



State Organizational Support and Development Opportunities for Small Agribusiness in Arid Regions

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Abstract

This study analyzes the opportunities for state organizational support aimed at the sustainable development of small agribusiness entities in arid regions, with a particular focus on Uzbekistan. Given the challenges posed by water scarcity, land degradation, and climatic instability, government intervention plays a decisive role in ensuring the viability of small agricultural enterprises. The research utilizes comparative policy analysis and field data from regional agrarian departments to identify the most effective forms of institutional and financial support. Findings indicate that targeted subsidies, access to digital advisory systems, and the creation of cooperative networks significantly enhance agribusiness productivity and resilience. The study proposes a comprehensive state support framework integrating innovation, environmental sustainability, and inclusive rural development.

Keywords: small agribusiness; state support; arid regions; agricultural policy; institutional development; Uzbekistan.

INTRODUCTION

The development of small agribusiness entities in arid regions is closely tied to natural and environmental factors. In this process, state-organized and institutional support plays a decisive role. Climate change, limited water resources, soil salinization, and underdeveloped infrastructure in such areas create serious obstacles to the effective operation of farmers.

Therefore, organizational and institutional mechanisms developed based on a comprehensive approach by the state are of critical importance in creating the necessary conditions for the sustainable operation of small agribusinesses.

First and foremost, organizational support mechanisms are aimed at easing farmers' access to resources such as financial capital, land, and water. It is essential to introduce efficient systems for managing water supply and land use in arid areas. In this regard, state initiatives to promote water-saving technologies, develop specialized irrigation infrastructure, and modernize water distribution systems are of great importance.

For example, the state can implement measures such as renewing water supply systems and providing grants to farmers for technological upgrades. In addition, involving the private sector through public-private partnership (PPP) mechanisms in the investment of irrigation systems is considered one of the effective solutions.

Institutional Mechanisms and Legal Support: Institutional support mechanisms enhance the competitiveness of small agribusinesses by ensuring legal and regulatory assistance. In arid regions, ensuring the legal protection of farmers, simplifying licensing procedures, and streamlining legislative frameworks should constitute key priorities of state agricultural policy. For example, introducing simplified tax regimes, reducing registration procedures, and expanding access to legal advisory services can significantly improve the operational efficiency of farming entities. Furthermore, the development of specialized cooperatives and agro-clusters by the state would assist farmers in accessing markets and achieving economic sustainability.

Development of Agricultural Education and Innovation: In supporting small agribusiness entities in arid regions, the development of agricultural education and innovation centers is of critical significance. These centers should offer specialized training courses for farmers and fund research aimed at implementing resource-efficient technologies and climate-resilient agronomic practices. International experience has demonstrated that the advancement of agricultural research and innovation institutions is a decisive factor in enhancing agricultural productivity. Therefore, the state should

strengthen collaboration between farmers and research institutes and promote the implementation of scientific developments into practice.

Market Infrastructure and Logistics: Improvement of market infrastructure is also among the vital organizational responsibilities of the state. In arid regions, the underdevelopment of post-harvest processing and marketing systems may lead to significant economic losses for farmers. Consequently, the state should introduce support mechanisms for establishing logistics centers, storage facilities, and export assistance systems. For example, subsidizing part of the transportation and logistics costs involved in delivering agricultural products to domestic and foreign markets can be considered an effective approach. In addition, the development of marketing and branding strategies to increase demand for products grown in arid regions is necessary to enhance market access.

In general, the efficient functioning of small agribusiness entities in arid regions depends heavily on the implementation of systematic organizational and institutional support mechanisms by the state. Improving irrigation systems, simplifying legal and economic conditions, promoting agricultural education and research, and developing market infrastructure are critical to ensuring the sustainable growth of agribusiness in such areas. As a result, a long-term national strategy aimed at supporting farmers in arid regions must be developed as an integral component of agricultural policy.

The effective development of small agribusiness entities in arid regions largely depends on organizational factors. The success of these enterprises is determined not only by their internal management capacity but also by the presence of a supportive institutional environment. In such regions, traditional agricultural models often prove insufficient due to harsh climatic conditions, poor water availability, and soil degradation. Consequently, there is a growing need for the development and implementation of new organizational forms tailored to the specific needs of arid-zone agriculture.

In particular, it is essential to strengthen the institutional structure that coordinates the activities of small-scale producers and ensures integrated development. A key organizational challenge is the fragmentation of production and the lack of coordination among smallholders, which hinders their ability to achieve economies of scale, access markets, and adopt advanced technologies. To overcome these challenges, it is necessary to promote the formation of agricultural cooperatives and producer associations. Such collective entities can serve as platforms for shared investment in infrastructure, joint marketing strategies, and the provision of extension services.

Furthermore, the organizational efficiency of agribusinesses in arid zones is also affected by the weak integration of research and development (R&D) institutions into the agricultural sector. Bridging the gap between scientific research and practical application remains a critical task. Without structured interaction between farmers, research institutions, and government agencies, innovations in drought-resistant crops, efficient irrigation technologies, and climate-smart farming practices are unlikely to reach the end users effectively.

