Terminal Evaluation Report

Developing climate resilience of farming communities in the drought-prone parts of Uzbekistan

UNDP PIMS #5002; AF #82613

Country:	Uzbekistan
Region:	Central Asia
Focal Area:	Adaptation Fund - Climate Change Adaptation
Implementing Agency:	United Nations Development Programme
Executive / National (Implementing) Partner:	Centre for Hydrometeorological Services (CHS)
Project Timeframe:	May 2014 – November 2021

Prepared by:
Richard Sobey, International Consultant / Team Leader
Madina Rajapova, National Consultant

October 2021

Table of Contents

Annexed in separate file: Audit trail from received comments on draft TE report

Exhibits:

Disclaimer

The Terminal Evaluation (TE) views were discussed with UNDP, Implementing Partner – Centre for Hydrometeorological Services (CHS), Project Board members, local government partners and other key stakeholders. There was a debriefing / stakeholder workshop held to present views and refine findings. UNDP, the project manager, and CHS provided comment on the draft report before finalization.

The views held within this report are those of the TE team.

Acknowledgement

The TE Team would like to acknowledge all project partners who supported the development of this report for the project, especially the project manager.

Abbreviations, acronyms & a few glossary terms

ABDA	Aral Basin Desert Area (where the project conducted tree planting)
AF	Adaptation Fund (the primary donor)
agromet	agrometeorology
APPC	Association of Production Pasture Cooperatives
aquifers	water extracted from boreholes in porous rocks, for consumption & horticulture use
Atlas	UNDP administration tracking system
AWPB	Annual work plan & budget
AWS	telemetric automatic weather station
CA	Conservation Agriculture
CCA	Climate Change Adaptation
CFS	Council of Farmers & Smallholders
CHS	Centre for Hydro-meteorological Services (State agency, a.k.a. Uzhydromet, as the Implementing Partner)
DEWS	Drought early-warning system (developed by the project) to forecast lower Amudarya river water scarcity
DoA	Department of Agriculture (Regional level)
drainage	removal of excess water (and dissolved salts) from the soil and groundwater, away from crop roots, so they can breathe, and not be so affected by salt levels in the saline soils
EA	Executing Agency (~IP)
furrow	a groove / trench in the soil, either for irrigation and drainage of salts away from crops, or for an accumulation of rainwater for fodder or tree planting
groundwater	water in the soil, which moves through it, below the soil groundwater table
hotbed	under-soil mulching & above-soil polythene to generate heat for earlier / shorter vegetable crop production
hydromet	hydro-meteorology
platform	hydromet software platform developed by the project, hosted by CHS, which included the DEWS module
hydroponic	horticulture production using water & plant nutrients without soil – used for fodder production
hydro-post	hydrological station
IAWG	Inter-agency working group, established at both national and KKPS regional level
IP	Project Implementing Partner (CHS)
irrigation	applying controlled amounts of water to land to assist in crop production
Khokimiyat	district government administration
KKPS	Autonomous region of Karakalpakstan
M&E	Monitoring and Evaluation
MoA	Ministry of Agriculture
MWR	Ministry of Water Resources
NIM	UNDP – National Implementation Modality
osmosis	plant root water moving into soil water, due to the higher concentration of dissolved salts in the latter
pasture	fodder production land, often with the fodder 'cut & baled' for livestock, note also 'pasture rotation rational-use plans' created for the PPCs
PB	Project Board
PIU	Project Implementation Unit (implemented the project on behalf of UNDP / IP)
PM	Project Manager (lead of the PIU)
PPC	Production Pasture Cooperative (originally 10 created by the project, then expanded to 13)
PPR	Project Performance Report for AF reporting
PPCWTF	Production Pasture Cooperative Women's Task Force
PRF	project results framework (~logframe / Strategic Results Framework)
purification	removal of saline salts from aquifer water, by reverse osmosis to make drinking water
salinity	soil or water with excess salts, where sodium chloride predominates. The KKPS soils, groundwater and aquifers are saline
salts	dissolved minerals in the soil & water, which when in greater concentration than in plant roots, causes water to be drawn out of the plant roots by osmosis, adversely affecting plant growth
saxaul	a drought & salt-tolerant tree species – nursery grown and planted in the ABDA
SCF	State Committee for Forestry, KKPS (Regional level)

seed bank	dormant pasture seed in the soil
SMART	Specific, Measurable, Achievable, Relevant and Time-bound (for logframe indicators)
soil bunds	to impound water (a.k.a. Liman irrigation)
soil leaching	using irrigation and drainage to remove excess salts from the soil, to make it less saline for crops
SOM	soil organic matter
SWC	Soil & Water Conservation (a.k.a. water-saving techniques)
TE	Terminal Evaluation (of this project – this report)
VCC	Village Citizens Council (a.k.a. Mahalla)
UNDP	United Nations Development Programme (CO Country Office)
WMO	UN World Meteorological Organisation

UNITS

ha	hectare (100 m x 100 metres)
m	million or meters
US$	United States dollar

Executive Summary

The executive summary is a 13-page summary of the Terminal Evaluation (TE) report.

Project Title	Developing Climate Resilience of Farming Communities in the Drought Prone Parts of Uzbekistan		
UNDP Project ID	5002	PIF approval	Jan-14
Donor (AF) ID	11602	CEO endorsement	May-14
Country	Uzbekistan	Prodoc signature	May-14
Region	Central Asia	Project manager hired	Sept-14
Focal Area	Climate change adaptation	Inception workshop	Oct-14
Strategic Programs	n/a	Terminal evaluation	Sept-21
Donor	Adaptation Fund (AF)	Closing date	Nov-21
Modality	UNDP-supported NIM		
Executive / Implementing Partner	CHS with UNDP via a Project Implementation Unit		
Other Partners	Centre for Hydrometeorological Services of the Republic of Uzbekistan (CHS)		
Project Financing	at CEO endorsement (USD)	at Terminal Evaluation (US$)*	
[1] AF finance (inc. GMS 8.5%)	5,415,103	5,031,372	
[2] UNDP contribution	200,000	268,990	
[3] Government	0	0	
[4] Other partners	0	270,882	
[5] Total co-financing [2 + 3+ 4]	200,000	539,872	
Project total costs [1 + 5]	5,615,103	5,571,244	

*Actual expenditures from 2014-21 through to 15th Oct 2021; At TE, AF finance = AF expenditure x 108.5

Project Description and Approach

Project Description

The project objective was to 'develop climate resilience in farming and pastoral communities in the drought-prone parts of Uzbekistan, specifically Karakalpakstan' (Aral Sea region). Within the Project Results Framework (PRF / logframe), there were four outcomes, with five outcome level indicators. The four outcomes:

1. Institutional and technical capacity for drought management and early-warning developed
2. Climate-resilient farming practices established on subsistence dekhan farms[1].
3. Landscape-level adaptation measures for soil conservation to improve climate resilience for over one million hectares (ha) of land
4. Knowledge of climate-resilient agriculture and pastoral systems in arid lands generated and disseminated

Project Location

The project location was primarily set in the Autonomous Region of Karakalpakstan (KKPS), and six of its northern districts - Bozatau, Muynak, Kegeili, Kanlykul, Chimbay, and Takhtakupir. The project was administered from the capital Tashkent, and the regional KKPS city of Nukus.

Project Approach

KKPS is the most vulnerable region of Uzbekistan, due to its arid conditions and being located at the delta end of the Amudarya river. It often receives little or no water and of low quality from this river due to upstream extraction. Climate change impacts are present and increasing, including high temperature days over 40^0 C are twice the national average. Land productivity is falling, and thus needing climate change adaptation (CCA) measures as a priority. As such, the objective of the project was to develop climate-resilience for farming and pastoral communities in the drought prone areas of KKPS. The project identified six districts that were the most vulnerable to human impact and climate change. The aim was to provide livelihood security and build resilience, for agriculture communities against climate change impacts. The detailed rationale for the component outcomes was:

- Through Outcome 1, an improved hydromet monitoring infrastructure will be put in place, which will serve as the backbone for a drought early-warning system (DEWS). This will provide timely localized weather forecasts, but also

[1] Household plots were re-classified as 'dekhan farms' in 1998, at which time the law of dekhan farms was passed

provide for monitoring weather patterns, through which modeling of climate change impacts can be informed

- This service will be complemented by a suite of CCA farming practices for crops and livestock for the targeted (80% small, 20% medium size) farmers under Outcome 2. These measures include conservation agriculture (CA), and horticulture hothouses, will help farmers manage the CC impacts to diversify their livelihoods
- Outcomes 1 and 2 will support a landscape-wide functional ecology approach to create Outcome 3, which seeks to reduce the impact of higher temperatures, lower rainfall, and windblown sand onto farmland. The latter will be addressed through community-engaged tree plantations
- Finally the key lessons from the project will be documented and disseminated with respect to Outcome 4

Source - prodoc

In reality the project was technically more complex in supporting the management of saline soils being used for crops, in purifying water for for drip irrigation, in *ex-situ* fodder production using hydronics, and in rehabilitating degraded pastures, among many other activities.

