ICARDA
Science for resilient livelihoods in dry areas

ICARDA Country Brief Series

Uzbekistan

Photo credit: Farida Kuldasheva 2021. A beekeeper inspects her hives, piloting a climate-smart hive management app.

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DSPACE GeoCC International Nurseries Data Management System OCS ONE CORPORATE SYSTEM The Dataverse Project

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Acronyms

CACIP	Central Asia Climate Information Portal
CIMMYT	International Maize and Wheat Improvement Center
FAO	Food and Agriculture Research Organization
GIZ	German Agency for International Cooperation
ICARDA	International Center for Agricultural Research in the Dry Areas
INDMS	International Nurseries Data Management System
IWWIP	International Winter Wheat Improvement Program
MEL	Monitoring, Evaluation & Learning
NARS	National Agricultural Research System

Introduction

The ICARDA country series provide a snapshot of the work ICARDA has done and what is ongoing in the different countries in which ICARDA operates. It highlights the projects implemented, the partnerships that ICARDA has formed for both project delivery and knowledge generation, the key research themes by ICARDA Scientists and features a summary of the impact ICARDA projects have delivered to the citizenry, especially the rural poor smallholder farmers. This brief aggregates data from 2016-2021 to arrive at situation analysis of where we are in 2021 in a target country. Information for country series is primarily retrieved from MEL (https://mel.cgiar.org) that serves as repository of produced outputs and hence allows the compilation and analysis to produce such briefs.

About ICARDA

Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is a non-profit, CGIAR Research Center that focusses on delivering innovative solutions for sustainable agricultural development in the non-tropical dry areas of the developing world.
We provide innovative, science-based solutions to improve the livelihoods and resilience of resource-poor smallholder farmers. We do this through strategic partnerships, linking research to development, and capacity development, and by taking into account gender equality and the role of youth in transforming the non-tropical dry areas.

Agriculture in Uzbekistan

Roughly 26% of Uzbek citizens work in the agricultural sector, and while the poverty rate (~14%) is higher than regional average, Uzbekistan's economy is growing. The main crops produced are wheat, cotton, and potatoes, yet fruit and vegetable production are expected to increase now that the state promotes diversification and supports exports by relaxing quotas and price controls have been removed over the past two years[1].

During Uzbekistan's former role as the key cotton producer for the Soviet Union, high irrigation requirements overused fresh water resources of two major rivers Amudarya and Sirdarya, most notably affecting inflow to the Aral Sea which is now 10% of its former size. Monocropping, intensive tillage and agrochemical use took a toll on arable land; 37% of the country's land productivity dynamic is classified as stressed or declined[2]. Over the past two decades, Uzbekistan has aimed to diversify crops—visible through the growing production of wheat and decrease of cotton. Yet cotton remains a main crop, and efforts are being made to improve irrigation techniques. Furthermore, the Uzbekistan government aims to grow the domestic textile industry to improve the self-sustainability of the cotton value chain and increase domestic revenue[1].

The *Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030* includes five key priorities: (1) ensuring food security of the population; (2) creating favorable agribusiness climate; (3) reducing the role of the state and increasing investment attractiveness; (4) ensuring the rational use of natural resources and protection the environment; and (5) development of extension services. The Uzbekistan government has placed a strong emphasis on improved technologies and digitization, marking 2020 as the "*Year of Science, Education and Development of the Digital Economy*", granting $600 million to fund new agricultural technologies and commits to create "Agricultural Knowledge and Innovation Centers", providing advisory and extension support to farmers.

[1] International Trade Administration. (2021). Uzbekistan- Country Commercial Guide.
[2] FAO. (2021). Land Degradation in Uzbekistan.

ICARDA in Uzbekistan

The ICARDA Central Asia Office was established in Uzbekistan in 1998, following a hosting arrangement between ICARDA and the Government of Uzbekistan. Currently, ICARDA's work in Uzbekistan has strong regional collaborations, including regional projects on rust-resilient wheat development and the Central Asia Climate Information Portal (CACIP). ICARDA's dryland expertise is critical to address the agricultural challenges faced by Uzbekistan today, including drought, soil salinity, pollution, and pest management.

Crop improvement
Through research activities and germplasm development, ICARDA has generated several improved crop varieties for Uzbekistan, particularly for wheat and chickpea. Crops are bred for resilience to environmental challenges of rising temperatures, drought, saline soils, and rust diseases.

Sustainable land management
To restore healthy, productive soils and promote sustainable agriculture practices, ICARDA promotes best practices for no-tillage and water management, including laser-leveling, raised bed planting, residue retention, and improved irrigation techniques. Conservation agriculture is promoted, to reduce ploughing, and increase land cover and crop diversity, resulting in better yields for a lower financial cost. To improve soil fertility and prevent erosion, direct seeding, soil mulching and crop rotation practices are used[3].