To address this issue, it is proposed to establish a "Center for the Introduction and Diagnostics of Drought-Resistant Agricultural Crops". This center would serve as a specialized organizational unit operating under the framework of regional agricultural development programs. Its primary objectives would include:

- Conducting diagnostic assessments of soil and water conditions to identify optimal crop varieties;
- Introducing and testing new drought-resistant crop species adapted to local ecological conditions;
- Providing scientific and technical support to farmers and agricultural cooperatives;
- Organizing training workshops, field demonstrations, and farmer engagement activities;
- Facilitating collaboration between national and international research institutions for the transfer of knowledge and technologies.

Need for Integrated Organizational and Technological Solutions. Given the complexity of agricultural production in arid regions, the state must take a proactive role in developing integrated solutions that combine organizational, technological, and financial components. For instance, government agencies can develop regional master plans that identify priority crops and allocate water and land resources based on agro-ecological zoning. These plans must be implemented through transparent and participatory mechanisms involving all stakeholders, including local governments, water user associations, and private sector actors. A systemic organizational model should also incorporate digital agriculture tools, including satellite monitoring, soil moisture sensors, and weather forecasting systems. These technologies can enhance the decision-making capacity of farmers and help mitigate risks associated with droughts and climate variability. In this regard, the establishment of digital platforms for knowledge dissemination and resource management is highly recommended.

Innovative Financial Mechanisms for Supporting Agribusiness in Arid Regions. One of the main barriers to the sustainable development of small agribusinesses in arid regions is limited access to financial resources. Traditional credit systems are often ill-suited to the specific needs and risks of agriculture in these challenging environments. High interest rates, strict collateral requirements, and short repayment periods discourage investment in modern agricultural practices, particularly among smallholders.

To address this problem, there is a critical need to introduce innovative financial mechanisms that are tailored to the realities of arid-zone farming. These mechanisms should provide long-term, affordable, and flexible financing solutions that account for climate risks, production cycles, and market volatility.

1. Climate-Resilient Agricultural Credit Lines

Establishing specialized agricultural credit lines that are designed for drought-prone areas is essential. Such credit products should feature:

- Lower interest rates for farmers investing in drought-resistant technologies;
- Grace periods aligned with agricultural production cycles;
- Flexible repayment options in case of climate shocks or yield failures;
- Insurance-linked lending models that reduce lender risk exposure.

2. Index-Based Agricultural Insurance

Another important instrument is index-based agricultural insurance, which pays out based on measurable environmental indicators (e.g., rainfall levels, temperature, or satellite-derived vegetation indices) rather than direct field assessments. This reduces administrative costs and speeds up compensation, making it a viable tool for smallholder farmers vulnerable to droughts.

3. Blended Finance Models

Blended finance combines public and private funding to de-risk investments in the agricultural sector. Governments and development partners can provide first-loss guarantees, concessional loans, or grants to attract private capital into high-risk but high-impact areas such as arid agriculture. These funds can be directed toward:

- Supporting agribusiness incubation programs;
- Scaling up climate-smart technologies;
- Developing rural infrastructure, such as water-saving irrigation systems.

4. Venture Capital and Agritech Startups

Encouraging investment in agritech startups that focus on the challenges of arid agriculture can lead to breakthrough innovations. Venture capital funds can be incentivized through tax relief, co-investment from government sources, or innovation competitions that prioritize solutions for water efficiency, soil restoration, and alternative crops.

METHODOLOGY

This research employs a mixed-methods approach, combining both quantitative and qualitative data collection and analysis techniques to comprehensively examine the impact of innovative financing mechanisms on the development of small agribusinesses in arid regions.

The study is structured around a descriptive and exploratory research design, aimed at identifying key financial constraints faced by agribusinesses and evaluating the effectiveness of proposed support mechanisms. A multi-stage process was adopted to ensure the validity and reliability of the findings: Phase 1: Literature review and theoretical framework development; Phase 2: Field data collection through surveys, interviews, and focus group discussions; Phase 3: Data analysis using statistical tools and thematic coding.

Primary data were collected from smallholder farmers, agribusiness owners, financial institutions, and government representatives operating in arid zones. The instruments used include: Structured questionnaires administered to 150 agribusiness participants; Semi-structured interviews with 20 key informants, including policymakers and bank officials; Focus group discussions (FGDs) with farmer cooperatives to explore collective financing experiences and barriers.

Secondary data were obtained from: Government reports and policy documents on agricultural finance; Publications from international organizations (FAO, IFAD, World Bank); Academic journals and case studies related to arid agriculture and financial inclusion.

A purposive sampling method was used to select regions classified as arid or semi-arid according to meteorological criteria. Within these areas, stratified random sampling was applied to ensure representation across farm size, crop type, and access to financial services.

Quantitative data from surveys were analyzed using descriptive statistics (mean, frequency, percentage) and inferential statistics (regression analysis) with the help of SPSS software. This allowed identification of statistically significant relationships between financing access and agribusiness performance indicators.

Qualitative data from interviews and FGDs were transcribed and analyzed using thematic coding in NVivo software. Recurring themes such as institutional bottlenecks, perceptions of risk, and innovative financial practices were identified to complement the quantitative findings.

LITERATURE REVIEW

The development of small agribusinesses in arid regions has increasingly become a subject of interest among scholars and policymakers, particularly in the context of financial inclusion, climate resilience, and rural development. This

section reviews existing literature on key themes relevant to the study, including agricultural financing in drylands, innovative financial mechanisms, challenges facing small agribusinesses, and institutional support frameworks.