Project Management

The project was steered by a Project Board (PB), chaired by the Centre for Hydrometeorological Services (CHS). The project established a Project Implementation Unit (PIU) which was led by a UNDP-appointed Project Manager, who reported to CHS and UNDP. The project was under UNDP-supported NIM, which specifically included financial control of project funds.

Purpose and Methodology

The objective of the Terminal Evaluation (TE) was to gain an independent analysis of the achievement of the project at completion, as well as to assess its sustainability and impact. The report focuses on assessing outcomes and project management. The TE additionally considered accountability and transparency, and provided lessons-learned for future UNDP-supported projects, in terms of design and implementation. The overall approach and methodology of the evaluation followed UNDP Guidance for Conducting Evaluations. The TE was an evidence-based assessment and relied on feedback from persons who were involved in the design, implementation, and supervision of the project.

Evaluation – Rating of project contribution to AF Goal, Impact, Objectives & Targets - Summary table

The table summarises the project contribution to the higher levels of the AF Framework, with a rating given[2]:

Contribution to AF Indicators	Result	Rating
AF Goal		
Assist Kyoto Protocol parties that are vulnerable to climate change in meeting CCA costs	AF provided US$4,990,878 directly to the project, who administered the funds in implementing the CCA measures	S
AF Impact		
Increased resilience at local, national, & regional levels to climate variability and change	The project was successful in increasing resilience in Karakalpakstan. It was particularly successful in aligning with government programmes, as well as steering them towards CCA. A key result of this, was CCA rising on the political agenda, and government adoption of project-tested practices and demonstrations for their larger government programmes in agriculture and Aral Sea bed tree planting	S
AF Objective		
Reduce vulnerability & increase adaptive capacity to respond to climate change impact / variability	CCA measures were adopted by in projects' six demonstration districts, with an estimated 50% of the population participating	S
AF Outcomes	**AF Linkage Indicator**	
2: Strengthened institutional capacity to reduce risks associated with human climate-induced socio-economic and environmental losses	2.1: # and type of targeted institutions with increased capacity to minimize exposure to climate variability There were 24 main institutions of which: 14 were government; five individual / civil society organizations, including householder, dekhan farmer, and Pasture Production Cooperative (PPC); and five academic	HS

[2] The table is based on AF Results Framework and is described as a requirement in the AF Evaluation Guideline. From AF. 2010. Project-Level Result Framework & Baseline Guidance Document. AFB/EFC.2/3.

	2.2: # of people with reduced risk to extreme weather Under the Conservation Agriculture (CA) activities, there were 41,194 direct / indirect beneficiaries adopting the measures Under the Soil & Water Conservation (SWC) activities, there were 43,750 direct / indirect beneficiaries adopting the measures Under the horticulture activities, there were 57,875 direct / indirect beneficiaries adopting the measures	
3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1: % of stakeholders aware of predicted climate change impacts, and of appropriate responses Stakeholders were being provided with seasonal drought early-warning system (DEWS) bulletins. There were 5,157 hard-copies disseminated, with the expectation is that once the DEWS is adopted by government, it will reach 50,000 farmers 3.2: Modification in behaviour of targeted population The uptake and adoption of activities was strong, being scaled up, replicated, and mainstreamed with government policies and plans	HS

Evaluation Ratings Summary

UNDP-supported projects of this type require the TE to evaluate the implementation according to set parameters and ratings. The summary ratings of this evaluation are presented:

Exhibit 2: TE Ratings Summary Table

1. Monitoring & Evaluation	Rating	2. Implementing Agency (UNDP) & Executing Entity / Implementing Partner Execution	Rating
Overall quality of M&E	**S**	**Overall quality of Implementation / Execution**	**HS**
M&E Design at entry	S	Quality of UNDP Implementation	S
M&E Implementation	S	Quality of Partner Execution (CHS)	HS
3. Assessment of Outcomes	**Rating**	**4. Sustainability**	**Rating**
Overall Project Outcome	**HS**	**Overall Likelihood of Sustainability**	**MU**
Overall Effectiveness of Results	HS	Financial resources	MU
- Objective	-	Socio-economic	MU
- Outcome 1	S	Institutional framework & governance	ML
- Outcome 2	HS	Environmental	MU
- Outcome 3	S		
- Outcome 4	HS		
Efficiency (cost)	HS		
Relevance	HS		

NB: Assessment of Overall Project Outcome includes Effectiveness of Results (Objective, Outcomes), Efficiency and Relevance

A detailed summary of the project is presented below.

Exhibit 3: TE Ratings and Achievement Summary Table

Project: **UNDP AF - Developing climate resilience of farming communities in the drought prone parts of Uzbekistan** (PIMS #5002; AF #82613)
Achievement Description & TE Rating
Results - Outcomes
Overall Project Objective Achievement - The overall grading is **Satisfactory** Outcome 1 was rated as satisfactory, with Outcomes 2, 3 and 4 all rated as highly satisfactory. The four Outcomes linked up effectively in providing a drought early-warning system (DEWS) and a climate change adaptation (CCA) holistic support package for Karakalpakstan (KKPS) government, and six of its most vulnerable districts. The establishment of 13 Production Pasture Cooperatives, and using ecological functionality principles to restore their pastures was one of the major successes of the project. **Justification**: **Summary Analysis** Outcome 1 - **Institutional & technical capacity for drought management and early-warning** (2 indicators) Forecasts & drought early-warning for Karakalpakstan (KKPS) - rated as satisfactory (S) – the justification was that there was a minor shortcoming in that the hydromet platform with its DEWS module didn't appear to be operating to its full potential. i.e. as yet, it has not been used by the Centre for Hydrometeorological Services (CHS, a.k.a. Uzhydromet) for full

hydrometeorological (hydromet) forecasts that incorporate data from the ten new Karakalpakstan (KKPS) automatic weather stations (AWSs), that the project provided. In KKPS, CHS has traditionally worked on a regional level forecast, and not district, thus the forecasts lacked granularity. The project installed ten AWSs to address this, and thus provide for more accurate localized weather forecasts. A reliable long-term forecast of water scarcity for the Amudarya river downstream areas was also needed for decision-making to mitigate against low water and drought occasions. To support both weather and water availability forecasting, the project developed a hydromet platform to deliver weather, agromet and drought early-warning forecasts, with CHS as the host. These early-warning hydromet forecasts are expected to reach 50,000 farmers.

Farmers & pastoralists receive scientific extension services to reduce drought risk – rated as satisfactory (S) – the justification was that despite the project having established three agriculture extension centres, their accessibility for remote smallholders was not fully tested. i.e. the minor shortcoming was that their outreach model post-project was untested.

Outcome 2 - **Climate-resilient farming established on smallholder farms** (1 indicator)

Farmers adopt climate-resilient conservation agriculture / water-saving measures - rated as highly satisfactory (HS) – the justification was that the project was able to fully demonstrate a variety of conservation agriculture (CA) and soil and water conservation (SWC) measures, and create a high level of uptake and adoption by the smallholders and other stakeholders.

In 2013, when the project was designed, it aimed to reach 40,000 smallholders (80% of them). In 2019, the number of smallholders had risen to 57,414 smallholders, with a rural population of ~193,907 persons (2020) for the six project districts.

The project invested in a significant basket of proven, but innovative CA / SWC practices, with a significant amount of new equipment to support the adoption of these new techniques. These included: laser-guided land levelling; drainage ditching and furrow-forming to reduce waterlogging and soil salinity; deep cultivation and plough-pan breaking to improve soil drainage and aeration; and mulching residues to build-up of soil organic matter (SOM). These measures allowed for a reduced volume of scarce irrigation water to be used, with drainage in order to lower salinity levels. Thus, through better management of salt-affected soils, the productivity of the soils for cropping was improved.

Outcome 3 – **Landscape-level CCA measures for soil conservation covering one million hectares (ha) of land** (1 indicator)

Coverage of landscape-level CCA measures for sandy soil stabilization – rated as satisfactory (S)

The project undertook extensive tree planting in the Aral Basin Desert Area (ABDA) having developed an effective model for seedling production and mobilization for planting. The success of the model was clear with the national / regional government of KKPS now adopting it and scaling-up. The overall target of one million hectares of tree planting can be put in this scaling-up context under the Aral Sea development plan. By project end, 75,800 ha of saxaul tree will have been planted.

The outcome was also about the Pasture Production Cooperatives (PPCs) and the rehabilitation of their degraded pastures (~27,000 ha). The project demonstrated fodder seed multiplication, the use of this seed for enrichment over-seeding of pasture, and then saturation irrigation to revitalize the dormant seed bank. This was highly successful and had a significant impact. The project and PPCs also developed 'pasture rotational rational-use plans, with rotational harvest of fodder on ~500 ha plots from March to November each year.