Capacity building
Farmer field days and trainings are frequently held to train farmers and local scientists and researchers on best farming practices, new techniques, and technologies.

Research
ICARDA leads research to investigate agricultural challenges and solutions, helping inform policy decisions and best practices for farmers. Some of recent studies for example on cotton production found that low-elevation cotton producing regions were more productive than high-elevation sites in the mountains, and the best time to plant cotton is mid-April[4].

Data for decision-making
In recent years, ICARDA has developed two digital platforms that enable the collection and dissemination of climate data to policymakers and beekeepers.

ICARDA projects in Uzbekistan

Below are summaries of all active projects in Uzbekistan as of December 2021. For a summary table with exact dates, budget, and project manager, see Annex A.

Ecologically Oriented Regional Development of the Aral Sea Region (2021-2023 | $300,000 | GIZ website)
To support economic and ecological development of the Aral Sea Region, ICARDA supports crop diversification by planting short-term crops in fallow land areas, training farmers on seed multiplication, and leveling cropland for water-saving technologies.

Strengthening regional collaboration and National Capacities for Surveillance and Management of Wheat Rust Diseases in Central Asia and Caucasus (2021-2023 | $250,000 | FAO Project Brief)
To fight wheat rust on a regional level, the project aims to build national capacities to improve surveillance, race analysis and integrated disease management. It will also support the development and deployment of disease resistant varieties. Participating countries include Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan, and Kazakhstan.

AI-Driven Climate-Smart Beekeeping for Women (AID-CSB) (2021-2022 | $420,000 | Project MEL Page)

[3] Aziz Nurbekov, Akmal Akramkhanov, Amir Kassam, Dossymbek Sydyk, Zokhid Ziyadullaev, Johannes Lamers. (31/12/2016). Conservation Agriculture for combating land degradation in Central Asia: a synthesis. AIMS Agriculture and Food, 1 (2), pp. 144-156. DOI https://hdl.handle.net/20.500.11766/4401

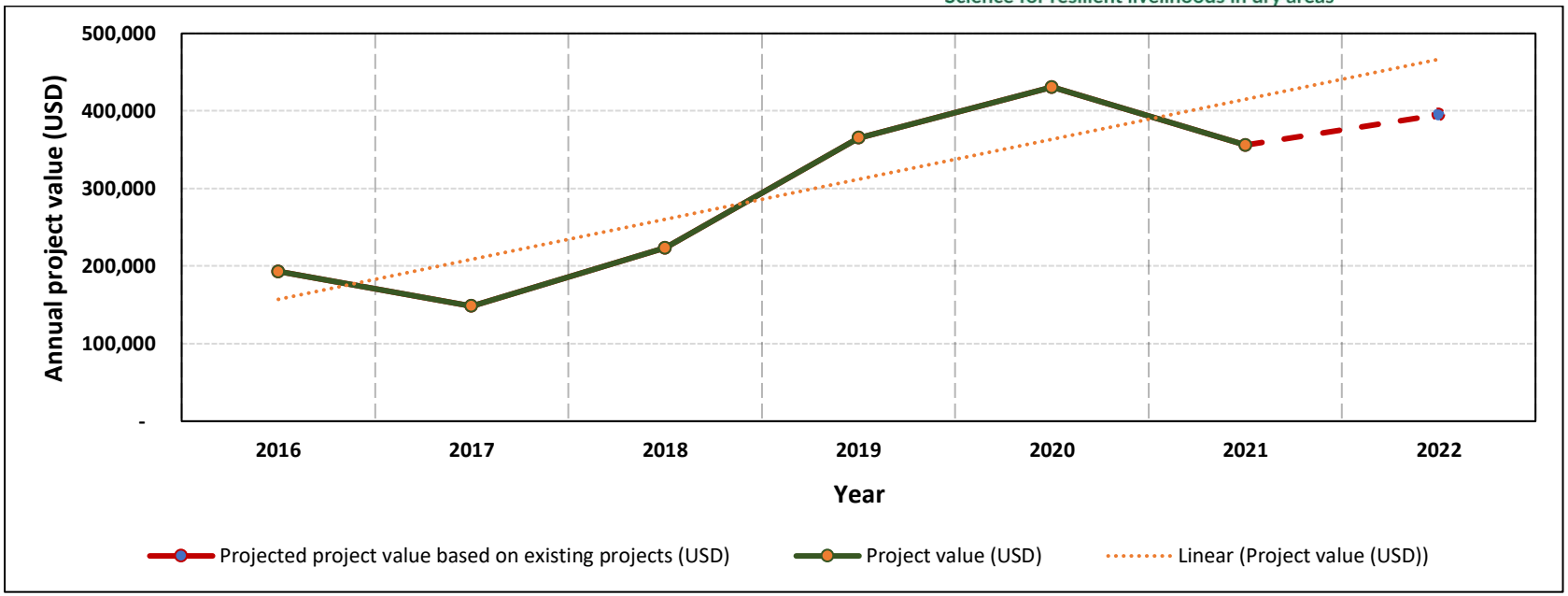
[4] Gianni Montanaro, Vinay Nangia, Prasanna Gowda, Shukhrat Mukhamedjanov, Azamat Mukhamedjanov, Mira Haddad, Tulkun Yuldashev, Weicheng Wu. (1/12/2021). Heat units-based potential yield assessment for cotton production in Uzbekistan. international journal of agricultural sustainability and biological engineering, 14 (6).