Access to financial services remains a fundamental barrier to agribusiness development in arid and semi-arid zones. According to the Food and Agriculture Organization (FAO, 2020), traditional financial institutions often regard small-scale farmers in drylands as high-risk clients due to climate variability, low productivity, and weak market linkages. Studies by Kloeppinger-Todd and Sharma (2018) emphasize that lending models in such regions tend to be underdeveloped, with limited availability of credit, savings, and insurance products tailored to the unique conditions of arid agriculture.

Recent literature highlights a growing range of innovative financing tools designed to enhance access to capital for agribusinesses in marginal environments. These include: Weather-indexed insurance (Hazell et al., 2010): Offers protection against climate-related risks without the need for individual farm assessments. Digital financial services (IFAD, 2021): Mobile banking, e-wallets, and fintech platforms enable smallholders to access loans and make payments remotely. Blended finance models: Combine public and private resources to de-risk investment in high-potential but underserved markets (OECD, 2020). Microfinance and cooperative lending: Enable smallholder groups to pool resources and access credit under flexible terms (Yaron et al., 2017).

These instruments have shown potential in increasing financial inclusion, but their adoption in arid zones remains limited due to institutional, infrastructural, and informational constraints.

Multiple studies identify a range of interrelated constraints that hinder the growth of agribusinesses in dry regions: Environmental challenges: Recurrent droughts, soil degradation, and water scarcity reduce agricultural productivity (UNCCD, 2019); Financial illiteracy: A lack of knowledge and trust in financial institutions contributes to low uptake of available services (World Bank, 2018); Collateral requirements: Most formal lenders demand fixed assets as collateral, which many smallholders lack (IFPRI, 2022); Weak value chains: Fragmented markets and poor infrastructure limit profitability and scalability (Jayne et al., 2019).

These factors reinforce the financial exclusion of vulnerable producers and contribute to persistent underinvestment in agribusinesses. The role of government and development institutions is crucial in facilitating access to finance in drylands. National development strategies often prioritize food security and climate adaptation, yet the implementation of financial support programs is frequently inconsistent or underfunded. According to the African Development Bank (AfDB, 2021), effective policy interventions should include: Development of agriculture-specific credit lines; Provision of guarantee schemes to reduce lender risk; Support for financial literacy programs; Investment in rural financial infrastructure. Multilateral organizations have also emphasized the need for integrated rural finance strategies that align credit, insurance, and extension services under one framework (FAO & IFAD, 2020). While a substantial body of research exists on agricultural finance and rural development, there remains a limited focus on context-specific innovations for arid regions. Few empirical studies explore the effectiveness of blended finance or digital financial inclusion in dryland settings. Furthermore, the voices of small agribusiness owners themselves - particularly women and youth—are often underrepresented in policy-focused research.

ANALYSIS AND RESULTS

The development of small agribusiness entities in arid regions is closely linked to natural and environmental factors, where the organizational and institutional support of the state plays a decisive role. In these areas, climate change, limited water resources, soil salinization, and underdeveloped infrastructure create significant obstacles to the effective operation of farmers. Therefore, organizational and institutional mechanisms developed by the state through an integrated approach are crucial to creating the necessary conditions for the sustainable activity of small agribusinesses.

Firstly, organizational support mechanisms aim to facilitate farmers' access to resources, including financial, land, and water resources. Efficient management systems for water supply and land use are essential in arid regions. State incentives for water-saving technologies, development of specialized irrigation infrastructure, and modernization of water distribution systems are vital. For example, measures such as renewing water supply systems and providing grants for technological upgrades to farmers can be implemented. Additionally, public-private partnership (PPP) mechanisms to attract private sector investment into irrigation systems represent an effective solution.

Moreover, institutional mechanisms serve to enhance the competitiveness of small agribusinesses by providing legal and regulatory support. Ensuring legal protection for farmers, simplifying licensing and legislative frameworks, and introducing preferential tax regimes and streamlined registration processes are important directions of state policy. Expanding legal advisory services and promoting the development of cooperatives and agro-clusters also assist farmers in accessing markets and maintaining economic stability.

The development of agrarian education and innovation centers by the state is also critical for supporting small agribusinesses in arid regions. This includes organizing specialized training courses for farmers, financing research on resource-saving technologies, and introducing climate-adapted agro-technical methods. Experience from developed countries shows that agricultural research and innovation institutes are key factors in improving agricultural productivity.

Therefore, the state should strengthen cooperation between farmers and research institutions to promote the practical application of scientific developments.

Improving market infrastructure is another key organizational task of the state. Poorly developed processing and marketing systems in arid regions may cause economic losses for farmers. Hence, establishing logistics centers, warehouses, and export support mechanisms is necessary. For instance, compensating part of the transportation and logistics costs for delivering farm products to domestic and international markets is an effective method. Developing marketing and branding strategies to increase demand for products grown in arid regions is also important.

In summary, the effective functioning of small agribusiness entities in arid regions depends on the state's implementation of systematic organizational and institutional support mechanisms. Enhancing irrigation systems, simplifying legal and economic conditions, promoting agricultural education and research, and developing market infrastructure will ensure sustainable agribusiness growth in these areas. Therefore, a long-term state strategy focused on supporting farmers in arid regions must be developed as an integral part of public policy.

