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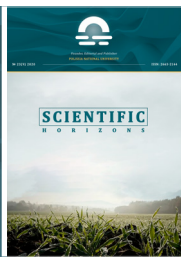

Internal control and cost management systems in agricultural enterprises: A case study of enterprises in the Karaganda region

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Abstract. The aim of the conducted study was to examine the features of internal cost control and management in agricultural enterprises in the Karaganda region, Republic of Kazakhstan. The set objective was achieved through a contextual and comparative analysis of three (N = 3) agricultural enterprises in the Karaganda region, selected through stratified sampling: "Agrofirma Zhanibek", "Karaganda Agro Invest-T", and "Shakhtyorskoe". The calculation of the point-biserial Pearson correlation coefficient

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(r = 0.43) revealed a moderate positive correlation between the size of an agricultural enterprise and its readiness for digitalisation of internal cost control and management. A strong negative correlation (r≈-0.98) was also identified between the level of enterprise digitalisation and the speed of report preparation. The comparative analysis of the systems at the agricultural enterprises revealed a positive impact of digitalisation of internal cost control and management on production efficiency, expressed through a 25-30% reduction in labour costs for manual auditing and repeated checks, a 40-50% acceleration in report generation, and a reduction in the likelihood of errors and penalty charges by 1-2% of the enterprise's total budget. According to Kurt Lewin's theoretical model, the enterprises were at different stages of transformation: while "Karaganda Agro Invest-T" was at the preparatory stage, "Agrofirma Zhanibek" and "Shakhtyorskoe" had made the transition to using digital cost control and management tools but required consolidation of the achieved results. The enterprises were advised to plan cost control and management considering regional specifics, to assess the current cost status in order to evaluate the efficiency of available resources, and to implement a multi-component management accounting system. The obtained data could be used for the modernisation of the cost control and management system, which would increase the competitiveness of agricultural enterprises in the Karaganda region

Keywords: government subsidies; sustainable development; agroclimatic modelling; information technology; modernisation

INTRODUCTION

Given the high resource intensity of agricultural enterprises, there arose a need to improve the efficiency. One of the key ways to achieve this goal was the development of an effective internal cost control and management system. The absence of such a system indicated that the chosen topic was relevant, and the results obtained could be used to improve the productivity and performance of agricultural enterprises. I. Yatsiv and S. Yatsiv (2024), in the study, stated that cost control and management was a prerequisite for the effective development of agricultural enterprises. The cited experts, in particular, emphasised that the relationship between cost management and the productivity of agricultural enterprises was moderated by the reduction in the cost of individual production operations, improvement in the quality, and subsequent enhancement of competitiveness. W.F. Abobatta and F.W. Fouad (2024) pointed out the link between cost management and the sustainable development of agricultural enterprises. According to these authors, the connection existed because internal control helped optimise expenses, thus bringing agricultural enterprises closer to the rational use of available resources. H. Abdelrady (2024) noted that internal control and cost management increased the attractiveness of agricultural enterprises for both national and international investors. The investment attractiveness of agricultural enterprises was enhanced due to the fact that cost control and management fostered an atmosphere of trust between parties, who then received complete and objective information for making effective strategic decisions. A similar idea was expressed by C. Khadka *et al.* (2024), who studied the role of cost control in the management system of an agricultural enterprise. The researchers put forward the idea that such control created a system of economic security for the enterprise, improving its reputation among potential investors.

N.L. Khomiuk *et al.* (2022) emphasised that cost control should be carried out at all management levels, including at the enterprises and at the points of cost origin. Based on this concept, the cited authors proposed a multi-level model in which the choice of control tools and methods depended on the objectives and expected outcomes of management, enterprise resources, management functions, and other factors. O. Pavelko *et al.* (2024) used a linear regression model to confirm a statistically significant correlation between the discount rate and the volume of bank investments in the agricultural sector. The existence of such a correlation highlighted the importance of streamlining the internal expenditure control system as a source of information about the financial status of an agricultural enterprise. E. Raji *et al.* (2024) also insisted on the need to develop a new cost control and management system for agricultural enterprises that would incorporate previously unaccounted climate, technological, or market factors. The researcher emphasised that the importance of such a model was due to the rapid development of the agricultural sector of the economy, which, if effectively integrated into the international economic system, produced more products than needed for domestic consumption. Thus, several conceptual models and approaches to cost management were proposed, taking into account the contextual realities of agricultural enterprise development.

According to S. Suieubayeva *et al.* (2022), the development of the agricultural sector was one of the strategic priorities of the Republic of Kazakhstan. The mentioned authors pointed out that this development involved, in particular, the rational use of available resources, which was fully aligned with the country's "Sustainable Development Agenda". G. Abdikerimova *et al.* (2024), in the comparative analysis, emphasised the growing demand for cattle and poultry meat

as one of the drivers of the development of Kazakhstan's agricultural sector. Such demand indicated the need for a systematic approach to accounting and controlling the resources of agricultural enterprises. D. Kangalakova *et al.* (2025) proposed the idea that the introduction of a universal accounting system could be effective in controlling not only material but also intangible resources, such as human capital. Such a control system would provide a systematic approach to resource accounting and planning with the aim of ensuring the sustainable development of agricultural sector enterprises.