Outcome 4 – **Knowledge disseminated of climate-resilient agriculture / pasture systems in arid lands** (1 indicator)

% of population practicing climate-resilient agriculture – rated as highly satisfactory (HS) – the justification was that the project made an extensive effort to educate, communicate, disseminate, and ultimately as a result, achieve a high uptake and adoption of project interventions, that are likely to be sustainable. The project was very active in its production of materials, and in the support for three extension service centres, which were established to research, pilot, demonstrate the best CA, SWC, horticulture, fodder production, and pasture management techniques. In order reach the farming communities and the younger generation, the project used social media.

Results - Outputs

Effectiveness - Outcome 1 Achievement – **Satisfactory**

Outcome 1 - **Institutional & technical capacity for drought management and early-warning**

Outcome 1 concerned: establishing a weather infrastructure network and hydromet forecasting capacity for KKPS; the development of early-warning forecasts; and the provision of extension service facilities. These are described under the four outputs:

Output 1.1 - Hydromet infrastructure with automatic telemetry (HS)

Ten AWSs were installed in KKPS for weather monitoring by CHS. The AWSs were equipped with SIM card transmitting equipment, which was linked to the data loggers. i.e. making them 'automatic / telemetric'. The AWSs were to UN World Meteorological Organization (WMO) standard, and are in use, however, to become fully part of the WMO synoptic grid, they need to undergo a calibration period. Five hydro-stations were installed in the downstream basin of the Amudarya river, although only two of the posts are telemetric. The others rely on manual download of data from their loggers.

Output 1.2 - Software platform of hydromet data with analysed information / access for end-users (S)

The project created a new hydromet information platform, for early-warning and forecasting of hydromet / agromet information. The hydromet early-warning platform (server) is hosted by CHS, with master access for CHS, Ministry of Water Resources (MWR), Ministry of Agriculture (MoA), and Ministry of Emergencies. The early-warning alerts / bulletins (hydromet, agromet, and drought early-warning) are sent to 15 primary users, in the form of mobile voice or email message.

Other recipients include: KKPS council / government administration, and its relevant districts, the water user association for Amudarya river downstream, and the farmers council. The expected future coverage is 50,000 farmers. The system is now in the final stages of operational testing. CHS have government agreement to integrate the platform into their systems, once the testing is complete.

The aim is for CHS to upgrade their long and short-term hydrometeorological (hydromet) forecasts, emergency / disaster forecasts, and provide forecasts with an agrometeorology (agromet) element. The drought early-warning system (DEWS) (see next output) is a component part (but self-standing module) of the hydromet platform.

Output 1.3 - Drought early-warning system (DEWS) to minimize the impact of drought (S)

Data from the water meters, historical data, and upstream mountain rain / snow data, and from the AWSs, is used via a software algorithm to predict water availability in the lower reaches of the Amudarya river. This allows DEWS to be used to forecast river low water / drought, for 6-8 months in advance. After testing with CHS, the package is now able to provide a both this early-warning seasonal forecast and also a monthly forecast during the crop growing season from March – September.

Under DEWS, MWR undertake some data interpretation, to be able to present an 'expected water deficit'. The hydromet platform with the DEWS module is shared by CHS and MWR. For the recipients, the early-warnings are qualitative (expected drought / low / medium / high volume), and quantitative - e.g. for the October 2020, bulletin, the prediction for April 2021 was a 30% reduction in water volume against the norm, with m^3 / per second flow rates given for two strategic hydro-station locations at Darganata (Tuyamuyn reservoir inflow) and Tuyamuyn- narrow gorge.

Output 1.4 - Extension services for smallholders to support them in CCA (S)

Three extension centres were created within: Tashkent State Agrarian University, Nukus campus; Agrarian-industrial College, Kegeyli District; and Konsawt Markaz Company. For the two academic centres, two high-tech greenhouses (of 400 m^2 and 144 m^2) were erected for research, training and extension services. The project provided two automatic micro-climate agromet stations, with an app called FieldClimate, which uses weather data from online weather forecast services, and the micro-climate data from the stations, in order to provide more localized weather information for modelling crop growth and plant disease problems.

The value in working with these institutions lay in their remit to undertake research, test, pilot and disseminate new advances in arid zone and saline soil farming, and in horticulture nursery production in particular. The services provided by the three centres include: plant breeding & plant protection; hothouse horticulture; drip irrigation; laser levelling & zero tillage; soil & water analysis; and in livestock breeding & vet service (Tashkent Agrarian University only). The extension centres provided services to 21,200 farmers (of which 28% women).

Effectiveness - Outcome 2 Achievement - The overall grading is **Highly Satisfactory**

Outcome 2 - **Climate-resilient farming established on smallholder farms**

Outcome 2 concerned: smallholders (40,000 smallholders, covering 80,000 ha) adopting CA measures (low till, mixed cropping, fodder production, crop residue for mulching) and SWC measures (land levelling, irrigation with drainage and furrows, drip irrigation) for more efficient water use and to reduce crop soil salinity; horticulture hothouses created; and mainstreaming CA / SWC practices into agriculture and water policy / regulations.

Output 2.1 - Conservation Agriculture (CA) (S)

The project indicated that this output (excluding fodder production) reached over 40,000 beneficiaries, which would equate to 20% of the population. The project introduced a number of CA activities including: crop residue choppers & mulching; plough-pan breaking using deep tines, and disc harrows for soil aeration; furrow formers; zero-till- direct drill machinery; with crop rotation, biological pest control, and organic fertilizer advice.

With project support, the PPCs constructed eight hydroponic units producing livestock fodder @7,240 kg / day. They were created to grow a legume and cereal plant for livestock fodder and protein, from which three products were produced – a vegetation biomass, a granulated bulk, and a liquid feed with a high protein content (as a milk substitute for young livestock). The benefit was reduced stress on pastures, with one unit able to produce products equivalent to 1,000 ha of pasture.

Output 2.2 – Soil & Water Conservation (SWC) (HS)

The number direct and indirect beneficiaries was presented as 43,750, however it was difficult to calculate the actual number of smallholders involved, or the area of land undergoing these SWC measures. The project undertook laser-guided land-levelling, furrow formation, with irrigation and drainage channels for saline soil crop production. The activity has been successful and will be replicated / scaled-up as the equipment can continue to be used for upcoming seasons.

The project drilled 18 boreholes to supply aquifer water for purification (using a reverse osmosis system) to produce drinking water for the farmers and their livestock, for the hydroponic fodder units and for drip irrigation. Due to the success of making clean water, more boreholes are being requested, although it appears extraction volumes and aquifer levels need to be monitored. The sodium hydrochloride produced as a by-product of the saline water purification, was also a useful disinfectant at the height of covid.

The project introduced the use of the glauconite mineral as a soil amelioration agent. It improves soil structure through binding and speeding up the production of soil organic matter (SOM) by soil organisms. Not only has KKPS known deposits of the mineral, but the project changed the conventional wisdom that glauconite wasn't good for soils.

Output 2.3 - Horticulture hothouses for smallholder farms established to minimize impacts of drought (HS)

The target of reaching 40% of smallholders equated to 16,000 smallholders benefiting from establishing 'hothouses' of one form or another. In practice, the main type was a polytunnel system, with undersoil mulching for added heat generation, known as a hotbed. The project records indicate 55,182 users benefitting from hotbeds, which was equivalent to ~25% of the population, including counting the number of pupils of schools that formed hotbeds. In perspective, in terms of smallholders, PPCs and schools:

- 2,534 smallholders created 2,534 hotbeds, each of 12 m^2 size
- 34 smallholders, and 78 schools created 112 hotbeds, each of 100 m^2 size
- 13 smallholders, 7 PPCs, and 5 schools created 28 hotbeds, each of of 115 m^2 size

Thus, in total the direct beneficiaries of the hotbeds were 2,581 smallholders, seven PPCs and 84 schools, thus the target of 16,000 smallholders was not attained, however the basic area of hotbed / poly-tunnel covered was presented as 18,767 ha, compared with a target of 20,000 ha. In short, the project intervention, was highly successful, especially in terms of widespread take-up by project smallholders, PPCs, and schools.

The hotbed system is one where a mulch of straw and manure is laid under the soil, and a plastic sheeting is laid above the soil. Heat is then generated from below as the manure decomposes, with the seedling plants not being exposed to cold soil temperatures. Heat is also generated from sunlight and wind protection under the plastic sheet. Thus, the system allows vegetable growth to start and end earlier in the season, which is needed when the growing season is short and the drop in autumn temperatures comes earlier (in part due to climate change). The project demonstrated drip irrigation (from purified water) to the larger hotbeds which was successfully adopted and replicated. As a result, horticulture improved socio-economic livelihoods and the availability of home-grown vegetables.