AID-CSB aims to support biodiversity and enable improved hive management among women, using a gender-sensitive, participatory process to localize a hive management app. In 2021, localized Uzbek and Russian versions of the Beekeeper's Companion app were generated, and in 2022 the project aims to increase app adoption, use, and add a new honeybee "Symptom Checker" feature.

CGIAR Research Program (CRP) on Wheat Phase II (2017-2022 | $8,154,475 | Proposal)
A multi-country initiative, in Uzbekistan the project aims to reduce rural poverty through the development, faster access, and adoption of improved winter wheat varieties. To encourage adoption, crop rotation strategies with maximum profitability are promoted.

ICARDA project value in Uzbekistan

The next graph depicts the value of ICARDA projects in Uzbekistan from 2016-2022, based on past, current, and planned projects. In contrast with many other countries in this series, Uzbekistan shows a growth trend with ICARDA project value more than doubling from 2016 (150K USD) to 2020 (431K USD). To maintain this growth, new funding sources will need to be procured to fill the place of CRP Wheat Phase II, which ends in December 2022.



Graph 1: Trajectory of ICARDA project value in Uzbekistan (Source: MEL, December 2021)[5]

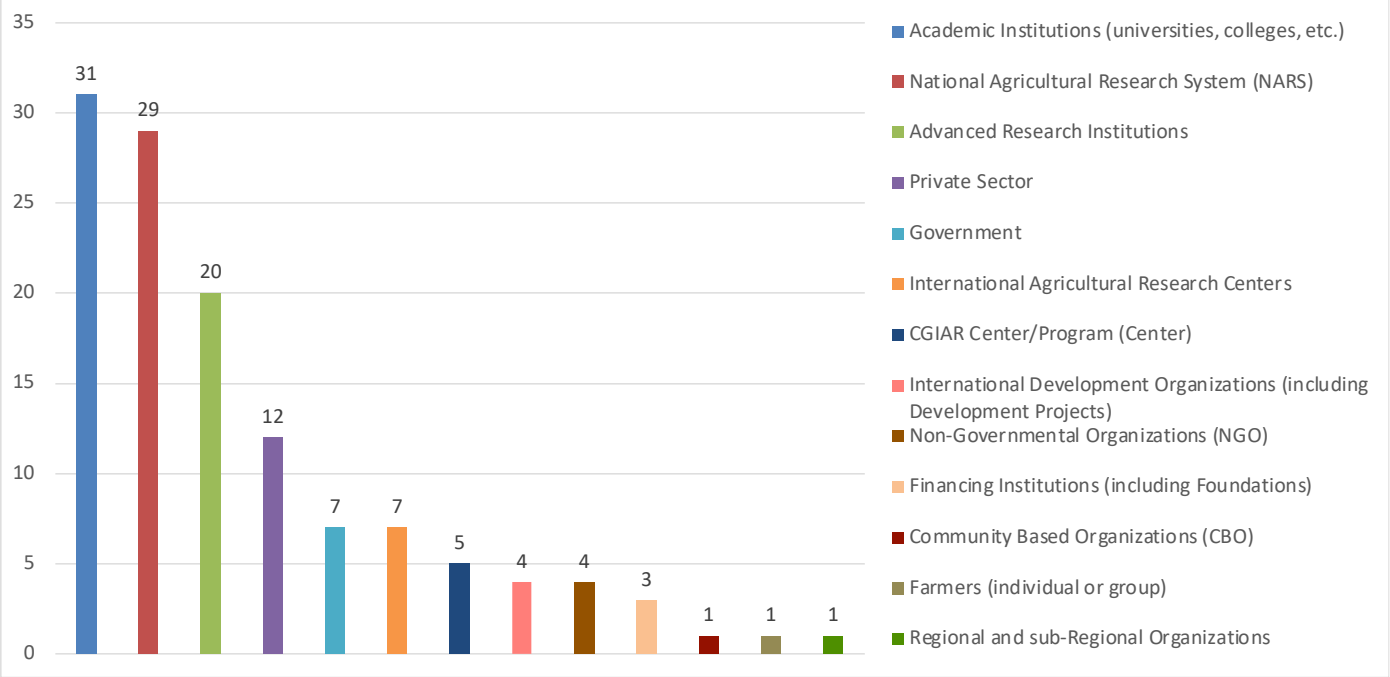
[5]Several assumptions were made in order to create this graph. Assumptions include: (1) All budget data in OCS at the time of data pull was up to date. (2) For multi-country projects, funds are distributed equally among countries. (3) Project spending is equally divided across all years.

