



Article

An Integral Criteria System for Assessing the Organizational and Economic Capacity of Greenhouse Use: Evidence from Samarkand Region, Uzbekistan

Suxrob Otavullayev

1. "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University, Tashkent, Uzbekistan

*Correspondence: aripovsuxrobox@gmail.com

Abstract: Economic efficiency in greenhouse production is a multifactor category, and measuring it through a single quantitative indicator yields an incomplete picture of a farm's actual condition: a farm achieving high yields may simultaneously exhibit low profitability or weak financial stability. This study develops an integral criteria system for assessing the organizational and economic capacity of greenhouse use at the farm level. The paper reviews the classical (Debreu, Farrell) and contemporary (DEA, SFA) strands of efficiency measurement, and on that basis substantiates a three-group system covering resource efficiency (land, labour and resource productivity), financial performance (profitability, unit cost, payback period) and organizational condition (financial stability category, cluster participation, use of state support). Four-level zonal thresholds are specified for each indicator, and a three-stage aggregation algorithm based on the "weakest link" principle is proposed, whereby a farm's integral rating is determined by its lowest-performing indicator rather than by a weighted average. The system is applied to greenhouse farms in Samarkand region, Uzbekistan, using official departmental and bank register data for 2025. The application reveals a substantial reserve for improving resource productivity - only 4.8 per cent of farms use hydroponic technology - and a binding data constraint, as approximately 48 per cent of regional farms are recorded in the bank register. The proposed system is complementary to, rather than a substitute for, Data Envelopment Analysis: it converts frontier-based results into an actionable management classification. The findings can be used to group farms by efficiency level and to design targeted state support measures.

Keywords: greenhouse farm; organizational and economic capacity; efficiency assessment criteria; resource efficiency; profitability; financial status category; zonal thresholds; Data Envelopment Analysis; Uzbekistan.

Citation: Otavullayev, S. An Integral Criteria System for Assessing the Organizational and Economic Capacity of Greenhouse Use: Evidence from Samarkand Region, Uzbekistan. American Journal of Economics and Business Management 2026, 9(9), 670-678.

Received: 15th Jul 2026

Revised: 10th Aug 2026

Accepted: 30th Aug 2026

Published: 19th Sep 2026



Copyright: © 2026 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license

(<https://creativecommons.org/licenses/by/4.0/>)

1. Introduction

Greenhouse production is among the most capital- and resource-intensive branches of agriculture. Protected cultivation allows substantially higher output per unit of area than open-field production and enables continuous year-round supply, consistent with international technical guidance on greenhouse vegetable production [1]; at the same time, energy costs account for a large share of production expenditure. For Uzbek conditions, Iskandarov [2] estimates that heating alone absorbs approximately 40 per

cent of total production costs. This combination of high productive potential and high cost intensity makes efficiency measurement a distinct research problem in the sector.

The sector is expanding steadily in Uzbekistan, consistent with the national Strategy for the Development of Agriculture for 2020–2030 [3]. The number of greenhouse structures rose from 78,551 in 2020 to 89,329 in 2024 (an increase of 13.7 per cent), while total area grew from 44.3 to 58.2 million square metres (31.4 per cent) over the same period [4]. Quantitative growth, however, is not fully reflected in qualitative indicators. Of the 5,325 greenhouse farms recorded in the national bank register, 15.6 per cent fall into the “red” (problematic) category and 7.3 per cent into the “non-recoverable” category, meaning that roughly one farm in four operates under financial distress [5].

Against this background, the question of how the notion of an “efficient farm” should be measured acquires practical significance. In administrative practice, efficiency is frequently assessed through a single indicator such as yield or profitability. Yet a farm with high yields may show low profitability because of its credit burden, while a farm with acceptable profitability may be wasting energy and water resources. Efficiency is therefore the outcome of a complex interaction between output-cost proportionality, rational resource use, and the institutional environment, and it requires assessment through an integrated criteria system.

The conceptual foundations of efficiency measurement trace back to Debreu’s coefficient of resource utilization [6] and Farrell’s decomposition of productive efficiency into technical and allocative components [7]; this distinction underlies the two major methodological strands that subsequently developed — parametric Stochastic Frontier Analysis, systematized by Kumbhakar and Lovell [8], and non-parametric Data Envelopment Analysis, introduced by Charnes, Cooper and Rhodes [9] and extended to variable returns to scale by Banker, Charnes and Cooper [10]. Färe, Grosskopf and Lovell integrated the production-frontier approach with socio-economic and environmental indicators [11], and Coelli, Rao, O’Donnell and Battese framed efficiency and productivity analysis as a unified methodological system [12]; a comparative bibliometric review by Lampe and Hilgers concludes that DEA and SFA are best viewed as complementary rather than mutually exclusive [13].

