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Article

Financial and Credit Relations in Agriculture

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Abstract: This article examines the economic substance and specific features of financial and credit relations in agriculture, with particular attention to seasonal working-capital needs, collateral constraints, concessional credit, agroleasing, investment appraisal, and digital monitoring. The study applies comparative financial analysis to three illustrative agribusiness cases: seasonal agro-credit financing, acquisition of agricultural machinery through credit versus leasing, and investment in a refrigerated warehouse and sorting complex. The results show that concessional credit can substantially reduce financing costs, while leasing can ease collateral pressure and align payments with seasonal cash flows. Investment appraisal based on NPV, IRR, and payback period demonstrates the importance of combining financial feasibility analysis with continuous monitoring of implementation risks. The paper concludes that agricultural finance systems should combine targeted credit support, guarantee mechanisms, diversified leasing products, risk-management instruments, and digital monitoring platforms to improve access to finance and the sustainability of agribusiness investment.

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Keywords: Agricultural economics; financial and credit relations; agro-credit; concessional financing; agroleasing; working capital; investment appraisal; NPV; IRR; digital monitoring; risk management; Smart Agro.

1. Introduction

Agricultural production differs from many industrial activities because biological production cycles, weather dependence, seasonality, and price volatility create a persistent mismatch between the timing of expenditures and cash inflows. These features increase demand for short- and medium-term finance and simultaneously raise the credit risk perceived by lenders [1]. In developing agricultural markets, limited collateral, information asymmetry, transaction costs, and income volatility may further restrict farmers' access to formal credit [2].

The agricultural finance literature therefore emphasizes the need for financing instruments that reflect the specific cash-flow and risk profiles of farms and agribusinesses [3]. Agricultural term finance can include loans, leasing, guarantees, insurance, and other structured instruments, while leasing is particularly useful when the financed asset itself can serve as security [4]. Recent evidence also indicates that well-designed financial services can promote investment in productive inputs and technologies, although access constraints remain significant in many lower- and middle-income settings [5].

In Uzbekistan, the modernization of agriculture requires a combination of affordable seasonal finance, investment credit, technical re-equipment, risk management, and stronger project monitoring [6]. Against this background, the purpose of this study is to evaluate the economic role of credit and leasing mechanisms in agriculture and to

demonstrate how investment appraisal and digital monitoring can improve the quality of agro-financial decision-making [7].

2. Method

The study uses a descriptive-analytical and comparative case-study approach. The analysis is based on the conceptual principles of agricultural finance, investment appraisal, and risk management presented in the literature. Three practical analytical cases are used to compare financing alternatives under conditions typical of agricultural production: (1) seasonal working-capital financing through standard commercial credit versus concessional agro-credit; (2) acquisition of a combine harvester through commercial bank credit versus agroleasing; and (3) appraisal and monitoring of an investment project for a refrigerated warehouse and sorting complex.

The comparative assessment applies interest expense, effective financing cost, collateral requirements, payment schedule, profitability effects, Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP). The NPV criterion is expressed as: NPV = Σ[CFt/(1+r)^t] − I0, where CFt is the net cash flow in year t, r is the discount rate, and I0 is the initial investment. IRR is the discount rate at which NPV equals zero, while PP indicates the period required to recover the initial investment. These criteria are widely used in agricultural investment appraisal and risk analysis .

The numerical examples are illustrative analytical cases intended to demonstrate the relative financial effects of alternative instruments rather than to estimate population-level causal effects. Accordingly, the results are interpreted comparatively, with emphasis on financing burden, seasonal liquidity, collateral constraints, and project viability.

3. Results

Seasonal working-capital financing

Agricultural enterprises frequently face their largest cash outflows during spring field operations, while the principal sales revenues are realized only after harvest. This seasonal gap can make standard commercial credit expensive and can reduce farm profitability. In the illustrative case of "Qashqadaryo Zamin-Iqbol," a 150-hectare farm required UZS 1.2 billion for fuel, fertilizers, and wages. A standard commercial loan at 25% per annum was compared with a nine-month concessional agro-credit arrangement with an effective rate of 9% after support mechanisms [8].

Table 1. Seasonal working-capital financing: standard commercial loan versus concessional agro-credit

Indicator	Standard commercial loan	Concessional agro-credit	Difference / effect
Loan amount	UZS 1.2 billion	UZS 1.2 billion	—
Effective annual rate	25%	9%	16 percentage points lower
9-month interest expense	UZS 225 million	UZS 81 million	UZS 144 million saved
Loan burden per hectare	UZS 1.5 million	UZS 540 thousand	64% reduction
Net profitability rate	12.4%	28.1%	+15.7 percentage points

The results indicate that reducing the effective interest rate has a direct effect on financing costs and farm profitability. The collateral structure—future crops and insurance—also demonstrates how alternative security arrangements can partially address the collateral limitations commonly reported in rural credit markets[9]

Agroleasing as an instrument of technical modernization

Leasing separates legal ownership from economic use and can reduce the need for additional collateral because the leased asset itself secures the transaction .This is

particularly relevant for machinery-intensive agricultural investments in which the asset generates income over several production cycles.