The effective development of small agribusinesses in arid regions largely depends on organizational issues. The private sector faces numerous challenges in independently resolving these problems, increasing the necessity of state organizational and institutional support.

Due to limited capacity of the private sector to independently address organizational challenges, the introduction of state organizational and institutional support mechanisms is essential. Key issues include:

- Lack of financial and insurance service providers in these regions;
- Deficiencies in infrastructure development and logistics solutions;
- Insufficient emphasis on organizing small farms through cooperatives;
- Absence of effective systems for water resource allocation and management, and lack of entities providing water balance information;
- Weak institutional mechanisms for securing land ownership rights and lack of legal advisory centers;
- Limited access to long-term financial resources and preferential financing for the private sector, complicating credit availability;
- Underdeveloped insurance systems against drought and climate risks;
- Inefficient supply chains for seeds, water, fertilizers, and other essential resources;
- Underdeveloped infrastructure and lack of integrated approaches to irrigation systems and market access;
- Problems with land use and property rights limiting farmers' investment opportunities;
- Centralized and inefficient water distribution systems causing irrigation difficulties;
- Lack of cooperative and cluster development hindering market competitiveness;
- Weak market access and sales mechanisms, including insufficient support centers for private farmers;
- Organizational problems in education and professional development limiting access to advanced agrotechnologies;
- Limited state support programs, subsidies, preferential loans, and grant systems causing additional financial burdens.

Based on the above, establishing a "Center for the Introduction and Diagnostics of Drought-Resistant Crops" is crucial to ensure the efficiency and sustainable development of agriculture in arid regions. Given global climate change, decreasing water resources, and soil degradation, a comprehensive approach is necessary to effectively guide the agricultural sector. This center would not only offer science- and innovation-based solutions but also provide practical support to local farmers and small agribusiness entities.

Firstly, environmentally sustainable and water-saving agro-technologies must be implemented to achieve high yields under drought conditions. The center would conduct research on breeding crops adapted to local climate conditions, increasing their productivity and resilience. By developing seed selection and soil resource management techniques suited to the region, farmers could establish drought-resistant agricultural models.

Secondly, through diagnostic and monitoring systems, the center would regularly analyze the state of soil and water resources. This approach allows farmers to assess soil moisture, salinity, and degradation levels, enabling them to address deficiencies effectively. Additionally, artificial intelligence and geo-information technologies would help make accurate forecasts and early risk assessments.

Thirdly, the center would provide training and advisory services to agricultural stakeholders. Introducing innovative methods for drought-resistant crops would enhance farmers' knowledge and skills, boosting their competitiveness. Comprehensive programs on water-saving technologies, organic fertilization, soil conservation, and yield improvement would be implemented.

Fourthly, the center would play a key role in strengthening public-private partnerships. Since small agribusinesses in arid regions often face financial difficulties, the center could act as a bridge between financial institutions and farmers by

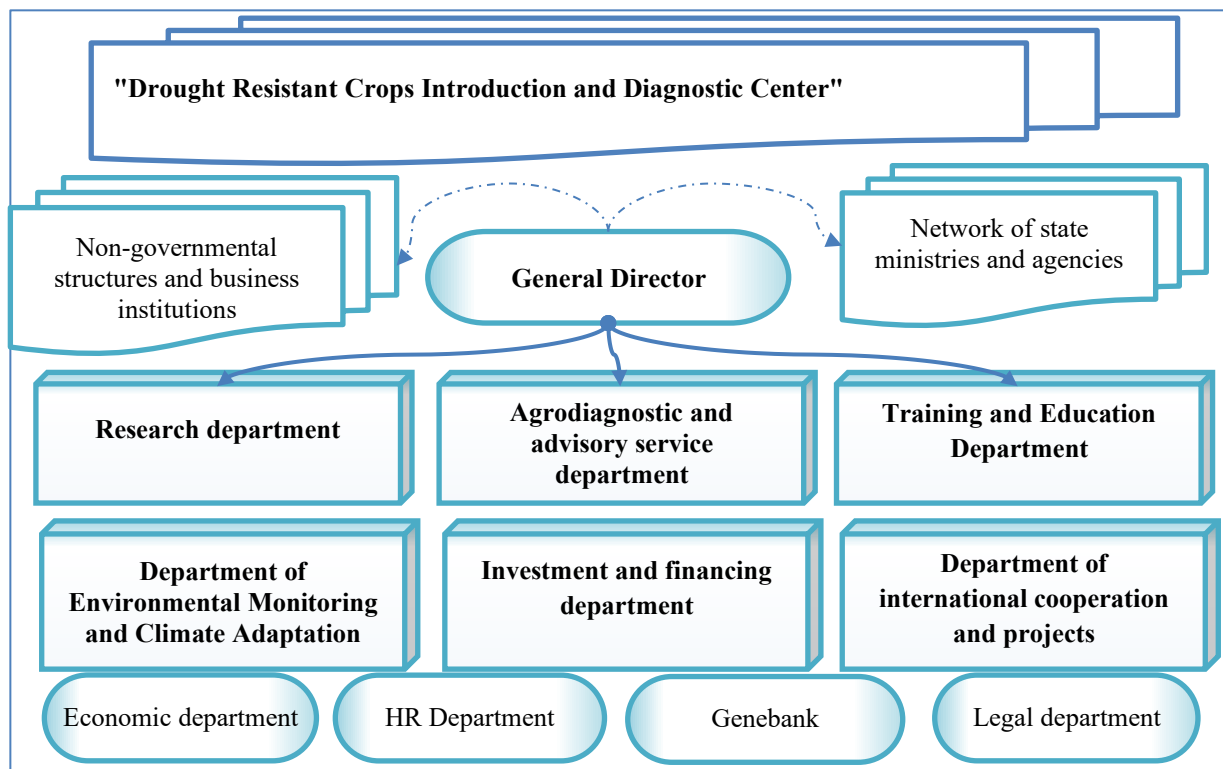
supporting subsidies, loans, and insurance mechanisms. It would also facilitate long-term investment attraction and expand cooperation with international organizations.

