4.2. Evaluation of economic efficiency of investments in organic production at the family farms

Marko Jeločnik[1], Jonel Subić[2]

[1]Institute of Agricultural Economics (IAE), Belgrade, marko_j@iep.bg.ac.rs; [2]Institute of Agricultural Economics (IAE), Belgrade, jonel_s@iep.bg.ac.rs

Abstract: Investments have important role in development of agriculture, both at macro or micro level. The main goal of chapter is to present the basic methods (static and dynamic) used for evaluation of economic efficiency of investments in agriculture made at farm level.

Economic advantage for small family farms to enrol the organic production system would be presented within the chapter throughout the comparative analysis of the economic justification of investment in organic or conventional vegetable production organized in protected area (purchase of plastic greenhouse and necessary equipment). Assuming the identical production and market preconditions, the initial presumption has been proven, i.e. better value of indicators of economic assessment of investments would be achieved if investment object is implemented in organic system of production.

Keywords: investment, evaluation, static and dynamic methods, organic production, plastic green house, vegetable.

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1. Introduction

1.1 Relation between sustainability, agriculture and farm

Starting from core definition of the terms sustainable, or sustainability, it describes certain object as capable of being sustained. In natural sciences it usually refers to the method of harvesting or using a resource so that it's not depleted or permanently damaged, i.e. it's able to last or continue for a long time, while in social sciences it more often relays to the use of sustainable methods (Merriam-Webster, 2020).

Sustainability is primarily environmental (ecological) determinant, and its use was firstly recorded in 1924. In last several decades, it has come to interconnection between the terms sustainability and development. As global definition for sustainability is deriving from the scientific reconsideration of relations between nature and society, it could be determined as a meeting of essential human needs while preserving the life-support systems of the planet Earth (Kates et al., 2001).

Nowadays, the concept of sustainable development (primarily focused to sustainability of economic activity) is based on the principle of moral justice and the tendency that our descendants must inherit the identical development opportunities available to us (the need for controlled environmental degradation and the highly efficient use of available natural resources). Likewise, it's relied on fact that the man is only a fragment of nature that does not have a right to change it irretrievably by its economic activity, endangering the survival of other living beings (Subić et al., 2017).

As a set of economic activities, agriculture represents the usage of biological processes (involves the generation of organic matter) on agricultural holdings in order to produce several products (primarily food, but also biofuels, fibre, raw materials for the industry, etc.) needed by human population. Based on science and practical principles, agriculture is generally turned to land cultivation, as well as growing, breeding and use of crops, mushrooms and domestic animals. Nowadays, it encompasses "way of life" and "means of life" for the people engaged in this sector of economy (USDA, 2020; MCE, 2020).

Agriculture is an economic activity as old as human society. Initially, it emerged from the tendency to meet the basic human needs towards food and self-preservation. Later, during the development of civilization, agriculture has been transformed throughout the few stages from strictly natural (food production in volume that overlaps with basic needs of farm members) into commodity production (produced surpluses at the farm are exchanged for other goods or services). Further, with expressed specialization (favouring of certain production lines within a particular branch of agriculture) it is expected to provide global food security respecting the basic food safety principles (Đurić, 2015).

Over the centuries agriculture has been the leader within the processes of rural areas evolution, i.e. in boosting of their economic growth and changing the rural landscapes. Currently, although the agriculture stays for the number of rural territories the main initiator of economic activity, while generating the several positive effects on local rural communities, its economic impact is continuously weakening. Rural communities are changing their expectations more intensely toward the main output of agriculture. Besides the food production, they require from agriculture certain level of involvement into the so called "local public services", as are environmental and landscape services, water management and flood control, social care, etc. In line with mentioned, rural areas are transferring from directly productive (based on agriculture) to some extent consumptive areas (Van Huylenbroeck et al., 2007).

Coming closer to the field of agriculture, one of officially adopted definitions interprets the term sustainable development as the management and conservation of natural resources (primarily land, water, plant and animal biodiversity, etc.), together with technological and governmental modifications towards ensuring and permanently serving the needs of current and future generations. In its essence, it does not endanger the environment, technically is relevant, economically viable and socially suitable (Hodge, Hardi, 1997; Hardaker, 1997).

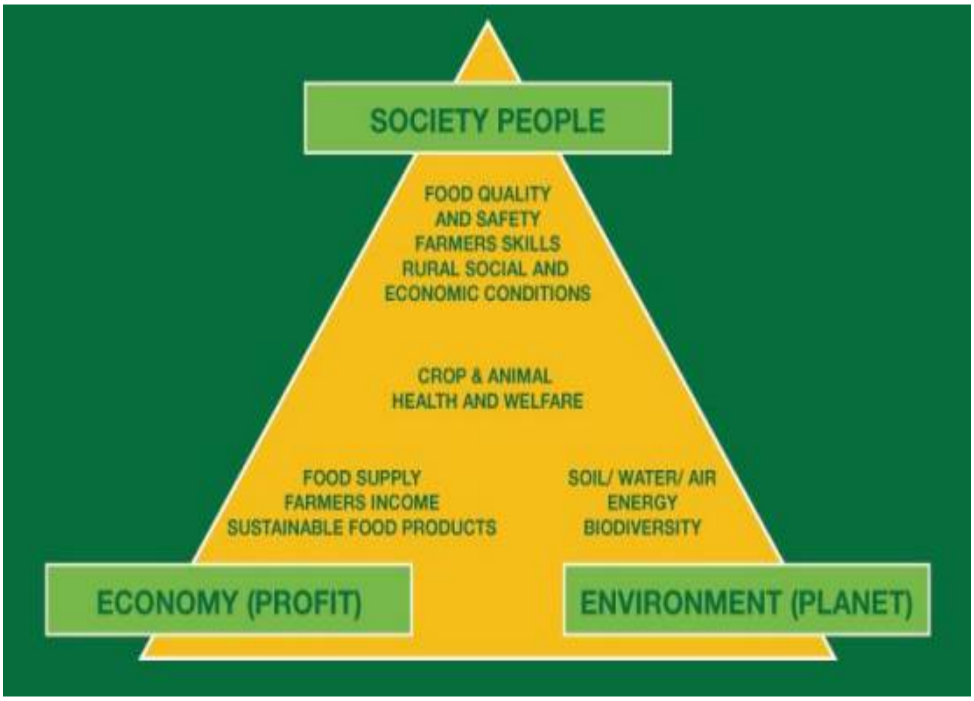
Considering the macro aspect (global agriculture), sustainability is introduced through the integrated system of activities and procedures primarily related to crop and animal production conducted at wider rural area. In long distance they have to provide: a) food security for local population (by quantity, quality and structure of offered agro-food products); b) preservation of natural environment; c) adequate valorisation and efficient utilization of available agro-resources; d) boosting of agricultural competitiveness and complete realization of produced surpluses; and e) stabilization of farm income and growth of the living standard of the local rural community (Subić et al., 2012).

Sustainable development of agriculture targets and mutually connects the interests of all stakeholders primarily active in sector of agriculture in certain rural area, such as: agricultural holdings (family farms or companies of different size, both smallholders and large producers), agro-business companies and manufacturers, cooperatives, associations of producers, local population, agricultural extension offices, etc. In regard to territorial scope, character and significance, developmental needs and actions in agriculture and rural areas could be initiated and supported locally or by state managing authorities (Vorley, 2002; Subić et al., 2013).

Regardless to the authority level (from local to regional, or global), official approach to sustainable agriculture has to be followed by well established strategic framework (adequate legislation, strategic documents, normative and codes, clear and realistic vision, etc.). Reaching of the desired level of sustainability (in pre-defined timeframe and prioritised areas of agriculture and rural development) has to be driven by the fulfilment of previously set strategic goals, measures and reform activities. List with strategic measures created by any authority usually involves intensification of production, change in system of production, or increase and modernization of available production capacities, while achieving each of them requires certain level of investments and pre-investment analysis.

It's underlined again that although the term sustainability is usually associated to environmental issues of natural resources, sustainable agriculture is multi-dimensional approach (Picture 1.).

Picture 1. Aspects of sustainable agriculture



Source: Ore, 2015.

In line with the formal intention to preserve global wealth inheritance of available natural resources to upcoming generations, adequate functioning of sustainable agriculture is based on three interdependent, overlapping and equally important pillars: a) ecological sustainability (requirement that direction and level of development should be consistent with the maintenance of ecological processes, i.e. driving the applied practices into the course of preserving or improving biophysical productivity of accessible natural resources); b) economic sustainability (agro-development should be economically feasible and efficient, i.e. agro-output and costs of production and marketing have to be capable for easy adjustment to unstable environmental, social and economic circumstances); and c) social sustainability (agro-development should be socially responsible, i.e. it has to fit the global needs for quality agro-food products affecting their fair and efficient distribution, as well as appropriate technology transfer, etc.), (Yunlong, Smit, 1994; Smith, McDonald, 1998; Bachev et al., 2017).

Principally, sustainability assessment of agriculture or some sub-sector of agriculture (within the specified territorial unit), as well as evaluation of certain farm, or group of farms usually represents challenging issue as it considers very complex analysis of many case-specific variables (it involves different processes and systems of production, inputs/outputs, technology, logistic and marketing activities, support tools, stakeholders, climate conditions, etc.), (Picture 2.). In line with the above, there is no established yet standardized methodological approach for measuring sustainability of agriculture or any individual farm (Andreoli, Tellarini, 2000; Lampridi et al., 2019).

It should be noted that by its definition organic farming is strongly directed to ecological pillar, as it uses inputs (primarily fertilizers and pesticides) and techniques (e.g. crop rotation, green manure, compost, biological pest control, etc.) proven to be environmentally friendly. It eliminates or strictly limits the application of certain inputs such as synthetic petrochemical fertilizers and pesticides, plant growth regulators, antibiotics, GMO, etc. Orientation to other pillars could be found in fact that this system of agricultural production is globally spread, while surfaces under several production lines are constantly and sometimes rapidly increasing. From the farmer's point of view, expansion is justified by strong public support related to reduction or prohibition of "dirty" technologies used in conventional agriculture, along with the opportunity to approach the higher profits in emerging market niches (increase in consumers' concerns for the use of healthy and safe food products), especially for farms that are stuck in saturated bulk markets, or economically weak farms that cannot compete the economy-of-scale or technologically modern agricultural production (Jeločnik et al., 2015).

Picture 2. Variables engaged in assessment of the agricultural sustainability

Source: Lampridi et al., 2019.

Having in mind previously described general (macro) approach to the concept of sustainability (reliance on ecological, social and economic pillars of sustainability), it is possible to define the sustainability at micro level, i.e. the concept of farm sustainability. It could be defined as the ability (its internal potentials) of certain farm to operate, survive and grow within the particular socio-economic and natural surroundings (rural territory), while keeping up in longer period its administrative, economic, ecological and social functions at satisfactory level. Concepts mutually differ in additional pillar added to the farm sustainability: a) managerial sustainability (its level of efficiency towards the organization of activities and establishment of relationships inside/outside the estate, along with level of adaptability to changing surrounding, in line with main affinities and abilities of the farm owner); b) economic sustainability (its level of productivity in use of available resources, economic efficiency and financial stability); c) social sustainability (its accountability for preserving and advancing the welfare of farm members, other stakeholders involved in agro-business and whole rural community); d) ecological sustainability (its level of responsibility and behaving towards the natural environment), (Bachev, 2016).

Although the farm sustainability should harmonize all segments that influence the preservation or increase of entire farm capital (economic capital – incomes, savings, production assets, available elements of physical infrastructure, etc.; social capital – existence and quality of available social services to farm members; natural capital – quality of air and available water resources, existence of specific landscape, biodiversity, etc.), in practice, it's usually related solely to economic aspect (Pingault, Preault, 2007).

Above could be explained on one, somewhat, common example. Under the world-wide pressure of economy of scale, in order to secure their short-term competitiveness farmers are "forced" to ignore certain aspects of sustainability. So, in this internal conflict among the pillars, usually guided by pure striving to reach the high profitability, farms generally cannot compensate caused ecological and social costs derived from agricultural production, services and processing organized at the estate. Over-intensified production that relies on excessive use of agro-inputs has to lead to higher yields and farm incomes, but in same time it initiates endangering of natural (in and out of the farm) and social capital (unduly use of fertilizers, pesticides or mechanization, i.e. fossil fuels, directly increases the harmful emission of pollutants at certain farm threatening in long-term the quality of surface and ground water, soil complex, safety of produced yields, health of consumers and local population, boosting the climate change effects, etc.). It is very hard (being pricy or nearly futile), even for big and economically powerful farms, to optimize the structure and intensity of production that will perfectly balance the sustainability pillars. Equalization of their importance at current stage of civilization and under universal ethics is normally directed by scientifically generated norms and tech-tech knowledge converted into the principles of good agricultural practice, as well as certain instruments of public support, constant rising of producers' awareness, requirements from the market, etc.