These foundations have been widely applied in horticulture and, more specifically, in greenhouse production. Reig-Martínez, Picazo-Tadeo and Estruch assessed Spanish citrus farms using DEA, treating environmental performance as a distinct dimension alongside technical efficiency [14], while Tzouvelekas, Pantzios and Fotopoulos used SFA to decompose technical, allocative and economic efficiency in Greek farming systems and linked efficiency to farm size, management quality and access to finance [15]. Greenhouse-specific applications of DEA — to cucumber production in Iran [16], to production in Michigan [17], and to provincial greenhouse-vegetable production in China [18] — consistently identify energy-saving and input-use reserves, but none of these studies translates an efficiency score into an operational administrative classification. Multi-criteria approaches move beyond a single score: Banaeian, Zangeneh and Golinska-Dawson combined DEA with ELECTRE IV to evaluate horticultural sustainability across environmental, energy and technological criteria [19], and international technical evidence on resource-use efficiency in protected cultivation more broadly supports treating energy, water and capital productivity as interdependent dimensions of farm performance [20].

From a sectoral perspective, Chazova proposed a criteria system for the sustainable development of the protected-cultivation vegetable market, incorporating production, socio-economic and institutional dimensions [21], while Verreth argued that a greenhouse efficiency framework must also capture the state of the market environment along the value chain [22], and Goncharova’s analysis of investment patterns in Dutch glasshouse horticulture highlighted the importance of capital intensity and payback

periods in investment decisions [23]. For Uzbek conditions, Iskandarov substantiated the need to assess socio-economic effect, land efficiency, labour productivity, resource use and profitability in mutual connection, while Durmanov placed particular emphasis on evaluating the organizational and economic mechanisms that underpin greenhouse farm performance [24]. Studies of cooperative and cluster relations in the agrarian sector, including Qosimov [25] and Roziqov [26], further indicate that farm outcomes depend not only on internal production efficiency but also on integration with market, logistics and support infrastructure.

Two gaps emerge from this body of work. First, in the literature reviewed here the criteria are generally presented as separate groups; the integration of resource, financial and organizational dimensions into a single farm-level computational algorithm has not been systematically developed. Second, existing frameworks are rarely anchored in the administrative data actually available in the country concerned, which limits their operational use. Accordingly, the aim of this study is to substantiate an integral criteria system for assessing the organizational and economic capacity of greenhouse use and to develop the procedure for its practical application. The specific objectives are: (i) to justify the composition of the criteria system on the basis of internationally validated approaches; (ii) to specify zonal thresholds for each indicator; (iii) to formulate an aggregation rule producing a single integral rating; and (iv) to test the applicability of the system using data on greenhouse farms in Samarkand region.

2. Materials and Methods

2.1 Research design

The study follows a design in which the criteria system is first constructed deductively from established efficiency measurement theory and then tested against empirical material from a single region. Samarkand region was selected as the test case because it accounts for approximately 10 per cent of the country's active greenhouse farms and greenhouse area, and because its farm structure - dominated by small and medium-scale units - is representative of the sector outside the capital region.

2.2 Data

The empirical base comprises three groups of sources. National-level indicators on the number, area and output of greenhouse structures for 2020-2024 were obtained from official government sources, as noted above. Regional structural indicators for Samarkand region as of 2025 - the number of greenhouse farms, active farms, total and active area, and distribution by cultivation technology - as well as bank register data on the financial status of farms were obtained from official departmental sources, as noted above. Data on vegetable production volumes were taken from the national statistics agency [27]. The legal framework was analysed on the basis of the normative acts adopted in 2019-2026 and published on the official legal information portal [3], [28]–[31].

Two data constraints apply and are carried through the analysis. First, only about 48 per cent of greenhouse farms in Samarkand region are recorded in the bank register, so the financial status distribution reported here refers to the national register rather than to the region. Second, the 2021 observation in the regional area series is treated as a statistical anomaly and excluded from growth calculations, since area is reported as having tripled in a year in which the number of structures fell.

2.3 Methods

The following methods were applied: scientific abstraction in defining the criteria groups; economic-statistical analysis (dynamics, averages, structural analysis and grouping) in processing the empirical data; comparative analysis in positioning the proposed system against existing frameworks; a systems approach in establishing the

interdependence between criteria groups; expert assessment in specifying the zonal thresholds; and logical generalization in formulating the conclusions.