Output 2.4 - Regulatory framework to support farmer CCA measures in replication and upscaling (S)

In the last five years the 'natural resources / agriculture' legislative framework has dramatically improved (including the land law, with land tenure secured, and the cooperatives law – promoting the development of collective farming legal entities). These have increased the interest in investing in agriculture, and as a result the government has been promoting the upgrade of legislation in the sectors. The project supported the regulatory framework through recommendations to ministries on CCA and sustainable development of agriculture. This support was a good example of CCA legislation mainstreaming.

Effectiveness - Outcome 3 Achievement - The overall grading is **Satisfactory**

Outcome 3 – **Landscape-level CCA measures for soil conservation covering one million hectares (ha) of land**

Outcome 3 concerned: 70,000 ha of arid land being planted with saxaul trees for soil stabilization; 20,000 people in ten cooperatives to participate in tree planting; and ten community organizations to manage the tree plantations.

Output 3.1 – Saxaul tree planting for sandy soil stabilization in the Aral Basin Desert Area (ABDA) (S)

Saxaul tee seedlings planted within the ABDA will cover 75,800 ha by end of project. The trees are drought and salt-tolerant saxaul trees. Five PPCs were engaged to collect seed, establish tree nurseries and grow 30 million saxaul seedlings , which were then provided to KKPS State Committee for Forestry (SCF), who supervised the tree planting in the ABDA. The PPCs mobilized their members for this landscape-level tree planting. The tree planting camps, which were up to 300 km from the nearest settlements, ran from autumn through to spring (October – March), with ~2,000 seasonal workers engaged.

The planting is now in its third season, but survival rates have been low at as ~30%, in part due to sandy soil and low moisture. From 2018-20, tree planting preparation methods were improved, with the roots pre-dipped in a mixture (soil, manure, water-absorbent additive, & water). Under this method, survival rates have been up to 70% in some parts.

In terms of overall effectiveness of the ABDA tree planting, it was difficult to verify, either in terms of plantation establishment or if sufficient seedlings were also grown by the SCF themselves, to achieve the 1,000 trees / ha planting density.

Output 3.2: Community management in tree planting & maintenance, with employment (MS)

The PPCs and others are involved annually in the tree planting program. The PPCs supported both tree nursery and tree planting operations with 20,315 seasonal jobs (8,118 for women); and 126 permanent jobs (58 women). The management and maintenance of the tree planting scheme is under the SCF.

Output 3.3: Cooperative management to enhance community ownership in land restoration (HS)

The output (as opposed to the exact indicator) concerns the PPC's management of their ~27,000 ha of pasture land. The PPC's own 101,479 head of livestock (47,830 cattle; 58,860 sheep / goats in 2019). Whilst the numbers of livestock has increased, the productivity of their pastures is low. The activities as described here were arguably the most significant result of the project.

Production Pasture Cooperative (PPC)

Thirteen Production Pasture Cooperatives (PPCs) were established, with 25,889 members. They united 19 rural hamlets with 64,723 residents. The PPCs are active in the improvement of their degraded pastures (26,238 ha of pasture and 386 ha of

irrigated crop land). The project created and galvanized the 13 PPCs. Their land has recently been tenured to them for 30 years, which was an important government step, that encourages long-term and shared investment in their land. The PPCs have prepared business plans, including for rational pasture use. The project supported two different pasture restoration demonstrations: pasture irrigation; and grassland seed stock production with the aim to undertake pasture restoration through assisted re-seeding. The aim, together with the soil conservation measures (bunding areas so soils could initially be saturated with water, drainage ditching, and irrigation to lower soil salinity levels) is to make the 27,000 ha ecologically functional again.

Production Pasture Cooperative's Women's Task Force (PPCWTF)

As part of the development of the PPCs, the project created a PPCWTF within each. Ten women's groups were created to ensure a fair distribution of work, income and profits. An important part of their work was the collection of seed and the establishment of seed stores (cereal seed for fodder & drought-tolerant seed for pasture reclamation), and in mobilizing seasonal task forces for tree planting. From the ten women's groups, there is a leadership of ~108 women who develop annual workplans.

Pasture restoration demonstration No. 1 (drought-tolerant fodder seed collection & multiplication)

Over 60% of KKPS's livestock are fed with pasture fodder, however the pastures are degraded, and now contain few and unpalatable species, thus the edible species composition needed to be restored. In 2020, the project supported an applied on-farm research demonstration. The Nukus Natural Sciences Research Institute, with PPC women collected seed, from the Ustyurt Plateau, of 20 species of drought and salt-tolerant wild plant fodder species. These seeds were grown to produce 33 ha of seed stock multiplication and demonstration (nursery) areas, on the PPC farms. Off-nursery testing of seed has started to be undertaken, which when planted in furrows, to hold water, ahead of the spring / autumn rainy season, the percentage survival was at 30%, which for a first trial was promising. It is expected that in 2022, 1,300 kg of seed from the stock areas will be collected and sown over 3,250 ha of degraded pastures.

Pasture restoration demonstration No.2 (using river water)

The project demonstration was to use delta water to irrigate the pasture soil sufficiently to allow the gemination from the soil seed bank, of perennial fodder plant species. Once this initial re-growth has been established, the dependence on watering in future years is reduced. In order to saturate the soil sufficiently, with a one-time spring flooding, irrigation and drainage was used, i.e. soil bunding, with a channel drainage system covering ~500 ha plots. In November 2018, ~3,000 ha of pasture in Kegeyli and Chimbay districts were irrigated this way. The result was the pasture rejuvenated from 15 to 32 mostly palatable plant species. The four demonstration PPCs, after harvesting and baling, estimated re-growth had increased their stock of fodder herbage by 60%.

Pasture Rotational Rational-Use Plans

The success of the pasture restoration pilot (and seed multiplication) resulted in the development of 'pasture rotational rational-use plans'. For example – Shaxaman Jaylawi PPC Pasture Plan (total ~7,000 ha of pasture) – On a demonstration area, pasture productivity was increased from 350 kg / ha to 650 kg / ha after managed irrigation on pasture fields, with species composition increasing from eight to 17 plant species, 12 of which are palatable to livestock. The plan itself included dividing their pastures into eight sections of 880 ha each, of which seven contained standard fodder species, and one with camel thorn and the liquorice herb legume. The plan is for each of the seven areas to be over-seeded with five important fodder species, and then irrigated, with a rotational harvest from each section in May through to November. The plan estimates that pasture productivity under this management scheme will increase productivity by five times.

Effectiveness - Outcome 4 Achievement - The overall grading is **Highly Satisfactory**

Outcome 4 – **Knowledge disseminated of climate-resilient agricultural / pastoral systems in arid lands** (1 indicator)

Outcome 4 concerned lessons learned bulletins on climate-resilient agriculture and water-saving measures; and farmer awareness events, also covered by the media.

Output 4.1 - Inventory of tested agronomic and water-saving measures to present successful practices (S)

Knowledge materials were developed in three languages (Karakalpak, Uzbek, & Russian).

Output 4.2: Lessons learned for climate-resilient arid land agriculture & pastoral systems disseminated (S)

Thirty-eight knowledge materials were prepared, including thematic brochures, manuals / guides, brochures, and videos

Output 4.3: Smallholders & livestock keepers hold regular meetings with support of authorities & media (S)

The project established the KKPS Association of Production Pasture Cooperatives (APPC) in February 2020. The APPC is developing to provide a number of services to the PPCs, including methods to improve the supply chain efficiency and added-value (e.g. in primary processing), and in marketing / product sale – introduction of buyers.

Training & Awareness

The project produced a high number of technical guides and awareness materials. There were 44 training courses including two international study tours (to Spain on understanding arid zone salt / drought-tolerant agriculture with irrigation, and to Israel on understanding water management in agriculture), and two visits to the Fergana Valley (on understanding horticulture and hydroponics). The number of participants attending training events was 10,491 (of which 23% women).

The project produced 63 technical reports. Under Outcome 1, the project produced 23 technical reports, including 4 on AWS, 14 on DEWS, and 5 on extension; Under Outcome 2, there were 25 reports, including 15 on soil CA, 5 on hothouse production, and 5 on updating the regulatory framework; Under Outcome 3, there were 10 reports, including 5 on tree nurseries / tree planting, 5 on pastures; as well as others - 3 on baseline and 2 on gender. Apart from social media posts, the project also produced 31 awareness materials.

Efficiency

The hydromet services, CA, and extension measures would not have been undertaken without the project, nor put together in such a cohesive way. The project efficiently utilised funds in procuring and installing a sufficient (and significant) number of pieces of equipment, that met state and smallholder needs on scale to effectively demonstrate, (saturate to a degree) and garner sufficient interest to replicate and scale-up.