Some estimations show that in the upcoming period, at this level of agricultural knowledge and practice, further growth of productivity would certainly lead to decline in quality of used arable land and environment. This means that the next step of intensification would probably miss the component of sustainability of applied practices and used varieties (the crops have already come to about 80% of their yield capacity, reducing the manoeuvring space for advancement of currently used agricultural production systems), (Ewert et al., 2005).

Besides, in line with the certain specificities of agriculture primarily that it's based on biological processes and mechanisms regulated by nature, production is applied under the law of diminishing returns. In other words, farmers have to be aware that the constant increase in intensification of production is not fully proportional to gained yields, i.e. profits. In one moment, any additional investment in certain input will be absurd, leading to losses and fall of overall farm profits (Hallam, 1991; Drummond, Goodwin, 2004). Simple example is represented in specific relation between the crop (gained yields-profit) and used mineral fertilizers (incurred costs). Under the normal conditions of production, crop can absorb only a limited volume of some mineral element (e.g. nitrogen) that will influence the yields growth. After that level, any additional increase in fertilization will affect less and less volume of nitrogen utilized by crop, while the rest will directly leach into the soil complex and water resources causing at the same time the economic loss and environmental accident. In other words, there is no economic logic for farmer to additionally invest in used inputs if they are not providing optimal outputs, while pushing the production over the limits of profitability will surely lead the farm to the weakening of its economic and ecological sustainability.

Accordingly, good solution that will reconcile conflicting pillars of sustainability (principally economic and ecological aspects), or balance expectations of farmers and other stakeholders active within the agro-business sector (including the expectations of state and local authorities, consumers and global society) could be found in practicing of organic agricultural production as a huge step in returning to the primordial laws of nature (Tomaš Simin et al., 2019). Otherwise, slight changing of devastating scheme of pure conventional agriculture could be done with introduction of ecologically oriented agricultural practices (e.g. integral production) based on principles of good agricultural practices (GAP or some other common production standards) and frequent formal control of applied production and post-production activities, used natural resources (e.g. soil and water quality) and produced agro-food products (Subić, Jeločnik, 2013).

Factors that define farm sustainability are usually grouped towards the certain pillar of sustainability, while following could be highlighted: a) managerial factors - include characteristics of farm members, their production experience, knowledge, skills and aspirations, practicing of non-agricultural activities, used marketing and supply channels and strategies, engaged labour, etc.; b) economic factors - describe introduced production system and established production lines and activities, level of specialization, economic power, farm size and level of used capital assets, capital turnover, financial dependence, economic capability to achieve profit, presence of tech-tech innovations and openness for tech-tech innovations, etc.; c) social factors – include reliance on public support and policies, relation to agricultural extension and local community, access to social infrastructure, impact on rural dynamics, etc.; d) environmental/ecological factors – encompass the level of biodiversity at estate, type and volume of used or produced energy, impact of climate change accidents, practicing of water, soil and fertilization management, type of pest control, etc. (Subić et al., 2012; Subić et al., 2013; Subić, Jeločnik, 2014; Baccar et al., 2019; Friedman, Morris, 2019).

1.2 Creation of value-added at the farm

Farm sustainability is highly correlated with creation of additional value at the farm estate. In current economic theory value-added could be defined as a strategy in order to gain certain level of competitive advantage towards the increasingly pronounced market competition.

Possible reconsideration of the term value-added differs according to perceptions of the sub-term value (exchange value or use value). Observing the exchange value, i.e. total costs and relation between the inputs and gained products and services, the value-added is determined as products' value reduced for the value of used inputs (e.g. one of the best options is costs reduction followed by the growth in production efficiency). On the other hand, use value is associated just to the final product or service ignoring the production activities, so in this case the value-added is determined as any improvement on product that leads to greater business' effectiveness (e.g. gained products must be labelled as superior, leading to consumers' over-satisfaction in compare to the use of competitors' products). At the end in both cases value-added is referring to a change done during the certain period (De Chernatony et al., 2000; Jensen et al., 2012).

Related to confrontation of organic and conventional food products, more appropriate is the definition for value-added focused to use value. Although it could be considered as economic category, value-added has many relations with other pillars of sustainability. Value-added is something that makes the product more attractive to consumers. It relates to increase in quality, value or volume that farmer incorporate into his products or services expecting to initiate upward trend in selling and farm incomes gaining.

Value-added is, under the given circumstances, the best possible portfolio of farm activities and agricultural practices created by farmer in order to adjust the farm output (primarily agro-food products and services) to the consumers' preferences. It usually affects the change in shape, form and structure, appearance of specific characteristics, as well as permanent availability, or emerging the new identity and quality level that was not apparent in previously offered farm products and services.

Value-added is typical for farmers who want to change their position within the supply chain or at nearby markets by direct approach to the end consumers. They are modifying applied production processes with main goal to shift, stress or preserve certain characteristics of their products and services. Value-added could be observed as a farmer project that is succeeding in synergy with other stakeholders involved in agri-business. In initial stage, it should deal with gathering of basic market information related to consumers and competition. Further, it requires development of adequate vision and strategic approach, and finally if being estimated that idea will contribute to empowering of farm sustainability, it should be followed with development of operational plans, estimation of economic efficiency of planned investment, coming up with the adequate financing opportunities, etc. General suggestion could be to begin with basic commodities and services, while adding later a certain amount of inventiveness towards the creation of upgraded or new products, highly competitive and desired by local consumers that will boost the total farm revenues (Coltrain et al., 2000).

As a wider concept, agricultural value-added initiative was established in order to support the farmers in absorbing the frequent shocks (decrease in net farm income caused by price volatility of the primary products) derived from globalization. It represents a strategic response to highly competitive global market and fast commoditization in agro-sector (Amanor Boadu, 2003). Representing the dominant part of mentioned concept, i.e. establishing economic relationships between consumers' preferences, farm practices and rural communities, creation of the value-added at the farm estate is usually observed as (Royer, 1995; Feenstra, Lewis, 1999; Fleming, 2005; Evans, 2006; Tangermann, 2011; Lu, Dudensing, 2015):

1) processing of raw agricultural products (e.g. from pure mechanic cleaning, cutting, weighing, packing and storing of raw fruits and vegetables, to producing the food products of higher degree of processing, such as juices, jams or pickled veggies), or even implementation of vertical integration as specific marketing approach towards the produced quantities, usually linked to specialized farms, which includes engagement of part or all activities characterized for transfer of certain raw agricultural products into the final food products (e.g. transfer of grains into the flour and later into the bakery or pastry products);

2) collection and market realization of locally-produced agricultural products tagged with preserved specific characteristics and identity, or preparing of local food products from locally produced raw material under the traditional recipe, additionally labelled with certified local designations;

3) production of agro-food products in a manner that increases their value (e.g. establishing of organic, eco, integral or some other system of production, or production in protected area – greenhouses, or production with the use of irrigation or certain innovative technological solution, or simple realization of crop products throughout the livestock products – feeding of animals, etc.), introduction of quality schemes and products certification, or production of farm based renewable energy from own agricultural resources (e.g. production of biofuels);

4) diversification of farm activities with introduction of certain non-agricultural activities (e.g. offering of agro-tourism or recreational tourism services, production of handicrafts, running the grocery shop, etc.).

Related to establishing the direct relation between the production of value-added products and generation of additional farm incomes, it should be noted that orientation to organic agriculture could be a reasonable solution for farmers. Above arises from the production of agro-food products with suitable market identity, that could capture the price premium buyers who would like to pay extra for the higher quality and safer products than their generic version. Some surveys at EU level show that organic food-products prices have upward trend and could be at least 10% (usually some livestock products) to even 500% (potatoes) higher than the conventionally produced products (depending on the type of product, its seasonality and used market channel), (Simin et al., 2019). Similarly, direct insight in sauerkraut production shows that compared to conventionally produced and processed cabbage, although it requires approximately identical level of investment in production facility and equipment, production of organic sauerkraut could be for 20% more profitable (Jeločnik et al., 2019). On the other hand, reaching the higher prices could be a possible limitation for producers or retail chains during the recession period, when due to their budget contractions consumers more often have been opting for the cheaper conventionally produced substitutes.

Except direct benefit for the farmers (maximising the potential of farming operations, full employment of farm members and increase in farm income), creation of farm value-added products also has certain effects on the strengthening of rural communities, especially those in which the local offer is too modest or the value chain is commonly ending with the transfer of primary products to the processors located out the community. Farm could improve the community well-being through the advancement of its image, creation of new jobs and engagement of local labour, slowing-down of the migration, enlargement of community budget, etc. (Alonso, Northcote, 2013).

Considering a constantly growing gap between the incomes per capita in rural and urban areas, many governments are interested in developing policies that will support creation of farmers' income or establishment of nonfarm jobs in rural areas. In that context, they are also supporting the formation of value-added at the farm level. For example, in USA principally following supporting measures are in use: agro-food products promotion, marketing and state labelling, operational and technical assistance, offering of favourable loans and grants, conduction of market research, organization of different trainings, legal issues support, etc. (Kilkenny, Schluter, 2001).

1.3 Investments as a factor of farm sustainability

From the aspect of farm sustainability, whether being focused on enlargement of existing primary production, change of the system of production, introduction of processing or non-agricultural activities at the farm estate, engaging in additional farmers' work or one of external labour, purchasing of new or additional machinery, equipment and supplies, (re)building and equipping of certain facilities, use of more energy, etc., i.e. making of proper investments in all cases is required.

The most often, investment considers the transfer of financial assets into the purchase and up-building of capital goods (facilities, land, livestock, machinery, tools, equipment, etc.), which are not the subject of current consumption but they are in function of production of consumer goods and services in long-term period. Size of investment in capital goods has to be proportional to previously determined volume of production based on potential use of consumer goods (Hayes, 2006). Investment could be seen as a complex process of interconnection of several economic and financial elements into a practical activity of advancement and enlargement of social legacy, i.e. the purchase of assets with hope that they will enable creation of profit and broader well-being (Stiglitz, Walsh, 2006). Nowadays the term also refers to any investment in human capital such as acquiring of knowledge, specific skills or experience (Wolla, 2013). Investment supposes making of a sacrifice in current moment hoping that certain benefits will derive in upcoming future. So its significant characteristics are current sacrifice and future benefit, as investment considers giving up from present values towards the uncertain future reward (Rawal, 2015).

Investments could be grouped according to many factors. In regard to sector of agriculture, the most proper division is, according to their purpose, to real and financial investments. Prior contribute to the establishment of new or improvement of existing production at the farm (by its structure, quality and quantity), leading the farm to decrease the current costs of production, as to enlarge the volume or increase the quality of produced goods and services, i.e. influencing the growth of total farm's profit. They could appear as new investments (investments that are done at once usually during the purchase of new machinery, production facilities, land, equipment, livestock, establishment of plantations, etc.), or current investments (such are investments in reconstruction, renovation or replacement of obsolete capital goods, investments in rationalization of production, investments in technological transfer, investments in environmental protection, or protection of human and animal welfare, etc.). Financial investments relate to acquisition of property rights of already existing highly liquid assets (e.g. investment in securities). Besides, according to the used sources of financing, they could be realized by own funds (from farm accumulation), or by external funds (e.g. bank or public loans and grants). Regarding the level of dependence, investments could be mutually exclusive (they cannot be simultaneously implemented), complementary (implementation of one investment increases the cash flow of another investment), or substitute (implementation of one investment decreases the cash flow of another project). Towards the level of labour involvement, they could be labour-intensive or capital-intensive. In regard to the number of subjects involved in their realization, investments could be individual (done by one farmer) or group investments (require more participants). According to their size (i.e. value or significance), small investments are usually internally analysed and approved, while larger usually require external analysis and objectiveness. Focusing the object of investment at specific farm, there are investments in fixed assets (in land, livestock, machinery, production and processing facilities, equipment, etc.) and intangible assets (in research, patents, licenses, etc.), as well as investments in permanent working capital (e.g. financial assets constantly required for the maintaining of minimal level of key inputs, wages and rents), (Carter et al., 1997; Cicea et al., 2008; Subić, 2010).

In practice, each individual investment is described by following elements: object of investment (e.g. land, plantation, machinery, property rights, etc.), investor (e.g. physical person or legal entity that invest), investment process (activities related to transfer of financial assets into the investment object), and process of financing (activities related to obtaining of financial funds required for investment realization), (Sredojević, 2011).

