

INNOVATION SCIENCE AND TECHNOLOGY



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ISSUE 10



Acceptance of papers **October, 2025**



**Acceptance of
papers**

Published monthly



Topics

economics,
technology, social
sciences



ISSN 3060-5229

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THE SCIENTIFIC-POPULAR ELECTRONIC
JOURNAL **"INNOVATION SCIENCE AND
TECHNOLOGY"** HAS BEEN REGISTERED
UNDER THE NUMBER **C-5669633** BY THE
AGENCY FOR INFORMATION AND MASS
COMMUNICATIONS (AOKA) OF THE
REPUBLIC OF UZBEKISTAN, EFFECTIVE
FROM OCTOBER 9, 2024.

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The scientific electronic journal "Innovation Science and Technology" has been included in the list of scientific publications recommended for the publication of main scientific results of dissertations for the award of PhD and DSc degrees in economics and technical sciences, in accordance with the Resolution No. 370 of the Presidium of the Higher Attestation Commission of the Republic of Uzbekistan, dated May 8, 2025.

Electronic publication, Issue 10. 334 pages.
Approved for publication on October, 2025.

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HYBRID COSTING CALCULATION MODEL THAT COMBINES PROCESS-BASED AND CUSTOM-BASED CALCULATION IN FRUIT AND VEGETABLE PROCESSING ENTERPRISES

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Abstract. *The article develops the scientific and methodological foundations of a hybrid cost calculation model combining process costing and job-order costing methods in the context of the simultaneous existence of continuous technological flows and small-batch special recipes at fruit and vegetable processing enterprises. At the center of the model lies the concept of inextricably linking the indicators of the yield coefficient, processing share, energy intensity, and standard losses with cost centers. The research results showed that the introduction of the hybrid model into practice increases the accuracy of cost accounting by 9.6% and serves to assess profitability by product segments.*

Keywords: *hybrid cost model, process costing, job-order costing, yield coefficient, energy intensity, cost centers, drivers, product segment.*

INTRODUCTION

The fruit and vegetable processing industry is one of the strategic sectors in the agro-industrial complex of Uzbekistan, and its development is one of the most effective ways to increase the added value of agricultural products and expand export potential. The Resolution of the President of the Republic of Uzbekistan No. RP-2505 of March 5, 2016 established a comprehensive set of measures to redirect the sector to deep processing. As a result of these reforms, the production volume and product range of enterprises in the sector expanded, but the methodological basis for cost accounting lagged behind these changes.

The peculiarity of fruit and vegetable processing enterprises is that they simultaneously carry out two types of production processes: firstly, continuous technological flows (juicing, concentration, sterilization, aseptic filling) - for tomato paste, juice, concentrate and other mass products; secondly, small series of special recipes (export orders, premium-segment products, organic lines, branded packaging) - for single product types with high added value. There are suitable costing methods for these two types of processes: process costing and job-order costing. However, most fruit and vegetable enterprises use these two methods in an unconnected manner, which limits the accuracy of costing.

LITERATURE REVIEW ON THE TOPIC

In his work, CTHorngren gave a comparative description of process and order calculation methods and emphasized the advantages of a hybrid approach that combines both methods.[1]

RSKaplan and R.Cooper substantiated the importance of developing a suitable system of drivers for each cost center within the framework of the Activity-Based Costing theory.[2]

SMHenning's process costing in the food industry emphasizes the need to take into account the output coefficient and loss rates when calculating equivalent units.[3]

THBatul studied the creation of job cost sheets for export orders and the role of this approach in managing export profitability.[4]

RESEARCH METHODOLOGY

The empirical basis of the study is the production, technological and financial reports of the enterprises "East agro international" LLC, "Asian jam" LLC and "Green world-group" LLC for 2021–2024. These three

enterprises produce tomato paste, juice, concentrate, puree, packaged jam, jam, frozen fruits and vegetables and dried products, and actively operate in the export and domestic markets.