The composition of the criteria system was determined by five design principles: (i) integrity - the criteria form a set of interacting elements rather than a sum of separately measured indicators; (ii) multidimensionality - technical, financial and institutional dimensions are covered simultaneously; (iii) evidential grounding - each indicator rests on an internationally validated approach; (iv) operational feasibility - the system relies on indicators computable at farm level rather than on a complex econometric model; and (v) national adaptability - the system reflects the regional and institutional specificities of Uzbek greenhouse farming.

Zonal thresholds were specified by combining three sources: the methodology of sustainable development criteria for the protected-cultivation market proposed by Chazova; the financial status classification applied in national banking practice; and the financial rehabilitation measures established by Resolution No. 777 of the Cabinet of Ministers of 21 November 2024 [28].

2.4 Aggregation rule

Let a farm be characterized by indicators $x_1, \dots, x_n$, each assigned to one of four ordered zones $z \in \{\text{green, yellow, red, non-recoverable}\}$. The integral rating of the farm is defined as the minimum over its indicator zones:

$$Z(\text{farm}) = \min \{ z(x_1), z(x_2), \dots, z(x_n) \}$$

This min-operator formalizes the "weakest link" principle. It was preferred to a weighted-average rule because the relationship between indicators in greenhouse production is constraining rather than compensatory: where the energy supply is interrupted or credit obligations are unmet, high land productivity does not translate into an economic result. To limit the sensitivity of the rule to short-term fluctuations, assessment is recommended on the basis of three-year averages rather than single-year values.

3. Results

3.1 Composition of the criteria system

The proposed system comprises three groups of criteria. Group A measures how efficiently the limited resources available in the greenhouse are converted into output; Group B measures the financial result of the farm; and Group C reflects its institutional and organizational stability. The composition of the system, the computation formula for each indicator and its methodological anchor are presented in Table 1.

Table 1. Criteria system for assessing the efficiency of greenhouse use

Criteria group	Indicator	Formula / measure	Methodological anchor
A. Resource efficiency	Land productivity (H)	$H = M / S$, t/ha	Farrell; Charnes et al.
	Labour productivity (LP)	$LP = M / L$, t/worker	Coelli et al.
	Energy / water productivity (RP)	$RP = M / R$, t/GJ or t/m ³	Reig-Martínez et al.
B. Financial performance	Profitability (P)	$P = (Pr / C) \times 100 \%$	Kumbhakar & Lovell
	Unit cost (UC)	$UC = C / M$, UZS/kg	Verreth
	Payback period (PP)	$PP = K / Pr$, years	Goncharova

C. Organizational condition	Financial stability	green / yellow / red / non-recoverable	Bank register; Chazova
	Cluster and cooperative participation	share of the entity within the cluster	Roziqov; Decree PF-181 [29]
	Use of state support	share of credit / subsidy received, %	CM Res. 567 [30]; 206 [31]

Note: M - output volume (t); S - cultivated area (ha); L - labour input (workers); R - resource consumed (energy, water, fertilizer); C - total costs; Pr - profit; K - capital investment.

Source: compiled by the author.

Group A rests on the technical efficiency tradition. Land productivity captures output per unit of area and constitutes the principal measure of technical efficiency in international practice. Labour productivity acquires particular weight in greenhouse production because of its high labour intensity. Resource productivity measures output per unit of energy, water or fertilizer consumed, and thus addresses the most cost-intensive dimension of the sector.

Group B measures financial outcomes. Profitability expresses the economic return per unit of expenditure; unit cost, when compared with the market price, determines competitiveness; and the payback period is the decisive criterion for investment decisions in a branch characterized by high capital intensity.

Group C measures institutional standing. Financial stability is assessed through categorization by debt burden, fulfilment of credit obligations and recovery potential. Cluster participation reflects the degree to which a farm is connected to value-chain, logistics, storage and export infrastructure. Use of state support measures the extent to which a farm draws on credit, subsidies, tax preferences and guaranteed energy supply.

3.2 Zonal thresholds

For each indicator, four ordered zones were specified, with a corresponding management measure attached to each (Table 2). The thresholds are set so that the financial stability categories used in banking practice map directly onto the zones, which allows the organizational criteria to be populated from existing administrative records without additional classification.