It should be underlined that investments in agriculture are usually affected by its specificities (primarily impact of natural and climate conditions, reliance on biological processes, mismatch of production and working period, expressed seasonality, etc.). Generally they are considered as investing in: land and land improvement (e.g. enlargement of estates, spatial arrangement, cleaning of forest, improvement of physical and chemical characteristics of soil complex, implementation of drainage system or irrigation channels, etc.), establishment and maintaining of plantations (e.g. perennial crops, windproof and anti-erosion belts), basic herd (enlargement of existing herd or replacement of unproductive animals), production and processing facilities (e.g. farm building, greenhouse, cold storage, stables, warehouse, fencing, well, etc.), equipment and mechanization (e.g. replacement of obsolete or purchase of new units), (Novković et al., 2015).

Investments are the factor of development, both at micro and macro level. Without investments previously set developmental goals could not be realized. They are the tool for maintaining the sustainability of farms and rural communities, as they shape business and social environment within the agricultural sector and rural areas. Investments are prerequisite for tech-tech development of agriculture, proper infrastructural equipping of rural areas, or further increase in efficiency of agriculture (primarily efficiency of used fixed assets and labour). Also, they result in additional diversification of (non)agricultural activities, presence of entrepreneurial initiatives and general improve of people's wellbeing within the certain rural territory.

There are several motives why is reasonable to support investing in agriculture and rural areas: agriculture should satisfy continually increasing need for food; it's a significant provider of jobs and powerful tool in poverty reduction; by settled and used surface rural areas dominate over the urban areas; agriculture is highly related to the most of economy sectors, providing them needed raw materials used as inputs; generally agriculture attracts a lower number of investors although it does not require large initial capital; usually agriculture is the most subsidised and supported sector of economy; although is limited resource, land could be observed as inexhaustible factor of production; etc. (Deininger et al., 2011; Lowder et al., 2012).

One of key attributes of investment is its irreversibility, as once is done, there are usually limited number of alternatives for which investment object can be used. This is especially evident in agriculture, e.g. it is assumed that previously purchased dairy cows will be just in function of milk production, or established greenhouse will be probably used just for the growing of veggies, rarely for medicinal herbs, flowers and spices. On the other hand, tractors could be used for land cultivation or crop care in many lines of crop production, as well as for transport of agro-inputs or agro-products, etc. So, beside the intensity of farm need towards the investment object, farmer's relation to investments is mainly caused by their risk aversion. Usually economically weak farms rather will accept lower level of investments and returns in exchange to face lower risks, while well-to-do farms with more diversified incomes are more likely to accept higher risks while expecting the higher returns. In line with expressed uncertainty and slower adjustment to changes in production circumstances, one of characteristics of agriculture is that farmers are generally unwilling to invest in required equipment, land improvements, advancement of their knowledge and skills, etc., or they make just "sub-optimal" level of investments. By this they additionally aggravate the state of available capital assets and natural resources (Zepeda, 2001). Simultaneously with the growth of farms' economic power mentioned limitations become the subject of the certain level of changes in farmers approach.

In order to avoid making bad investment, decisions that could cause absence of expected profits, occurrence of possible risks and unwanted events, additionally burden farm finances, even brings to farm bankruptcy, each investment has to be preceded by adequate investment analysis. Analysis has to avoid farmer subjectivity, and has to be turned to commonly used assessment approach (based on use of scientific and analytical methods).

Main goal of this chapter is to present economic logic and general steps in investment analysis related to the use of basic models and indicators for evaluation of investment decision at farm level. Previously given theoretical background (introduction of selected indicators) will be followed by suitable case study. It will assume practical demonstration of evaluation process of economic efficiency of investments made at small family farm, i.e. evaluation of economic advantage for farmer to enrol the system of organic agricultural production (comparative analysis of the economic justification of investment in organic or conventional vegetable production organized in protected area under the identical production and market preconditions - purchasing of plastic greenhouse and required equipment).

At the end, some prior analysis that compared level of economic effectiveness reached in organic and other systems of production has showed that there is no strict conclusion which system is more profitable. It is usually influenced by distinct characteristics of used crops and animals (varieties) or production location, marketing and supplying possibilities, labour and management quality and skilfulness, disposed tech-tech solutions, available micro-climate conditions, economic status of the farm, present level of public support, etc. (Klonsky, Livingston, 1994; Nemes, 2009). But there is no doubt that from the sustainability aspects organic production sounds more complete, as it's primarily based on agro-inputs minimization and greater use of manual labour and renewable resources. Besides, as mentioned above, generally level of profitability reached in organic farming (especially in early transition period) largely relies on size, structure and awareness of demand (consumers quality), as well as consumers' readiness to pay certain level of price premium (their paying capacity).

2. Methodological approach and used data sources

Used methodology considers the application of static and dynamic indicators in order to assess and compare justification of investments done in establishment of conventional or organic vegetable production organized in protected area (plastic green-house).

All data used for the development of given chapter context and structure is previously consulted with appropriate scientific and practical literature. Although case study presented in chapter has hypothetic character, all used data (technical elements of investment, organization of production, supply and marketing channels, etc.) are quite realistic, as were obtained from in-depth interviews with the conventional and organic vegetable producers located in green belt (suburb) of Belgrade during the 2019-2020.

Better understanding of given case study and introduced mechanism for investments evaluation will be provided by tabularly presentation of obtained data and derived results. Besides, high level of comparability of prepared investment calculations will be assured by presentation of all financial values in EU currency (EUR), (used exchange rate is 1 EUR = 117.5894 RSD).

Steps in investment calculations development

Investment calculation is analytical method used for determination of the economic effectiveness of investments, i.e. economic effects that will arise from the entire production process conducted over the life of investment. It represents a fundamental base for decision making towards the farm enrolment in previously planned investment process (whether financing of certain farm investment should be done or not, or which among suggested projects' alternative should be implemented).

Decision making summarizes the whole complexity of investment problem, as it has to consider adequate selection of considered investment alternatives, the best possible farm capital allocation and perfect timing for investment realization, towards the main purpose of investment, fair returns it gives and tolerable risk level for the farm. According to this, development of investment analysis supposes a prior chronological determination of all cash receipts from the investment (value of production that will be realized out of the farm) and all cash expenditures needed for investment utilization (expenditures required for purchase or establishment of investment object, as well as expenditures related to its use, maintenance and liquidation minus the costs of depreciation and interests) for the entire period of its exploitation, expressed in annual amounts, i.e. determination of cash flow. Besides, for the purpose of investment evaluation, it should estimate possible prices of final agro-food and other products and production costs that will occur within the investment life (Hargitay, Yu, 1993; Ćejvanović et al., 2010).

In order to obtain quite realistic results and implement right investment alternative, the investment analysis during its development should pass through several steps and analytical procedures, such as (FAO, 1993; Subić, 2017):

- collection of basic investor data, i.e. farm data (e.g. administrative data, size of used land complex, number of animals, structure of farm members, available mechanization, facilities and capital equipment, total and structure of economic output, practiced production lines, used supply and marketing chain, etc.);
- drafting technical description of planned investment (e.g. main characteristics of object of investment, expected price, method and time of purchasing or phase of establishing, available financial resources, etc.);
- development of financial plan (forming of total annual incomes and costs (including their structure) that appear during the life of investment);
- evaluation of expected investment project effects (creation of cash and economic flows for entire period of investment exploitation[1] and use of selected evaluation methods and indicators);
- verification of investment analysis, reporting and adequate recommendation for selection of the best possible investment alternative.

Evaluation of investments could involve many methods, which mutually differ in relation to the fact whether they consider or not the time value of money (division on static and dynamic methods). Main advantage of static methods is their simple use and easiness to calculate, while main disadvantage is insufficient reliability of the obtained results, since they are usually based on business results from one (representative) year of investment exploitation. They could be a good solution for pre-investment studies, assessment of low-value investments with short life cycle, or during the periods characterized by low interest rates. Contrary to previous, dynamic methods respect the current level of interest rate, expressing in this way mismatch between the values of money in initial moment of investing or during the period of investment object usage. So, in order to compare all values more precisely, by discounting all future receipts and expenditures that relate to investment they are brought to same moment, usually to beginning of the investment period and their present value (Ivanović, 2013; Gogić, 2014; Puška et al. 2018).

At current moment money is more valuable than in a year's time or later, as the time reduces its value. As cash flow (receipts and expenditures) of investment is turned to future (from couple to several years), money obtained or spent in upcoming period is worth less today. How much it is worth less depends on used interest rate and length of the investments' life cycle. So, discounting refers to the process of diminution of future cash inflows (receipts) and/or cash outflows (expenditures) for the value of interest generated during the future period. It assumes the use of a discount factor, i.e. minimum rate of return on investment, calculating under the following formula (Carter et al., 1997):

$$r = \frac{1}{(1+i)^n}$$

[1] Use of assessment indicators requires previous creation of overview of economic receipts and expenditures (except depreciation and paid interests on investment) that are done during the period of investment procurement and exploitation, i.e. economic flow. Final result derived from the economic flow is the net cash flow, and by its discounting we come to the net present value (NPV) of investment, and further to other evaluation indicators (Jeločnik, Nastić, 2019).

Where,

r - discount factor;

i - interest rate;

n - period of life cycle of investment.

Static methods for the evaluation of economic effectiveness of investment

Static assessment of investment projects does not consider the entire life cycle of investment. It relates just to one, representative year, assuming that in this year it had reached the full utilization of implemented investment (usually fifth year), as well as financial relaxation of investor. Besides general simplicity, main method disadvantage is economic analysis of just one production year, what could lead to incomplete perception of investment effects. Static assessment involves many indicators. Although there is no strict definition of indicators that should be used in investment analysis, in practice the most common are (Subić, 2010; Bartosova et al., 2015):

1) Total Output-Total Input Ratio

Indicator represents the ratio between the total incomes (market value of production) and total expenditures (costs of production) that come from the investment exploitation in previously determined representative year. It is expressed by the Economical-efficiency coefficient (i.e. profitability coefficient):

$$Ee = \frac{Ot}{It}$$

Where,

Ee - economical-efficiency coefficient;

Ot - total output (market value of production);

It - total input (costs of production).

Production could be considered economical (economically efficient) if the value of coefficient is greater than one or equals to one. In this case, investment is considered as justified.

2) Net Profit Margin

Indicator represents the profitability of production, as the ratio between the profit and total income that comes from the investment exploitation in observed year. It is presented by the Net Profit Margin Ratio:

$$NPMR = \frac{P}{Ot} * 100$$

Where,

NPMR - net profit margin ratio;

P - profit;

Ot - total output (income).

Investment could be considered justified if the gained ratio value is greater than the current interest rate on the capital market.

3) Accounting Rate of Return

Profitability of investment could be considered as the ratio between the profit gained from investment exploitation in representative year and total value of investment. It is presented by Accounting Rate of Return:

$$ARR = \frac{P}{Vi} * 100$$

Where,

ARR - accounting rate of return;

P - profit;

Vi - total value of investment (initial outlay).

Investment could be considered justified if the value of ARR is greater than the current interest rate on the capital market.

4) Simple Payback Period (SPP)

Indicator represents the ratio between the total value of the invested financial resources and net cash flow generated in representative year of investment exploitation (it is assumed that all cash flows gained during project exploitation have approximately equal values). It is described by the period of investment usage needed for returning of previously invested financial resources, i.e. number of years required to compensate the initial outlay with the financial assets generated (accumulated) in net cash flow (i.e. difference between cash inflows (incomes) and cash outflows (expenses)). Method is commonly used in practice, while it could be mathematically expressed as:

$$SPP = \left(\frac{V_i}{CF_n}\right) * 100$$

Where,

SPP - simple payback period;

V_i - total value of investment (initial outlay);

CF_n - net cash flow in representative year (year n).

Dynamic methods for the evaluation of economic effectiveness of investment

Opposite to static methods, dynamic methods observe the cash inflows (receipts) and cash outflows (expenditures) during the entire life cycle of investment. Regarding greater complexity and respecting the component of time, they offer more complete and realistic analysis of investments' effectiveness. They involve a number of methods, where the Net present value (NPV), Internal rate of return (IRR) and Dynamic payback period (DPP) are the most used in practice (Jones, Smith, 1982; Carter et al., 1997; Tauer, 2000; Tassey, 2003; Andrić et al., 2005; Cicea et al., 2008; Götze et al., 2008; Sedliacikova, 2013; Arnaboldi et al., 2015; Bartnik et al., 2016).