ANALYSIS AND RESULTS

As a result of the analysis of production processes in fruit and vegetable processing enterprises, two types of product groups were identified: first, mass products (tomato paste, juice, concentrate, puree) - are produced in a continuous technological flow and are suitable for process costing; second, special products (export orders, premium segment, organic lines, branded packaging) - are produced in small batches and are suitable for job-order costing. The following table presents the structural elements of the hybrid model and their areas of application (Table 1):

Table 1
Components of a hybrid cost model¹

Element	Process approach	Bespoke approach
Product type	Tomato paste, juice, concentrate, puree	Export orders, premium, organic, branded packaging
Size feature	Large volumes, continuous flow	Small series, special recipe
Tannarx object	Technological stage (cost center)	Specific order or series
Main driver	Volume (kg, liters), equivalent units	Machine-hours, labor-hours, batch number
Indirect costs	Divided into stages	Distributed at fixed rates
Account document	Cost report (production cost report)	Job cost sheet
Accounting period	Monthly (closing period)	When the order is closed

At the heart of the hybrid model is a system of cost centers and drivers. The enterprise has 9 main cost centers: 4 main production (receipt of raw materials, boiling and concentration, aseptic filling, cold storage) and 5 auxiliary (energy, cold storage, laboratory, technical service workshop, internal logistics). For each cost center, a corresponding driver is defined: for mass products - kg or equivalent units; for special products - machine-hours and labor-hours.

The key structural indicators of the developed hybrid model are as follows (Table 2):

Table 2
Hybrid model drivers and indicators²

Indicator	Calculation formula	Normative value	Scope of application
Output coefficient (CK)	Finished product weight / Raw material weight	0.16–0.20 (tomato paste); 0.55–0.65 (mash)	Calculating equivalent units
Recycling rate (QU)	Main product weight / Total product weight	0.85–0.92	Distribution of the price between primary and secondary products
Energy capacity (ES)	Energy consumption / Finished product	0.25–0.42 kWh/kg	Conversion cost estimation
Normative losses (MY)	Losses / Raw materials received	5–8% (norm); 8–12 % (critical)	Determining excess losses
Unit conversion cost	Conversion costs / Equivalent units	Depending on the type of product	Calculating the labor and energy component of the cost price

The practical application of the hybrid model is carried out according to the following algorithm: the first step is to group the product (mass or special); the second step is to determine the corresponding cost center and driver; the third step is to record direct costs (raw materials, supplies); the fourth step is to allocate conversion costs based on calculated rates; the fifth step is to transfer the costs of auxiliary services to the cost of the main

¹ Developed by the author

² Developed by the author

product through drivers; the sixth step is to calculate the cost of the finished product and prepare a cost report.

The results of the pilot project of Asian Jam LLC showed that the implementation of the hybrid model in practice led to the following significant economic results. First, the accuracy of cost calculations increased by 9.6%: while the unit cost of tomato paste in the current system was calculated at 992 soums/kg, the hybrid model showed 1,088 soums/kg, which was closer to the real figure. Second, the profitability of export orders was accurately assessed: the profitability of an order for a special recipe for European export was found to be 28.4% (previously this figure was estimated at 14.2%, i.e. twice as low). Third, the sources of excess losses were identified: the loss at stage 2 (juice separation) was found to be 8.2%, which exceeded the norm, and the technology was corrected. Fourth, the profitability of product segments was clearly assessed: the gross margin of mass products was 26.4%, and the gross margin of specialty products was 42.8%.

CONCLUSION AND SUGGESTIONS

The results of the research allowed us to draw the following conclusions:

The unique nature of fruit and vegetable processing plants – the simultaneous presence of continuous flows and small batch production – requires a hybrid approach that combines process and order calculations. No traditional method can fully cover these complex production processes individually.

The proposed hybrid model is based on 9 cost centers and 5 network drivers (output coefficient, recycling rate, energy capacity, standard losses, unit conversion cost), and is based on dividing products into two groups - mass products and special products - and applying an appropriate calculation method for each group.

The implementation of the hybrid model increases the accuracy of cost accounting by 9.6%, allows for an accurate assessment of the profitability of product segments, shows the effectiveness of export orders, and leads to the identification of sources of excess losses.

The hybrid model's close integration with the current synthetic accounts and the proposed working accounts system reduces the gap between accounting and management accounting and ensures that information is obtained from a single source.

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Proofreader: Zokir ALIBEKOV

Layout and Designer: Oloviddin Sobir ugli

2025. № 10

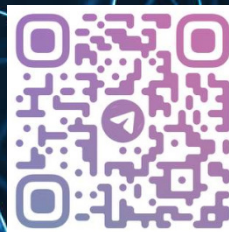
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