Based on the data analysed, there was no unified conceptual model of internal cost control and management in academic sources that could ensure the sustainable development of agricultural enterprises. The absence of such a model underscored the relevance of research aimed at studying the specifics of cost control and management in the national sector. Possessing significant agricultural potential, the Republic of Kazakhstan could benefit from the development and implementation of a multi-component accounting and analysis system. Thus, the objective of this study was to analyse the features of cost control and management systems in the agricultural sector of the Republic of Kazakhstan. The study's tasks included examining case studies of individual agricultural enterprises in the Karaganda region, identifying the factors influencing cost accounting and control strategies, and developing recommendations to improve the effectiveness.

MATERIALS AND METHODS

The study, conducted between January and June 2024, included the use of several analytical methods, including the case study method. Using this method, a sample was compiled, containing three (N = 3) agricultural enterprises of the Republic of Kazakhstan: Limited Liability Partnership (LLP) "Agrofirma Zhanibek", LLP "Karaganda Agro Invest-T", and LLP "Shakhtyorskoe". Given the weak information and communication component in the strategies of the selected enterprises, data on the listed enterprises were taken from sources such as State Procurement of the Republic of Kazakhstan (2024), the National Information and Analytical Centre (n.d.), and Statsnet (n.d.). The use of stratified sampling implied the inclusion of cases that met the following selection criteria: the agricultural enterprise was registered or operated in the Karaganda region of the Republic of Kazakhstan; the enterprise had an internal cost control and management system; and information on the cost control and management system of the enterprise was publicly available. Non-compliance with one or more of these criteria served as the exclusion criterion from further analysis. To examine the cases, a multi-structured analytical framework was developed, including such key components as enterprise profile, cost management, and internal control. The analysis also took into account the obstacles faced by the selected enterprises in implementing cost control and management.

A COSO analysis was carried out to identify the enterprises' readiness to implement information technologies (IT) in cost control and management. Readiness was assessed based on the following parameters: Control environment – reflected in the availability of job descriptions, the number of IT-related training sessions conducted, and the existence of internal IT security policies; Risk assessment – seen in the existence of procedures for regular IT audit checks and the use of vulnerability analysis tools for IT-based cost control systems; Control activities – expressed in the number of implemented automated cost control procedures, the level of document workflow automation, and the availability of electronic access rights and data access control systems; Information and communication – reflected in the presence of an integrated IT system for interdepartmental data exchange and the regularity of automated report distribution; Monitoring – in the form of the frequency and completeness of internal audits using IT systems, the presence of automatic alerts for inconsistencies or deviations from budget limits, and reports on IT implementation monitoring results in cost control. During the comparative analysis, attention was paid to which elements of cost control and management had already been implemented at the selected enterprises, and which required further implementation or refinement. During the analysis, the point-biserial Pearson correlation coefficient was also calculated using formula (1):

$$r_{pb} = (M_1 - M_o)/s \times \sqrt{\frac{pq}{n}}, \quad (1)$$

where M_1 – mean value of the quantitative variable in the group with Y = 1; M_0 – mean value of the quantitative variable in the group with Y = 0; s – standard deviation of the quantitative variable X across the entire sample; p – proportion of observations with Y = 1; q – proportion of observations with Y = 0, i.e., q = 1 – p; n – total number of observations.

The Pearson correlation coefficient, calculated using Microsoft Excel, was used to determine the potential relationship between the size of the agricultural enterprise and its readiness to implement IT in internal cost control and management, as well as between the use of such technologies and the effectiveness of internal control and management, expressed in the speed of enterprise activity reporting. The recommendations proposed in the study were considered within the paradigm of Kurt Lewin's model, which assumes that the transition to a new cost control and management system is a multi-stage process. The study identified the transformation stages at which the selected enterprises were positioned and proposed strategies for progressing to a higher level.

RESULTS

Features of control and management of costs of agricultural enterprises in Kazakhstan. As one of the cases, LLP "Karaganda Agro Invest-T" was examined – a small enterprise registered in 2020, whose main activity is the processing and preservation of meat. The study of data on "Karaganda Agro Invest-T" made it possible to conclude that the main factors influencing the enterprise's cost management were its relatively small size – up to 5 employees – as well as financial risks in the form of tax arrears and property seizures (National Information and Analytical Centre, n.d.). The case indicated that the selected agricultural enterprise needed the implementation of basic accounting systems and optimisation of production processes. The proposed changes would help optimise the enterprise's expenditures, thereby increasing its efficiency and competitiveness.

The main areas of activity of LLP "Zhanibek-Aidos" are crop production and animal husbandry, which imply the presence of numerous factors influencing production cost management (State Procurement of the Republic of Kazakhstan, 2024). Among these factors, in particular, were seasonal and price fluctuations in raw materials. The identified types of fluctuations suggested that the agricultural enterprise in question should plan its expenses more carefully so that seasonal profits could at least partially offset off-season losses. The activity analysis made it possible to conclude that, as of 2025, LLP "Zhanibek-Aidos" also needed supplier diversification to reduce seasonal and other risks. A diversified supplier network required revision of the existing cost control and management system to achieve optimisation and ensure sustainable development in the context of economic uncertainty.

