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Management of financial and credit systems and the socio-humanitarian component of their development

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Intelligent decision support systems in precision agriculture and resource conservation

Abstract. Ukrainian agriculture faces productivity pressures amid wartime disruptions and volatile commodity markets. Traditional agriculture enterprise management no longer suffices for maintaining competitiveness. Intelligent agromonitoring systems integrate remote sensing and ground sensors to support evidence-based decision-making.

Problem statement. Fragmented adoption of intelligent technologies limits effectiveness. Many agriculture enterprises lack integrated platforms combining satellite imagery with soil sensor data. Small producers face barriers including unreliable rural connectivity, high equipment costs, and insufficient technical expertise.

Unresolved aspects. Key challenges include limited interoperability between monitoring hardware and software, absence of standardized data formats linking field observations with accounting, and insufficient local-language interfaces. The effectiveness of cooperative purchasing models requires further investigation.

Purpose of the article. To substantiate the strategic role of the intelligent systems based on analytical support of the agromonitoring data and to propose a framework for integrating remote sensing and predictive models into farm planning.

Presentation of the main material. The article analyzes four intelligent monitoring technologies: satellite remote sensing, weather stations, soil sensors, and drones. It examines decision support across operational levels including irrigation timing and pest control, tactical levels covering crop selection, and strategic levels such as land investment. Resource optimization for fertilizers, water, and fuel demonstrates cost reductions of fifteen to thirty percent. Implementation barriers including connectivity gaps and skill shortages are addressed with corresponding solutions. Special attention is given to early warning for disease outbreaks and drought stress detection.

Conclusions. the intelligent systems based on analytical support of the agromonitoring data enhances decision quality, reduces input expenditures, and improves yield forecasts. A comprehensive monitoring framework enables enterprises to navigate production uncertainty and sustain competitiveness.

Keywords: *intelligent systems, agromonitoring, precision agriculture, decision support, yield forecasting, resource optimization, management of agricultural enterprises.*

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Introduction. Ukrainian agricultural enterprises increasingly rely on intelligent systems to maintain productivity amid wartime disruptions, logistics constraints, and fluctuating global grain prices. Traditional field scouting and retrospective analysis no longer provide the responsiveness required for effective farm management. Satellite imagery, weather stations, soil sensors, and drone technologies generate continuous data streams that enable evidence-based decisions about irrigation, fertilization, pest control, and harvest timing. The integration of these tools into daily operations enhances resource efficiency and reduces production uncertainty, particularly for large-scale grain and oilseed producers (Zhuravel and Nitsenko, 2025).

At the same time, Ukrainian farm managers must overcome limited rural connectivity, high upfront equipment costs, and gaps in digital literacy. Government programs supporting precision agriculture and cooperative purchasing models for small and medium farms are gradually closing these gaps. This study examines how analytical support based on agromonitoring data transforms management decisions in Ukrainian agribusiness, identifies key applications across operational and strategic levels, and proposes a framework for integrating sensor technologies into farm planning processes (Kocherha and Nitsenko, 2025).

Literature review. The methodological foundations of agribusiness management in Ukraine have evolved under digitalization, wartime disruptions, and European integration pressures. Contemporary research emphasizes integrated analytical and intelligent frameworks combining financial monitoring, process optimization, and adaptive methodologies to enhance enterprise competitiveness. Diukarev A. (2025) analyzes strategic and operational frameworks for Ukrainian agribusiness management, highlighting the Balanced Scorecard (BSC) for translating strategic goals into actionable measures across financial, customer, internal process, and learning perspectives. The author also examines resource-based view (RBV) and process-oriented management, arguing that identification of valuable, rare, and inimitable resources is crucial for competitiveness. Lyashenko R. (2019) proposes an original definition of system management in agribusiness as a comprehensive method based on project approach and process management principles, aimed at achieving SMART objectives using predetermined strategic resources in agricultural production.

Sokol M. (2024) investigates Agile approaches integration into agribusiness under digital economy conditions, identifying Agile principles enabling rapid market response and process optimization. A comparative analysis of Scrum and Kanban methodologies in agriculture is provided, along with implementation recommendations. Kalachevska L. (2024) and Nitsenko V. (2011, 2013) examine innovative business management models in agriculture facing global market challenges, emphasizing technology adoption, value chain optimization, and sustainable practices while highlighting strategic partnerships and innovative financing mechanisms. Slobodianyk A., Plotnyk P., and Zazymko S. (2020) address modern agroholding management under digitalization, showing that integrated crop management systems utilizing GPS loggers and historical weather data outperform traditional approaches. Key development directions include innovation acceleration, predictive market monitoring, and competitiveness assessment.