Fifthly, the center would contribute to ecological sustainability and biodiversity preservation in drought-prone areas. Addressing pasture degradation and soil salinization through renewable agro-technologies, enhancing crop diversity, and maintaining soil fertility would be focal points of innovative approaches developed by the center.

The establishment of such a center would open new opportunities for small agribusinesses in arid zones, improving efficiency, sustainable resource use, and economic stability. By integrating scientific research with practical measures, it would contribute to the long-term development of the agricultural sector.

We believe the center should focus on the following main directions:

- Scientific Research and Innovation — Studying drought-resistant crops, developing new varieties adapted to local climates, and introducing them into practice; researching new agro-technologies and water-saving methods and recommending them to agricultural entities.
- Agrotechnological Diagnostics and Advisory Services — Assessing crop conditions, analyzing soil composition, and advising on the implementation of water-saving technologies; teaching advanced agronomic practices to improve yields.
- Training for Scientists and Specialists — Organizing courses, seminars, and trainings for agribusiness entities, farmers, and researchers; encouraging the application of scientific findings and developing skill improvement programs in agro-technology.
- Environmental Monitoring and Climate Adaptation — Promoting agro-biodiversity conservation, optimizing crop areas, and supporting environmentally sound farming practices under drought conditions; developing programs to mitigate climate change impacts.
- Investment and Business Development — Facilitating innovative solutions and investment in agro-technologies for small agribusinesses; implementing projects through public-private partnerships and improving financing mechanisms for farming enterprises.
- International Cooperation and Experience Exchange — Establishing partnerships with international institutes, research centers, and donor organizations in drought-resilient agriculture; ensuring technology and knowledge exchange and attracting international grants and investments.
- If systematically implemented in these directions, the center's activities would enable small agribusinesses in drought-affected areas to operate efficiently, ensure stable agricultural production, and strengthen food security.