Table 2. Zonal thresholds for assessing greenhouse farm efficiency

Indicator	Green zone	Yellow zone	Red zone	Non-recoverable
Profitability, %	> 15	5-15	0-5	< 0
Payback period, years	< 5	5-8	8-12	> 12
Land productivity (vs. national mean)	> 120 %	80-120 %	50-80 %	< 50 %
Financial stability category	green	yellow	red	non-recoverable
Recommended measure	incentivize	monitor	rehabilitate	restructure

Source: compiled by the author on the basis of Chazova, the financial rehabilitation measures established by Resolution No. 777 of the Cabinet of Ministers, and departmental analytical data.

3.3 Assessment algorithm

Application of the system proceeds in three stages. At the first stage, indicators in Groups A, B and C are computed separately for each farm and matched against the thresholds in Table 2. At the second stage, the results are summarized by group. At the third stage, the integral rating is assigned using the min-operator specified in Section 2.4.

The practical implication of this rule can be illustrated as follows. A farm situated in the green zone on land productivity and profitability, but classified as "red" on financial stability, receives a red integral rating. Under a weighted-average rule the same farm would be rated yellow or green, and the constraint that actually threatens the continuity of its operations would be concealed by its strong performance elsewhere.

3.4 Application to Samarkand region

As of 2025, Samarkand region hosts 317 greenhouse farms, of which 311 are active; total area amounts to 517.8 hectares, with 489.3 hectares in active use. By cultivation technology, 296 farms operate on conventional soil-based methods and 15 farms - approximately 4.8 per cent - use hydroponics; no polycarbonate greenhouses are recorded. Assessed against Group A criteria, this structure indicates a substantial reserve for raising resource productivity, since hydroponic systems deliver higher yields and water productivity than soil-based cultivation.

Assessment against Group C criteria exposed a data constraint. Of the 317 farms in the region, only 153 - approximately 48 per cent - are recorded in the bank register, meaning that the financial stability category cannot be established from official sources for more than half of the regional population. At the national level, the register covers 5,325 farms, distributed by financial status as shown in Table 3.

Table 3. Distribution of greenhouse farms by financial status, Uzbekistan, 2025

Category	Condition	Share, %	Recommended measure
Green	stable	58.0	incentivize
Yellow	requires monitoring	19.2	monitor
Red	problematic	15.6	rehabilitate
Non-recoverable	requires restructuring	7.3	restructure
Total	n = 5,325 farms	100.0	-

Source: compiled by the author from bank register data.

Taken together, the national distribution indicates that 22.9 per cent of registered farms - the red and non-recoverable categories combined - would receive a red or lower integral rating under the proposed system on the strength of the Group C criterion alone, irrespective of their performance on resource and financial indicators.

4. Discussion

The system proposed here differs from existing frameworks in three respects. Chazova formulated sustainability criteria for the protected-cultivation market primarily at sector level; the present system rescales the criteria so that they can be computed for an individual farm entity. Iskandarov substantiated a set of indicators for Uzbek conditions, but the question of linking them to zonal thresholds and to a single integral rating remained open. Durmanov treated organizational and economic mechanisms as the object of assessment; in the present system the mechanism is not the object but enters as one component of the Group C criteria, namely the degree to which a farm draws on state support.

The choice of the min-operator warrants further comment. International practice more commonly employs weighted averages or frontier-based aggregation. In greenhouse production, however, the dependence between indicators is constraining

rather than compensatory. Energy accounts for the largest single share of production cost, and an interruption in energy supply or an unserviceable credit obligation prevents high land productivity from being converted into an economic result. Assessment by the minimum therefore reflects the farm's operational reality more accurately. The trade-off is that the rule is strict: a temporary decline in a single indicator can move a farm into a lower zone. Averaging over at least three years mitigates this sensitivity, and the rule should be applied for classification rather than for ranking.

The proposed system is complementary to Data Envelopment Analysis rather than an alternative to it. DEA positions farms relative to the efficiency frontier and identifies, for each inefficient unit, which input is being over-consumed and by how much. The zonal threshold system performs a different function: it converts frontier results into a management decision. A workable sequence for applied use is therefore to classify farms into zones using the criteria system first, and then to apply DEA to farms in the yellow and red zones in order to identify specific optimization reserves. This two-step procedure is consistent with the hybrid logic advocated by Lampe and Hilgers.

From a policy perspective, the system offers an operational link between diagnosis and intervention. Because the zones are aligned with the financial status categories already recorded in the bank register, the classification can be produced from existing administrative data without creating a parallel reporting system. This matters in a context where the state support framework has expanded rapidly and where the targeting of that support has become the principal efficiency question.