Nosach N. and Yehiozarian A. (2024) focus on monitoring and controlling systems at agricultural enterprises, analyzing differences between monitoring and controlling, their synergy in decision processes, and identifying financial, production, strategic, and operational controlling types within an intelligent hierarchical structure. Tkachenko H. (2021) examines economic monitoring of agricultural enterprises in reengineering context, defining reengineering for increasing production efficiency and market response speed while observing declining profitability trends during 2015-2019. Shelehenko D. and Boichuk Y. (2024) characterize conceptual approaches to monitoring economic activity within innovative business planning and big data utilization, proving that innovative business planning relies on systematic analysis of large data volumes oriented toward long-term efficiency and environmental safety.

Collectively, these studies demonstrate that effective management decision support in Ukrainian agribusiness depends on integration of intelligent monitoring systems, adaptive methodologies like Agile and BSC, and systematic analysis of economic and environmental factors. The convergence of digital tools, process optimization, and strategic controlling enhances enterprise resilience and competitiveness.

Purpose, objectives and research methods. The purpose of the study is to justify the role of intelligent systems based on analytical support of the agromonitoring data in improving management decisions within Ukrainian agricultural enterprises under conditions of wartime disruption, economic instability, and accelerated technological change. In a context marked by volatile grain prices, logistical constraints, and climate variability, farm management requires a comprehensive analytical framework that integrates sensor data, predictive models, resource optimization, and risk assessment tools.

Achieving this purpose involves solving the following research objectives:

– to analyze key performance indicators (yield per hectare, input cost reduction, irrigation efficiency) that reflect the effectiveness of data-driven agromanagement strategies;

– to examine sectoral applications of intelligent monitoring technologies in grain, oilseed, and livestock farming under wartime and infrastructure constraints;

– to assess the impact of external factors – rural connectivity, government support programs, and digital infrastructure – on the scalability and effectiveness of intelligent agromonitoring analytics;

– to characterize emerging trends such as AI-based disease detection, drone scouting, IoT sensor networks, and predictive yield modeling in shaping farm operational decisions;

– to evaluate risks and limitations associated with uneven technology adoption, data interoperability gaps, and insufficient digital literacy among farm personnel.

The study applies methods of system analysis, comparative benchmarking, structural diagnostics, expert evaluation, and inductive generalization. The methodological framework is based on an interdisciplinary approach that combines precision agriculture, management accounting, agronomic modeling, and risk management theory. This enables a comprehensive understanding of both quantitative performance indicators and qualitative transformation drivers shaping the intelligent digital agromanagement landscape in Ukraine.

Results. Intelligent agromonitoring represents a critical technological advancement in modern Ukrainian agriculture, providing real-time data collection and analysis capabilities that fundamentally transform managerial decision-making processes. This system integrates satellite imagery, ground-based sensors, weather stations, and IoT devices to create comprehensive datasets about crop conditions, soil health, and environmental factors. The implementation of intelligent agromonitoring technologies in Ukraine has become increasingly important given the country's position as a major global grain exporter and the need to optimize agricultural productivity despite ongoing challenges. These data-driven approaches enable farm managers and agribusiness leaders to make informed decisions that enhance operational efficiency, reduce costs, and improve crop yields (Elijah, 2023; Nitsenko and Dengub, 2026).

Understanding why intelligent agromonitoring delivers such powerful decision-support capabilities requires a closer look at its underlying technological architecture. Modern intelligent agromonitoring systems in Ukraine consist of multiple integrated technological components that work together to provide comprehensive agricultural intelligence. Satellite-based remote sensing platforms, including Sentinel-2 and Landsat missions, deliver multispectral imagery that enables vegetation index calculations such as NDVI (Normalized Difference Vegetation Index) and NDMI (Normalized Difference Moisture Index). Ground-based weather stations and soil sensors provide localized data on temperature, precipitation, humidity, and soil moisture levels at various depths. In addition, drone technology has emerged as a valuable tool for high-resolution field monitoring, enabling detailed assessment of crop health, pest infestations, and irrigation effectiveness at scales that complement satellite observations (Vynohradenko et al., 2024). The relationship between each technological component, the data it generates, and its specific application in managerial decision-making is systematized in Table 1.