Despite the lack of costed financial inputs from project government partners and smallholders, there was obviously a significant project 'buy-in' with counterpart resources being enabled. These inputs and outputs, including from the collectively-managed and owner-decision-making membership of the PPCs, indicated a high project relevance. The project was high value for money. Thus, the (cost) efficiency was rated as **highly satisfactory**.

Relevance

Relevance

The measures were relevant under a number of UN SDGs and under UNDP country programming. The project was in-line with the national agriculture strategy, and a number of farming-based decrees. The project followed and implemented national policy in supporting regional development planning, in improving weather and water early-warning forecasting systems, in CCA in farming through SWC, in horticulture, and in providing a science-based research and best-practice edge to extension services. The project design remained highly relevant. Relevance was thus graded as **highly satisfactory**.

Ownership

The project worked in close cooperation with CHS as the main implementing partner, who despite not directly managing the funds, played a key role in steering the project, and in actively supporting and leading the process with the inter-agency working groups (IAWGs) for the selection of intervention projects. The PPCs were instrumental providing leadership and ownership throughout the project's portfolio of work.

Mainstreaming

The project supported and / or influenced a number of pieces of policy and legislation including: Agriculture development strategy 2020-30 (2019); Development of water management 2020-30 (2020); Improvement of knowledge & innovation system in agriculture services (2021); and Food security & state support for agriculture during covid (2020). To note also, the project also supported the development of production pasture cooperatives, which is under a recent government policy.

Gender Equality & Empowerment of Women

The project established the women's task forces within each PPC to ensure equitable sharing of profits from the cooperatives and from their tree seedling production, and tree planting employment.

The project produced a report - Gender in agriculture business and CCA measures in northern regions of KKPS (2021), which was of high quality. Its recommendations included: expand awareness / training for women in income-generating activities; expand outreach on financial banking services for women, and promoting entrepreneurship in CCA; improve women's financial literacy and management skills; support CCA projects developed by women through loans from banks; and awareness in activities in addressing gender stereotypes in education and employment.

Implementation - Execution

Implementation – The overall rating is **Highly Satisfactory**

Project Implementation: According to the given five categories - coordination & operational matters, partnership arrangements & stakeholder engagement, finance & co-finance, M&E systems, and adaptive management (work planning, reporting & communications)

Coordination & Operational Management - overall

The project was signed between UNDP and CHS in May 2014. CHS were described in the prodoc as the Executive and Implementing Partner (IP) and provided oversight as joint chair of the Project Board (PB). UNDP were described as the multi-lateral implementing entity (senior supplier) on behalf of AF. The prodoc described the working arrangement for the UNDP-supported NIM, which meant that UNDP administered the project, and a UNDP-appointed Project Implementation Unit (PIU) implemented and managed the project.

Coordination & Operational Management by Implementing Agency (UNDP) - The rating is **Satisfactory**

In 2017-18, implementation of Components 2 and 3 was strengthened with added oversight by the UN Joint Programme Aral Region (UNJPAR) manager. In June 2019, the AF board approved an 18 month project extension from 31 May 2020 to 30 November 2021. So the project moved from a 6-year to a 7.5-year project. The early establishment of the national Inter-agency working group (IAWG) and in particular the sub-national IAWG, improved project operational functionality. With these changes, and especially with the SNIAWG, the project demonstrated effective adaptive management. Seven Project

Board (PB) meetings have been held so far, i.e. once a year.

Coordination & Operational Management by the Implementing Partner (IP - CHS) - The rating is **Highly Satisfactory**

Apart from their role as executive, CHS were also described as the project's main beneficiary, and representative of all key stakeholders. CHS provided PB oversight and regular meetings with the PM for example. They were also the recipient of most of the Component 1 hydromet infrastructure and equipment, and responsible for its operation. CHS were also the host recipient of the hydromet services delivery platform - for the weather and river water flow forecasts

Project Implementation Unit (PIU))

The project was implemented by a PIU, who coordinated closely with both UNDP and CHS. The staffing of the PIU (as hired by UNDP) included seven members - project manager (PM), administrative / financial assistant, field assistant, procurement assistant, public relations specialist, and the two component task managers. The PM was seconded from senior position from within CHS which was good for project communication with CHS. The PIU was nested in two offices, inside CHS in Tashkent and in UNJPAR in Nukus.

Institutional Mechanisms & Stakeholder Engagement

This was by far the most important aspect of the project and the most successful. One of the AF indicators concerned the number and type of type of institution with increased capacity to minimize climate change risk. The answer is - considering the main institutions only, there were 24 institutions of which 14 were government, including schools; five individual / civil society organizations, including smallholder and PPC; and five academic. In addition, as a conduit to support project implementation (and of other donor development projects), the NIAWG and SNIAWG were created.

Financial management & finance

UNDP Financial management and Finance

Under the UNDP-supported financial arrangement, UNDP managed the book-keeping under their standard systems , with no separate bank account required. All spending could be and was presented in annual Combined Delivery Reports, which could separate out the project expenditure under standard UNDP Atlas codes. The funding provided by the Adaptation Fund was $5,415,103 which included project implementation cost of $4,990,878, and a UNDP Headquarters General Management Service (GMS) fee of $424,225 (8.5%), which included all indirect UNDP support services. Furthermore it was indicated that for direct UNDP CO services to the project, that these should be reimbursed by the IP / government, in effect meaning additionally charged to the project. These direct costs were re-iterated and agreed under a UNDP – CHS letter of agreement (December 2016), with a total not to exceed $145,000, and that they would be paid for from the UNDP co-financing TRAC funds of $200,000.

In the early years of the project, there were some delays in obtaining project payments, which were largely solved through SNIAWG selecting and approving project interventions. With the GMS fee taken at source, the release of AF tranches was:

AF Tranche #	1	2	3	4	5	6	Total
Received	05/2014	09/2015	08/2017	01/2019	03/2020	12/2020	
Tranche value	164,863	1,029,163	1,375,163	1,004,763	863,963	552,963	4,990,878

AF tranches were released based on 80% utilization of the previous tranche.

Co-financing

Co-financing to date, was $558,127, which included UNDP TRAC funds $287,245, UNDP Climate promise $119,995, UK FCDO COP-26 preparation $124,336, and Canada fund $26,551.

Adaptive management (work planning, reporting & communications)

Work planning

An Inception Workshop was held in October 2014, with the inception report in March 2015, which was 11 months after project start, however this was only six months after the PM was officially hired. The project's working method was adopted, essentially being: PM to prepare the AWPBs with the national project coordinator (CHS) , for approval by the RR and PB; and the National Implementing Agency (CHS) to coordinate the workplan schedule with the Ministry of Finance, bearing in mind the IAWGs. The prodoc included a 6-year workplan with budget breakdown by year and by component and project management. Due to project extension, there were actually eight AWPBs from 2014 to 2021. The AWPBs were prepared by the PM and cleared by the UNDP.

	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Total**
Prodoc plan	164,863	1,029,163	1,375,163	1,004,763	863,963	552,963	0	0	4,990,878
Disbursed	26,545	170,386	490,844	569,175	918,228	1,321,450	710,908	429,671	4,637,209

With AF base funds of $4,990,878 and AF base fund disbursement of $4,637,209 by 15th October 2021, this represents a spend of 93%.

Reporting

The primary reporting method for fund release was an annual Project Progress Reports (PPR), which up on clearance from the UNDP Istanbul regional office and its GEF / AF representative, and an 80% spend of the previous tranche, the next tranche would be released.

Communications

The project PM held regular meetings with CHS in their office. There were also *ad hoc* meetings as necessary, and formal (quarterly) progress meetings. As a result of covid, the project adapted in going 'on-line', when 'face to face' meetings could not be held. The project's telegram group messages proved to be especially useful during covid.

Monitoring & Evaluation

M&E Systems – Design & Implementation – The rating for the overall quality of M&E is **Satisfactory**

The M&E system design and the implementation of the M&E system was rated as Satisfactory. The prodoc management arrangements, described the Executive (CHS) as responsible for M&E, however, under UNDP-supported NIM, this was clearly the role of UNDP and their designated PIU. CHS and the IAWGs were more directly responsible for general project oversight and direction. The arrangements were however clear that UNDP were accountable for effective implementation of the project. The main external M&E was through the MTR and this Terminal Evaluation.

Sustainability

Sustainability - According to the four risk categories (financial, socio-economic, institutional & governance and environmental), present status, and towards the future is assessed.

Overall Rating: Moderately Unlikely

Financial Risks to Sustainability - The rating is Moderately Unlikely, meaning there are significant risks to sustainability.

From 2020, the Ministry of Finance (MoF), who are also a NIAWG member, introduced a new reporting system, whereby both national and all donor funds are put before parliament, with budgets approved by law. Plans are also divided by subject matter, so changes in overall sector funding has become more transparent. Planting in the ABDA has become a government priority, however it could become a 'black hole' for state and donor funds, without a cost-benefit analysis, and without independent monitoring of survival rates and of impact on controlling sandstorms.

