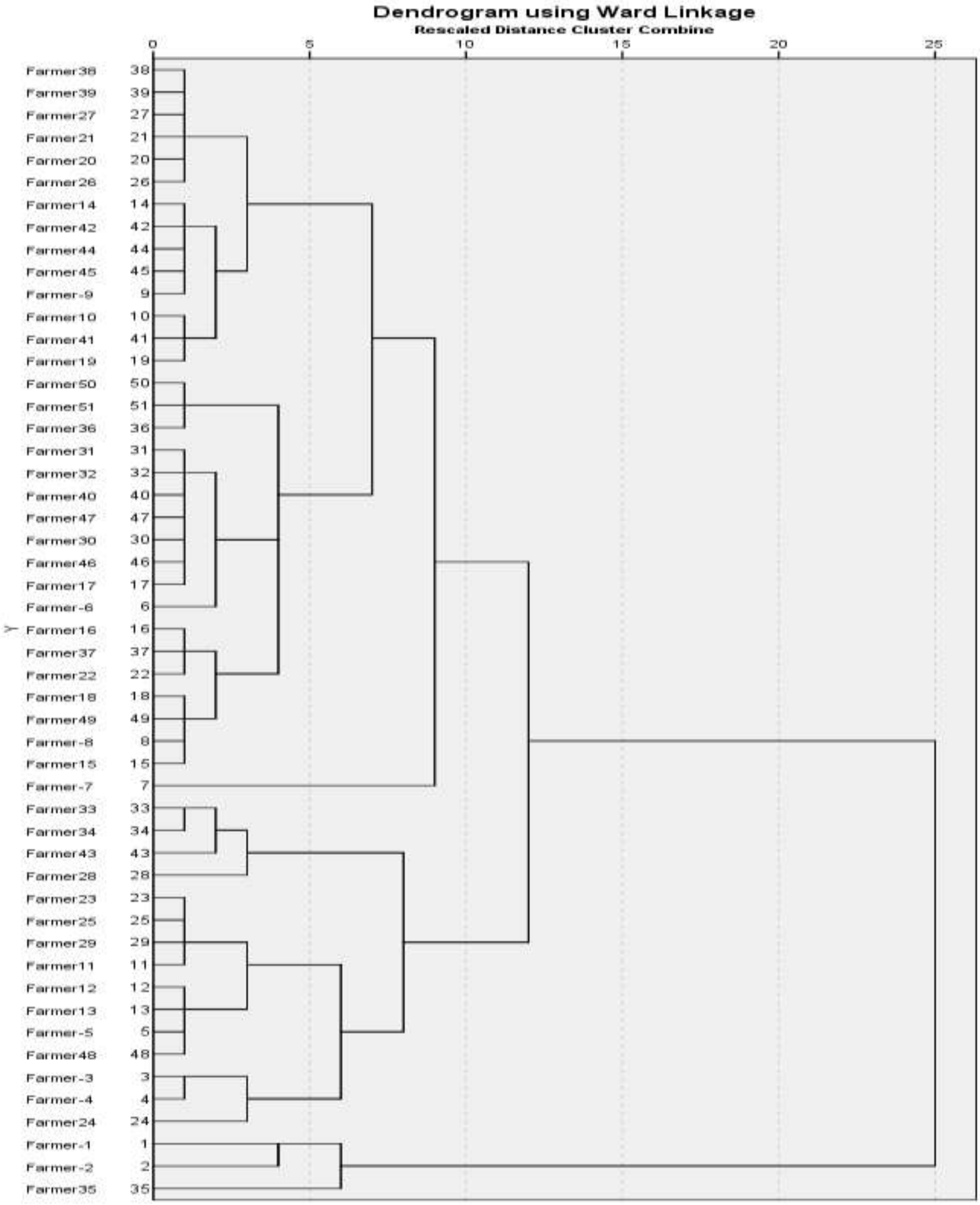


**Figure 11: Clusters of 51 farmers of Kosovo in 2019**

*Source*: Own calculation based on the SPSS statistical analyses. Data base from primary data

Cluster-1 (3): Farmer-1, Farmer-2, Farmer-35,

Cluster-2 (11): Farmer-3, Farmer-4, Farmer-5, Farmer11, Farmer12, Farmer13, Farmer23, Farmer24, Farmer25, Farmer29, Farmer48