1) Net Present Value (NPV)

Method estimates the absolute profitability of planned investment (it is profit oriented analytical tool). It expresses the total sum of increases in the investors' financial result caused by the procurement (building/construction) and use of certain investment object until the time of its liquidation that are brought down (according to previously defined discount factor) to the initial moment of investment implementation. Method is highly consistent with the objective of maximizing the farm's wealth.

Method discounts all expected cash inflows (receipts) and cash outflows (expenditures) that appeared, both during the period of the investment object procurement and during its exploitation, at the initial moment of investment usage (n = 0). Then the sum of discounted cash inflows is reduced by the sum of discounted cash outflows determining on that way the value of the expected net cash flow (sum of net annual financial benefits) derived from the investment use. So by method is calculated the present value of the sum of financial results gained within the investment life cycle. Indicator usually assumes that all cash inflows/outflows appear in same time intervals (e.g. at the end of year), or that over the years cash inflows/outflows could be presented in their average mutually equal values. Method could be mathematically presented by next simplified formula:

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+i)^t} - I$$

Where,

CF_t - net cash flow gained in year t, while t could take value from 1 to n (n represents entire period of investment exploitation);

i - interest rate;

I - initial value of investment (initial outlay);

1+i - discount rate.

If the gained value for NPV is greater than zero (NPV > 0), meaning that all expenditures incurred during the investment object procurement and use are reimbursed, or investment earns more than the discount rate, so investment will be considered as economically justified. Method is usually applied during the pre-investment period (while investment idea is planning and elaborating), in which the obtained value signalizes the investor either to enter or not into the investment process.

Group of factors that primarily affect the value of the NPV include: the value of initial investment outlay, level of interest rate (higher rates result in the decrease in NPV), value of net annual financial benefits gained from the investment exploitation, etc.

Certain NPV disadvantages are: difficulties to determine proper discount rate (in reality risk is dynamic category that requires constant recalculation of the used discount rate); it is useful just for the projects whose costs and benefits could be expressed in monetary value; method could not be used for risky investments as it does not accounts to managerial flexibility in situation of frequent inflow/outflow fluctuations; etc.

2) Internal Rate of Return (IRR)

This is a method which could present absolute and relative effectiveness of investment. Nowadays it is widely used for the evaluation of investments at the level of legal entity (e.g. for assessment whether it is worth to invest in certain project at the farm). It's a powerful tool for ranking of investment alternatives towards the level of their economic effectiveness.

Indicator could be observed like the interest rate under which the sums of cash inflows and cash outflows that have appeared during the investment procurement and exploitation are mutually equating after they have been discounted to the previously defined moment (usually the initial moment of investment object implementation).

Indicator shows the average ability of invested financial assets to earn the money during life cycle of investment. It represents the interest rate at which the NPV equals to zero, while ratio between the cash inflows and cash outflows equals to one. The method indicates for how much the discount (i.e. interest) rate may increase while the investment still remains economically justified. Internal rate of return (IRR) could be presented by following mathematical formula:

$$0 = NPV = \sum_{t=1}^{n} CF_t \ /(1+IRR)^t$$

Where,

CF_t - net cash flow gained in year t, while t could take value from 1 to n (n represents entire period of investment exploitation);

IRR - internal rate of return;

NPV - net present value.

Internal rate of return could be also calculated by next formula:

$$IRR = i_{min} + (i_{max} - i_{min}) * \frac{NPV(+)}{NPV(+) + |\ NPV(-)\ |}$$

Where,

IRR - internal rate of return;

NPV (+) - net present value of the investment under discount rate (i_{min});

NPV (-) - net present value of the investment under discount rate (i_{max});

i_{min} - discount rate under which the value of NPV is positive for the last time;

i_{max} - discount rate under which the value of NPV is negative for the first time.

Evaluation of investment considers the comparison of IRR with assumed interest rate (i - usually the interest rate at which the financial assets could be borrowed). Investment is economically justified when the value of IRR is above or equals to assumed interest rate (IRR ≥ i). Contrary, if the value of IRR is less than assumed interest rate (i), it could be considered that project's rate of return will not overrun its costs (costs of debt and equity), so project has to be rejected. The higher the IRR, the project is characterized with higher growth potential. Sometimes investors are facing the situation that very small (by value) investment could gain towering IRR, while in some cases they could pick the investment with lower IRR but higher absolute value opportunity.

The value of used interest rate is the most often conditioned by: expected investment life cycle, expected risk level within the period of investment exploitation, used structure of assets for financing of investment, etc. Structure of initially used financial assets (relation between the amounts of internal - farm assets and external - borrowed assets) for the investment procurement, usually affects the use of mixed (weighted) interest rate during the IRR or NPV calculation. Used "calculative" interest rate implies exact proportion of financial assets structure and height of interests' rates linked to them.

Method has certain disadvantages: above all its uselessness in situations in which there is negative cash flow, or there are frequent cash flow oscillations from-to positive-negative values (except in initial moment of investment implementation); as a decision making tool method is generally unreliable in assessment of mutually exclusive investments or investments that largely differ in length of life cycle; method is impractical if the interest rate at capital market is unstable; etc.

Determination of IRR could be affected by certain factors such are the amount and distribution of economic benefits within the period of investment exploitation, the value of initial outlay, duration of investment life cycle, etc.

3) Discounted (Dynamic) Payback Period (DPP)

Any investor is eager to know the time of the expected return of initially invested financial assets. Method represents a sort of determination of the amortization period of implemented investment, i.e. it determines the period in which it is possible to make a return of initial outlay and settled interest from the sum of discounted net annual benefits derived from the investment exploitation. It could be also defined as a part of planned investment life cycle in which it is feasible to return the previously invested assets together with appropriate level of interest, i.e. until the moment when NPV equals to zero. Indicator could be expressed by following formula:

$$\sum_{t=0}^{[n_d]}(Ci_t - Co_t) * (1+i)^{-t} = NPV([n_d]) < 0$$

$$\sum_{t=0}^{[n_d]+1}(Ci_t - Co_t) * (1+i)^{-t} = NPV([n_d]+1) \geq 0$$

Where,

t - expected life cycle of investment, while t could take value from 0 to n;

$[n_d]$ and $[n_d]+1$ - marginal points of depreciation period;

i - interest rate;

Ci_t - annual cash inflow;

Co_t - annual cash outflow;

NPV - net present value.

Indicator's value is expressed in years. If the payback period of the investment is shorter than its life cycle or shorter than period of loan expiration, investment could be considered as acceptable. A conservative view is that justification of investment requires DPP shorter than the half of investment life cycle.

DPP is mostly used for risk assessment in investment realization, considering the growth of uncertainty in determination of investments' economic effectiveness as times goes by.

Although it's easy to use, method is partially unreliable in evaluation of high value projects, since it carries a certain dose of subjectivity. It is usually used as additional check to the NPV and IRR methods. Main disadvantages of DPP are considered to be: incomplete comprehension of time value of money, as it does not give any indices whether the investment contributes to the growth of the investor's capital, along with the fact that all net cash flows beyond the payback period are ignored. Calculation of DPP could become complex if during the life cycle of investment, a multiple negative cash flows appear.

Break-even analysis

Among the influence of many factors active within the production environment, the biological character of agricultural production primarily affects the certain level of its uncertainty. In these circumstances, the evaluation of economic effectiveness of investment at the farm level can be easily and reliably made by the use of Break-even point (BEP) analysis. BEP analysis is appropriate method for reconsideration of the relation between fixed and variable costs, and returns related to the use of certain investment object. It determines the moment in which the investment will make a positive return. Analysis calculates the volume of production that will initiate the covering of all costs. So BEP could be understood as the critical or minimal value of the production volume or sales incomes under which the investment is not economically justified. Additional indicator related to BEP analysis is the Margin of safety, which presents the level of possible fall (in percentage) of volume of production or sale without loss expression. It can be presented by following formulas (Gutierrez, Dalsted, 1990; Dubas et al., 2011; Hancock et al., 2015):

$$BEP_r = \frac{FC}{GM} * 100$$

$$BEP_v = \frac{I * BEP_r}{100}$$

$$MS = \left(1 - \frac{BEP_v}{I}\right) * 100$$

While,

$$GM = I - VC$$

Where,

BEP_r - Break-even point (relative);

BEP_v - Break-even point (value);

MS - Margin of safety;

GM - Gross margin;

I - incomes;

FC - Fixed costs (immaterial costs without depreciation and paid interest reduced for labour costs);

VC - Variable costs (material costs increased by labour costs).

3. Case study: Evaluation of economic effectiveness of investment in conventional or organic vegetable production in protected area (plastic greenhouse)

Logic and mechanism of application of previously defined methodology will be practically presented within the following case study. The model for choosing the best investment alternative at farm level will be considered in detail.

Description of farm capacities and investment idea

Observed farm is traditionally oriented to vegetable production in protected area (plastic greenhouse). It's located in semi-urban area "green-belt" of the Belgrade, Serbia. Currently, farm has on disposal 5 technically unified plastic greenhouses, with productive capacity of each greenhouse of 500 m^2. According to market requirements and available resources, farm is in position to enlarge its production capacities by building and equipping of new plastic greenhouse at the remote part of property. As at that location exists all technical pre-conditions (access to water – well and public electric grid) for establishment of both, conventional or organic production of veggies, farmer is comparing whether to invest in new greenhouse and enrol in organic production in which he has certain experience (i.e. creation of farm value-added by skipping to new system of production), or to continue with current conventional practice. Being aware of all (dis)advantages of each production system, he will select the best investment alternative according the results and suggestions derived from investments' economic assessment.

It will be procured tunnel type plastic greenhouse, with size of 500 m^2 (dimensions 50 m x 10 m x 4.75 m). It will have galvanized double-pipe construction covered with double foil (proper automatic inflating foil enables creation of air chambers that could increase the inward temperature for several degrees in cold days). The sides of greenhouse could be lifted up for better ventilation during the period with high temperature and humidity. Greenhouse will be purchased together with adequate equipment from local dealer of agro-equipment. Additional equipment involves electric water pump of 2.2. KW and proper irrigation system (its combined system that includes covering of production area with 10 rows of drip system and greenhouse drizzling system framed by installation of 8 fine tuning sprinklers in 2 rows, as well as primary and lateral hoses, connectors, etc.). Costs of greenhouse procurement will also cover transportation to defined location and its installation.

Farm is mostly involved in production of tomatoes, cucumber, peppers, onions and garlic, spinach, green salad, leek, radishes, mangold, carrot, etc. In order to simplify development of investment analysis crop rotation will consider just tomatoes, spinach and green salad. All commonly used inputs (pesticides, fertilizers, seed, tape drip lines, raffia, clips, etc.) are purchased in local agro-pharmacy. Produced vegetables are primarily realized through the green market, and some smaller quantities within the long-term contract with one of city bakeries. In case of potential approaching to organic production, products will be mainly realized at farm gate, while some quantities will be sold at the green market (within department for organically produced agro-food products). In production activities are continuously involved 5 farm members (two generation), while in season and certain production peaks 2-3 external workers are additionally involved (as full employees or on part time basis). Farm disposes with required agro-machinery (tractor, moto-cultivator, equipment, etc.), production and infrastructure facilities (space for manipulation and packaging of vegetables, access to electro transformers, storage for vegetables and inputs, garage, several universal sheds, etc.), land, several wells, transportation van, etc. that can be used for production in newly established facility.

Potential investment, whether it will be used in conventional or organic production, considers identical technical characteristics of procured elements, unique initial outlay, almost identical organization of production activities, etc. So, derived results from applied methods for investment's evaluation could be mutually highly comparable and strongly turned to the selection of the best possible investment alternative (procurement of plastic greenhouse in order to farm approach to organic or conventional production of veggies).

Investment analysis

Procurement of required fixed assets involves several components (Table 1.), whose technical characteristics are previously described.

Table 1. Planned investment in new fixed assets (in EUR)

No.	Description	Value
I	**Production facilities**	**11,250.00**
1.	Plastic green-house (500 m^2)	11,250.00
II	**Equipment**	**1,250.00**
1.	Electric vacuum pump (2.2 kW)	537.64
2.	Irrigation system	712.36

Source: IAE, 2019/2020.

Total value and structure of planned investment is defined in next table (Table 2.). It involves investment in fixed assets and appropriate volume of permanent working capital.

Table 2. Total investment (in EUR)

No.	Description	New investment	Total investment	Share in total investment (in %)
I	**Fixed assets**	**12,500.00**	**12,500.00**	**90.91**
1.	Production facility	11,250.00	11,250.00	81.82
2.	Equipment	1,250.00	1,250.00	9.09
II	**Permanent working capital**	**1,250.00**	**1,250.00**	**9.09**
Total		**13,750.00**	**13,750.00**	**100.00**

Source: IAE, 2019/2020.