Socio-economic Risks to Sustainability - The rating is Moderately Unlikely

Due to the project, smallholder income has increased by an estimated 35%, bringing farmers a higher level of livelihood security. The income of PPCs is increasing due to measures such as land-levelling / drainage, and from hydroponics . Through the use of boreholes and filtration units, the project provided a new supply of clean water to an estimated over 10,000 persons. This included providing a supply to a number of schools which also had a significant positive health impact.

There are future plans to rationalize the production of crops and livestock under the farm cluster / PPC system. However, officials in some cases, are still reluctant to turn away from cotton production. This is because of its export income, but the downside is these 'old' state producers are a major users of river water, which impacts the many smallholders, and efforts to restore ecological functionality of the ecosystems, including the pastures.

Institutional & Governance Risks to Sustainability - The rating is Moderately Likely, meaning there are moderate risks to sustainability.

There were a number of existing and created institutions that the project worked with. Such institutions are the backbone to not only for project success, but also for uptake, adoption and sustainability of project actions. In terms of introducing best-practice scientific advances, the project did well to work with these institutes, especially: in applied research in introducing drought-tolerant wild & improved fodder species to restore degraded pastures; in the development of hydroponic fodder production to augment livestock feed; and in using glauconite for crop soil amelioration. The value, testing and scaling-up of these activities needs to built upon.

In 2020, the KKPS government declared it will use the project achievements, as a basis for its larger-scale programs aimed in particular at socio-economic development. The governance of pasture land has also been improved due to the new land and cooperatives laws.

Environmental Risks to Sustainability - The rating is Moderately Unlikely

In the northern regions of KKPS, farmers irrigate their lands mainly through river water from the lower Amudarya river and its channelized system. The water is managed by government decision who pass the decisions to water consumer associations, who allow distribution according to this and local farm needs.

However, due to insufficient supply, and with the recent transition to the farm cluster and cooperative systems, the clusters and cooperatives have begun to sink more boreholes to supply water, for drinking and horticulture. Such boreholes are subject to drilling permission, and maintaining a sustainable flow rate, however, it is not evident if this water is metered.

Impact

Impact

Impact of farming patterns on the environment

Due to land-levelling and early-warning forecasts, in Takhtakupir for example, cotton productivity has increased, but the result of this, is a tendency (by officials) to not reduce sufficiently coverage of land under cotton, which would be a regressive step. It is here that the SNIAWG and their strategic planning teams need to fully understand the holistic nature of the project's CCA lessons and apply them, and not turn to old habits that just generate a short-term cash income for the state treasury.

Impact of hydromet / drought EWS on farming patterns and the environment

District administrations receive CHS warnings on lower Amudarya river water scarcity with recommendations on adaptation measures. The project through its hard-copy bulletins and now via the hydromet platform has been providing these early-warnings on expected water deficit. The advance warnings are six months ahead of time, which allows for farm planning on which crops to plant, is very useful. If the early warnings, forecast an up-coming water deficit, then the farming communities may irrigate (if sufficient water) in the autumn ahead of the spring planting season. The issue here is one where using more water at the wrong time of the year, may just exacerbate the river water shortage problem. In Chimbay, due to water scarcity and crop loss – the district administration has designated a staff member to disseminate the water scarcity early-warning via social media (telegram) to the smallholders.

The project impact for farmers was to improve their trust in local early warnings forecasts on river water supply, and weather forecasts, especially when they are directly linked to agriculture advice bulletins on farming activities. This is beginning to happen, but the scale of the impact to date is difficult to measure.

Catalytic Effect

The TE prepared a Theory of Change flowchart for the project's main outcomes – see text of full report

Scaling-up & Replication

Tree planting - For ABDA tree planting, the project created an operational system, which technically and institutionally has proved to be effective. This included: tree plantation site soil survey; tree seed collection and nursery production by PPCs; supply of tree planting equipment; mass mobilization / deployment of tree planters from the PPCs; and 75,000 ha of tree plantation established. Based on this, the government has taken up the methods and set very ambitious targets. The 5-year ABDA state tree planting program is for 5.5 million ha with 1.5 million ha in 2022, and 1.6 m ha in 2023. This is a large plan with funds allocated through differing stakeholders include the Ministry of Emergencies. The state program is going to work with the PPCs to produce tree seed and the SCF will physically continue to set up the planting operations.

Pasture Restoration - Fodder seed for pasture restoration - seed collection with multiplication; enrichment seeding, and irrigation to kick-start the seed bank germination, drainage; and rotational harvesting of pasture blocks, making the pastures ecologically functional again, and productive for livestock fodder

Land levelling - Land levelling – 12 machines – a further 38,000 ha is planned to be levelled and human / livestock crops

Horticulture, hotbeds, hydroponics - Hotbeds cultivation is being increased; borehole drilling for cleaned water for drip irrigation is being expanded; and there are plans are to attract more investors to hydroponic fodder production

Demonstration

- Ecological functionality of pastures restored based on ecology and *ex-situ* livestock carrying capacity – 'pasture rotation rational-use plans' – with hay-baling production
- Micro-climate agromet weather forecasting was piloted by two academic institutes

New techniques /approaches

- Use of seed collected from 20 drought-tolerant wild fodder species to restore degraded pastures, with the establishment of seed stock multiplication and demonstration test areas
- Use of glauconite mineral as a soil amelioration agent

Conclusions

Weather and water forecasting

CHS is expected to maintain the AWSs and hydro-posts, and host the hydromet platform, with its DEWS module, which can provide early-warning weather and water scarcity notifications. One concern is whether it will be used to its full potential. Whilst the DEWS early-warnings on drought, and agromet cropping actions, have been prepared to date with project support, it now requires CHS, MWR and MoA to work together without the project facilitating actions.

Additionally, the hydromet data from the 10 AWSs in KKPS needs to be utilized, and fed back into the forecasting system, for which the platform can be used. DEWS is a seasonal forecast on water availability prepared in October for a long-term forecast in March the following year – for the crop planting season, but also monthly thereafter during the season until September. CHS also need to ensure that the AWSs complete their calibration period so that they can be added to the global synoptic grid. This will also allow others to produce and improve long and short-term weather forecasting for KKPS. At present, the AWSs in KKPS are used for standard weather forecasting.

This was the original expectation of delivering a multi-module information platform, with hydromet and drought early-warning, and agromet forecasting. The former with data coming from the new AWSs, and the latter from the new hydro-posts, with added upstream rain / snowfall data. By project end, DEWS was running as a self-contained module, and the multi-module platform was operating as a early-warning notification system for CHS, MWR, MoA, Ministry of Emergencies, and KKPS government, and others in KKPS.

Soil improvement measures

Soil problems include water scarcity, high salinity, and low soil organic matter (SOM). There is still an over production (reliance for export income) on cotton which is dependent on irrigated water, however government quotas have recently been rescinded. Thus there is a change, which the project has generally supported, from cotton / wheat production to to lucerne / bean crops, which also both fix soil nitrogen as an added benefit. In order to address the low SOM, the project introduced 'zero till' machinery which cuts the roots of residue crops below the soil surface, aiding plant material decomposition and thus build-up of SOM and soil nutrients the following season. Also not having a surface residue also reduces the incidence of plant pathogens and insect pests.

The project succeeded in popularizing the adoption of CA / SWC measures, but it should be remembered that understanding and solutions needed to be very specific. These included the management of dry arid soils with a lack of water, but also the management of the river soils adjacent to the river and its channelized 'herringbone' system, where the water table and soil salinity are high, and as such for crops, need a system of both irrigation and drainage.

Pasture restoration, and hydroponic fodder

KKPS has over one million ha of pasture land, with over 90% heavily degraded due to upstream water extraction from the Amudarya river. In no-water years, there is virtually no vegetation growth. The pastures are on sand / silt alluvial soils or on clay-pans (~50% each). These old pasture areas need to flood to get seeds to germinate, but don't receive it. Smallholders keep livestock, which in the absence of gazing land, need fodder.

The challenge has been to bring back degraded pasture areas, which then need to be nurtured with machine harvesting of fodder and hay. The restoration of pasture is at an early stage, thus livestock rotation, and to experiment with stocking rates and timing, and then to replicate and scale-up is for the future.

The project has begun with: a 'pasture seed stock & multiplication demonstration', for enrichment seeding works; with saturation irrigation of bunded pasture areas to germinate the dormant seed bank; and now also importantly with pasture rotation rational-use plans for fodder and hay production. Whilst this is underway, the project has been supporting intensive fodder production of cereals and lucerne using hydroponics (growing in water with added plant nutrients, but without soil), to alleviate pressure on the pastures.