Partnerships

ICARDA engages a number of local, national, regional and international entities as a means of ensuring effectiveness and efficiency of knowledge generate and project delivery at scale. This section highlights over 100 partners with which ICARDA's Uzbekistan projects have worked both in project delivery and knowledge generation and dissemination.

Project delivery partners

Of the project partners in Uzbekistan, academic institutions, National Agricultural Research System (NARS), advanced research institutions, and private sector are the most common partner types. These partnerships support the generation of technically sound evidence, integration of ICARDA's work within national agriculture programs, and long-term sustainability through private sector engagement. Future projects may consider more collaborations with community-based organizations and farmers' groups to generate more ownership at the farmer and community levels.



Knowledge generation partners

ICARDA collaborates with a wide range of partners in the generation and dissemination of scientific knowledge, in a bid to increase the uptake of research outputs and influence policy-makers to create an enabling environment for the advancement and adoption of agriculture technologies at scale. Over the past 5 years, ICARDA has partnered with 56 partners to generate 218 knowledge products in Uzbekistan. Partners who have generated 3 or more knowledge products in partnership with ICARDA are listed in Figure 3 below. The majority of knowledge products were generated in collaboration with international partners, many of these products uploaded in MEL are led by the University of Wuerzburg due to proper recording of outputs in repository, for example their collaboration on several maps on crop type and yield.

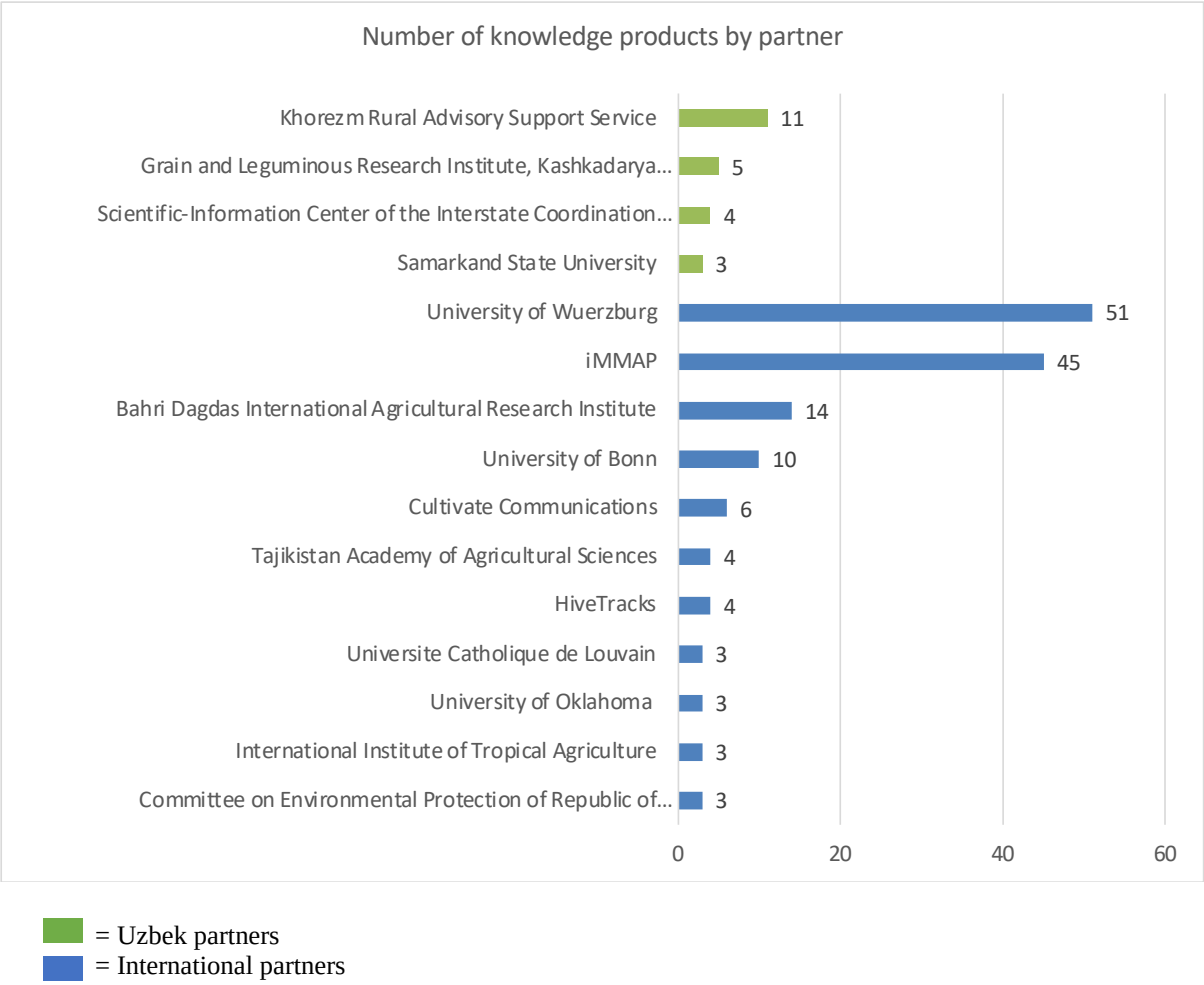


Figure 2: Distribution of knowledge product collaborations amongst institutions (Source: MEL December 2021, Elaboration: MEL)