In line with general agro-accounting practice, investment in permanent working capital as a part of investment in plastic green-house and required equipment for veggies production is determined as 10% of the value of fixed assets. Within the structure of total investment more than 90% will be linked to the procurement of fixed assets, while more than 80% relies to the purchase of needed production facility (plastic green-house).

Financing of investment assumes partly use of farm financial resources (accumulation), where part of used sum will be additionally refunded with the public grant for farm investments in greenhouses establishment (it could be refunded up to the 60% of the total value of investment (in fixed assets) excluding the VAT). Rest will be financed from bank credit. With farm's financial assets, entire value of permanent working capital and larger part of fixed assets will be financed. Within the structure of financing sources share of accumulation is for almost 50% higher than the share of borrowed capital (Table 3.).

Table 3. Sources of investment's financing (in EUR)

No.	Description	New investment	Total investment	Share in total investment (in %)
I	**Internal financial resources**	**8,125.00**	**8,125.00**	**59.09**
1.	Fixed assets	6,875.00	6,875.00	50.00
2.	Permanent working capital	1,250.00	1,250.00	9.09
II	**External financial resources**	**5,625.00**	**5,625.00**	**40.91**
1.	Fixed assets	5,625.00	5,625.00	40.91
Total			**13,750.00**	**100.00**

Source: IAE, 2019/2020.

Analysis is based on "calculative" interest rate of 3.05%. It represents weighted interest rate, gained after the crossing of share of used internal and external financial assets with the value of their interests' rates. It is assumed that internal financial assets could be saved in the bank under the interest rate of 1%, while farm would take the commercial credit under the interest rate of 6%. Repayment of credit will last for 5 years.

According to the above formation of total farm income will consider crop rotation of three crops (tomatoes, spinach and green salad) and assigned value of subsidies for establishment of organic production. Related to discrepancy in gained yields and market prices, total value of annually generated farm income differs toward the applied production system (Tables 4.1. and 4.2.).

Differences in sale prices are mostly the result of gained price premium for organic products at local market. Lower yields in organic production of vegetables derive from reduced input application and farm tendency to compensate the products' quantity with higher quality. Differences in fruit classes are not in relation to their quality, but to the unstandardized fruit size and shape. Write-offs mostly consider spoiled vegetable, or mechanically damaged fruits that are not for human consumption. As farmer is fully experienced in applied production technology, it's assumed that it will not come to the expressed oscillations in gained yields. Besides, stability of local market is resulting in identical prices of vegetable during the entire life cycle of investment. In other words, analysis considers the immutable amount of total annual incomes.

Farmer could generate for almost 18% higher incomes while practicing the organic production. It is primarily caused by unsaturated local market of organic products that boosts products' prices, and relatively high income of consumers willing to buy organic products (farm products are mainly realized in Belgrade, large regional consumer centre). State incentives related to veggies production are slightly over the 1% of the sum of total incomes.

As direct material (main inputs) are considered seedlings, and used fertilizers and pesticides (Table 5.). It should be mentioned that costs of seedlings involve the costs of their production at the farm and price of previously purchased seed of veggies. Types of inputs that are commonly used at farm are most often advised by local extension officer, representative of national association of organic producers or local dealers of agro-inputs. Applied volumes of certain input are in line with general recommendations and applied practice.

Table 4.1. Forming of total farm incomes (cash inflow), (in EUR) - conventional production

Source: IAE, 2019/2020.

No.	Products, subsidies and services	UM	Year of investment life cycle														
			I			II			III			IV			V		
			Price per UM	Quantity	Value	Price per UM	Quantity	Value	Price per UM	Quantity	Value	Price per UM	Quantity	Value	Price per UM	Quantity	Value
0	1	2	3	4	5=3x4	6	7	8=6x7	9	10	11=9x10	12	13	14=12x13	15	16	17=15x16
1.	Sales incomes				13,458.06			13,458.06			13,458.06			13,458.06			13,458.06
1.1.	Spinach I class (90%)	kg	0.85	1,125.00	956.72	0.85	1,125.00	956.72	0.85	1,125.00	956.72	0.85	1,125.00	956.72	0.85	1,125.00	956.72
1.2.	Spinach II class (9%)	kg	0.60	112.50	66.97	0.60	112.50	66.97	0.60	112.50	66.97	0.60	112.50	66.97	0.60	112.50	66.97
1.3.	Spinach rejected (1%)	kg	0.00	12.5	0.00	0.00	12.5	0.00	0.00	12.5	0.00	0.00	12.5	0.00	0.00	12.5	0.00
1.4.	Tomatoes I class (88%)	kg	0.94	8,250.00	7,717.53	0.94	8,250.00	7,717.53	0.94	8,250.00	7,717.53	0.94	8,250.00	7,717.53	0.94	8,250.00	7,717.53
1.5.	Tomatoes II class (10%)	kg	0.65	937.50	613.89	0.65	937.50	613.89	0.65	937.50	613.89	0.65	937.50	613.89	0.65	937.50	613.89
1.6.	Tomatoes rejected (2%)	kg	0.00	187.50	0.00	0.00	187.50	0.00	0.00	187.50	0.00	0.00	187.50	0.00	0.00	187.50	0.00
1.7.	Green salad I class (90%)	pcs	0.43	9,018.00	3,834.53	0.43	9,018.00	3,834.53	0.43	9,018.00	3,834.53	0.43	9,018.00	3,834.53	0.43	9,018.00	3,834.53
1.8.	Green salad II class (9%)	pcs	0.30	901.80	268.42	0.30	901.80	268.42	0.30	901.80	268.42	0.30	901.80	268.42	0.30	901.80	268.42
1.9.	Green salad rejected (1%)	pcs	0.00	100.20	0.00	0.00	100.20	0.00	0.00	100.20	0.00	0.00	100.20	0.00	0.00	100.20	0.00
2.	Subsidies	ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	Services	ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total incomes					**13,458.06**			**13,458.06**			**13,458.06**			**13,458.06**			**13,458.06**

Table 4.2. Forming of total farm incomes (cash inflow), (in EUR) - organic production

No.	Products, subsidies and services	UM	Year of investment life cycle														
			I			II			III			IV			V		
			Price per UM	Quantity	Value	Price per UM	Quantity	Value	Price per UM	Quantity	Value	Price per UM	Quantity	Value	Price per UM	Quantity	Value
0	1	2	3	4	5=3x4	6	7	8=6x7	9	10	11=9x10	12	13	14=12x13	15	16	17=15x16
1.	Sales incomes				15,636.64			15,636.64			15,636.64			15,636.64			15,636.64
1.1.	Spinach I class (95%)	kg	1.17	989.58	1,157.43	1.17	989.58	1,157.43	1.17	989.58	1,157.43	1.17	989.58	1,157.43	1.17	989.58	1,157.43
1.2.	Spinach II class (4%)	kg	0.82	41.67	34.11	0.82	41.67	34.11	0.82	41.67	34.11	0.82	41.67	34.11	0.82	41.67	34.11
1.3.	Spinach rejected (1%)	kg	0.00	10.42	0.00	0.00	10.42	0.00	0.00	10.42	0.00	0.00	10.42	0.00	0.00	10.42	0.00
1.4.	Tomatoes I class (92%)	kg	1.29	7,187.50	9,247.24	1.29	7,187.50	9,247.24	1.29	7,187.50	9,247.24	1.29	7,187.50	9,247.24	1.29	7,187.50	9,247.24
1.5.	Tomatoes II class (6%)	kg	0.90	468.75	422.16	0.90	468.75	422.16	0.90	468.75	422.16	0.90	468.75	422.16	0.90	468.75	422.16
1.6.	Tomatoes rejected (2%)	kg	0.00	156.25	0.00	0.00	156.25	0.00	0.00	156.25	0.00	0.00	156.25	0.00	0.00	156.25	0.00
1.7.	Green salad I class (95%)	pcs	0.58	7,932.50	4,638.97	0.58	7,932.50	4,638.97	0.58	7,932.50	4,638.97	0.58	7,932.50	4,638.97	0.58	7,932.50	4,638.97
1.8.	Green salad II class (4%)	pcs	0.41	334.00	136.73	0.41	334.00	136.73	0.41	334.00	136.73	0.41	334.00	136.73	0.41	334.00	136.73
1.9.	Green salad rejected (1%)	pcs	0.00	83.50	0.00	0.00	83.50	0.00	0.00	83.50	0.00	0.00	83.50	0.00	0.00	83.50	0.00
2.	Incentives*	ha	221.11	0.05	11.06	221.11	0.05	11.06	221.11	0.05	11.06	221.11	0.05	11.06	221.11	0.05	11.06
3.	Subsidies**	500 m^2	350.00	0.60	210.00	350.00	0.60	210.00	350.00	0.60	210.00	350.00	0.60	210.00	350.00	0.60	210.00
4.	Services	ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total incomes					**15,857.70**			**15,857.70**			**15,857.70**			**15,857.70**			**15,857.70**

Source: IAE, 2019/2020.

*State incentives for establishment of organic production (on annual basis) are approximately 221 EUR/ha (www.agropress.org.rs/cir/details/itemlist/tag/organska%20proizvodnja).

**State subsidies for covering of control and certification costs (up to 50% without VAT), (www.srbijadanas.com/biz/novcanik/zasto-je-organska-hrana-u-srbiji-toliko-skupa-2019-01-18

Table 5. Planned costs of direct material (main inputs), (in EUR)

No.	Description	Year of investment life cycle				
		I	II	III	IV	V
Conventional production of vegetables						
1.	Seedlings	1,574.53	1,574.53	1,574.53	1,574.53	1,574.53
2.	Mineral fertilizers	133.64	133.64	133.64	133.64	133.64
3.	Pesticides	229.39	229.39	229.39	229.39	229.39
Total		**1,937.55**	**1,937.55**	**1,937.55**	**1,937.55**	**1,937.55**
Organic production of vegetables						
1.	Seedlings	1,731.12	1,731.12	1,731.12	1,731.12	1,731.12
2.	Mineral fertilizers	146.93	146.93	146.93	146.93	146.93
3.	Pesticides	252.20	252.20	252.20	252.20	252.20
Total		**2,130.24**	**2,130.24**	**2,130.24**	**2,130.24**	**2,130.24**

Source: IAE, 2019/2020.

In order to fully simplify conducted analysis, in line with farmer's previous experience and assumed price stability, all presented categories of costs represent the value of optimal quantity of used inputs towards the selected crops and system of production (inter-annually all costs within the certain cost category have unique value). Used inputs in organic production generate for almost 10% higher annual costs.

Table 6. Planned costs of electricity and fuel (in EUR)

No.	Description	Year of investment life cycle				
		I	II	III	IV	V
Conventional production of vegetables						
1.	Electricity	233.44	233.44	233.44	233.44	233.44
2.	Fuel	340.06	340.06	340.06	340.06	340.06
Total		**573.50**	**573.50**	**573.50**	**573.50**	**573.50**
Organic production of vegetables						
1.	Electricity	228.77	228.77	228.77	228.77	228.77
2.	Fuel	329.65	329.65	329.65	329.65	329.65
Total		**558.42**	**558.42**	**558.42**	**558.42**	**558.42**

Source: IAE, 2019/2020.

Electricity is mainly used for running of irrigation system, while fuel is spent in some activities that imply use of mechanization (e.g. soil cultivation prior to planting of new crop, transportation, etc.). Considering fairly balanced water needs of used crops, almost unified level of transportation and utilized mechanization, observed systems of production could assume approximately identical costs of energy (Table 6.).

Table 7. Planned other material costs (in EUR)

No.	Descriptions	Year of investment life cycle				
		I	II	III	IV	V
Conventional production of vegetables						
1.	Change of external foil at the facility	0.00	0.00	0.00	0.00	661.44
2.	Packaging	252.45	227.66	240.06	252.45	227.66
3.	Binder and raffia	11.48	11.48	11.48	11.48	11.48
4.	Mulch foil	29.75	29.75	29.75	29.75	29.75
5.	Drip tapes	38.67	38.67	38.67	38.67	38.67
6.	Water purification filter	9.92	9.92	9.92	9.92	9.92
Total		**342.26**	**317.47**	**329.87**	**342.26**	**978.91**
Organic production of vegetables						
1.	Change of external foil at the facility	0.00	0.00	0.00	0.00	661.44
2.	Packaging	238.23	211.46	222.97	238.23	211.46
3.	Binder and raffia	10.52	10.52	10.52	10.52	10.52
4.	Mulch foil	27.27	27.27	27.27	27.27	27.27
5.	Drip tapes	35.45	35.45	35.45	35.45	35.45
6.	Water purification filter	11.34	11.34	11.34	11234	11.34
Total		**322.81**	**296.04**	**307.55**	**322.81**	**957.47**

Source: IAE, 2019/2020.