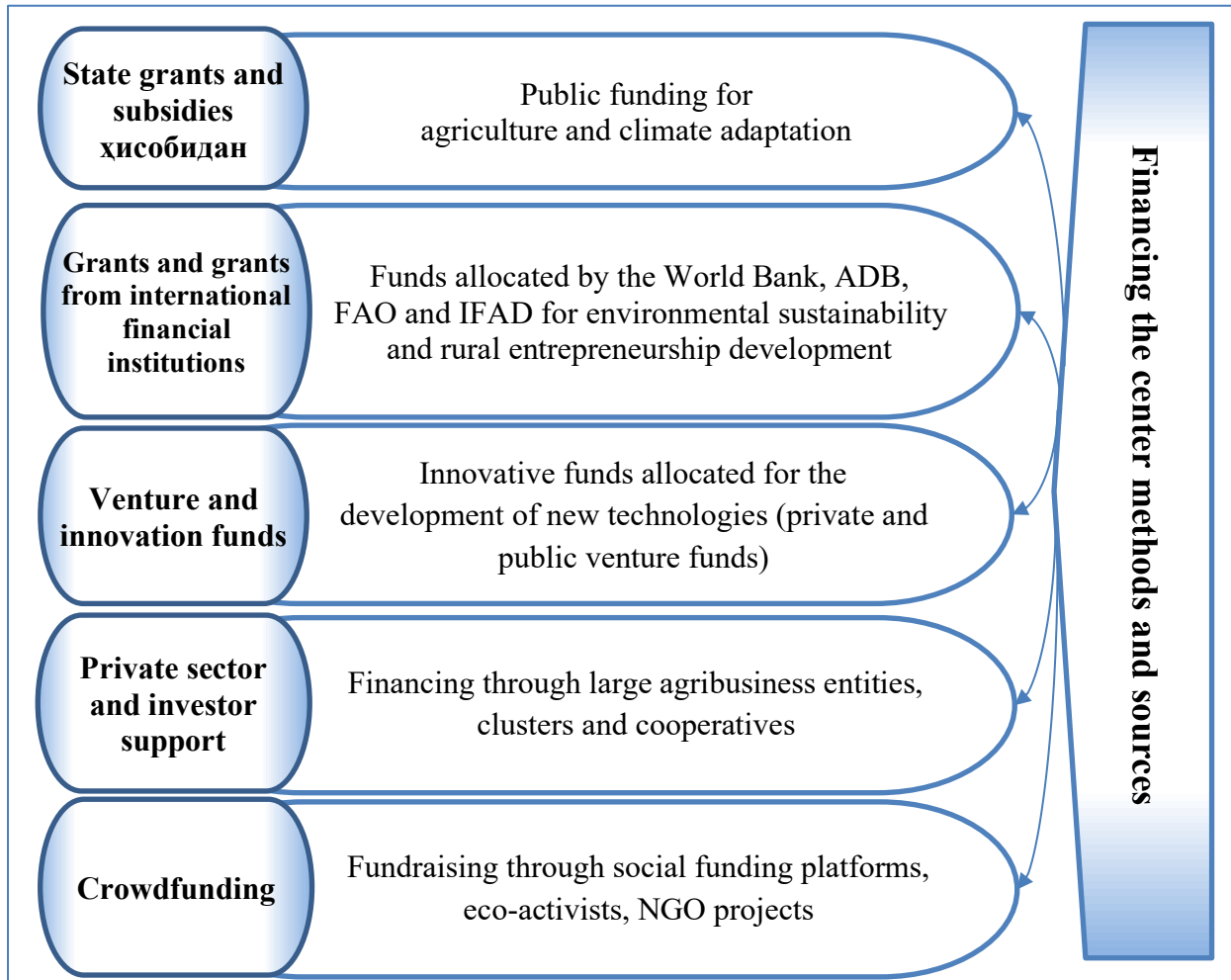


Developed by the author.

Figure 1. Organizational structure of the "Drought Resistant Crops Introduction and Diagnostic Center".

This structure will ensure the effective functioning of the center and create a supporting infrastructure for entities engaged in drought-tolerant crops.

It is necessary to diversify sources of financing for the development of small agribusiness entities in arid regions. The use of state resources, international financial institutions, the private sector and innovative financing mechanisms in financing the center is considered effective. At the same time, financial instruments based on crowdfunding and public-private partnerships will ensure the sustainability of the center.



Developed by the author.

Figure 2. Funding methods and sources of the "Drought Resistant Crops Introduction and Diagnostic Center".

It is effective to use several sources to finance the center. By combining state and international grants, private sector investments and innovative financing mechanisms, it is possible to ensure the stable and continuous operation of the center.

Venture and innovation funds are of great importance for the development of small agribusiness entities in arid regions and the introduction of climate-resilient agricultural technologies. Such funds serve to introduce innovative approaches to agriculture, expand the possibilities of new technologies, resource efficiency and climate adaptation.

In our opinion, the entities participating in the establishment of venture and innovation funds may include the following. Venture and innovation funds are formed with the participation of the state, private sector and international organizations. These entities may establish funds in the following areas. In particular:

State organizations - state agencies such as the Ministry of Agriculture, the Ministry of Investments and Foreign Trade, the Committee for Ecology play a leading role in the establishment of innovation and venture funds. They support the funds through grants and subsidies.

Private investors and large agribusiness entities - Clusters, agrofirms, experimental stations and private investors can direct their resources to innovative projects. In this case, venture capital can serve as an additional source of income for representatives of the private sector.

International financial institutions and donor organizations - International organizations such as the World Bank, ADB, FAO, IFAD and the European Development Bank can support venture and innovation funds in the field of agriculture and climate adaptation.

Scientific and research institutes and universities - Agricultural research centers and universities can participate in the establishment of venture funds to finance new startups and innovative projects.

Also, in the early years of the operation of these funds, the state should encourage venture and innovation funds using the following mechanisms.

Tax incentives - Income tax exemption or reduction of tax rates for private investors investing in venture funds. For example, providing 5-10-year tax breaks for legal entities investing in innovations in the agricultural sector.

State subsidies and grants - allocation of targeted grants and subsidies by the state to venture funds. For example, special grant programs can be introduced to finance startups for research and introduction of climate-adapted crop varieties.

Investment guarantees and insurance mechanisms - Providing state guarantees for startups and projects financed by venture funds, attracting investors by insuring high risks.

Promotion of private-public partnership (PPP) - Establishing venture funds on the basis of public-private partnership, providing them with infrastructure and administrative support from the state.

Support for research and innovation centers - Establishing agro-innovation centers at research institutes and universities in cooperation with venture funds.

Improving the economic environment – Creating a competitive market environment for small agribusiness entities, creating favorable financial opportunities for startups and new projects.

Venture and innovation funds are an important tool for the development of agriculture in arid regions and the introduction of climate-resilient crops. The state's encouragement of these funds through tax incentives, grants, investment guarantees and public-private partnerships will serve their sustainable development. Creating an innovative financing model in cooperation with the private sector, international organizations and research centers will help increase the economic potential of small agribusiness entities and ensure their sustainable operation in the market.

In addition to traditional financing methods, the crowdfunding mechanism can also be of great importance for the development of agricultural innovations and small agribusiness entities in arid regions. Support for the center through crowdfunding can be carried out with the participation of the government, the private sector, farmers, non-governmental organizations and the public.