Registered in 2001, the agricultural enterprise "Shakhtyorskoe" is engaged in the production and sale of agricultural seed crops, the cultivation of potatoes, as well as cereals, legumes, and oilseeds. As of 2025, the area of cultivated land amounted to 35 thousand hectares, and the total number of employees was 250 (Statsnet, n.d.). Similar to LLP "Zhanibek-Aidos", the main challenges for LLP "Shakhtyorskoe" were a strong dependence on weather conditions and the need for modern equipment and machinery to reduce costs. Given these specifics, it was concluded that the agricultural enterprise in question required the implementation of monitoring systems, including technologies for forecasting weather conditions and planning agricultural work in the context of cost reduction. It was also established that LLP "Shakhtyorskoe" required regular maintenance of machinery, which could reduce unplanned expenses. The COSO analytical tool helped identify the elements that determined the selection and application of internal control and resource management tools for agricultural enterprises in the Karaganda region. In the study of digital tools for cost control and management, emphasis was placed on the progress already achieved, as well as on the elements requiring further strengthening. The results of the comparative analysis are presented in Table 1.

***Table 1**. COSO analysis of digitalisation of internal control systems and cost management of individual agricultural enterprises of the Karaganda region*

Component	Examples
1. Control environment	Zhanibek Aidos: Presence of an internal audit department; a policy for segregation of duties; regular training sessions for the accounting and IT departments. Karaganda Agro Invest-T: Documented instructions for expenditure and procurement checks; an approved regulation for contract verification; the head of the finance department is responsible for budget execution. Shakhtyorskoe: All decisions are made by the director; the control policy is not formally documented; no internal auditor.
2. Risk assessment	Zhanibek Aidos: Annual analysis of budget overrun risks is conducted; stress scenarios are planned in case of fluctuations in fuel and lubricants prices. Karaganda Agro Invest-T: Risk assessment is conducted informally; relies on the experience of the chief accountant. Shakhtyorskoe: Risk assessment is not carried out as a separate procedure.
3. Control activities	Zhanibek Aidos: Dual verification of all invoices through ERP and automatic control of limit overruns. Karaganda Agro Invest-T: Paper-based dual verification + director's approval; transition to BAS: Agro is planned. Shakhtyorskoe: Only visual document verification by the accountant.
4. Information and communication	Zhanibek Aidos: SAP ERP integration with cloud storage; employee access to reports via a mobile app; regular distribution of instructions. Karaganda Agro Invest-T: Reports are prepared manually in 1C and Excel; as data volume increases, the risk of errors also rises. Shakhtyorskoe: Reports are prepared only on paper or in Word.
5. Monitoring	Zhanibek Aidos: Ongoing internal audit, monthly monitoring of budget deviations. Karaganda Agro Invest-T: Expenditure monitoring is conducted quarterly; no automatic overspending alerts. Shakhtyorskoe: Monitoring is conducted only at the end of the year for reporting to the tax authority.

***Source:** compiled by the authors based on N. Kamalova and L. Xu (2024), A. Bekbossinova and R. Doszhan (2025), National Information and Analytical Centre (n.d.)*

Based on Table 1, it was concluded that "Zhanibek Aidos" demonstrated high maturity of the control environment: there was internal auditing, segregation of duties, and a data protection policy. For "Karaganda Agro Invest-T", this environment was formed more through internal rules and the responsibility of the accounting department – without IT tools, the risks of the "human factor" remained. "Shakhtyorskoe" effectively had no formalised control environment: control was concentrated in the hands of a single person – the director – which increased the risk of errors and misconduct. In terms of risk management, "Zhanibek Aidos" carried out full analyses of overspending and budget violations – which allowed management actions to be taken in advance. "Karaganda Agro Invest-T" still did this intuitively, relying on the chief accountant's experience. "Shakhtyorskoe" did not formally assess risks and responded to deviations only after the fact. In the context of control activities, a clear difference between the selected enterprises was also observed. "Zhanibek Aidos" had automated key stages of control – spending limits and dual checks were performed within the ERP system, minimising manual data entry (National Information and Analytical Centre, n.d.).

In "Karaganda Agro Invest-T", control was still entirely paper-based, which created excessive administrative costs and increased the risk of errors. In "Shakhtyorskoe", control activities were minimal: the accountant checked everything manually, increasing the likelihood of undetected errors. In the information and communication domain, "Zhanibek Aidos" demonstrated high speed and transparency of data exchange – ERP was integrated with the cloud, and staff could monitor indicators online. "Karaganda Agro Invest-T" continued to use Excel and 1C without a unified interface – making it difficult to quickly prepare a consolidated report. LLP "Shakhtyorskoe" used paper-based reporting, reducing the speed of managerial decision-making. Significant differences were also noted in how monitoring was conducted in the selected agricultural enterprises. In "Zhanibek Aidos", regular internal audits and budget monitoring were organised every month, allowing for prompt deviation management. In "Karaganda Agro Invest-T", monitoring occurred once per quarter, without automatic alerts on overspending. In "Shakhtyorskoe", monitoring was nominally carried out once a year – only to comply with tax authority requirements.

Thus, agricultural enterprises in the Karaganda region demonstrated different approaches to internal control and cost management. These differences were also evident in the choice and intensity of use of digital platforms and tools. The existence of such distinctions suggested varying effectiveness in internal cost control and management among agricultural enterprises in the Karaganda region.