Cluster-3 (32): Farmer-6, Farmer-8, Farmer-9,
Farmer10, Farmer14, Farmer15, Farmer16, Farmer17, Farmer18, Farmer19,
Farmer20, Farmer21, Farmer22, Farmer26, Farmer27,
Farmer30, Farmer31, Farmer32, Farmer36, Farmer37, Farmer38, Farmer39,
Farmer40, Farmer41, Farmer42 Farmer44, Farmer45, Farmer46, Farmer47, Farmer49,
Farmer50, Farmer51

Cluster-4 (1): Farmer7

Cluster-5 (4): Farmer28, Farmer33, Farmer34, Farmer43

# 5. CONCLUSIONS AND RECOMMENDATIONS

The analyses emerged some issues concerning the renewable water resources accompanying with some economic issues, which sometimes can be difficult for solutions to the emerging problems of the performance of the economies of this study. The complex economic issues and distribution or allocation of the renewable water resources is needed for creating comparisons among economies based on their different features as economic variances. During the comparing processes, the different measures of correlations and significances among the economic variances will be cleared. The following chapters make it clear the measurements of these correlations.

The main issues of the study and analyses are the water management and the allocations of the renewable water resources and their influences on the economic development and prosperity of the performances of the selected countries. Their impact can be followed on the GDP growth and agricultural value-added based on the total country area cultivated and human development index.

In this study, the water resources are allocated into three branches, namely Total Internal renewable water resources per capita (InterWRCap5), Total renewable water resources per capita (TRenewWRCap6), and Dam capacity per capita (DamCapita7). The biggest amount of water resources is the TRenewWRCap6, from which Total internal renewable water resources per capita (InterWRCap5) can be calculated. This last can be all of the total resources or only some parts of it depending on the geographical conditions of a given country. Total internal renewable water resources per capita mean only the water flow or rivers or water channels coming from original resources inside the given country. But the total water resources are more than the internal water resources, because some parts of it come from out of the given country. The dam capacity means the measure of water resources reserved behind dams. This dam capacity water amount can be original either from out of a given country or only inside the given country. Also, the measure of the water resources is calculated per capita, therefore this measure is always depending on the number of populations, so this statistical data is a partly ecological and partly economic one.

The GDP growth rate is the basic statistical data, which includes the results of the agricultural industry, in this study as agricultural value-added depending on the total country area cultivated. The human development index concerns the employment issues and conditions consisting of three branches, namely healthy-life, knowledgeable, and standard of living. Therefore, the HDI extends the purchase power parity of the consumers additionally to the employment issues. Surely, the purchase power parity of the consumers based on the employment issues retired people and social security, and subsidies for family households and companies. Therefore, the HDI is complex data and that is why this can concern all of the performance and society of the given country.

The main conclusions are that the economic prosperity of the countries needs for water cleaning and efficient allocation of the renewable water resources for economic sectors and fragments of the water consumers for family households and farming households and municipal consuming institutions.

The other issue is that the how depending measure of the agricultural value-added on the total country area cultivated from sides of extensive development issues and intensive technological development and somehow the innovative conditions concerning the HDI, mostly the knowledgeable. Also, the extensive development issue depends mostly on the irrigation system as a part of the intensive technology. Sometimes the measure of the total country area cultivated can extend by irrigation improvement as an intensive method for increasing the cultivated areas. The yield per hectare can be increased by the irrigation system. Therefore, these correlations among economic variances can deem the economic conditions very complexly. So, the new scientific results focus on these correlations among the economic variables.

I suggest the policymakers to improve the agriculture in Kosovo, which can also be useful generally for the agricultural sector of other countries.
There is an important missing element, namely the vertically integrated product channel among different levels of the product channel from the soil of farmers to tables of consumers. Also, horizontal integration is a cooperation among farmers producing basic materials in the agricultural sector. The two missing elements also show that the farmers have less possibility to obtain their competitiveness against the other producers in national and international markets.

In Kosovo, the income tax decrease is a form of central support based on the agricultural policy, which cannot be successful for farmers, because this support system does not aim at exactly supported investment for improving agricultural production. Therefore, the tax-subsidies are only additional income-support, which all of the farmers can obtain who have income from the agricultural production without implementing any demands for the improving technology and increasing yield, as output in this sector.