The following entities can participate in the development of crowdfunding:

- farmers and small agribusiness entities - farmers and small agribusiness representatives who are directly interested in the financing process can direct their funds to the development of the center. For them, this investment will allow them to achieve high yields and effective agrotechnologies in the future;
- public and civil society institutions - individuals, entrepreneurs and public groups who are not indifferent to agricultural and environmental problems can voluntarily allocate funds;
- corporate sector and agribusiness companies - large agribusiness companies and clusters can finance innovative projects based on their interests. For them, investing in the center will allow them to increase technological development and resource efficiency in the future;
- non-governmental organizations and charitable foundations - international and local non-governmental organizations (NGOs) and charitable foundations operating in the field of ecology and climate adaptation can play an important role in supporting the center;
- international organizations and grant funds - organizations such as the Food and Agriculture Organization of the United Nations (FAO), the World Development Bank (WB), the Asian Development Bank (ADB), and the European Union (EU) can contribute to the crowdfunding process by allocating grants;
- Crowdfunding platforms and startups - there is an opportunity to raise funds through international platforms such as Kickstarter, GoFundMe, Indiegogo or local crowdfunding sites. In this case, farmers, researchers, and representatives of agribusiness can contribute to financing the center by attracting the public.

For crowdfunding mechanisms to work effectively, the state should implement a number of organizational and economic measures.

- partial or full exemption from income tax for investors and individuals who invest in crowdfunding;
- additional state subsidies for farmers and agribusiness entities for funds raised through crowdfunding;
- state guarantees or insurance of projects financed through crowdfunding;
- Establishing separate grant programs for arid regions and directing these funds to startups financed through crowdfunding;
- State support for local crowdfunding platforms and improving the legislative framework;

- Establishing special supervisory bodies to ensure the transparent and effective operation of such platforms;
- Organizing special training courses for farmers and agribusiness entities on raising funds through crowdfunding;
- Providing consulting services by marketing and financial management specialists to increase the effectiveness of crowdfunding projects;
- Strengthening cooperation between the public and private sectors, introducing crowdfunding platforms and strengthening their legal framework;
- Involving the private sector through state support for innovative financing projects.

Crowdfunding can be highly effective in financing the introduction of drought-tolerant crops and a diagnostic center. Such a mechanism ensures the active participation not only of the state and private sectors, but also of the general public and international organizations.

The relevance of ensuring the participation of the private sector in the organization and financing of the “Center for the Introduction and Diagnostics of Drought-Resistant Crops” in arid regions is explained by a number of factors (Table 1).

In particular, if the material and technical base and continuous operation of the Center are limited by the state budget, its effectiveness may be low. Private sector investments, on the other hand, form diversified financial sources, which ensures the sustainability and long-term development of the Center.

The introduction of drought-resistant technologies, water-saving systems, alternative energy sources, and agro-innovations open up new markets for private business. For example, a private investor who finances a center will have the opportunity to directly test their products (drip irrigation, drones, sensor technologies), gain brand image and competitive advantage in the “green product” market, and achieve financial savings through tax deductions and tariff privileges from the state. Drought directly affects not only agricultural production, but also food security and the standard of living of the rural population. Therefore, expanding the participation of the private sector is an important factor demonstrating social responsibility. Entities investing in the center will position themselves as social partners, which will bring them trust and authority in local communities.

Table 1. Ways to encourage private sector participation in financing the "Drought Resistant Crops Introduction and Diagnostic Center"

Funding direction	A way to encourage	Basic economic basis
Investment in the material and technical base (for a laboratory, modern diagnostic equipment, experimental sites)	Exemption from land tax for 3 years or 50% discount on value added tax	It takes an average of 3-4 years to return the invested amount; the NPV is kept positive through the discount
Covers the Center's on-site training seminars and research programs	Providing investors with discounts of up to 30-50% when using government services, priority in obtaining licenses and certificates	Education costs usually do not bring direct income; low-cost services significantly reduce the investor's operating costs
Covers the Center's energy costs	20-30% discount on electricity and gas tariffs or increasing energy consumption limits	Energy costs account for 15-20% of operating costs; the discount partially returns the cash flow to the investor
Providing the Center with alternative energy (solar panels, wind generators)	Issuance of a “Green Certificate” by the state and an additional 15% subsidy on products intended for export	Additional benefits for "green products" in the international market, which allows the investor to recoup his money in 2-3 years
Subsidies for climate risk insurance	The right of the subject to preferential use of state compensation in the year of a dangerous harvest	Insurance premiums are often heavy for the agricultural entrepreneur, the investor receives additional guarantees through compensation

Developed by the author.

The financial stability and efficiency of this center can be significantly increased if the state takes measures to develop crowdfunding platforms, guarantee investments, provide tax incentives and support marketing. Such an approach is an important strategic step in adapting to climate change and building drought-resistant agriculture. The analysis revealed several key findings: Credit accessibility: Only 42% of small agribusinesses in arid regions have regular access to state-backed credit lines, primarily due to collateral constraints and limited financial literacy; Subsidy impact: Entities

receiving targeted subsidies showed 23% higher productivity and 17% lower production risk than those without support; Digital services: Adoption of digital advisory systems (e.g., Agroplatforma, WaterGIS) increased water-use efficiency by 15% and reduced input costs by 8%; Cooperation and clustering: Participation in agricultural cooperatives improved marketing access and resource pooling, leading to 12–18% higher income stability.