According to technical specification, change of foil at the plastic green-house (Table 7.) is planned to be carried out every five years. Depending on specific type of vegetable, for packaging plastic bags, wooden or plastic crates or cardboard boxes are mostly used. Primarily in order to prevent deadlocks in work of irrigation system, filters for mechanical purification of water are changed on annual basis. As water is drawing from farm well, there are no costs of used water. There is slight difference between the sums of observed cost category in used production systems.

Annual amount of depreciation of procured facility (plastic green-house) and equipment is calculated under the generally used depreciation rates in agro-accounting practice (Table 8.).

Table 8. Depreciation (in EUR)

Type of investment	Purchase price (without VAT)	Useful life (year)	Depreciation rate (in %)	Annual value of depreciation	Repayment period of credit (years)	Salvage value
Production facility	9,375.00	15	6.67	625.00	5	6,250.00
Equipment	1,041.67	10	10.00	104.17	5	520.83
Fixed assets	**10,416.67**	**-**	**-**	**729.17**	-	**6,770.83**
Permanent working capital	1,250.00	-	-	-	-	**1,125.00**
Salvage value of investment		**-**	**-**	**-**	-	**8,020.83**

Source: IAE, 2019/2020.

Calculation of annual value of depreciation considers the price of purchased fixed assets decreased for the VAT value. Under salvage value of investment in our case is considered the undepreciated book value of fixed assets left after the repayment of entire credit increased for the value of permanent working capital. In order to facilitate investment analysis, it is assumed that repayment period of used credit and life cycle of investment will last the same time period (5 years).

Costs of labour (Table 9.) involve just costs of external labour that will be engaged in newly established green-house. Paid gross salary is in line with average gross salary at local level, characteristic for this sector of agriculture. Both, full and seasonal employees are skilful and experienced in vegetable production, and they are mostly engaged in farm activities for many years. For almost 15% higher salaries in organic production are caused by more expressed requirement for manual labour during the usual daily shifts.

Table 9. Required labour and costs of labour (in EUR)

No.	Description	Number of workers	Share in total number of employees (in %)	Average number of working months	Average monthly gross salary	Average annual gross salary
0	1	2	3	4	5	6 = 2 x 4 x 5
Conventional production of vegetables						
I	**Full employees**	2	50.00	9	415.87	7,485.70
II	**Seasonal employees**	2	50.00	1	415.87	831.74
Total		**4**	**100.00**	**10**	**831.74**	**8,317.44**
Organic production of vegetables						
I	**Full employees**	2	50.00	9	476.73	8,581.16
II	**Seasonal employees**	2	50.00	1	476.73	953.46
Total		**4**	**100.00**	**10**	**953.46**	**9,534.63**

Source: IAE, 2019/2020.

As was previously said, farm will take a 5 year credit from the commercial bank. The credit values 5,000 EUR. Grace period is one year, and credit is burdened with 6 % interest rate. Annuities will be paid quarterly (calculated by the method of equal annuities), (Table 10.).

Table 10. Credit repayment (in EUR)

Year of investment life cycle	Unpaid part of credit	Interest	Principal	Annuity
I	5,962.50	0.00	0.00	0.00
II	4,602.43	327.53	1,360.07	1,687.60
III	3,158.90	244.07	1,443.53	1,687.60
IV	1,626.79	155.49	1,532.11	1,687.60
V	0.00	61.47	1,626.13	1,687.60

Source: IAE, 2019/2020.

There are large differences between the generated non-material costs in observed systems of production (depending on the year, they are three to four times higher in organic production). In conventional production, non-material costs are primarily directed to paying fitting local or national taxes (e.g. tax for melioration, property tax, etc.) greenmarket fees, maintenance of mechanisation, etc. (Table 11.). On the other side, total sum of non-material costs in organic production is additionally burdened with the costs of control and certification of production activities, as well as with the costs of required laboratory analyses (farm traditionally practices the crop-rotation of three crops. Soil and water analysis are made every second year, usually before the start of vegetation. Fruits of each crop are analysed after harvesting. Fruit analysis is 127.56 EUR/crop, while soil and water analysis involved in calculation amounts 85.04 EUR each).

Table 11. Other non-material costs (in EUR)

No.	Description	Year of investment life cycle				
		I	II	III	IV	V
Conventional production of vegetables						
1.	Taxes and greenmarket fee	225.00	225.00	225.00	225.00	225.00
2.	Other non-material costs	57.50	57.50	57.50	57.50	57.50
Total		**282.50**	**282.50**	**282.50**	**282.50**	**282.50**
Organic production of vegetables						
1.	Laboratory analysis (soil, water and fruit)	552.77	382.69	552.77	382.69	552.77
2.	Control and certification	405.00	405.00	405.00	405.00	405.00
3.	Taxes and other costs	87.50	87.50	87.50	87.50	87.50
Total		**1,045.27**	**875.19**	**1,045.27**	**875.19**	**1,045.27**

Source: IAE, 2019/2020.

In both system of veggies production, within the sum of total costs the group of non-material costs are dominating (Table 12.). This is primarily caused by the fact that vegetable growing in green-house is labour intensive production. Quite a high share in the structure of total costs has the costs of direct material. It could be noticed that cash outflow is pretty much unvaried throughout the entire life cycle of investment. Besides, in average sum of total costs is for more than 16.5% higher in organic than in conventional production.

Table 12. Forming of total costs of production (cash outflow), (in EUR)

No.	Cost category	Year of investment life cycle				
		I	II	III	IV	V
Conventional production of vegetables						
I	**Material costs**	**2,853.32**	**2,828.53**	**2,840.92**	**2,853.32**	**3,489.96**
1.	Direct material	1,937.55	1,937.55	1,937.55	1,937.55	1,937.55
2.	Energy	573.50	573.50	573.50	573.50	573.50
3.	Other material costs	342.26	317.47	329.87	342.26	978.91
II	**Non-material costs**	**9,329.11**	**9,656.64**	**9,573.18**	**9,484.60**	**9,390.58**
1.	Depreciation	729.17	729.17	729.17	729.17	729.17
2.	Labour	8,317.44	8,317.44	8,317.44	8,317.44	8,317.44
3.	Interest	0.00	327.53	244.07	155.49	61.47
4.	Other non-material costs	282.50	282.50	282.50	282.50	282.50
Total (I+II)		**12,182.42**	**12,485.16**	**12,414.10**	**12,337.91**	**12,880.54**

Organic production of vegetables						
I	**Material costs**	**3,011.47**	**2,984.70**	**2,996.21**	**3,011.47**	**3,646.14**
1.	Direct material	2,130.24	2,130.24	2,130.24	2,130.24	2,130.24
2.	Energy	558.42	558.42	558.42	558.42	558.42
3.	Other material costs	322.81	296.04	307.55	322.81	957.47
II	**Non-material costs**	**11,309.06**	**11,466.51**	**11,553.13**	**11,294.47**	**11,370.54**
1.	Depreciation	729.17	729.17	729.17	729.17	729.17
2.	Labour	9,534.63	9,534.63	9,534.63	9,534.63	9,534.63
3.	Interest	0.00	327.53	244.07	155.49	61.47
4.	Other non-material costs	1,045.27	875.19	1,045.27	875.19	1,045.27
Total (I+II)		**14,320.53**	**14,451.21**	**14,549.35**	**14,305.94**	**15,016.68**

Source: IAE, 2019/2020.

Value of net profit is well-balanced during the observed period. Significant cut in last year is caused by the costs that will be paid for foil changing (Table 13.). It should be noted that income tax could differs from country to country (its value in Serbia for family farms is 10%), in line with tax legislation. As previously mentioned, somewhat higher values of net profit gained in organic production (in average over the 30%) are generally caused by attraction of price premium at local market.

Table 13. Profit and loss statement (in EUR)

No.	Description	Year of investment life cycle				
		I	II	III	IV	V
Conventional production of vegetables						
I	**Total incomes (1+2+3)**	**13,458.06**	**13,458.06**	**13,458.06**	**13,458.06**	**13,458.06**
1.	Sales incomes	13,458.06	13,458.06	13,458.06	13,458.06	13,458.06
2.	Subsidies	0.00	0.00	0.00	0.00	0.00
3.	Other incomes (services)	0.00	0.00	0.00	0.00	0.00
II	**Total expenditures (1+2)**	**12,182.42**	**12,485.16**	**12,414.10**	**12,337.91**	**12,880.54**
1.	Business expenditures	12,182.42	12,157.64	12,170.03	12,182.42	12,819.07
1.1.	Material costs	2,853.32	2,828.53	2,840.92	2,853.32	3,489.96
1.2.	Non-material costs without depreciation and interest	8,599.94	8,599.94	8,599.94	8,599.94	8,599.94
1.3.	Depreciation	729.17	729.17	729.17	729.17	729.17
2.	Financial expenditures	0.00	327.53	244.07	155.49	61.47
2.1.	Interest	0.00	327.53	244.07	155.49	61.47
III	**Gross profit (I-II)**	**1,275.64**	**972.90**	**1,043.96**	**1,120.15**	**577.52**
IV	**Income tax**	127.56	97.29	104.40	112.01	57.75
V	**Net profit (III-IV)**	**1,148.07**	**875.61**	**939.57**	**1,008.13**	**519.77**
Organic production of vegetables						
I	**Total incomes (1+2+3)**	**15,857.70**	**15,857.70**	**15,857.70**	**15,857.70**	**15,857.70**
1.	Sales incomes	15,636.64	15,636.64	15,636.64	15,636.64	15,636.64
2.	Subsidies	221.06	221.06	221.06	221.06	221.06
3.	Other incomes (services)	0.00	0.00	0.00	0.00	0.00
II	**Total expenditures (1+2)**	**14,320.53**	**14,451.21**	**14,549.35**	**14,305.94**	**15,016.68**
1.	Business expenditures	14,320.53	14,123.68	14,305.28	14,150.45	14,955.20
1.1.	Material costs	3,011.47	2,984.70	2,996.21	3,011.47	3,646.14
1.2.	Non-material costs without depreciation and interest	10,579.90	10,409.81	10,579.90	10,409.81	10,579.90
1.3.	Depreciation	729.17	729.17	729.17	729.17	729.17
2.	Financial expenditures	0.00	327.53	244.07	155.49	61.47
2.1.	Interest	0.00	327.53	244.07	155.49	61.47
III	**Gross profit (I-II)**	**1,537.16**	**1,406.49**	**1,308.35**	**1,551.76**	**841.02**
IV	**Income tax**	153.72	140.65	130.84	155.18	84.10
V	**Net profit (III-IV)**	**1,383.45**	**1,265.84**	**1,177.52**	**1,396.58**	**756.92**

Source: IAE, 2019/2020.

Like in case with net profit, during the formation of both flows (net cash or economic flow), the value of final result gained in organic production is in some extent more expressed (primarily initiated at income side), (Tables 14. and 15.). Of course, comparing the both flows, final results gained in economic flow are generally higher as they not involve obligation towards the financial resources (paid annuities). In further analysis of investment (development of static and dynamic assessment indicators) the economic flow will be used.