Capacity Development

Over the past 5 years in Uzbekistan, ICARDA capacity development work has involved the training of 303 men and 173 women through group trainings (Figure 3). For individual degrees, only two women had internships, which may be due to the smaller office size in Uzbekistan. There is no clear trend over time in the total number of people trained in Uzbekistan, possibly due to underreporting of capacity development in MEL. Typically more men than women are trained, with the exception of 2021 due to the *AI-Driven Climate-Smart Beekeeping for Women* project.

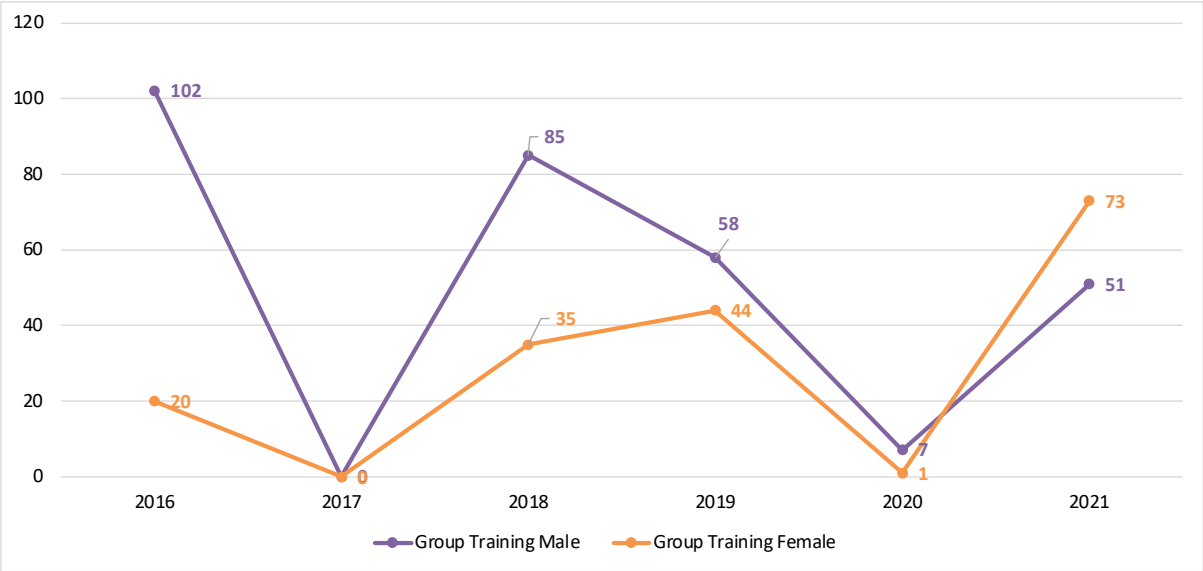


Figure 3: Capacity Development in Uzbekistan (Source: MEL December 2021)

Research themes

From a key word search, the research themes ICARDA scientists have worked on with respect to Uzbekistan provide several insights on ICARDA's work (Figure 5). Key crops include wheat and cotton, and a strong data analysis and presentation theme is visible through keywords on CACIP and land cover mappings. The key words also highlight regional collaborations, as several other Central Asian countries are mentioned and several key words were repeated in Russian, helping Uzbekistan and regional users to find knowledge products. The keywords shown in the graph below account for 707 out of the 2,398 thematic area mentions.

