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METHODOLOGY FOR CALCULATING THE EFFECTIVENESS OF INVESTMENTS IN THE FRUIT AND VEGETABLES SECTOR

M.Kholikulov - PhD student at «Tashkent Institute of Irrigation and Agricultural Mechanization Engineers» National Research University

Abstract

This article theoretically examines the issues of analyzing and assessing investment efficiency. A new formula adapted for assessing investment efficiency in the agricultural sector is proposed. It takes into account factors such as sustainability, logistics efficiency, and crop yield. These factors take into account variability in agriculture, efficient resource management, and environmental sustainability. The article proposes new approaches to assessing investment efficiency by integrating modern approaches and various indicators.

Keywords: *Investment efficiency, Agricultural sector, Sustainability, Logistics efficiency, Crop yield, Financial indicators, Modern farming techniques, Government policies.*

Introduction. Improving investment efficiency is important for increasing profits in agriculture, using resources efficiently, and responding to market demands. Macroeconomic factors such as the impact of government policies, risk levels, and the tax system also significantly affect investment attractiveness.

An analysis of theoretical sources shows that currently a number of economists believe that taking into account both objective and subjective factors when analyzing investment efficiency is necessary to achieve the ultimate results.

The effectiveness of investments is assessed through financial indicators and calculation methods. The main purpose of assessing effectiveness is to determine how profitable an investment.

Literature review: In their work "Principles of Corporate Finance" by Richard Braley, Stuart Myers, and Allen Franklin, they describe in detail the basics of calculating financial indicators of investments, including indicators such as NPV, IRR, and ROI, and present universal formulas and rules for assessing the effectiveness of investment projects.

Damodaran, Aswath's "Investment Valuation: Tools and Techniques for Determining the Value of Any Asset" offers a methodological framework for assessing the financial value of investments. Practical examples of calculating IRR and ROI are given, and these indicators provide reliable mechanisms for assessing future returns on investment. The report "Sustainable Agriculture and Food Systems" developed by FAO provides recommendations on sustainability and logistics efficiency in agriculture. It emphasizes environmentally friendly practices and resource-saving mechanisms. Porter, Michael E. "Competitive Advantage: Creating and Sustaining Superior Performance" includes practical recommendations for ensuring competitiveness by improving logistics efficiency in agriculture. Factors such as S, L, C presented in the article are important criteria for assessing sustainability, logistics and productivity in agriculture. Environmental sustainability, taken from FAO sources, and Michael Porter's theories on logistics efficiency are relevant to the content of the article. IMF (International Monetary Fund). The "World Economic Outlook" report analyzes global indicators of inflation rates, refinancing rates and the investment climate. Local scientists highlight the role of the tax system in improving the investment climate and areas such as improving the regulatory framework. Factors affecting the investment climate, such as state policy, inflation, political stability, and the tax system, form the basis for the analysis in the article. The information provided in these sources is used to scientifically substantiate the factors presented in the article.

Research methodology: This study employs a mixed-method approach, combining qualitative and quantitative techniques to assess investment efficiency in the agricultural sector. Key indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), and Return on Investment (ROI) were used for financial analysis. These indicators were adapted with a new formula incorporating sustainability, logistics efficiency, and crop yield as factors.

Data was collected from secondary sources, including reports from the FAO, IMF, and established financial literature. The methodology integrates theoretical analysis with practical evaluation by proposing an innovative formula, FVE-ROI, which adjusts traditional ROI calculations for agricultural-specific variables. A comparative analysis was conducted to evaluate the impact of sustainability, logistics efficiency, and crop yield on investment outcomes. Scoring intervals (0 to 1) were used for these factors to provide a standardized framework for assessment. This approach ensures a comprehensive evaluation of how environmental and logistical variables influence profitability in the agricultural sector. The findings are supported by case studies and scenario simulations to validate the proposed formula's application and relevance.

Key indicators and methodologies: Net Present Value (NPV). NPV is an indicator that represents the current value of an investment project, comparing the current value of the future cash flows expected from the project with the investment costs.:

Formula: $$NPV = \sum \frac{R_t}{(1+i)^t} - C$$

Here:

R_t- t cash flow during the period,
i – discount rate,
t – time period,
C – initial investment.

Note: If the NPV is positive, the investment is considered profitable..

Internal Rate of Return (IRR). IRR is the internal rate of return of an investment project, which is the discount rate that equates the expected future cash flows of the project to their present value. In other words, IRR is the interest rate that makes the project's NPV (Net Present Value) equal to zero.:

Formula: NPV=0 find the value of i that is.

Note: IRR is the internal rate of return of an investment. If the IRR is higher than the investor's required rate of return, the investment is profitable..

Payback Period is the time required to recover the initial capital invested in an investment project. This indicator shows how quickly the project will cover its costs and start generating net income:

Formula:

$$PaybackPeriod=\frac{\text{Investment used}}{\text{Annual income}}$$

Note: This indicator shows the time it takes for an investment to pay for itself. A short payback period confirms the effectiveness of the investment..

Return on investment (ROI):

Formula:

$$ROI=(\frac{\text{Income}}{\text{Investment}})\times 100\%$$

Note: ROI expresses the efficiency of investment in percentages .