Internal control and cost management, using the example of individual agricultural enterprises in the Karaganda Region. The agricultural enterprises included in the sample differed significantly in terms of employee numbers, cultivated land areas, and other quantitative indicators. The identified differences suggested a potential correlation between certain quantitative enterprise indicators – particularly size – and the likelihood of implementing digital technologies for internal cost control and management. The point-biserial Pearson correlation coefficient was calculated for the selected agricultural enterprises. The resulting coefficient was r = 0.43, indicating a moderate positive relationship between enterprise size and its readiness to implement digital technologies for internal cost control and management. Compared to small enterprises, medium and large agricultural producers were more likely to implement digital solutions and platforms for internal cost control and management. A subsequent digital analysis was conducted to identify potential correlation between the level of digitalisation of the enterprise and the effectiveness of cost control, as reflected in the average time required to prepare operational reports. The results of the comparative analysis of the impact of digitalisation level on the duration of report preparation are presented in Table 2.

***Table 2**. Impact of the level of digitalisation on the duration of reporting in the period from January 1 to June 30, 2024*

No.	Enterprise	Level of digitalisation (index, 0-1)	Report preparation time (working days)
1	LLP "Zhanibek"	1	6
2	LLP "Karaganda Agro Invest-T"	0.5	10
3	Shakhtyorskoe LLP	0.2	11

***Note:** when determining the level of digitalisation of the enterprise, a progressive scale was used, on which "0" meant a complete absence of digitalisation, and "1"* meant *digitalisation of all processes of internal control and cost management of the enterprise*

***Source:** compiled by the authors based on A. Tkacheva et al. (2024)*

Based on the data in Table 2, the relationship between enterprise digitalisation and the effectiveness of cost control and management was confirmed. The quantitative expression of this relationship was determined by calculating the point-biserial Pearson correlation coefficient, which for the given sample amounted to -0.98 ($r \approx -0.98$). The identified negative correlation indicated that as the level of automation

and implementation of dual control tools increased, the time required for report preparation decreased, thereby improving the efficiency of cost management. The highest level of automation and digitalisation was observed at the enterprise "Zhanibek": in 2023-2024, an SAP ERP system was implemented, electronic document management was established, and a payment calendar was introduced to automate treasury operations (State Procurement of the Republic of Kazakhstan, 2024). As a result, the average time for preparing management and financial reports was reduced from approximately 10 working days to 5-7 days, representing an acceleration of 40-50%. In addition, automation of invoice approvals reduced labour costs for manual checks and dual verification of documents by approximately 25-30%, calculated in person-days per month.

At the enterprise "Karaganda Agro Invest-T", according to the National Information and Analytical Centre (n.d.), a full-fledged ERP platform had not yet been implemented, although a transition to the BAS: Agro system was under discussion. Currently, cost control was carried out mainly manually using standard accounting software (1C). The lack of automation resulted in a longer reporting cycle – on average 9-10 working days – and a higher risk of errors and invoice approval delays compared to "Zhanibek". "Shakhtyorskoe" also had not yet implemented an integrated digital platform. Cost control and auditing were carried out through traditional dual document checks and periodic internal audits, but without the use of automated analytical tools (Statsnet, n.d.). Consequently, the longest duration of management report preparation was observed – on average 10-12 working days – along with a risk of cost duplication due to the shortcomings of paper-based accounting.

The comparative analysis helped identify the key advantages of using modern digital platforms, including SAP and BAS: Agro, for internal cost control in agricultural enterprises. The calculations indicated that automating cost control helped reduce labour costs for manual audits and repeated checks by 25-30%. Compared to manual data processing, the use of digital platforms helped accelerate report preparation by 40-50%. A decrease in the probability of errors and penalty accruals by 1-2% of the total enterprise budget was also observed. Thus, the conclusion was made regarding the economic feasibility of using digital platforms to ensure internal cost control in agricultural enterprises. A comparative analysis of the internal control systems of the enterprises was also carried out, taking into account the strengths and weaknesses. The comparison aimed primarily to identify key barriers to the use of modern internal control systems in the context of the selected agricultural enterprises. The result of the analysis is presented in Table 3.

***Table 3**. Comparative analysis of cost control and management systems at LLP "Karaganda Agro Invest-T", "Zhanibek-Aidos", and "Shakhtyorskoe", Karaganda Region, Republic of Kazakhstan*