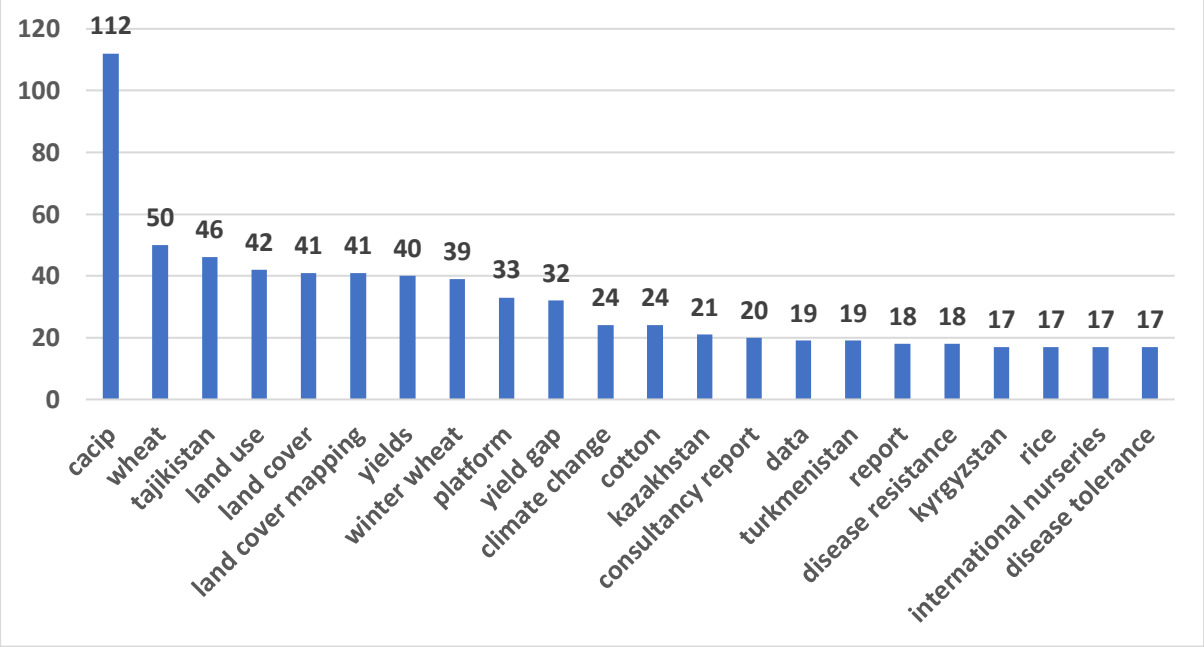


Figure 4: Frequency of research themes within ICARDA publications on Uzbekistan (Source: MEL, December 2021)

Variety development

As part of the varietal nursery development process, ICARDA conducts a number of multi-location trials to ensure that the varieties developed as well adapted and suitable for different agro-ecological

zones within its areas of operation. Uzbekistan has participated and benefitted from this process with a total of 198 trial lines of chickpea, lentil, faba bean, grass pea, barley and wheat since 2017 (Figure 5). Chickpea is the crop type with the most variety lines developed, and 2018-2020 was the time period with most new lines developed.

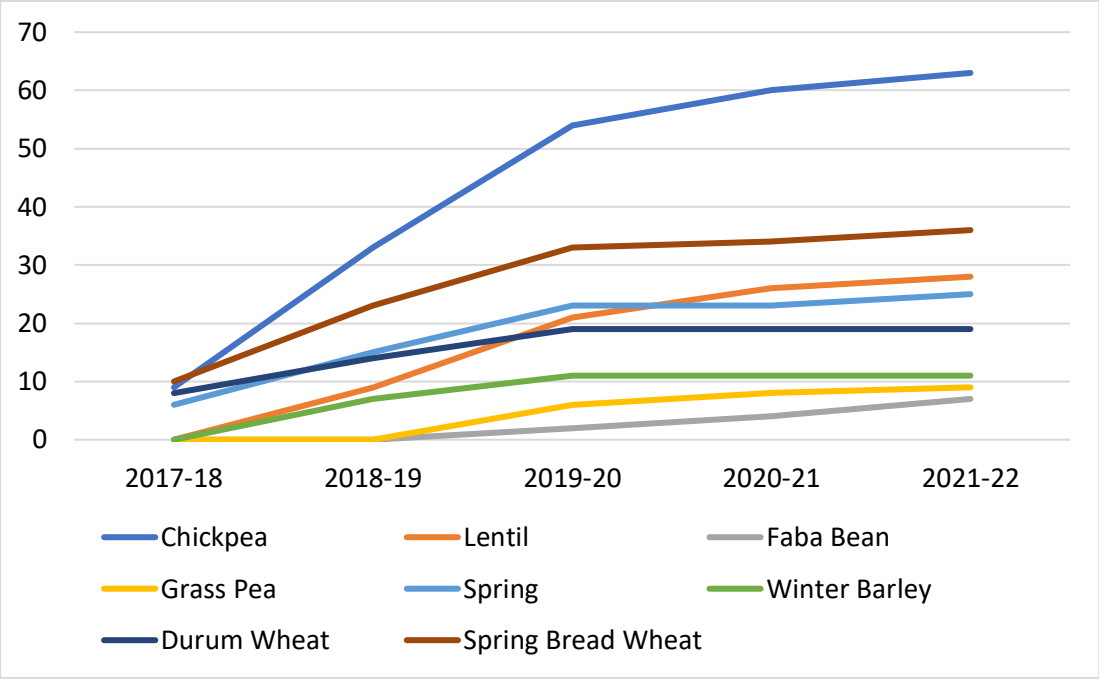


Figure 5: Cumulative ICARDA variety trials lines distributed to Uzbekistan (Source: International Nurseries Data Management System (INDMS) 2021)

Variety release

Variety release is a key pre-requisite for taking crop technologies to scale through wide distribution networks. ICARDA has contributed to the release of 13 varieties of 4 crops by the Uzbek government. The crops include: winter wheat, lentil, chickpea, and durum wheat (Figure 6). The release of ICARDA-germplasm varieties by the Uzbekistan government has greatly increased over the past five years (Figure 7). The ICARDA-supported varieties released by the Uzbekistan government were bred for resistance to drought, salt, diseases, as well as higher-yield and seed color.