Table 14. Forming of net cash flow (in EUR)

No.	Description	Zero moment	Year of investment life cycle				
			I	II	III	IV	V
	Conventional production of vegetables						
I	**Total cash inflow (1+2+3)**	**13,750.00**	**19,708.06**	**13,458.06**	**13,458.06**	**13,458.06**	**21,478.90**
1.	Total income	0,00	13,458.06	13,458.06	13,458.06	13,458.06	13,458.06
2.	Financial resources	13,750.00					
	2.1. Internal resources	8,125.00					
	2.2. External resources	5,625.00					
3.	Salvage value	0,00	6,250.00	0.00	0.00	0.00	8,020.83
	3.1. Fixed assets	0,00	6,250.00				6,770.83
	3.2. Permanent working capital	0,00					1,250.00
II	**Total cash outflow (4+5+6+7)**	**13,750.00**	**11,580.82**	**13,213.36**	**13,232.86**	**13,252.87**	**13,835.26**
4.	Investment value	13,750.00					
	4.1. In fixed assets	12,500.00					
	4.2. In permanent working capital	1,125.00					
5.	Costs without depreciation and interest	0.00	11,453.26	11,428.47	11,440.86	11,453.26	12,089.90
6.	Income tax	0.00	127.56	97.29	104.40	112.01	57.75
7.	Obligation towards financial resources (annuities)	0.00	0.00	1,687.60	1,687.60	1,687.60	1,687.60
III	**Net cash flow (I-II)**	**0.00**	**8,127.24**	**244.70**	**225.20**	**205.19**	**7,643.64**
	Organic production of vegetables						
I	**Total cash inflow (1+2+3)**	**13,750.00**	**22,107.70**	**15,857.70**	**15,857.70**	**15,857.70**	**23,878.53**
1.	Total income	0,00	15,857.70	15,857.70	15,857.70	15,857.70	15,857.70
2.	Financial resources	13,750.00					
	2.1. Internal resources	8,125.00					
	2.2. External resources	5,625.00					
3.	Salvage value	0,00	6,250.00	0.00	0.00	0.00	8,020.83
	3.1. Fixed assets	0,00	6,250.00				6,770.83
	3.2. Permanent working capital	0,00					1,250.00
II	**Total cash outflow (4+5+6+7)**	**13,750.00**	**13,745.08**	**15,222.77**	**15,394.55**	**15,264.06**	**15,997.74**
4.	Investment value	13,750.00					
	4.1. In fixed assets	12,500.00					
	4.2. In permanent working capital	1,250.00					
5.	Costs without depreciation and interest	0.00	13,591.37	13,394.52	13,576.11	13,421.28	14,226.04
6.	Income tax	0.00	153.72	140.65	130.84	155.18	84.10
7.	Obligation towards financial resources (annuities)	0.00	0.00	1,687.60	1,687.60	1,687.60	1,687.60
III	**Net cash flow (I-II)**	**0.00**	**8,362.61**	**634.93**	**463.15**	**593.64**	**7,880.79**

Source: IAE, 2019/2020.

Table 15. Forming of economic flow (in EUR)

No.	Description	Zero moment	Year of investment life cycle				
			1	2	3	4	5
	Conventional production of vegetables						
I	**Total cash inflow (1+2)**	**0,00**	**19,708.06**	**13,458.06**	**13,458.06**	**13,458.06**	**21,478.90**
1.	Total income	0,00	13,458.06	13,458.06	13,458.06	13,458.06	13,458.06
2.	Salvage value	0,00	6,250.00	0.00	0.00	0.00	8,020.83
	2.1. Fixed assets	0,00	6,250.00				6,770.83
	2.2. Permanent working capital	0,00					1,125.00
II	**Total cash outflow (3+4+5)**	**13,750.00**	**11,580.82**	**11,525.76**	**11,545.26**	**11,565.27**	**12,147.66**
3.	Investment value	13,750.00					
	3.1. In fixed assets	12,500.00					
	3.2. In permanent working capital	1,250.00					
4.	Costs without depreciation and interest	0,00	11,453.26	11,428.47	11,440.86	11,453.26	12,089.90
5.	Income tax	0.00	127.56	97.29	104.40	112.01	57.75

III	**Net cash flow (I-II)**	**-13,750.00**	**8,127.24**	**1,932.30**	**1,912.80**	**1,892.79**	**9,331.24**
	Organic production of vegetables						
I	**Total cash inflow (1+2)**	**0,00**	**22,107.70**	**15,857.70**	**15,857.70**	**15,857.70**	**23,878.53**
1.	Total income	0,00	15,857.70	15,857.70	15,857.70	15,857.70	15,857.70
2.	Salvage value	0,00	6,250.00	0.00	0.00	0.00	8,020.83
	2.1. Fixed assets	0,00	6,250.00				6,770.83
	2.2. Permanent working capital	0,00					1,250.00
II	**Total cash outflow (3+4+5)**	**13,750.00**	**13,745.08**	**13,535.17**	**13,706.95**	**13,576.46**	**14,310.14**
3.	Investment value	13,750.00					
	3.1. In fixed assets	12,500.00					
	3.2. In permanent working capital	1,250.00					
4.	Costs without depreciation and interest	0,00	13,591.37	13,394.52	13,576.11	13,421.28	14,226.04
5.	Income tax	0.00	153.72	140.65	130.84	155.18	84.10
III	**Net cash flow (I-II)**	**-13,750.00**	**8,362.61**	**2,322.53**	**2,150.75**	**2,281.24**	**9,568.39**

Source: IAE, 2019/2020.

The economic result (i.e. economic effect of the farm business) depends both of the market value of realized production and incurred costs. In case that market value of farm output overcomes the incurred costs, it will gain certain level of gross profit and accumulation. Otherwise farm will realize loss and possible insolvency (Sredojević, Simić, 2016). Investment is economically justified in both systems, as the value of Economical-efficiency coefficient is higher than one in representative year (fifth year) of investment exploitation (Table 16.). According to this indicator it could be not be determined to which system investment fits the best, as in both cases indicator has shown almost identical values during the entire life cycle of investment.

Table 16. Economical-efficiency coefficient (in EUR), (Ee > 1)

Year of investment life cycle	Total output (market value of production)	Total input (costs of production)	Ee
0	**1**	**2**	**3 = 1/2**
	Conventional production of vegetables		
I	13,458.06	12,182.42	1.10
II	13,458.06	12,485.16	1.08
III	13,458.06	12,414.10	1.08
IV	13,458.06	12,337.91	1.09
V*	13,458.06	12,880.54	1.04
	Organic production of vegetables		
I	15,636.64	14,320.53	1.09
II	15,636.64	14,451.21	1.08
III	15,636.64	14,549.35	1.07
IV	15,636.64	14,305.94	1.09
V*	15,636.64	15,016.68	1.04

Source: IAE, 2019/2020.

Like with previous indicator, similar situation occurs with Net profit margin ratio (Table 17.). Investment is economically justified in both systems, as the indicator value is higher than assumed "calculative" interest rate (weighted interest rate, i.e. 3.05%), as in representative, as well as in all other observed years. Sharp drop in indicators' value in fifth year is affected by the costs of foil change. Assessment of investment based on this indicator slightly favours the system of organic production.

Table 17. Net profit margin ratio (in EUR), (NPMR > i)

Year of investment life cycle	Profit	Total output (income)	NPMR
0	**1**	**2**	**3 = 1/2*100**
Conventional production of vegetables			
I	1,148.07	13,458.06	8.53
II	875.61	13,458.06	6.51
III	939.57	13,458.06	6.98
IV	1,008.13	13,458.06	7.49
V*	519.77	13,458.06	3.86
Organic production of vegetables			
I	1,383.45	15,636.64	8.85
II	1,265.84	15,636.64	8.10
III	1,177.52	15,636.64	7.53
IV	1,396.58	15,636.64	8.93
V*	756.92	15,636.64	4.84

Source: IAE, 2019/2020.

Considering ARR (Table 18.), investment could economically fit both systems, as the value of indicator in representative year oversteps the value of supposed "calculative" interest rate, i.e. 3.05%. Again, sharp drop in indicators' value in representative year is affected by the costs of foil change. According to this indicator, investment is better matching for the organic production.

Table 18. Accounting rate of return (in EUR), (ARR > i)

Year of investment life cycle	Profit	Initial outlay	ARR
0	**1**	**2**	**3 = 1/2*100**
Conventional production of vegetables			
I	1,148.07	13,750.00	8.35
II	875.61	13,750.00	6.37
III	939.57	13,750.00	6.83
IV	1,008.13	13,750.00	7.33
V*	519.77	13,750.00	3.78
Organic production of vegetables			
I	1,383.45	13,750.00	10.06
II	1,265.84	13,750.00	9.21
III	1,177.52	13,750.00	8.56
IV	1,396.58	13,750.00	10.16
V*	756.92	13,750.00	5.50

Source: IAE, 2019/2020.

Table 19. Simple payback period (in EUR), (SPP < n)

Year of investment life cycle	Net cash flow from economic flow	Cumulative net cash flow
Conventional production of vegetables		
0	-13,750.00	-13,750.00
I	8,127.24	-5,622.76
II	1,932.30	-3,690.46
III	1,912.80	-1,777.65
IV	1,892.79	115.14
V	9,331.24	9,446.38
Organic production of vegetables		
0	-13,750.00	-13,750.00
I	8,362.61	-5,387.39
II	2,322.53	-3,064.85
III	2,150.75	-914.10
IV	2,281.24	1,367.14
V	9,568.39	10,935.53

Source: IAE, 2019/2020.

According to value for SPP (Table 19.), investment will be returned in 3 years and 11.27 months in case of conventional production, or 3 years and 4.81 months in case of organic production. In both systems of production investment will be economically effective, as its exploitation will successfully compensate initial outlay before the date of credit expiration. SPP also slightly favours the organic production.

In relation to the NPV (Table 20.), in both cases, during the use of investment in observed five years period, investment will make the increase in investors' profit possible (discounted by the i = 3.05 to the zero moment) for almost 7.5 thousands EUR, or almost 8.8 thousands EUR. According to this indicator, preference will be given to investments' implementation within the organic system of production.

Table 20. Net present value (NPV) and internal rate of return (IRR), (in EUR)

No.	Description	Zero moment	Year of investment life cycle					Cumulative
			I	II	III	IV	V	
0	1	2	3	4	5	6	7	8
Conventional production of vegetables								
1.	Net cash flow from economic flow (columns 3 to 7)	-13,750.00	8,127.24	1,932.30	1,912.80	1,892.79	9,331.24	***23,196.38***
2.	Discount rate (%)	3.05	3.05	3.05	3.05	3.05	3.05	-
3.	Discount factor $(1+i)^{-n}$ where i = discount rate; n = year of investment life cycle	1.0000	0.9704	0.9418	0.9139	0.8869	0.8607	-
4.	Present value of net cash flow from economic flow (columns 3 to 7)	-13,750.00	7,887.04	1,819.78	1,748.17	1,678.75	8,031.47	***21,165.22***
5.	**Net present value of investment (columns 2 to 7)**	**7,415.22**						
6.	**Relative net present value of investment [(columns 2 to 7) / | column 2|]*100 > i**	**54.00%**						
7.	**Internal rate of return (IRR > i)**	**20.46%**						
Organic production of vegetables								
1.	Net cash flow from economic flow (columns 3 to 7)	-13,750.00	8,362.61	2,322.53	2,150.75	2,281.24	9,568.39	***24,685.53***
2.	Discount rate (%)	3.05	3.05	3.05	3.05	3.05	3.05	
3.	Discount factor $(1+i)^{-n}$ where i = discount rate; n = year of investment life cycle	1.0000	0.9704	0.9418	0.9139	0.8869	0.8607	
4.	Present value of net cash flow from economic flow (columns 3 to 7)	-13,750.00	8,115.46	2,187.28	1,965.64	2,023.28	8,235.59	***22,527.25***
5.	**Net present value of investment (columns 2 to 7)**	**8,777.25**						
6.	**Relative net present value of investment [(columns 2 to 7) / | column 2|]*100 > i**	**64.00%**						
7.	**Internal rate of return (IRR > i)**	**23.49%**						

Source: IAE, 2019/2020.

According to IRR, investment is profitable in both systems of production, as indicators' value significantly overcomes the "calculative" interest rate (3.05%), and even interest rate related to borrowed capital (6.00%). Considering higher IRR value, it could be concluded that investment utilization better fits the system of organic production.

Considering DPP (Table 21.), investment will be returned in 4 years and 0.92 months in case of conventional production, or 3 years and 8.79 months in case of organic production. So, investment is economically justified in both production systems, as it will result in credit repayment before its expiration. Like in case of SPP, this indicator also favours the organic production.

Table 21. Dynamic payback period (in EUR), (DPP < n)

Year of investment life cycle	Present value of net cash flow from economic flow	Cumulative net cash flow
Conventional production of vegetables		
0	-13,750.00	-13,750.00
I	7,887.04	-5,862.96
II	1,819.78	-4,043.18
III	1,748.17	-2,295.01
IV	1,678.75	-616.26
V	8,031.47	7,415.22
Organic production of vegetables		
0	-13,750.00	-13,750.00
I	8,115.46	-5,634.54
II	2,187.28	-3,447.26
III	1,965.64	-1,481.62
IV	2,023.28	541.66
V	8,235.59	8,777.25

Source: IAE, 2019/2020.

Table 22. Variable costs (in EUR)

No.	Description	Year of investment life cycle				
		I	II	III	IV	V
Conventional production of vegetables						
1.	Variable costs (VC = MC + L)	11,170.76	11,145.97	11,158.36	11,170.76	11,807.40
2.	Material costs (MC)	2,853.32	2,828.53	2,840.92	2,853.32	3,489.96
3.	Labour (L)	8,317.44	8,317.44	8,317.44	8,317.44	8,317.44
Organic production of vegetables						
1.	Variable costs (VC = MC + L)	12,546.10	12,519.33	12,530.84	12,546.10	13,180.76
2.	Material costs (MC)	3,011.47	2,984.70	2,996.21	3,011.47	3,646.14
3.	Labour (L)	9,534.63	9,534.63	9,534.63	9,534.63	9,534.63

Source: IAE, 2019/2020.