From saline to clean water, but aquifers need replenishment

Extracted aquifer water is saline and needs to be purified, if it is to be used for drinking, for hydroponics, or for drip irrigation in horticulture. However, if there is over extraction from these aquifers (more borehole drilling is being requested by the PPCs with local official support, for example), then they are unlikely to be replenished, and the result will be a permanent water shortage, which is likely to make more areas uninhabitable. Due to drought, some areas have been temporarily uninhabitable, and settlements have had to move with state support. Thus the project's water purification technology on its own is not a panacea.

Horticulture

Low spring temperatures and then early frost in the autumn impedes on the production of horticulture crops. The intervention solution was hotbeds prepared in the soil with bio-organic stimulators (straw / manure under the soil) to raise soil temperature. The below-ground system was augmented by above ground polythene tunnels to trap sunlight heat, and also raise the soil surface temperature. The result of this is an earlier seed germination / seedling growth, and it allows for a quicker plant flowering / fruiting cycle to maturity before autumn frost.

New legislation, including the Cooperative & Land laws

The project supported agriculture policy change, however the building blocks for this were the change in the land ownership law , plus the Cooperatives Law, which together provided much greater livelihood security. The project also directly supported a number of PPCs. The model for this institutional change, in cooperatives becoming self-governing, was partly adapted from experiences in the Fergana Valley, Korea, and Israel.

Lessons Learned

Institutional Structures

The project worked closely with state institutions (e.g. CHS hosting the hydromet / DEWS platform), but also with a number of academic / research institutes (Tashkent Agrarian University in Nukus, and the Kegeyli Agrarian-industrial College in the demonstration of high-tech greenhouses, and agromet stations; Nukus Natural Sciences Research Institute in fodder seed multiplication, and ecologically-based pasture rehabilitation; and Nukus Science Academy in using glauconite mineral as a soil amelioration agent). The value in working with these institutions lay in their remit to undertake research, test, pilot and disseminate new advances in arid zone farming. The solutions needed by the project were not just the obvious CA / SWC measures (no till – direct drill, mulching, soil bunding), but were activities that needed both new and efficient technologies such as laser-levelling and hydroponics, but

also technologies based on ecological principles to begin the process of pasture restoration. The solutions also needed to be understood in the context of high salinity soils in a low lying river delta, with a naturally high water table.

Extension and access to agromet information

For joining up the agriculture information network, from a farmers point of view, there isn't a plan at present. CHS provide hydromet services directly to MoA who pass on to their Departments of Agriculture, especially seasonal, monthly, and 10-day windows, on a regional level. However the farmers at present, have to rather hunt down this information separately. Thus, there is a need for a clearer model in not only how on a farmer-level, to access hydromet / agromet / DEWS information, but in the general outreach model to farmers. The further use of smart-phone apps and telegram groups needs to be explored, but for the latter not overloading the quantity of information, or compromising the quality, but in finding a balance, to keep the farmers engaged in such services.

Aquifer extraction

Due to the success of making potable water, more boreholes are being requested, however the extent that either the extraction or if the monitoring of aquifer levels is being undertaken needs to be addressed. This is based on the importance of the water scarcity problem, with resulting salinity rates increasing as a result, but also the issue needing to rise on the political agenda of MWR in KKPS.

Tree planting in the ABDA

The cost-benefit of nursery production and planting of saxaul trees needs to be assessed, to see how improvements can be made. The extent that the ABDA tree planting reduces the severity of dust storm damage is also difficult to determine in the short-term, but needs longer-term monitoring

The cost-benefit of the impressive now working pasture restoration efforts needs to be assessed, for a number of reasons: there is a clear community vested interest; livelihoods should improve as a result, and in terms of a (climate change mitigation measure) carbon-sink, there should also be benefits, if much larger areas of pasture can be restored.

Recommendations

Exhibit 4: Key Recommendations Table [with responsible entity]

1. The multi-module early-warning platform for hydromet / drought / agromet needs to be finalized and adopted by CHS. CHS need to indicate how the weather data from the ten new AWSs will be used via the platform to provide more localized forecasts for the farmers in KKPS [CHS / UNDP]
2. In light of the project's successful achievements in demonstrating CCA measures, it would be useful to now assess them against, the Aral Sea Basin Programme 2021-30, and make any recommendations. This would be especially useful, in assessing the four project components in a holistic way, and where overall impacts were greater when particular activities were implemented with other activities [PIU / UNDP with KKPS government]
3. The CA activity 'zero till - direct drill' may not be supported by agribusiness, because of grain crop contamination with weed seed. However, the long-term conservation of the soil is of higher importance and is sustainable. Local legislation to incentivize and / or protect the CA direct-drill areas may be needed. [PIU / UNDP with KKPS government]
4. The PPCs to update their annual and 5-year development plans, with the uptake of project activities, including the tree nursery production and hydroponic fodder production, so they are transparent for their PPC members, but also equitable in providing the fodder products at a fair price for their members, before any outside sales [PPCs, APPC]
5. The project developed a 'pasture rotation rational-use plan' for each PPC, however, these plans need to be supported and monitored, to assess their on-going quality in achieving desired aims. Records need keeping of rotations of fodder cuts and baling volumes from the pasture areas [PPCs, with the VCCs and KKPS DoA]
6. Concerning the pasture rehabilitation demonstrations (delta irrigation / drainage for seed germination, pasture seed multiplication & re-seeding), it is an example of applied research, and there is a need to monitor and refine methods [Nukus Research Institute for Natural Sciences with the PPCs]
7. Monitoring of the saxaul tree nurseries is important, because technical efficiencies should be found for the large scaling-up of production and planting by government. The PPCs are involved twice – as seedling producers, and as young tree planters, so the vested interest in a professional operation is high. [Nukus Research Institute for Natural Sciences with the PPCs, with the KKPS State Committee for Forestry, and the PPCs]
8. It is also important to monitor the saxaul tree plantations, to identify lessons to improve tree survival rates, and the impact on reducing sand / dust storms. It is important that the lead monitor is an independent institution [Nukus Research Institute for Natural Sciences with the PPCs, with the KKPS State Committee for Forestry, and the PPCs]

Full report

1. INTRODUCTION

1.1. The project

The UNDP-supported, Adaptation Fund (AF) financed project was titled 'Developing climate resilience of farming communities in the drought prone parts of Uzbekistan (PIMS #5002)'[3]. The 7.5-year project started in May 2014 and will end in November 2021. The UNDP-AF project was under UNDP-supported National Implementation Modality (NIM), with the Centre of Hydrometeorological Services (CHS, a.k.a Uzhydromet) as the designated National Implementation Partner (IP)[4]. The IP worked in collaboration with with a number of responsible parties, who were coordinated through a national and sub-national inter-agency working group (NIAWG / SNIAWG). The members of this group included: Council of Ministers of the Republic Karakalpakstan (KKPS); State Committee for Ecology & Nature Protection (SCENP); Ministry of Agriculture (MoA); Minister of Water Resources (MWR); Ministry of Economic Development & Poverty Reduction; and State Committee for Land, Geodesy, Cartography & State Cadastry. UNDP appointed a Project Implementation Unit (PIU), which was led by a Project Manager (PM). UNDP and the PIU were supported by a Project Board (PB), led by CHS.

1.2. Purpose of the evaluation, report structure, and scope

Purpose & Structure

The objective of the Terminal Evaluation (TE) was to gain an independent analysis of the achievement of the project at completion, as well as to assess its sustainability and impact. The report focuses on assessing outcomes and project management. The TE additionally considered accountability and transparency, and provided lessons-learned for future projects. This report is in six sections - introduction, description, findings, sustainability, impact and conclusions / lessons / recommendations. The findings (Section 3) are additionally divided into strategy and design, implementation & management, and results. The project performance was measured based on the indicators of the project's results framework (PRF). The TE and its 'ratings' were given according to the 'Guidance for conducting Terminal Evaluations of UNDP-supported GEF-financed projects (2020)'

Brief Scope of the Terminal Evaluation (TE)

- Project design and development context
- Effectiveness - Progress towards results against logframe indicators – at Adaptation Fund (AF) levels, project objective, each outcome level and down to output level. Also, unintended results (positive and negative) were reported
- Relevance (of the project design, inc. how the Theory of Change was applied[5]), (Cost) Efficiency, & Country Ownership
- Gender Equity
- Project Implementation and Adaptive Management (of both the AF Implementing Agency - UNDP and the National Executing Entity – the Implementation Partner) - According to seven categories (management, work planning, finance, monitoring, engagement, reporting & communications)
- Sustainability – four categories
- Impact (climate, ecological systems & policy) & Catalytic effect (inc. innovativeness, replicability and scaling-up)
- Conclusions & emerging Lessons learned
- Recommendations - these are important because they are responded to and published on the UNDP Evaluation Resource Centre website (https://erc.undp.org/evaluation)