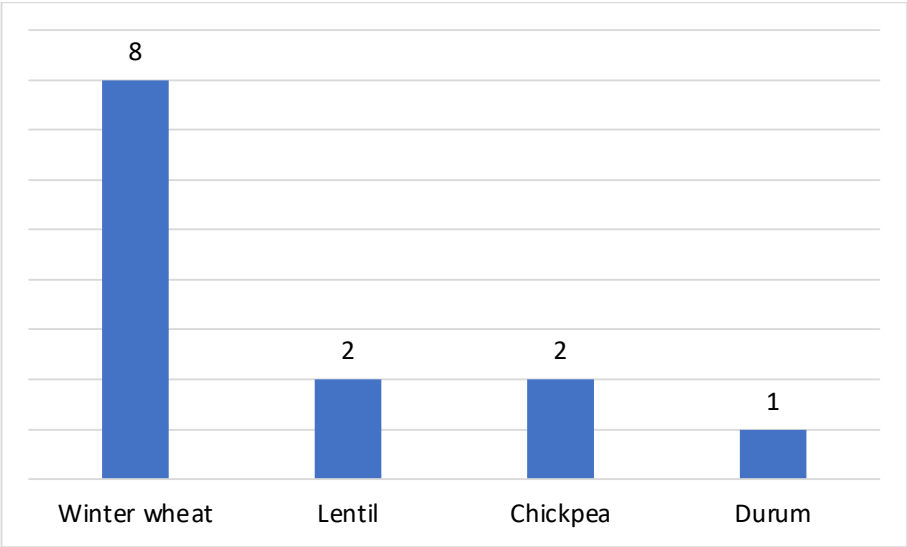


Figure 6: Varietal Releases from ICARDA germplasm by the Uzbek government 1983-2020 (Source: INDMS 2021)

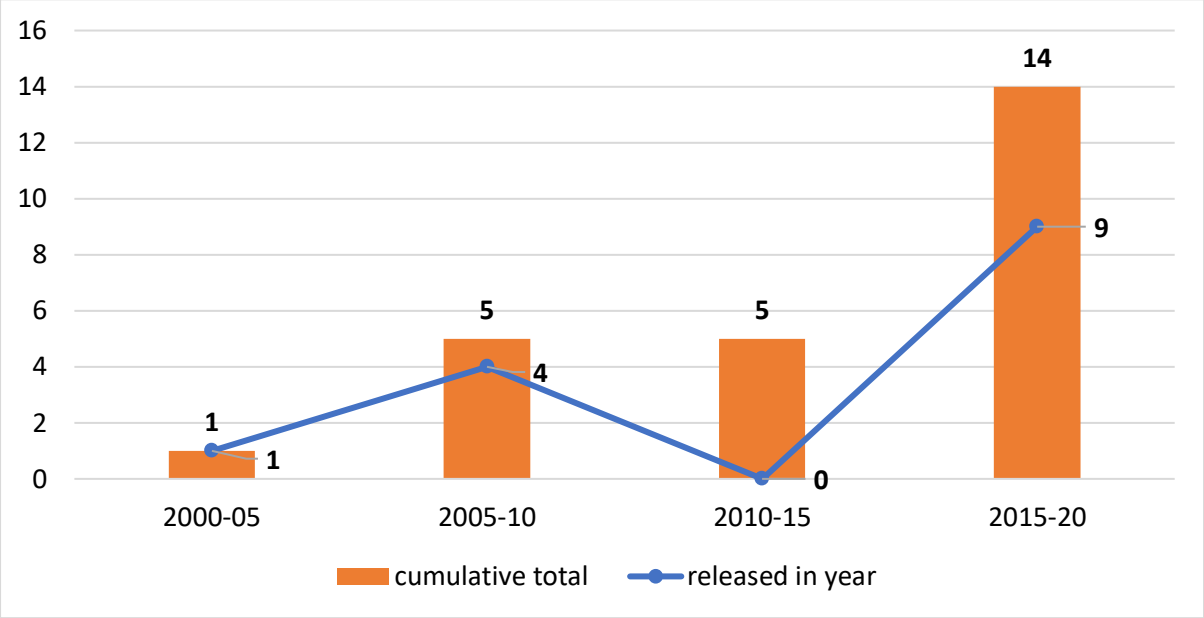


Figure 7: Trend of ICARDA germplasm release by the Uzbek government (Source: INDMS 2021)