Table 1. Intelligent Technological Components of Agromonitoring Systems and Their Applications in Managerial Decision-Making

Intelligent Technology Component	**Data Provided**	**Application in Decision-Making**
Satellite Remote Sensing	Vegetation indices, crop health, field boundaries	Crop monitoring, yield forecasting, anomaly detection
Weather Stations	Temperature, precipitation, humidity, wind speed	Irrigation scheduling, disease risk assessment, harvest timing
Soil Sensors	Moisture content, temperature, nutrient levels	Fertilization planning, irrigation optimization
Drones/UAVs	High-resolution imagery, thermal data	Precision spraying, localized problem identification
IoT Field Devices	Real-time environmental conditions	Automated irrigation control, alert systems

Source: constructed using (Vynohradenko et al., 2024).

Collecting data from these diverse sources, however, represents only the first step in the decision-support chain, because raw information without proper processing has limited practical value. The transformation of raw agromonitoring data into actionable intelligence requires sophisticated analytical frameworks and processing capabilities. Machine learning algorithms are increasingly employed to identify patterns in historical data, predict crop performance, and detect anomalies that may indicate disease outbreaks or pest infestations (Kyryvoshein, Kryvobok, & Zhylchenko, 2024). Cloud-based platforms aggregate data from multiple sources, creating unified dashboards that present key performance indicators and alerts to farm managers. Advanced analytics enable the segmentation of fields into management zones based on soil characteristics and productivity potential, allowing for variable rate application of inputs such as fertilizers and pesticides. This data processing infrastructure is essential for converting the vast amounts of collected information into specific, timely recommendations for agricultural operations. The Ukrainian agricultural technology sector has responded to this need by developing specialized platforms tailored to local conditions. Several such intelligent platforms have emerged to serve the agromonitoring needs of different scales of agricultural operations. These intelligent platforms typically offer features such as field mapping, crop rotation planning, vegetation monitoring through time-series analysis, and weather forecasting integrated with agronomic recommendations. Their analytical capabilities include comparative analysis across seasons, benchmarking against regional averages, and predictive modeling for yield estimation. Integration with farm management software allows seamless connection between monitoring data and operational planning, including resource allocation, labor scheduling, and logistics coordination (GeoPard, 2025). The sophistication of these analytical tools continues to evolve, incorporating artificial intelligence to provide increasingly precise and personalized recommendations.

Once the data is processed and contextualized, it becomes a powerful input for decision-making across different management levels, each of which requires distinct types of information and analytical support. Agromonitoring data serves as a foundation for strategic decision-making at multiple organizational levels within agribusiness enterprises. At the operational level, daily and weekly data inform tactical decisions about irrigation scheduling, pesticide application timing, and harvest readiness assessment. At the tactical level, seasonal data supports decisions regarding crop selection, input procurement, and resource allocation across different fields or farm units. At the strategic level, multi-year datasets enable long-term planning decisions such as land acquisition, infrastructure investment, and crop rotation strategies (SrajanAI, 2025). The availability of objective, quantitative data reduces reliance on subjective judgment and traditional practices, enabling evidence-based decision-making that can significantly improve business outcomes. For clarity, Table 2 aligns each decision level with its typical time horizon, the kinds of decisions made, and the primary data sources that feed into them.

Table 2. Decision levels, time horizons, and corresponding data sources in agribusiness management

Decision Level	Time Horizon	Typical Decisions Supported	Key Data Sources
Operational	Daily to Weekly	Irrigation timing, spraying schedules, harvest operations	Real-time sensors, weather forecasts, satellite imagery
Tactical	Seasonal	Crop selection, input purchasing, labor planning	Historical yields, soil maps, market prices
Strategic	Multi-year	Land investment, equipment acquisition, business expansion	Long-term trends, climate data, market analysis
Risk Management	Ongoing	Insurance decisions, hedging strategies, diversification	Weather patterns, yield variability, market volatility

Source: constructed using (SrajanAI, 2025).