Criterion	LLP "Karaganda Agro Invest-T"	LLP "Agrofirma Zhanibek"	Shakhtyorskoe LLP
Cost Management Approach	Mainly manual and accounting, no automation	Partially automated, seasonal budgeting	Management accounting system, technology orientation
Main challenges	Financial restrictions, arrests and debts, lack of investment	Fluctuations in fuel and seed prices, dependence on subsidies	Risks of weather conditions, equipment wear and tear, complex logistics
Total annual budget	120 million tenge	350 million tenge	500 million tenge
Total annual costs	100 million tenge (83% of the budget)	310 million tenge (89% of the budget)	420 million tenge (84% of the budget)
Cost structure			
Material resources	60 million tenge (60% of costs)	180 million tenge (58% of costs)	230 million tenge (55% of costs)
Fuel and lubricants	20 million tenge (20% of costs)	80 million tenge (26% of costs)	120 million tenge (29% of costs)
Remuneration	15 million tenge (15% of costs)	35 million tenge (11% of costs)	50 million tenge (12% of costs)
Other expenses (repairs, rent, taxes)	5 million tenge (5% of costs)	15 million tenge (5% of costs)	20 million tenge (4% of costs)
Type of cost control	Basic (accounting for direct and indirect costs, control of payments)	Seasonal plan-fact analysis, subsidies, financial statements	Planned analytical accounting, depreciation accounting, scheduled preventive maintenance of equipment
Financial planning	Minimal, no investment planning	Partial, taking into account seasonality and government support	Advanced, includes crop profitability analysis
Current solutions to reduce costs	Reducing fixed costs, seeking support	Use of state programs (Qoldau), change of suppliers	Implementation of agrotechnologies, digital field maps, agronomic planning
Recommended steps	Implementation of basic management accounting, digitalisation	Expansion of automation, staff training	Environmental, Social, and Governance reporting, crop profitability monitoring, digital farming

***Source:** compiled by the authors based on State Procurement of the Republic of Kazakhstan (2024), National Information and Analytical Centre (n.d.), Statsnet (n.d.)*

From Table 3 it is evident that the universal problems of cost control and management in agricultural enterprises include difficulties in accessing finance, lack of accounting automation, staffing shortages, rising prices for key resources, dependence on weather and climate conditions, and challenges in subsidy reporting. Understanding these universal challenges helps develop effective strategies for creating, implementing, and maintaining the efficient functioning of internal cost control and management systems in agricultural enterprises. A comparative analysis of agricultural enterprises LLP "Karaganda Agro Invest-T", LLP "Agrofirma Zhanibek", and LLP "Shakhtyorskoe" shows that the effectiveness of cost management directly depends on the scale of business, level of automation, and nature of production activities. Small enterprises generally use simplified accounting methods with minimal resources and limited opportunities to invest in digital solutions (Pylypenko *et al.*, 2025). In contrast, larger farms strive to implement seasonal budgeting, management accounting, monitoring systems, and digital field maps, which allow for more precise planning and optimisation of production costs (Zagurskiy *et al.*, 2024). All companies face common challenges – rising resource prices, staffing shortages, dependence on weather conditions, and complications in subsidy reporting. The most effective solutions include digitalisation, participation in state support programmes (e.g., Qoldau.kz), development of financial control systems, and staff training in cost planning and analysis. Thus, it was found that the intensity of digital technology implementation into internal cost control and management systems partly depends on the size and turnover of an agricultural enterprise. Active use of IT should be considered a long-term investment in improving enterprise management efficiency. Increased efficiency is reflected in reduced time spent on completing and verifying documentation, reduced organisational costs, and minimised risk of errors that lead to financial losses.

Recommendations for the implementation of a system for monitoring and managing the costs of agricultural enterprises in the context of the Karaganda region. Based on the analysis of individual agricultural enterprises in the Karaganda region, recommendations were developed for the implementation of internal cost control and management systems. One of the key recommendations is to take into account the specifics of the Karaganda region, characterised by an arid climate, which implies additional costs for irrigation and moisture retention. It is also proposed to consider the geographical remoteness of the region and related logistics costs. The remoteness of some agricultural enterprises also implies the need for local processing of agricultural products, the establishment of which requires short-term investments but could reduce future costs (Mukhamediyarova *et al.*, 2025). A distinctive feature of the studied region is the development of livestock farming, which requires constant control of the feed base and expenses for the maintenance of cattle. As with local processing, livestock development in the region implies substantial simultaneous investments, the effective planning of which can ensure the long-term profitability of enterprises. A detailed study of the region's specifics during cost planning and accounting can be conducted using tools such as ABC analysis, which categorises costs by the impact on total production costs, and XYZ analysis, which identifies predictability and stability of consumption or supplies, for example, seasonal fluctuations in feed. Another recommended analytical tool is agroclimatic modelling, which involves the use of meteorological station data, satellites, and geographic information systems to forecast yields and plan costs, including consideration of adverse climatic factors.

Agricultural enterprises in the region are also advised to analyse the current state of costs to determine the main categories. In the agricultural sector of the economy, the main expenses typically include costs for seed purchase; purchase, maintenance, and repair of machinery; rent of agricultural and production areas; employee salaries; and logistics operations (Zakharchuk *et al.*, 2019). Understanding the main costs enables agricultural enterprises to conduct strategic planning and maintain sustainable development even in conditions of economic uncertainty (Lupenko *et al.*, 2021). It is also recommended to analyse the current state to identify bottlenecks and inefficient links in the production and supply chain and remove or replace such elements where possible. Comparative analysis suggests that certain agricultural enterprises in the Karaganda region may benefit from the creation of a multi-component management accounting system. The proposed accounting system involves the implementation of responsibility centres, i.e., allocation of costs by departments and types of activity. In such a system, the normative method of cost accounting also plays a key role – that is, comparing planned and actual expenses. Comparative accounting helps identify sources of overspending and revise enterprise operations to avoid unnecessary costs. Thus, the proposed management accounting system is based on variance analysis – the regular identification of overspending causes and planning strategies for rational cost reduction.