Impact assessment: wheat

The number of varieties released through the breeding programs of NARS in Uzbekistan continues to increase, bucking the previous trend of introducing Russian varieties. For example, Gallayaral Research Station has so far developed 37 bread wheat varieties (15 for rainfed and 22 for irrigated areas), nine durum wheat, 18 barley, and several varieties of legume and oil crops (National Catalogue of Agricultural Crops, 2019). ICARDA and International Maize and Wheat Improvement Center (CIMMYT) have also collaborated with the NARS to release several drought and salinity tolerant wheat varieties for both irrigated and rainfed areas. These varieties are resistant to biotic and abiotic stresses and lodging and can better adapt to local climatic and environmental conditions.

Two surveys were carried out in Uzbekistan where the first which was carried out in 2013 involved 1,526 households from eight major wheat producing provinces representing over 70% of wheat area and 62% of wheat production. The second was carried in 2018 in only three out of the previous eight provinces involving 608 households representing 24% and 30% of total national wheat area and growers, respectively. During the second survey, 41 varieties were under cultivation out of which, three improved rust-resistant wheat varieties that originated from the joint ICARDA/CIMMYT/Turkey International Winter Wheat Improvement Program (IWWIP) based in Turkey were found in farmers' hands where they were being cultivated by 8.6% of the farmers in the three revisited provinces, covering 8.13% of the total wheat area in these three provinces. This clearly shows the importance of the Uzbekistan-CGIAR collaboration, despite the relatively short period since their release. Adopting improved wheat varieties led to 516.1 kg/ha (11.3%) increase in yields, 33.7 USD (17.9%) higher net income, and a 10.6 kg/capita/year (18.1%) increase in wheat consumption – showing clear livelihoods and food security benefits from the improved wheat varieties.

Innovations

ICARDA-led innovations in Uzbekistan reported in the CGIAR dashboard include two innovations on the techniques and lines developed for winter wheat.

Development and utilization of primary winter synthetics to incorporate important new traits in winter wheat varieties (2018)
Innovation: A new technique was used to develop synthetic winter wheat varieties with resistance to disease and drought, and high grain mineral content.
Stage of innovation: Stage 3: available/ ready for uptake (AV); synthetic germplasm has been developed, characterized, published and offered to CIMMYT cooperators through IWWIN (International Winter Wheat Improvement Network), available here: http://www.iwwip.org/Nursery.
Source: https://marlo.cgiar.org/summaries/Wheat/projectInnovationSummary.do?innovationID=464&phaseID=62

Elite winter wheat lines were developed and made publicly accessible (2018)
Innovation: New winter and facultative wheat varieties were developed for irrigated and semi-arid environments and it has been made available globally.
Stage of innovation: Stage 3: available/ ready for uptake; seeds of the elite lines have been distributed through IWWIP international nurseries framework and available via the website: http://www.iwwip.org/Nursery

Source: https://marlo.cgiar.org/summaries/Wheat/projectInnovationSummary.do?innovationID=465&phaseID=62

Policy Contributions

There are no ICARDA policy contributions reported in the CGIAR dashboard.

Opportunities in Uzbekistan

Given the climate-related challenges faced by dryland Uzbekistan today and the growth of ICARDA's portfolio there in recent years, there following domains require continued support and collaboration to find solutions:

- Crop improvement, including
    - diversification for resilient agroecosystems
    - rotation (cotton-wheat or cotton-legume based systems)
    - Accelerated fruit and vegetable breeding
- Forecasting and modelling tools for decision-making
- Improved systems for water efficiency and security
- Agriculture knowledge and information system
- Sustainable and inclusive value chain development
- Aquaculture
- Alternative incomes in the Aral Sea region for climate resilience

Annex A: Summary of on-going projects in Uzbekistan (Source: MEL December 2021)

Project Title	Grant value (USD)	Countries	Donor	Date from	Date to	Project Leader
Ecologically Oriented Regional Development of the Aral Sea Region	$300,000	Uzbekistan	GIZ	2021-07-20	2023-07-19	Akmal Akramkhanov
Strengthening regional collaboration and National Capacities for Surveillance and Management of Wheat Rust Diseases in Central Asia and Caucasus	250,000	Kazakhstan Kyrgyzstan Tajikistan Turkmenistan Uzbekistan	FAO	2021-12-01	2023-12-01	Kumarse Nazari
AI-Driven Climate-Smart Beekeeping for Women (AID-CSB)	420,000	Ethiopia Uzbekistan	German Federal Foreign Office	2021-03-01	2022-12-15	Laura Becker
CRP WHEAT Phase II	8,154,475	Bangladesh Egypt Ethiopia India Mexico Morocco Nepal Nigeria Pakistan Uzbekistan Afghanistan	CGIAR	2017-01-01	2022-12-31	Michael Baum