Three limitations should be acknowledged. First, and most importantly, the coverage of the bank register in Samarkand region - approximately 48 per cent - does not permit Group C criteria to be computed for the full regional population; the distribution of regional farms across categories must be established through an official survey before the system can be applied comprehensively at regional level. Second, the system does not yet incorporate an environmental dimension. Reig-Martínez et al. treat environmental performance as a separate dimension alongside technical efficiency, and given the policy priority now attached to phasing out unfiltered coal boilers, extending the system with indicators such as emissions or pesticide and nitrogen use per hectare is a natural direction for further work. Third, the zonal thresholds were specified through expert assessment rather than derived statistically; their calibration against observed distributions once register coverage improves would strengthen the system's empirical foundation.

5. Conclusions

Assessing economic efficiency in greenhouse production through a single indicator yields an incomplete picture of a farm's condition. Because efficiency is the outcome of interaction between resource productivity, financial results and institutional standing, it requires measurement through an integrated criteria system.

The study substantiates a three-group system covering resource efficiency (land, labour and resource productivity), financial performance (profitability, unit cost, payback period) and organizational condition (financial stability category, cluster participation, use of state support). The system rests on internationally validated approaches and comprises indicators computable at farm level without recourse to complex econometric modelling.

Four-level zonal thresholds were specified for each indicator, and a three-stage aggregation algorithm based on the "weakest link" principle was formulated. The min-operator prevents a serious weakness in one dimension from being concealed by strong performance in others - a property that distinguishes the proposed system from weighted-average approaches.

Application to Samarkand region demonstrates both the operational value and the current constraints of the system. A substantial reserve for raising resource productivity was identified, with hydroponics accounting for only 4.8 per cent of farms, while assessment of organizational criteria is limited by bank register coverage of approximately 48 per cent.

On this basis, four practical recommendations follow: to apply the criteria system and zonal thresholds in the assessment of greenhouse farms; to extend bank register coverage and link it to a digital monitoring platform; to apply DEA to farms classified in the yellow and red zones in order to identify optimization reserves; and to incorporate an environmental dimension into the system at the next stage of its development.

REFERENCES

- [1] Food and Agriculture Organization of the United Nations, *Good Agricultural Practices for Greenhouse Vegetable Crops*. Rome, Italy: FAO, 2013.
- [2] S. T. Iskandarov, "Improving the economic foundations of the development of protected-cultivation vegetable growing," PhD dissertation abstract, specialty 08.00.04, Tashkent, Uzbekistan, 2018 (in Uzbek).
- [3] President of the Republic of Uzbekistan, "On approving the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020–2030," Decree No. PF-5853, Tashkent, Uzbekistan, Oct. 23, 2019. [Online]. Available: <https://lex.uz>
- [4] Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan, "Data on the number, area and output of greenhouses," Tashkent, Uzbekistan, 2025. [Online]. Available: <https://gov.uz>
- [5] Ministry of Agriculture of the Republic of Uzbekistan, "Departmental data on greenhouse farms of Samarkand region and bank register data on the financial status of greenhouse farms," Tashkent, Uzbekistan, 2025. [source details to be specified]
- [6] G. Debreu, "The coefficient of resource utilization," *Econometrica*, vol. 19, no. 3, pp. 273–292, 1951.
- [7] M. J. Farrell, "The measurement of productive efficiency," *Journal of the Royal Statistical Society, Series A (General)*, vol. 120, no. 3, pp. 253–290, 1957.
- [8] S. C. Kumbhakar and C. A. K. Lovell, *Stochastic Frontier Analysis*. Cambridge, U.K.: Cambridge Univ. Press, 2000.
- [9] A. Charnes, W. W. Cooper, and E. Rhodes, "Measuring the efficiency of decision making units," *European Journal of Operational Research*, vol. 2, no. 6, pp. 429–444, 1978.
- [10] R. D. Banker, A. Charnes, and W. W. Cooper, "Some models for estimating technical and scale inefficiencies in data envelopment analysis," *Management Science*, vol. 30, no. 9, pp. 1078–1092, 1984.
- [11] R. Färe, S. Grosskopf, and C. A. K. Lovell, *Production Frontiers*. Cambridge, U.K.: Cambridge Univ. Press, 1994.
- [12] T. J. Coelli, D. S. P. Rao, C. J. O'Donnell, and G. E. Battese, *An Introduction to Efficiency and Productivity Analysis*, 2nd ed. New York, NY, USA: Springer, 2005.
- [13] H. W. Lampe and D. Hilgers, "Trajectories of efficiency measurement: A bibliometric analysis of DEA and SFA," *European Journal of Operational Research*, vol. 240, no. 1, pp. 1–21, 2015.
- [14] E. Reig-Martínez, A. J. Picazo-Tadeo, and V. Estruch, "The economic and environmental performance of Spanish citrus farms: A DEA-based approach," *Land Use Policy*, vol. 28, no. 1, pp. 274–280, 2011.
- [15] V. Tzouvelekas, C. J. Pantzios, and C. Fotopoulos, "Technical efficiency of alternative farming systems: The case of Greek organic and conventional olive-growing farms," *Food Policy*, vol. 26, no. 6, pp. 549–569, 2001.
- [16] R. Pahlavan, M. Omid, and A. Akram, "Application of data envelopment analysis for performance assessment and energy efficiency improvement opportunities in greenhouse cucumber production," *Journal of Agricultural Science and Technology*, vol. 14, no. 7, pp. 1465–1475, 2012.
- [17] Z. Dong, Z. Guan, K. Grogan, and T. Skevas, "Energy and environmental efficiency of greenhouse production in Michigan," in *Proc. Southern Agricultural Economics Association Annual Meeting*, 2015.
- [18] Y. Liang, X. Jing, Y. Wang, Y. Shi, and J. Ruan, "Evaluating production process efficiency of provincial greenhouse vegetables in China using data envelopment analysis," *Processes*, vol. 7, no. 11, art. no. 780, 2019.