Among the most practically valuable intelligent applications of agromonitoring data, yield forecasting stands out for its direct impact on production planning and market positioning, as it transforms uncertainty into calculable risk. By analyzing vegetation indices throughout the growing season and correlating them with historical yield data, predictive models can estimate expected production volumes weeks or months before harvest. This advance knowledge allows farm managers to make informed decisions about storage capacity requirements, transportation logistics, and marketing strategies. Early yield estimates also support financial planning by providing more accurate revenue projections, which is particularly important for securing operating loans and managing cash flow. Furthermore, the integration of weather forecasts with crop development models further refines these predictions, accounting for potential impacts of upcoming weather events. Production planning based on agromonitoring data extends beyond simple yield estimation to encompass quality assessment and harvest optimization (Sable et al., 2025). Spectral analysis can indicate crop maturity levels and potential quality parameters such as protein content in wheat or oil content in sunflowers. This information enables managers to prioritize harvest sequences, directing equipment to fields where crops have reached optimal maturity while allowing additional development time for others. Variable rate harvesting strategies can be implemented based on within-field productivity zones identified through monitoring data. Additionally, yield forecasts inform decisions about forward contracting, allowing agribusinesses to lock in favorable prices when production estimates indicate surplus availability.

Beyond forecasting and planning, agromonitoring data drives significant operational cost savings through precision agriculture techniques, thereby improving overall farm profitability. Variable rate application technologies, guided by soil maps and vegetation indices, ensure that fertilizers, pesticides, and other inputs are applied only where needed and in appropriate quantities. This targeted approach can reduce input costs by 15-30% while maintaining or improving yields, representing substantial savings for large-scale operations. Water management is similarly optimized through soil moisture monitoring and evapotranspiration modeling, which determine precise irrigation requirements and prevent both under-watering and wasteful over-irrigation. Energy costs associated with irrigation pumping are minimized by operating systems only when necessary and at optimal times (Elijah, 2023). A detailed quantification of these savings, along with the methods and data requirements for each resource category, is presented in Table 3.

Table 3. Resource Optimization through Agromonitoring: Methods, Cost Reductions, and Data Requirements

Resource Category	Optimization Method	Typical Cost Reduction	Data Requirements
Fertilizers	Variable rate application based on soil and crop needs	15-25%	Soil maps, vegetation indices, yield history
Pesticides	Targeted application to affected areas only	20-30%	Pest scouting data, disease models, weather conditions
Water/Irrigation	Precision scheduling based on actual crop needs	25-40%	Soil moisture, weather forecasts, crop stage
Fuel	Optimized field operations and route planning	10-15%	Field boundaries, equipment tracking, task maps
Labor	Efficient scheduling and task prioritization	15-20%	Crop development stages, weather windows, equipment availability

Source: constructed using (Elijah, 2023).

Cost optimization, however, is only one dimension of improved management, because agricultural production remains inherently exposed to unpredictable environmental and biological risks. Equally important is the role of intelligent agromonitoring systems in providing critical early warning capabilities that enable proactive risk management in Ukrainian agriculture, where weather variability and pest pressures pose significant threats to production. Anomaly detection algorithms continuously compare current crop conditions against historical baselines and expected development patterns, flagging deviations that may indicate emerging problems. Disease risk models integrate weather data with crop susceptibility information to predict favorable conditions for pathogen development, allowing preventive treatments before outbreaks occur. Drought stress can be identified through vegetation indices and soil moisture data weeks before visible symptoms appear, enabling timely irrigation interventions or adjustments to management strategies. These early warning capabilities transform risk management from reactive crisis response to proactive threat mitigation. The integration of agromonitoring data with insurance and financial risk management tools represents an emerging frontier in Ukrainian agribusiness decision support. Satellite-based crop monitoring provides objective documentation of crop conditions throughout the season, supporting insurance claims and enabling parametric insurance products that trigger automatic payouts based on measurable indicators like vegetation indices or weather parameters. Historical monitoring data helps quantify production risks for different fields and crops, informing diversification strategies and hedging decisions. Climate trend analysis based on long-term monitoring datasets enables assessment of changing risk profiles and adaptation planning (FutureWater, 2025). This data-driven approach to risk management provides agribusiness managers with tools to protect their operations against both acute shocks and chronic stresses.

Despite the considerable benefits outlined above, Ukrainian agribusinesses face several practical obstacles when implementing and fully utilizing intelligent agromonitoring technologies, and these obstacles must be addressed systematically. Infrastructure limitations, including inconsistent internet connectivity in rural areas, can hinder real-time data transmission and access to cloud-based platforms. The initial investment required for sensors, software subscriptions, and training represents a barrier for small and medium-sized farms, though cooperative models and government support programs are emerging to address this issue. Data literacy and technical expertise gaps among farm managers and workers require substantial training investments to ensure effective utilization of monitoring systems. Additionally, the integration of intelligent agromonitoring platforms with existing farm management systems and workflows often requires customization and technical support that may not be readily available (Synowiec, 2021). These challenges, their impact on adoption, and the solutions being developed in response are summarized in Table 4.