Table 2. Acquisition of a combine harvester: commercial bank credit (Option A) versus agroleasing (Option B)

Indicator	Commercial credit (Option A)	Agroleasing (Option B)	Difference / advantage
Asset value	$120,000	$120,000	—
Initial down payment	25% ($30,000)	15% ($18,000)	$12,000 less initial capital
Financing period	3 years	5 years	2 years longer
Collateral	Real estate valued at 125%	No additional collateral	Collateral pressure reduced
Annual rate	22%	14% (9% with subsidy)	Up to 13 percentage points lower
Payment schedule	Equal monthly installments	Twice yearly during harvest	Better seasonal alignment
Annual tax effect	Standard treatment	Approx. $4,500 depreciation-related saving	Additional tax shield

The comparison suggests that leasing can reduce the initial capital requirement, lengthen the financing horizon, and align payments with harvest-generated cash flows. These advantages are consistent with the established role of leasing as a medium-term agricultural finance instrument for equipment acquisition[10] .

Investment appraisal and monitoring

The third case examines a $800,000 investment in a 1,000-ton refrigerated warehouse and sorting complex in Taylak district, Samarkand region. The project was assumed to be financed with 50% equity and 50% bank credit, with a five-year appraisal horizon and a 12% discount rate. Planned net cash flows were $180,000, $240,000, $300,000, $320,000, and $350,000 for years 1–5, respectively [11].

Table 3. Investment appraisal results for the refrigerated warehouse and sorting complex

Financial criterion	Result	Interpretation
NPV	+$167,541	Positive value indicates economic acceptability
IRR	19.4%	Exceeds the 12% discount rate
Simple payback period	3.6 years	Initial investment recovered within project horizon
Financial criterion	**Result**	**Interpretation**
NPV	+$167,541	Positive value indicates economic acceptability
IRR	19.4%	Exceeds the 12% discount rate
Simple payback period	3.6 years	Initial investment recovered within project horizon

The positive NPV and an IRR above the discount rate indicate that the project is financially viable under the stated assumptions. Such indicators are standard tools for evaluating agricultural investments, but their interpretation should be complemented by sensitivity and risk analysis because agricultural revenues and operating costs can vary significantly [12]

Monitoring also identified operational deviations: warehouse readiness reached only 75% by month 6 because imported equipment was delayed at customs; electricity costs in the first operating year rose to $26,000 instead of the planned $15,000; and second-year revenue reached $190,000 instead of $240,000 following a sharp increase in fruit

procurement prices. Corrective actions included accelerated customs clearance, installation of 100 kW solar panels, and renegotiation of export contracts.

4. Discussion

The results support the view that agricultural finance must be adapted to the biological and seasonal characteristics of farming rather than treated as a standard corporate lending problem. The first case demonstrates that the price of credit can materially affect profitability when working-capital needs are large and revenues are delayed until harvest. This finding is consistent with research showing that high financing costs, collateral requirements, and administrative barriers are among the principal constraints to agricultural finance in developing economies [13].

The importance of collateral design is also evident. Conventional lenders commonly prefer land, buildings, or other liquid assets, yet small farmers often lack such collateral. Empirical evidence from Pakistan and Nigeria confirms that collateral availability significantly influences access to formal agricultural credit [14]. Guarantee funds, crop-based security, and insurance-backed lending can therefore help broaden access, provided that credit appraisal remains linked to realistic cash-flow capacity and risk assessment .

The second case highlights the role of leasing in technical modernization. FAO guidance emphasizes that agricultural leasing can facilitate machinery investment because ownership remains with the lessor and the asset itself can provide security. For farms with limited immovable collateral, this structure can be more suitable than conventional investment credit. Seasonal repayment schedules also reduce liquidity stress and better synchronize debt service with agricultural revenue cycles.

The third case shows that NPV, IRR, and payback analysis provide only an initial decision framework. Agricultural investments remain exposed to construction delays, energy costs, procurement-price shocks, weather variability, and market changes. Risk-sensitive appraisal and continuous monitoring are therefore essential. Digital monitoring , GIS, remote sensing, and data-driven agriculture can improve the timeliness of project information and strengthen lenders' ability to identify deviations before they become severe.

From a policy perspective, the evidence favors an integrated agro-financial model rather than reliance on a single subsidized credit instrument. Access to finance is most effective when credit is combined with risk management, savings, insurance, investment planning, market access, and appropriate financial products [15]. For Uzbekistan, expanding guarantee mechanisms, developing leasing products for smart-agriculture technologies, and introducing unified digital monitoring systems could support both financial inclusion and investment discipline

5. Conclusion

Financial and credit relations in agriculture should reflect the sector's seasonal cash flows, production risks, long investment cycles, and collateral constraints. The comparative cases show that concessional agro-credit can materially reduce financing costs and improve profitability, while agroleasing can lower initial capital requirements, reduce collateral pressure, and synchronize repayments with harvest periods. Investment projects should be evaluated using NPV, IRR, and payback indicators and then supported by continuous risk-based monitoring during implementation and operation. The overall policy implication is that a more resilient agro-financial system requires a balanced combination of credit guarantees, insurance, concessional but disciplined financing, diversified leasing instruments for machinery and Smart Agro technologies, and digital monitoring platforms that allow banks, investors, and agricultural enterprises to track project performance in real time.

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