In addition to the above recommendations, agricultural enterprises in the Karaganda region are encouraged to implement IT for more efficient cost control and management. The comparative analysis shows that due to a lack of funding, qualified personnel, and other reasons, some agricultural enterprises in the Karaganda region do not fully utilise IT potential, which may affect the quality of cost control and accounting. The use of automated accounting and reporting systems such as 1C: Agro, AgriBusiness ERP, and SAP Rural Sourcing Management ensures effective cost management through

real-time registration (Kipkenei *et al.*, 2022; Ying, 2024). Agricultural enterprises may also integrate GIS systems to monitor crop, field, and equipment conditions for cost planning and accounting. The key objective of using such control systems is the rational use of available resources, avoidance of overspending, and continuous search for ways to optimise costs. In developing the recommendations, it was also taken into account that implementing improved cost control and management systems is impossible without the involvement of qualified personnel. Based on this, regional agricultural enterprises are advised to enhance staff qualifications by training accountants and economists in management accounting, preparing machine operators and agronomists to work with digital accounting systems, and encouraging initiatives for saving and cost optimisation. Based on the results of the conducted analysis, it was also concluded that investing in the training and retraining of staff can reduce the outflow of qualified personnel, thereby lowering the cost of hiring new employees.

Further application of the cost-benefit method allows the conclusion that the proposed recommendations are realistic and appropriate for effective cost control and ensuring the sustainable development of agricultural enterprises. The main costs of implementing the proposed recommendations include initial IT investments, staff training, and stakeholder consulting. These costs vary depending on company size, strategic objectives, service providers, and other factors. In a hypothetical scenario where USD 50,000 is invested in technical equipment and staff training at an agricultural enterprise with a discount rate of 10% and a 2-year implementation period, the investment would be cost-effective and generate annual cost savings of USD 30,000. High return on investment is possible due to direct and indirect benefits, including reduced production costs, increased yield and controllability, improved profitability, and the readiness of qualified staff for long-term cooperation. If the proposed recommendations are properly implemented and supported by state or private programmes, payback may be documented within 1.5 to 3 years. At the same time, enterprises should take into account existing risks, including a lack of qualified personnel, stakeholder resistance to change, and limited access to technology in certain regions of the country (Shahini & Shtal, 2023).

Some of these risks can be minimised if the proposed recommendations are implemented through Kurt Lewin's model. In the first stage – "unfreezing" – it is important to prepare agricultural enterprises for the upcoming changes. Such preparation involves analysing the current state of costs and processes, justifying the need for changes, creating change coalitions, conducting information and persuasion sessions, and launching pilot changes. At the "unfreezing" stage is LLP "Karaganda Agro Invest-T" – an enterprise where resource control and management are carried out mainly manually. In addition to the mentioned company, a hypothetical agricultural enterprise that found that 15% of fertilisers were being used inefficiently – leading to higher product cost and reduced competitiveness – may also illustrate the first transformation stage. Understanding the medium- and long-term consequences of inefficient fertiliser use motivates responsible parties to make changes to optimise costs.

The second stage is the implementation of transformation – that is, the introduction of new technologies, procedures, and skills to optimise costs. At this stage are "Agrofirma Zhanibek" and "Shakhtyorskoe", which are gradually transitioning to the intensive use of digital platforms and tools for cost control and management. At the change stage, a management accounting system will be introduced, appropriate software installed, personnel trained to use new systems, key performance indicators and reporting set up, and feedback and process adjustment ensured. In the proposed scenario, the change process would include training machine operators to log the hours and routes in a selected mobile application and providing agronomists with field productivity maps. In the "refreezing" stage, the main task is to consolidate the changes as the new norm and ensure the sustainable functioning. At this stage, strategies may include formalising new procedures, regular reporting and analysis, material and non-material staff incentives, training employees in new standards, and integration with state support programmes and external auditors. For an agricultural enterprise facing irrational fertiliser use, the "refreezing" stage may include submitting an annual report under the new accounting system to the local agricultural administration on the use of the provided subsidy.

Thus, the conditions for the functioning of internal cost control and management systems in agricultural enterprises of the Republic of Kazakhstan were considered. Comparative case analysis revealed that certain enterprises in the Karaganda region have underdeveloped accounting and reporting systems, which may reduce the efficiency of the management and competitiveness. Recommendations were made to improve the efficiency of the cost control and management systems of agricultural enterprises in the Karaganda region of the Republic of Kazakhstan.

DISCUSSION

The comparative analysis showed that certain enterprises in the Karaganda region, including LLP "Karaganda Agro Invest-T", had an outdated, manual accounting and reporting system, which reduced the quality of its operations. The idea presented in the study regarding the importance of a modernised cost control and management system was confirmed by earlier research, including M. Jakobsen (2024). According to M. Jakobsen, who studied the experience of seven financially successful Danish agricultural companies, business

entities striving for sustainable development abandoned the official accounting system for making current decisions, preferring locally developed models and practical rules. M. Jakobsen emphasised that the transition to new forms of reporting helped agricultural enterprises to compensate for the illusion of cost control created by the formal reporting system. The present study offered precise figures characterising management efficiency, for example, a 25-30% reduction in the time spent on document verification and approval. Thus, the idea of revising the existing system of cost control and management in agricultural enterprises found confirmation in an international context.