Table 4. Implementation challenges of agromonitoring systems in ukraine and potential solutions

Challenge	Impact on Adoption	Potential Solutions
Limited rural connectivity	Delays in data access, inability to use real-time features	Offline-capable apps, satellite internet, mobile data expansion
High initial costs	Barrier for small and medium farms	Cooperative purchasing, government subsidies, service-based models
Technical skill gaps	Underutilization of system capabilities	Training programs, simplified interfaces, decision support automation
Data integration issues	Fragmented information, inefficient workflows	API development, standardized formats, integration platforms
Language and localization difficulties	Difficulty using international platforms	Ukrainian language interfaces, local crop models, regional calibration

Source: constructed using (Synowiec, 2021).

Looking toward the future, the trajectory of agromonitoring-based decision support in Ukrainian agribusiness points toward increasingly automated and intelligent systems that require minimal human interpretation, thereby reducing the cognitive burden on farm managers. Artificial intelligence and machine learning models will evolve to provide prescriptive recommendations rather than just descriptive analytics, suggesting specific actions with predicted outcomes and confidence levels. Integration with autonomous equipment will enable closed-loop systems where monitoring data directly triggers appropriate responses, such as automated irrigation adjustments or targeted pesticide applications by robotic systems. Blockchain technology may be incorporated to create verifiable records of agricultural practices and conditions, supporting traceability requirements for export markets and sustainability certifications. Moreover, the convergence of agromonitoring with other digital agriculture technologies, including robotics, genomics, and market intelligence platforms, will create comprehensive decision support ecosystems that optimize entire agricultural value chains from field to market (Shebanina et al., 2025, Ostapenko et al., 2025). The continued evolution of these systems promises to further embed data-driven logic into the daily practice of Ukrainian agribusiness management, ultimately reshaping the competitive landscape of the sector.

Discussion. The research confirms that agromonitoring data enhances management decisions in Ukrainian agribusiness through integration of satellite sensing, weather stations, soil sensors, and drone technologies. Despite wartime disruptions and rural connectivity gaps, agricultural enterprises demonstrate resilience by adopting precision tools enabling real-time crop monitoring, variable rate input application, and proactive risk detection. These intelligent technologies facilitate operational cost reductions of fifteen to thirty percent for fertilizers, water, and fuel while improving yield forecasts and early warning for disease outbreaks.

Diukarev (2025) emphasizes that strategic frameworks like the Balanced Scorecard translate agromonitoring data into actionable measures across financial and operational perspectives, supporting the need for integrated analytical systems linking field observations with resource allocation. Lyashenko (2019) defines system management as a comprehensive method based on project approach, aligning with structured monitoring frameworks combining real-time sensor data with strategic planning. Sokol (2024) argues that Agile approaches enable rapid market response under digital economy conditions, reinforcing the importance of adaptive management methodologies for farms facing volatile grain prices.

Kalachevska (2024) highlights strategic partnerships and innovative financing as essential for technology adoption. Slobodianyk, Plotnyk, and Zazymko (2020) show that integrated crop management systems utilizing GPS loggers outperform traditional approaches, supporting the shift toward predictive monitoring in Ukrainian agroholdings. Nosach and Yehiozarian (2024) analyze synergy between monitoring and controlling systems, validating the multi-level decision framework where operational, tactical, strategic, and risk management levels each require distinct data sources.

Tkachenko (2021) observes declining profitability trends during 2015-2019, underscoring urgency of reengineering production processes. Shelehenko and Boichuk (2024) prove that innovative business planning relies on systematic analysis of large data volumes oriented toward long-term efficiency, reinforcing resource optimization quantified in Table 3. The study also highlights early warning systems for disease outbreaks, drought stress detection through vegetation indices, and parametric insurance products based on satellite-derived measurements. Implementation barriers including connectivity gaps, capital costs, and skill shortages require corresponding solutions such as offline-capable applications, cooperative purchasing, and training programs.

Overall, the discussion supports a multidimensional approach where agromonitoring technologies must be complemented by adaptive methodologies like Agile and BSC, systematic economic analysis, and strategic controlling frameworks. Future research should develop integrated intelligent models combining real-time sensor data with predictive analytics, compliance monitoring for export markets, and scenario-based forecasting under climate variability. Such models will enable Ukrainian agricultural enterprises to navigate production uncertainty, enhance resource efficiency, and sustain competitiveness in international grain and oilseed markets.