- [19] N. Banaeian, M. Zangeneh, and P. Golinska-Dawson, "Multi-criteria sustainability performance assessment of horticultural crops using DEA and ELECTRE IV methods," *Renewable Agriculture and Food Systems*, 2022.
- [20] C. Stanghellini, "Resource use efficiency in protected cultivation," Wageningen Univ. & Research, Wageningen, The Netherlands. [publication year to be verified]
- [21] I. Yu. Chazova, "Organizational and economic mechanism of sustainable development of the protected-cultivation vegetable market," Doctoral dissertation, Izhevsk, Russia, 2017 (in Russian).
- [22] D. M. I. Verreth, "Economic analyses of the Dutch greenhouse chain in a changing environment," Doctoral dissertation, Wageningen Univ., Wageningen, The Netherlands, 2013.
- [23] N. V. Goncharova, "Investment patterns in Dutch glasshouse horticulture," Doctoral dissertation, Wageningen Univ., Wageningen, The Netherlands, 2007.
- [24] A. Sh. Durmanov, "Improving the scientific and methodological foundations for increasing the efficiency of greenhouse farm activity," DSc dissertation, Tashkent, Uzbekistan, 2025 (in Uzbek). [Online]. Available: <https://oak.uz>
- [25] M. S. Qosimov, "Development of cooperative and cluster relations in the agrarian sector," PhD dissertation, Tashkent, Uzbekistan, 2023 (in Uzbek).
- [26] J. M. Roziqov, "Improving the management of fruit and vegetable clusters," PhD dissertation, Tashkent, Uzbekistan, 2023 (in Uzbek).
- [27] Statistics Agency of the Republic of Uzbekistan, "Vegetable production in farms of all categories, Samarkand region," Tashkent, Uzbekistan, 2024. [Online]. Available: <https://stat.uz>
- [28] Cabinet of Ministers of the Republic of Uzbekistan, "On additional measures for the financial rehabilitation and support of greenhouse farms," Resolution No. 777, Tashkent, Uzbekistan, Nov. 21, 2024. [Online]. Available: <https://lex.uz>
- [29] President of the Republic of Uzbekistan, "On additional measures to increase the efficiency of greenhouse farm activity and expand export volumes," Decree No. PF-181, Tashkent, Uzbekistan, Oct. 8, 2025. [Online]. Available: <https://lex.uz>
- [30] Cabinet of Ministers of the Republic of Uzbekistan, "On additional measures to support the activities of greenhouse farms and enterprises exporting fruit and vegetables," Resolution No. 567, Tashkent, Uzbekistan, Oct. 27, 2023. [Online]. Available: <https://lex.uz>
- [31] Cabinet of Ministers of the Republic of Uzbekistan, "On measures to fundamentally improve the system of state support for the agrarian and food sectors," Resolution No. 206, Tashkent, Uzbekistan, Apr. 28, 2026. [Online]. Available: <https://lex.uz>