According to B.R. Joshi (2024), cost management, including budgeting and delegation, made it possible to maintain operational efficiency and maximise profits. Using Agriculture Development Bank Limited, Nepal, as the research context, B.R. Joshi emphasised the importance of implementing robust cost control methods to improve financial stability and competitiveness in the agricultural sector. The findings presented by B.R. Joshi broadly coincided with the idea presented in this study that, compared to other economic sectors, the agricultural sector developed in significantly more unpredictable conditions, increasing the need for modernised control methods as levers to ensure stability and sustainable development.

The present study also paid significant attention to how exactly cost management in an agricultural enterprise improved various aspects of its efficiency. It was particularly proven that automated cost control and management reduced the risk of errors and helped to avoid penalty accruals amounting to 1-2% of the enterprise's total budget. Based on a comparative analysis of agricultural enterprises in the Karaganda region, it was concluded that revising the existing control and management system would help optimise resources and reduce the cost of production, making it more competitive at local or national levels. The idea of a correlation between cost control and management systems and enterprise profitability was also confirmed by previous studies, including M.N. Lestari *et al.* (2020). Using statistical data from individual Indonesian agricultural enterprises, M.N. Lestari *et al.* concluded that there was a positive correlation between cost control, production, and operating profit, with a coefficient of determination of 75.1%. The data obtained in the international context highlighted the relevance of research aimed at improving the internal cost control and management system of agricultural enterprises in Kazakhstan. Considering the certain similarity of the political, economic, and sociocultural contexts of Indonesia and the Republic of Kazakhstan, it was concluded that the changes that took place in one country could be successfully implemented in the other.

The study emphasised that a modernised cost control and management system ensured the sustainable development of the enterprise even in unfavourable conditions. As an example, certain agricultural enterprises in the Karaganda region were used, which had an arid climate and complex logistics. The recommendation to implement modernised control and management systems as a risk minimisation tool was also confirmed by earlier studies, including the work of V. Kalisa and A. Aforabi (2024). Using maize cultivation in Kirehe, Rwanda, V. Kalisa and A. Aforabi concluded that there was a strong correlation ($r = 0.966$) between budget planning and the efficiency of irrigation projects in the arid region of the country. The data obtained were relevant to the Kazakhstani agricultural context, in which measures aimed at reducing the negative impact of the environment increased the cost of final products, making the production unprofitable. A comparative contextual analysis suggested that the implementation of a modernised cost control system contributed to the optimisation of costly resources, thereby increasing the competitiveness of an agricultural enterprise forced to operate in unfavourable climatic conditions.

This assumption was also partially confirmed by a systematic review of 136 relevant studies and 28 documents conducted by G. Papadopoulos *et al.* (2024). According to G. Papadopoulos *et al.*, the use of modern production technologies could reduce the use of pesticides by up to 60%, and fertilisers by up to 80%, thereby lowering the cost of production. G. Papadopoulos *et al.* also emphasised that such reductions required detailed accounting of available resources. The cited idea confirmed the one presented in this study about the interconnection between rational use of resources, the detailed accounting, and the competitiveness of an agricultural enterprise. The present study also paid considerable attention to the role of digital technologies in creating an effective cost control and management system for agricultural enterprises. A comparative analysis of three enterprises in Karaganda revealed a common issue – the episodic use of digital technologies for cost control and management, or a complete rejection of such technologies. The enterprises of the region were recommended to use innovative tools, as investments in modern cost management systems were found to be cost-effective in the medium and long term. The rationale for the use of modern digital tools for cost accounting was also confirmed by earlier research, including W. Geng *et al.* (2024). Based on the results of structural equation modelling, the authors concluded that digital capabilities, digital orientation, and digital transformation of enterprises had a positive and significant impact on the financial indicators of a company. From the point of view of the cited findings, investing in digital tools for cost control and management enhanced the company's resources.

The systematic review by G. Crispim *et al.* (2024) confirmed the advisability of investing in the development of digital control tools even under conditions of

limited financial resources. This recommendation could be particularly useful for small agricultural enterprises such as LLP "Karaganda Agro Invest-T", striving to find the place among larger and technically better-equipped competitors. According to H.F. Liang (2025), one of the key roles of digital technologies was that these technologies served as a source of diverse information required for decision-making in resource accounting and cost management. Such information could also be processed through artificial intelligence capabilities, enabling enterprises to optimise expenses on data analyst services. And although all sources cited in this paragraph pointed to the feasibility of using digital tools for cost control and management, no specific economic sector was mentioned in relation to this feasibility. From this point of view, the conducted study was unique and made a significant contribution to the current discourse by examining the digitalisation of the agricultural sector for cost optimisation.