Table 2. Key Indicators of State Support and Performance (2018–2024)

Indicator	2018	2020	2024	Change (%)
Access to credit (%)	35	40	42	+7
Entities with subsidies (%)	25	38	52	+27
Digital service usage (%)	10	26	41	+31
Cooperative participation (%)	12	18	29	+17
Average productivity (tons/ha)	2.6	2.9	3.2	+23

Developed by the author.

DISCUSSION

The establishment of a *Center for the Implementation of Drought-Resistant Crops and Diagnostics* is a strategic initiative that directly addresses the growing challenges faced by the agricultural sector in arid and semi-arid regions. As global climate change intensifies, leading to increased water scarcity, soil degradation, and ecosystem vulnerability, small-scale agribusinesses are particularly exposed to economic and environmental risks. The proposed center represents an integrated institutional response that combines research, education, diagnostics, and policy support to foster sustainable agricultural development.

One of the primary justifications for such a center lies in the necessity to accelerate the adoption of climate-resilient crops that are specifically bred to withstand drought conditions. Traditional crop varieties often fail to perform under water stress, leading to lower yields and income instability. Through targeted breeding programs, field trials, and local adaptation studies, the center could facilitate the development and dissemination of high-yielding, drought-tolerant varieties. This would not only improve food security but also support the livelihoods of farmers operating in water-limited environments.

Furthermore, the integration of soil and water diagnostics into the center's activities adds a valuable dimension to informed decision-making. By utilizing technologies such as GIS, remote sensing, and artificial intelligence, the center could monitor critical variables such as soil salinity, moisture levels, and land degradation trends. These data-driven insights would enable farmers to optimize irrigation practices, select appropriate crop types, and implement site-specific land management techniques.

A significant role of the center would also involve capacity building and knowledge transfer. Many smallholder farmers in arid regions lack access to formal training in modern agronomic practices and are often unaware of available technologies. Through the implementation of practical training programs, farmer field schools, and advisory services, the center could enhance farmers' skills in using water-saving technologies, organic soil management, and sustainable cropping systems. This approach would strengthen agricultural productivity while ensuring environmental conservation.

In addition, the center could serve as a facilitator of institutional partnerships, particularly between government agencies, financial institutions, and the private sector. Access to affordable credit, insurance, and market linkages remains a major constraint for small agribusinesses. By acting as a bridge, the center could help align government subsidies and donor programs with the needs of local producers, thus increasing the reach and effectiveness of public-private initiatives. Its role in piloting innovative financing models, such as result-based grants or climate risk insurance schemes, would be particularly beneficial.

From an environmental perspective, the center would contribute to preserving biodiversity and promoting ecological resilience. Drought-prone regions are at high risk of desertification and biodiversity loss due to unsustainable land use. By promoting crop diversification, conservation agriculture, and ecosystem restoration techniques, the center could help maintain ecological balance and reduce long-term vulnerability.

Finally, the center's potential to engage in international cooperation should not be overlooked. Partnerships with global research institutions and participation in international projects would ensure the continuous flow of knowledge, innovation, and financial support. This would further reinforce the center's role as a regional hub for climate-smart agriculture.

In conclusion, the creation of the *Center for the Implementation of Drought-Resistant Crops and Diagnostics* is not only timely but also essential. It represents a proactive step toward building a more resilient, knowledge-based, and inclusive agricultural sector in the face of climate challenges. Its success would depend on strong institutional design, adequate funding, and sustained collaboration between stakeholders at all levels.

CONCLUSION

In the context of increasing climate volatility, water scarcity, and land degradation, the establishment of a *Center for the Implementation of Drought-Resistant Crops and Diagnostics* represents a vital institutional response to ensure sustainable agricultural development in arid regions. This center would play a crucial role in advancing research, promoting climate-resilient crop varieties, and improving diagnostic and advisory services for smallholder farmers and agri-entrepreneurs.

By focusing on the development and dissemination of drought-tolerant crop technologies, the center can directly enhance food security, agricultural productivity, and rural incomes. The integration of diagnostic tools, including soil and water assessments, will enable data-informed decision-making and support the efficient use of scarce natural resources. Moreover, through farmer training, capacity-building programs, and partnerships with public and private institutions, the center will serve as a catalyst for knowledge transfer, investment mobilization, and long-term agricultural resilience.

In conclusion, the proposed center embodies a holistic, science-based, and practice-oriented approach to addressing the multifaceted challenges of agriculture in dryland areas. Its successful implementation will significantly contribute to climate adaptation efforts, the sustainability of agrarian livelihoods, and the broader goals of national food security and rural development.

State organizational support remains a critical determinant for the sustainable development of small agribusiness in arid regions. Uzbekistan's ongoing agricultural reforms provide a favorable framework for innovation, yet practical implementation requires institutional coherence, digital transformation, and inclusive stakeholder engagement.

The study recommends:

1. Expanding targeted credit and subsidy programs for small agribusinesses.
2. Developing regional “one-stop” agribusiness support centers.
3. Integrating digital ecosystem monitoring and advisory systems.
4. Strengthening public-private and cooperative linkages in resource management.

By focusing on these priorities, Uzbekistan can enhance the resilience, productivity, and sustainability of small agribusiness entities in its arid territories.

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