Conclusions. The performed analysis confirms that integrating of the intelligent systems based on the analytical tools with agromonitoring data improves farm management outcomes in Ukrainian agriculture under wartime pressures and economic turbulence. Real-time field observation intelligent systems have become essential for optimizing input usage, predicting harvest volumes, and reducing production hazards across grain and oilseed farming.

Empirical results reveal that farms employing satellite remote sensing, local weather tracking, soil probes, and unmanned aerial vehicles achieve greater operational flexibility and cost control during unstable market periods. Precision application of fertilizers, scheduled irrigation guided by moisture data, and automated anomaly detection contribute to documented savings of fifteen to thirty percent on key inputs without compromising crop output.

The assessment of adoption barriers indicates that the spread of agromonitoring depends heavily on broadband availability in rural zones, hardware purchase expenses, workforce digital competence, and state subsidies for smart farming technologies. The function of cooperative equipment sharing, offline software solutions, and simplified user interfaces further supports the need for context-specific and farmer-centered implementation strategies.

It is concluded that a thorough evaluation of agromonitoring effectiveness should combine quantitative efficiency metrics with qualitative assessments of technology integration, infrastructure readiness, and personnel training. Further studies should concentrate on creating unified intelligent models that support predictive analytics, climate adaptation planning, and strategic decision-making to help Ukrainian agricultural enterprises navigate sectoral transformations and maintain long-term market positions.

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Інтелектуальні системи підтримки прийняття рішень у точному землеробстві та ресурсозбереженні

Анотація. Українське сільське господарство стикається з проблемами продуктивності на тлі воєнних потрясінь та нестабільності товарних ринків. Традиційного управління сільськогосподарським підприємством вже недостатньо для збереження конкурентоспроможності. Системи інтелектуального агромоніторингу інтегрують дистанційне зондування та наземні датчики для підтримки прийняття рішень на основі фактичних даних.

Постановка проблеми. Фрагментарне впровадження інтелектуальних технологій агромоніторингу обмежує їхню ефективність. Багато сільськогосподарських підприємств не мають інтегрованих платформ, що поєднують супутникові знімки з даними ґрунтових датчиків. Дрібні виробники стикаються з такими перешкодами, як ненадійний інтернет у сільській місцевості, висока вартість обладнання та недостатній технічний досвід.

Невирішені аспекти. Ключові виклики включають обмежену сумісність між апаратним та програмним забезпеченням для моніторингу, відсутність стандартизованих форматів даних, що пов'язують польові спостереження з обліком, та недостатність інтерфейсів місцевою мовою. Ефективність моделей спільних закупівель потребує подальшого дослідження.

Мета статті. Обґрунтувати стратегічну роль інтелектуальних систем на основі аналітичної підтримки та даних агромоніторингу та запропонувати структуру для інтеграції дистанційного зондування та прогнозних моделей у планування господарської діяльності.

Виклад основного матеріалу. У статті проаналізовано чотири інтелектуальні технології моніторингу: супутникове дистанційне зондування, метеостанції, ґрунтові датчики та дрони. Розглянуто підтримку прийняття рішень на оперативному рівні, включаючи терміни зрошення та боротьбу зі шкідниками, на тактичному рівні, що охоплює вибір культур, та на стратегічному рівні, такому як інвестиції в землю. Оптимізація ресурсів щодо добрив, води та палива демонструє зниження витрат на 15–30 %. Бар'єри впровадження, включаючи прогалини у зв'язку та нестачу кваліфікованих кадрів, вирішуються за допомогою відповідних рішень. Особлива увага приділяється ранньому попередженню про спалахи хвороб та виявленню стресу від посухи.

Висновки. Інтелектуальні системи на основі аналітичної підтримки та даних агромоніторингу підвищують якість прийняття рішень, зменшує витрати на ресурси та покращує прогнози врожайності. Комплексна система моніторингу дозволяє підприємствам орієнтуватися в умовах невизначеності виробництва та підтримувати конкурентоспроможність.

Ключові слова: *інтелектуальні системи, агромоніторинг, точне землеробство, підтримка прийняття рішень, прогнозування врожайності, оптимізація ресурсів, управління сільськогосподарськими підприємствами.*

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