The agricultural policy in Kosovo can follow those priorities for supports relevant to EU agricultural policy, which are as follows:

- improvement of mechanisation and irrigation system;
- supports for farmers producing fruits, vegetables, which have favourable conditions;
- concentration for the arable land use and ownership for crop production to increase the profitability of the production; also, this land concentration helps to implement the advanced modern mechanization by less input and costs per hectare or unified yield;
- developing the animal husbandry, with accompanying with feed-crop production within the same farm, if it is possible;
- create a unified water supply channel system supported by the central governmental investment for drinking and irrigating water supply, and also to withdraw dirty water from farms;
- support farmers to achieve the book-keeping, accountancy, and financial plans accompanying with submitting of farmers for application obtaining financial supports either from EU or national central government;
- set up the unified supervising system for farmers at the country-wide-side level within a unified system, where each same supervisor cooperates with the same farmer-group consisting of 10-15 farmers specialized in fields of either crop production or animal husbandry according to each kind of crop-product or animal.

My opinion is that the above-mentioned suggestions for agricultural production can be integrated into the wholly regional and rural development programs of the government relevant to the EU strategy in fields of similar policies. The support for farmers should focus on improving mechanization and production technology in agricultural production, mostly on the consumption of fixed capital, which this last one is relevant to the agricultural policy of the European Union.

# 6. NOVEL FINDINGS OF THE DISSERTATION

1) The correlations among the renewable water resource use and dam capacity per capita in selected countries are not important. Generally, water uses for dam capacity per capita are not considerable. The renewable water resources are only the protentional water supply for agricultural production, which need for setting up the network to transfer the water to the farms.

2) The opposed correlations are not strong or only weak among the renewable water resources and the GDP growth rate at the level of the selected countries. There are opposed correlations between the GDP growth rate and agricultural value-added at the level of the 15 selected countries based on improving mechanization in agricultural production. The GDP is in inverse ratio to the economic variable as agricultural value-added. This means that if the GDP increases in any country, the agricultural value-added decreases in % of GDP, or opposite to these conditions. If the GDP decreases the agricultural value-added of countries can mostly increase in % of GDP. If the agricultural value-added increases in % of GDP, because of increasing yields based on the more using water resources and increasing the investment and consumption of fixed capital, therefore, the other economic sectors provide fewer results, which can lead to a decreasing trend or less increasing trend of the GDP, because the other industrial sectors have less development trend.

3) The HDI does not have any considerable correlations with the total country area cultivated, because the educated level and purchase power of human resources can independently change from measure of total country cultivated area, depends on the developed level of the mechanization, self-financial resources of farmers and the possible central governmental support for the innovation of farms in cases of 15 countries.

4) There are middle strong correlations between the total country area cultivated and the agricultural value added at the level of the selected countries, because the increasing total country area cultivated can lead to increase of the agricultural production, therefore, increase of the agricultural value added. Adequate qualified agricultural lands are very few and scarcity in Kosovo, which also is resulted in a less favourable water supply and longer period drought, therefore, the total country area cultivated will be less and also agricultural value added will decrease.

5) There are strong correlations among innovation knowledge, educated level, and skills of farmers and using advanced irrigation systems in Kosovo, because the skilled and more educated farmers can use more advanced technology including irrigation systems, which result higher yields and production by less production cost. The population has strong correlations with the changes of the GDP growth, personal remittances received fertilizer consumption, and arable land measure in the share of the land area within 5 neighbouring countries, Serbia, Kosovo, Albania, Bosnia-Herzegovina and North Macedonia. GDP growth increases and fertilizer consumption increases, but the agricultural value-added in the share of GDP, employment in agriculture in the share of total employment, and the agricultural land in the share of land area decrease. The inflation increases by the increasing purchasing the agricultural machines, the mechanization process decreases the level of employment in the agricultural sector.

# 7. SUMMARY

The study focuses on the most important objectives, namely economic background for water management in several selected countries, mostly neighbouring countries including Kosovo in Balkans regions and other EU regions and other important countries out of the EU. The international comparison is needed for analysing the possible future trends for improving the technological development in the agricultural industry emphasizing water management.

The main aims of the research focusing on how water management can influence the production technology and production efficiency in countries researched in the study. The water issue and the water use are very important for the economic development and growth, for the agricultural industry and also drinking water consumption of the populations either in Europe or other continents. Therefore, the international cooperation should be established in order to solve the very sensitive water difficulty appearing at the worldwide side. No any country can withdraw itself from this very dangerous problem, therefore the international solution is needed.

Based on the scientific results, the agricultural production can be integrated into the wholly regional and rural development programs of the government relevant to the EU strategy in fields of similar policies. The support for farmers should focus on improving mechanization and production technology in agricultural production, mostly on the consumption of fixed capital, which is relevant to the agricultural policy of the European Union.

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