The key idea of the proposed study also included the notion that the implementation of an updated cost control and management system required the involvement of qualified specialists. The validity of this idea was studied, for example, in the context of LLP "Karaganda Agro Invest-T", whose small staff did not contribute to the implementation of transformational processes and led to most cost control and management operations being carried out manually. A different situation was observed in LLP "Zhanibek-Aidos", which had sufficient human resources to implement the updated cost accounting system. The idea of the importance of human resources for the transition to digital cost management was also confirmed in earlier literature, including the work of D. Qorri *et al.* (2024). After analysing 149 studies in the field, D. Qorri *et al.* concluded that human resources were the driving force behind organisational changes, including the use of artificial intelligence capabilities for processing enterprise cost data. Similar conclusions were drawn in the study by O. Opoku (2024), whose relevance to the proposed discourse was due to its focus on the agricultural sector. According to O. Opoku, there was a statistically significant positive correlation between human resource management methods and the economic efficiency of the poultry sector. It should be noted, however, that unlike studies examining the relationship between human resource management strategies and the economic efficiency of various sectors, this study had a narrower focus. The presented study focused on the impact of human capital management practices on the implementation of a modernised cost control and management system. A narrower focus reduced the risk of bias in the conducted research, thereby increasing its value to the current discourse. Based on the conducted comparative analysis, it can be stated that most of the ideas proposed in this study were confirmed by earlier research. The uniqueness of the present study lay in its narrower research focus, with an emphasis on the implementation of a modernised cost control and management system in agricultural enterprises of the Karaganda region.

CONCLUSIONS

The conducted study confirmed that the level of effectiveness of internal control systems and cost management in agricultural enterprises of the Karaganda region of the Republic of Kazakhstan varied significantly and was largely determined by business scale, degree of automation, and human resource capacity. Using the example of three enterprises – "Karaganda Agro Invest-T", "Agrofirma Zhanibek", and "Shakhtyorskoe" – a comparative analysis was conducted, which revealed that the enterprise "Zhanibek" demonstrated the highest level of maturity of the control system, including the presence of internal audit, automated planning, and budget deviation monitoring. At the same time, "Karaganda Agro Invest-T" and "Shakhtyorskoe" mainly relied on manual or weakly formalised approaches, which increased the risk of errors, delayed reporting preparation, and raised the cost of management control. Quantitative data are significant: the Pearson coefficient calculated for the relationship between enterprise size and readiness for digitalisation amounted to $r = 0.43$, indicating a moderate positive correlation. A more pronounced inverse correlation of $r \approx -0.98$ was identified between the level of digitalisation and the duration of reporting preparation: the higher the level of automation, the less time is spent on the formation of management documents – from 6 working days at the fully digitalised "Zhanibek" to 10-11 days at "Shakhtyorskoe". In addition, calculations showed that investments of USD 50,000 could annually save the enterprise up to USD 30,000, with a payback period of 1.5 to 3 years, which demonstrates the economic feasibility of cost control automation.

Among the developed practical recommendations were the implementation of responsibility centres and the normative accounting method for plan-fact cost analysis; the use of ABC/XYZ methods and agro-climatic modelling for more accurate planning of expenses taking into account seasonality and climate risks; transition to modern ERP systems (SAP, BAS: Agro) and integration of geographic information platforms for field and machinery monitoring. Particular emphasis was placed on the need to invest in the training and retraining of personnel, as it is precisely the qualified human resource that ensures the successful implementation of digital and managerial innovations. For further research, it is recommended to expand the empirical base by including enterprises from other regions of Kazakhstan, as well as to conduct a longitudinal analysis of the impact of the implementation of digital platforms and responsibility centres on the dynamics of operating profit and

profitability of agribusiness under conditions of climate change and raw material price fluctuations.

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CONFLICT OF INTEREST

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Системи внутрішнього контролю та управління витратами в агропідприємствах: кейс підприємств Карагандинської області

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Анотація. Метою проведеного дослідження було вивчити особливості функціонування внутрішнього контролю та управління витратами на агропідприємствах Карагандинської області, Республіки Казахстан. Поставленої мети було досягнуто за допомогою проведення контекстуального і порівняльного аналізу трьох (N = 3) аграрних підприємств Карагандинської області, обраних за допомогою стратифікованого відбору: «Агрофірма Жанібек», «Караганда Агро Інвест-Т» і «Шахтарське». Підрахунок точкового бісеріального коефіцієнта Пірсона (r = 0,43) виявив середню позитивну кореляцію між розміром аграрного підприємства і його готовністю до цифровізації внутрішнього контролю та управління витратами. Було також виявлено високу зворотну кореляцію (r≈-0,98) між рівнем цифровізації підприємства та швидкістю підготовки звітності. Порівняльний аналіз систем аграрних підприємств виявив позитивний вплив цифровізації внутрішньої системи контролю та управління витратами на ефективність виробництва, що виявляється через скорочення на 25-30 % трудовитрат на ручний аудит і повторні перевірки, прискорення на 40-50 % формування звітності та зниження ймовірності помилок і штрафних донарахувань на 1-2 % від загального бюджету підприємства. З погляду теоретичної моделі Курта Левіна, підприємства перебувають на різних етапах трансформації: в той час як «Караганда Агро Інвест-Т» перебуває на підготовчому етапі, «Агрофірма Жанібек» і «Шахтарське» здійснили перехід до використання цифрових інструментів контролю та управління витратами, однак, потребують закріплення отриманого результату. Підприємствам було рекомендовано планувати контроль та управління витрат з урахуванням специфіки регіону, проведення поточного стану витрат для оцінювання ефективності використання наявних коштів та впровадження багатокомпонентної системи управлінського обліку. Отримані дані можуть бути використані для модернізації системи контролю та управління витратами, що підвищити конкурентоспроможність аграрних підприємств Карагандинської області

Ключові слова: державні субсидії; сталий розвиток; агрокліматичне моделювання; інформаційні технології; модернізація