Calculating the effectiveness of investments is important for several reasons: Financial decision-making - helps in choosing effective investment projects, ensures efficient allocation of resources. Risk assessment - helps in determining the risk level of the project and allows analyzing the acceptable risk. Performance evaluation - through financial indicators (NPV, IRR, ROI, etc.), it is possible to assess the effectiveness of investments and determine the payback period of the project.

Analysis and discussion of results: Agriculture, especially the horticulture sector, is unique in its characteristics. The horticulture sector is characterized by a diverse range of products to meet high consumer demand, with strong growth in domestic and export markets. Factors such as modern agriculture and well-organized logistics improve yields, quality and freshness. The sector is sustainable through water conservation and environmentally friendly practices, and also addresses climate issues with greenhouses and sustainable farming. Although automation is increasing, labor remains essential, especially during peak seasons. Health standards and traceability ensure product safety, and value-added processing and sustainable packaging meet the desires of modern consumers.

Based on the above factors, an investment return formula adjusted for agricultural efficiency is proposed:

Investment return formula adapted to the efficiency of the fruit and vegetable growing sector:

$$FVE\text{-}ROI=(\frac{Net\ profit}{Investment})\times S\times L\times C\times 100$$

Net Profit - Total revenue minus expenses (including seasonal adjustments, losses, and operating expenses);

Investment - Initial and ongoing capital investments (including land, infrastructure, labor, etc.);

S - Sustainability factor, which adjusts for environmentally harmful practices (value between 0 and 1; higher values indicate greater sustainability, which may lead to subsidies, tax breaks, or higher consumer premiums).

L - Logistics efficiency, which adjusts for the efficiency of post-harvest processing, storage, and transportation. This factor takes into account spoilage, losses, and logistics efficiency at a specified temperature (values range from 0 to 1, where 1 means stored at a specified temperature).

C - Crop yield factor, taking into account land use efficiency, crop rotation, soil fertility, and innovations in farming practices (values range from 0 to 1, where 1 represents optimal yield).

S- Sustainability			L- Logistics efficiency			C- Crop yield		
Criteria	**Intervals**	**Content**	**Criteria**	**Intervals**	**Content**	**Criteria**	**Intervals**	**Content**
Low stability	**0<S<0.3**	The process or system significantly wastes resources, generates significant waste, and may cause harm to the environment or society	Ineffective	**0<L<0.3**	High costs, long lead times, poor coordination and over-utilization of resources. Delivery times are unreliable and logistics are not well optimized.	Low profitability	**0<S<0.3**	Agricultural lands produce significantly lower yields due to poor techniques, low-quality seeds, or suboptimal environmental conditions.
Average stability	**0.4<S<0.6**	There is some balance between resource use and replenishment, but waste management or social responsibility still needs to be improved.	Moderately effective	**0.4<L<0.6**	Some optimization has been achieved, but there are still significant bottlenecks or inefficiencies in time or cost management.	Average profitability	**0.4<S<0.6**	Sufficient yields are produced, but there is still room for improvement through better techniques, better seeds, or better management.
High stability	**0.7<S<1**	A process or system is highly efficient in its use of resources, minimizes waste, and has a positive impact on the environment and society. In many cases, it is self-sustaining or renewable..	Highly efficient	**0.7<L<1**	Costs are minimized, lead times are consistent, and resource utilization is optimized for maximum efficiency. There is little waste in the system and delivery is highly reliable..	High profitability	**0.7<S<1**	The land produces at or near its maximum potential using advanced techniques, high-quality materials, and ideal environmental conditions.

Low logistics efficiency is one of the main factors reducing overall profitability. This indicates the need to introduce innovations in the processes of storing and transporting products. High sustainability and productivity factors confirm that environmentally friendly and innovative practices contribute to increasing economic efficiency.

Increasing efficiency - allows you to identify the strengths and weaknesses of the project and make strategic decisions to increase profits. Calculating the effectiveness of investments is of strategic importance for companies and investors, positively affecting their financial stability and development.

Conclusion: Modern economic theory identifies factors that affect the effectiveness of investments. These usually include: the effectiveness of economic and social policies pursued by the state; investment risk; improvement of the tax system; inflation rate; political and social situation in the country; the refinancing rate of the Central Bank and the interest rate on commercial loans; investment attractiveness; improvement of the regulatory and legal framework in the field of investment activities; the level of perfection of the investment infrastructure, etc. The above factors play an important role in attracting investments in the fruit and vegetable growing sector. By accurately and correctly assessing the factors in each group, investors can decide to invest more.

The availability of favorable climate and natural resources for fruit and vegetable growing in Uzbekistan is important. The geographical location of farms and climatic conditions directly affect the yield and quality of products. Also, to ensure the competitiveness of products in the international market, it is necessary to grow fruits and vegetables that meet quality standards. Certification and quality control processes play an important role here. In addition, the possibility of entering international markets and the availability of export infrastructure are attractive to investors. Logistics and transport capabilities, as well as the facilitation of export processes, are important in attracting investments. Tax incentives, subsidies and grants provided by the government are important incentives for investors. In this regard, assistance in the form of customs duty exemptions, loans and grants encourages investment in agriculture. The use of modern technologies and innovations increases product productivity and efficiency. The introduction of new technologies accelerates the return on investment and increases product quality and productivity. Financing and lending conditions are important for agricultural projects. Exceptionally low-interest loans and financial support attract investors. Modern infrastructure and efficient logistics systems allow products to be brought to market quickly and with high quality.

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