Table 23. Fixed costs (in EUR)

No.	Description	Year of investment life cycle				
		I	II	III	IV	V
Conventional production of vegetables						
1.	Fixed costs (FC = NMC - L)	282.50	282.50	282.50	282.50	282.50
2.	Non-material costs (NMT), without depreciation and interest	8,599.94	8,599.94	8,599.94	8,599.94	8,599.94
3.	Labour (L)	8,317.44	8,317.44	8,317.44	8,317.44	8,317.44
Organic production of vegetables						
1.	Fixed costs (FC = NMC - L)	1,045.27	875.19	1,045.27	875.19	1,045.27
2.	Non-material costs (NMT), without depreciation and interest	10,579.90	10,409.81	10,579.90	10,409.81	10,579.90
3.	Labour (L)	9,534.63	9,534.63	9,534.63	9,534.63	9,534.63

Source: IAE, 2019/2020.

According to evaluation of investment under uncertainty (Table 24.), use of investment passed the test in both systems of production. In both production systems investment the biggest risk for the investment is in the fifth year of investment exploitation when production volume mustn't fall below 17.11%, or 42.56%, i.e. gained incomes have not fallen below 2,303.26 EUR, or 6,655.27 EUR.

On the other hand, investment in both production systems is least risky in second year of investment use, when it could allow fall in production volume for 87.78%, or 71.92%, i.e. the gained sales income could be decreased for 11,813.71 EUR, or 11,246.65 EUR without fear of financial loss.

Table 24. Break-even point of investment exploitation (in EUR)

No.	Description	Year of investment life cycle				
		I	II	III	IV	V
	Conventional production of vegetables					
1.	Incomes (I)	13,458.06	13,458.06	13,458.06	13,458.06	13,458.06
2.	Variable costs (VC)	11,170.76	11,145.97	11,158.36	11,170.76	11,807.40
3.	Fixed costs (FC)	282.50	282.50	282.50	282.50	282.50
4.	Gross margin (GM = I - VC)	2,287.30	2,312.09	2,299.70	2,287.30	1,650.66
5.	Break-even point (relative) (BEPr = (FC / GM) * 100), in %	12.35	12.22	12.28	12.35	17.11
6.	Break-even point (value) (BEPv = (I * BEPr) / 100), in EUR	1,662.18	1,644.35	1,653.22	1,662.18	2,303.26
7.	Margin of safety (MS = ((1 - (BEPv / I)) * 100), in %	87.65	87.78	87.72	87.65	82.89
	Organic production of vegetables					
1.	Incomes (I)	15,636.64	15,636.64	15,636.64	15,636.64	15,636.64
2.	Variable costs (VC)	12,546.10	12,519.33	12,530.84	12,546.10	13,180.76
3.	Fixed costs (FC)	1,045.27	875.19	1,045.27	875.19	1,045.27
4.	Gross margin (GM = I - VC)	3,090.55	3,117.31	3,105.80	3,090.55	2,455.88
5.	Break-even point (relative) (BEPr = (FC / GM) * 100), in %	33.82	28.08	33.66	28.32	42.56
6.	Break-even point (value) (BEPv = (I * BEPr) / 100), in EUR	5,288.56	4,389.99	5,262.58	4,428.02	6,655.27
7.	Margin of safety (MS = ((1 - (BEPv / I)) * 100), in %	66.18	71.92	66.34	71.68	57.44

Source: IAE, 2019/2020.

Finally, as the step of verification of project assessment, one table that will summarize all used indicators during the economic analysis of investment will be presented (Table 25.).

Table 25. Values of used indicators – summarized

No.	Description	Conventional production	Organic production
1.	Total yields – annually		
1.1.	Spinach (kg/500 m^2)	1,250	1,042
1.2.	Tomatoes (kg/500 m^2)	9,375	7,812
1.3.	Green salad (pcs/500 m^2)	10,020	8,350
2.	Total sales income – annually		
2.1.	Spinach (EUR/500 m^2)	1,024	1,192
2.2.	Tomatoes (EUR/500 m^2)	8,331	9,669
2.3.	Green salad (EUR/500 m^2)	4,103	4,776
3.	Variable costs (EUR/500 m^2) – average	11,290. 65	12,664.63
4.	Total costs (EUR/500 m^2) – average	12,460.03	14,528.74
5.	Discount rate	3.05	3.05
6.	Net profit (EUR/500 m^2) – average	898.23	1,196.06
7.	Static project assessment		
7.1.	Economical-efficiency coefficient – average	1.08	1.07
7.2.	Net profit margin (%) – average	6.67	7.65
7.3.	Accounting rate of return (%) – average	6.53	8.70
7.4.	Simple payback period	3 years and 11.27 months	3 years and 4.81 months
8.	Dynamic project assessment		
8.1.	Net present value (EUR/500 m^2)	7,415.22	8,777.25
8.2.	Internal rate of return (%)	20.46	23.49
8.3.	Dynamic payback period	4 years and 0.92 months	3 years and 8.79 months
9.	Break-even point analysis		
9.1.	Break-even point (%) – average	13.26	33.29
9.2.	Break-even point (EUR/500 m^2) – average	1,785.07	5,204.88
9.3.	Margin of safety (%) – average	86.74	66.71

4. Conclusion

Awareness, understanding, accepting and at the end full implementation of principles of sustainability is fundamental for the further development of agriculture, rural communities and, above all, farms. Creation of the value-added at the farm and in that relation transferring to organic farming could be a road well taken in adjusting to the sustainability requirements (i.e. organic production perfectly matches the farm sustainability concept, as it does not endanger the environment, economically and managerially is viable and socially suitable).

At the other side, farm sustainability is generally difficult to achieve without additional labour engagement, procurement of proper machinery, equipment and supplies, availability of adequate production facilities, tech-tech proactivity, etc., i.e. without sufficient level of investments. Therefore, claim that investments are the prerequisite for survival of agriculture and rural areas has been proven to be very true. Farmers are constantly facing certain issues toward the investment process. There are always some levels of struggle between the lack of available financial assets and value of farm sustainability maintaining. Besides, farmers are usually not fully aware the investment's irreversibility, as well as the level of its own risk aversion, or willingness to get into the investment at all. So, avoiding the selection of wrong investment alternative, which could endanger farm profitability, even drive up to farm bankruptcy, should be in relation to expert investment analysis, i.e. analysis that will eliminate farmer's subjectivity. In order to evaluate economic efficiency of planned investment at the farm usually adequate static (Total Output-Total Input Ratio, Net Profit Margin, Accounting Rate of Return, or Simple Payback Period) and dynamic (Net Present Value, Internal Rate of Return, discounted Payback Period or Brake-even analysis) assessment methods are used.

To interpret the analytical strength of mentioned methods and their influence on selection of the best possible investment alternative, appropriate case study was developed. It considers farmers' justification of economic advantages to invest in plastic greenhouse and necessary equipment for vegetable production. According to the fact that procured assets could be used both in conventional or organic production of veggies, throughout the conducted economical assessment was also considered which system of production would be a better alternative for increasing of farm sustainability. As expected, establishment of organic production proved to be a more rational solution for farm profitability.

There is no firm belief in where is more profitable to invest, as it's not possible to generalize the gained results from the case study, since a small change in production and market presumptions can completely change the presented data. But in line with the fact that investing in both production systems is economically justified, our personal opinion is that from the aspect of current and future generations (whether they are on the side of production or consumption) is generally fairer to turn to nature and its laws, i.e. organic production.

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Appendix – Definitions of key terms

farm sustainability – it represents the ability of certain farm to operate, survive and grow within the particular socio-economic and natural surroundings, while keeping up for a longer period its administrative, economic, ecological and social functions at satisfactory level. Farm sustainability corresponds to four mutually equal aspects of sustainability: managerial sustainability; economic sustainability; social sustainability; and ecological sustainability.

value-added at farm level – under the given circumstances it represents the best possible portfolio of farm activities and agricultural practices created by farmer in order to fit the farm output (primarily agro-food products and services) with the consumers' preferences. It is usually related to changes in shape, form and structure, or appearance of specific characteristics of certain product, as well as its permanent availability, or emerging the new identity and quality level that was not available in previously offered farm products and services.

vertical integration at farm level - it represents the mechanism in which the farm introduces the previously produced primary product into the higher degree of processing (production of semi-finished products or food products) by engaging its own processing capacities.

investments in agriculture – they usually considers the transfer of financial assets into the purchase or up-building of capital goods (facilities, land, livestock, machinery, tools, equipment, etc.), which are not subject of current consumption but they are in function of production of consumer goods and services in long-term period.

time value of money – currently, money is more valuable than in upcoming years, as the time reduces its value. So, as a cash flow of investment is turned to future, money obtained or spent in upcoming period is worth less today. Amount for its worth lessens depends on used interest rate and length of the investments' life cycle.

static methods for evaluation of economic effectiveness of investment – static assessment does not consider the entire life cycle of investment. It relates just to one, representative year (usually fifth year), assuming that in this year previously procured investment object has reached its full rate of utilization. They do not consider the time value of money. Generally, the commonly used methods are Economical-efficiency coefficient, Net profit margin, Accounting rate of return, and Simple payback period.

dynamic methods for evaluation of economic effectiveness of investment - dynamic assessment observes the cash inflows and cash outflows during the entire life cycle of investment. It respects the component of time, offering more complete and reliable analysis of investments' effectiveness. The usually used dynamic methods in practice involve Net present value, Internal rate of return, and Dynamic payback period.

Ch. 4.2. EVALUATION OF ECONOMIC EFFICIENCY OF INVESTMENTS IN ORGANIC PRODUCTION AT THE FAMILY FARMS

OBJECTIVES:

The main purpose of previously presented chapter is to provide the students a practical knowledge how to use selected methods for assessment of economics efficiency of investment in sector of agriculture.

SKILLS:

Students have acquired advanced knowledge in tools for analytical analysis in decision making process towards the investment at farm level.

QUESTION 1 (PLEASE CHECK THE CORRECT ANSWER)

What are the main aspects of the micro (farm) sustainability concept?

- ☐ Managerial sustainability, economic sustainability and ecological sustainability
- ☐ Economic sustainability and social sustainability
- ☐ Ecological sustainability and economic sustainability
- ☐ Economic sustainability, ecological sustainability, managerial sustainability and social sustainability

QUESTION 2 (PLEASE CHECK THE CORRECT ANSWER)

What is the brief definition of value added formation at farm level?

- ☐ Strict adherence to the principles of organic agriculture or good agricultural practices
- ☐ Implementation of procedures for protection of local cultural and historical heritage
- ☐ Creation of the best possible portfolio of farm activities and agricultural practices in order to match the farm output with consumers' preferences
- ☐ Use of autochthonous animal and plant varieties adapted to the local ecosystem

QUESTION 3 (PLEASE CHECK THE CORRECT ANSWER)

To which time frame are usually focused the static methods for evaluation of economic effectiveness of investment?

- ☐ To moment when initial investment outlay is done
- ☐ To entire life cycle of investment
- ☐ To representative year of investment exploitation

QUESTION 4 (PLEASE CHECK THE CORRECT ANSWER)

What are the commonly used dynamic methods for evaluation of economic effectiveness of investment?

- ☐ Simple payback period, net profit margin and accounting rate of return
- ☐ Internal rate of return and accounting rate of return
- ☐ Net present value, internal rate of return and dynamic payback period
- ☐ None of previously mentioned

QUESTION 5 (PLEASE CHECK THE CORRECT ANSWER)

What determines the Margin of safety?

- ☐ It determines the level of farm incomes that will enable farmer to reach the decent living standard
- ☐ It determines the maximal use of pesticides per hectare of farms' utilized agricultural area
- ☐ It determines the level of possible fall in farms' volume of production or sale without loss expression
- ☐ It determines the required level of vitamins that have to be consumed in daily human nutrition

PRACTICAL APPLICATION OF THE PREVIOUSLY ACQUIRED KNOWLEDGE:

TASK: try to define/assume all production elements related to certain farm that are required for development of economic analysis (main production orientation and established production line at the farm, available production resources, level and market prices of used inputs and realized outputs, used supply and market chain, etc.). devise possible investment idea that will be in function of advancement of observed production line and current level of farm sustainability (procurement of certain fixed assets). define/assume all elements that will follow the realization of planned investment (value of initial outlay, possible financial structure and current external financing conditions, availability of subsidies, grants or incentives, etc.). make an evaluation of previously defined investment under preassumed circumstances by the use of static methods and devise the correct investment decision.