Higher level Linkage (Adaptation Fund, SDGs and Rio-markers)

Under the AF Results Framework, the programme area (focus) is Climate Change Adaptation (CCA) with the AF goal as: Assist developing-country parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation projects in order to implement climate-resilient measures'. The project is directly linked to two AF Expected Outcomes, with four AF indicators at this level. There is a table in the prodoc that aligns the project objective, outcomes and their indicators with the AF outcomes,

[3] This document is the Terminal Evaluation (TE) of the project

[4] A letter of agreement between UNDP and CHS sets out the UNDP-supported NIM, i.e. the joint implementation method, within which UNDP implementation services are provided to CHS, who in tern chair the project board

[5] There was no Theory of Change (ToC) applied for the prodoc, nor one proposed by the MTR, however the TE Team produced a summary ToC pathway – see Impact section of report

outputs and their indicators. UN Sustainable Development Goals (SDGs) are not listed, however the prodoc provides linkage to UNDAF Outcomes, and the Country Programme. Under this project, reporting indicators also include those relevant to the Rio Convention markers, which are proposed by the TE.[6]

1.3. Approach and Methodology

Approach & Methods

The overall approach and methodology of the evaluation followed the guidance outlined in UNDP Evaluation Guidelines (2021). The TE was an evidence-based assessment and relied on feedback from persons who were involved in the design, implementation, and supervision of the project. The TE team reviewed available documents **(Annex 7)**, conducted field visits and held interviews. The international consultant was the team leader and responsible for quality assurance and consolidation of the findings of the evaluation, and preparation of the TE report.

The field mission took place from 24th September – 15th October 2021, according to the agenda compiled in **Annex 10**. The agenda included a UNDP briefing on 24th September and a stakeholder seminar on 13th October. The TE was limited with the Team Leader prevented from travel due to in-country and UNDP travel restrictions, however the National Expert was present at all times, and travelled to the regions, to verify first-hand project results.

The TE determined if the project's building blocks (technical, financial, management, legal) were put in place and then, if together these were catalysed sufficiently to make the project successful. The TE method was to utilise a 'multi-level mixed evaluation', which is useful when evaluating delivery of a new service or approach, being piloted through state institutions. The method allows for cross-referencing and is suitable for finding insights which are sensitive and informative. The rating scales are provided in **Annex 9.** Pro-forma questions on key themes such as those provided by the UNDP guideline were updated by the TE (**Annex 14**).

Main partners and Stakeholder feedback

The TE interacted with the Project Implementation Unit (PIU), the UNDP Uzbekistan Country Office as well as with the executive (CHS) and project-associated stakeholders in the NIAWG, local government offices in KKPS, and demonstration farming and livestock pastoral groups. The TE visited the project areas to interact with local district administrators, technical staff and beneficiaries. Gaining a representative view from local stakeholders was partly limited by the covid situation, whereby the TE Team needed to conduct a number of meetings totally or partially by remote (Zoom). Additional telephone / email correspondence with stakeholders was arranged as necessary. **Annex 6** provides a list of people that the TE met and **Annex 10** is the mission agenda.

Ethics & Limitations

The review was conducted in accordance with the UN Ethical Guidelines for Evaluators, and the reviewer signed the Evaluation Consultant Code of Conduct Agreement (**Annex 15**). In particular, the TE team ensures the anonymity and confidentiality of individuals who were interviewed and surveyed. In respect to the UN Declaration of Human Rights, results are presented in a manner that clearly respects stakeholders' dignity and self-worth.

2. PROJECT DESCRIPTION

2.1. Development Context

Sector-wide linkage with the International Community

- UNFCCC & the Paris Agreement – Uzbekistan signed 2016, and ratified 2018, ZRU-491
- Sustainable Development Goals (SDGs, 2016) - the project contributes to Goal 15 - Protect, restore & promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- UNDAF Outcome 3 - Sustainable development integrated into country policies / programs; Outcome 6 - 'By 2020, rural population benefit from sustainable management of natural resources & resilience to disasters & climate change'
- UN Country Program Outcome 3.1 Increased availability of institutional products / services for the conservation and equitable use of natural & cultural resources. Output - 3.1.3 Methods / approaches implemented to address environment security and the socioeconomic development of vulnerable groups

[6] OECD Development Assistance Committee (DAC) Rio Markers for Climate Handbook - http://oe.cd/RioMarkers. The DAC codes are climate markers used to report to UNFCCC.

Project linkage to National Planning (Policy & Regulatory)

- Land law (2021) Presidential decree #6243 - Before there were five types of land, now only ownership and tenancy. The right to allocate land no longer resides with local government, but now with the regional KKPS oblast. Before due to the risk of farmers' land being taken, then there was little or no investment in their land.
- Pasture Law (2019) ZRU-538 – legal framework to allocate pasture land - Cooperatives establishment with land ownership / tenure certification
- Agriculture cooperatives in the horticulture industry (2019) President resolution PK-4239 – encourages the establishment of cooperatives
- Automatic Weather Stations - Presidential decree #4819
- CHS Strategic plan – includes automation and digitization of hardware and services
- Livestock decree –1998 – to intensify livestock
- Decree for fodder
- Water management strategy 2020-30 (2020) Presidential decree UP-6024.
- Water strategy (2021-23) - includes plans on land restoration / desalination
- Efficient use of water and improvement of land reclamation in KKPS (2020) Presidential decree PP-4912
- Water-saving technologies in agriculture (2020) Presidential decree PP-4919
- State management of agriculture and water (2018) Presidential decree UP-5418
- Drip irrigation- Presidential decree #4919; & Cabinet Minister decree #575 (2020)
- Horticulture & greenhouse development (2019) President resolution PK-4246
- Decision to establish extension service centers (2018) – To provide training on agriculture, and help farmers / cooperatives integrate value chains (production, harvesting, storage, processing, & export)
- Decree – rational use of irrigated land – being enforced for agriculture land – as get signature of cluster head
- Decree for rainfed water
- Activities of farms, dekhan farms & household lands (2017) Presidential decree UP-3318
- Protecting farms, dekhan farms & smallholders in the use of crop sown areas (2017) Presidential decree UP-5199
- Agriculture development strategy 2020-30 (2019) Presidential decree UP-5853; Measure to implement the strategy (2020) Presidential decree PP-4575; Measures to implement the strategy (2021) Presidential decree PP-5009
- Public administration in the agriculture sector (2019) Presidential decree UP-5708
- Mitigation of covid on the economic sectors (2020) Presidential decree UP-5969
- Socio-economic development of KKPS 2020-23 (2020) Presidential decree PP-4889
- Knowledge & innovation system, and modern services in agriculture (2021) Presidential decree PP-6159
- Development of the Aral Sea Region – State programme 2017-21 (2017) Presidential decree PP-2731
- Aral Basin Desert Area (ABDA) - President decree for Ministry of Emergencies, and others to support re-afforestation
- Mitigation of the Aral Sea Disaster, Recovery & development of the region 2015-18 (2015) Cabinet of Ministers #255
- KKPS land use policy (2020-30) - improved pasture system + afforestation within the Aral basin desert area (ABDA)
- Training of managers and specialists of farms (2016) Cabinet of Ministers #118
- Goals & objectives in sustainable development up to 2030 (2018) Cabinet of Ministers #841
- Cropland rational use – working with agricultural research institutes on land use pattern / rotation / change (e.g. cotton to lucerne or bean (KKPS Ministerial resolution)
- Environmental protection (2019) - air quality & water monitoring – project provided hydro-posts

Linkage to donor-projects

- World Bank CCA project – installation of 50 AWS) – CHS are integrated into their systems
- Aral Basin Desert Area (ABDA) - Huawei gave $30,000 for a 200 ha plot for Aral tree planting

2.2. Problems that the Project Sought to Address

Development challenge (prodoc, p3)

- 35% of Uzbekistan's of soils are salt-affected (15.6 million ha), including 50% of its irrigated cropland (2.1 million ha)[7]
- There is a high sensitivity of arid arable and pasture land to human pressure and climate change vulnerability
- The average annual temperature has been increasing by 0.3ºC every decade since 1960.

[7] Vargas et al 2018. Handbook for saline soil management. FAO: Rome; & Bucknall et al. 2003. Irrigation in Central Asia. World Bank

- In the Aral Basin Desert Area (ABDA), the maximum temperature has increased more than the national average
- The variation in weather patterns together with climate change, suggests that regions will need local CCA responses, and highlight the value of improved localized weather data for improved forecasting and climate modeling
- 90% of the country's water originates from neighbouring countries. The lack of water-sharing is a constraining factor. There is also an inherent scarcity of water within the country, which is compounded by over-abstraction.
- River water use in agriculture is 93% of overall water use, even though only 10% of the land is cultivated. Virtually all cultivated land is irrigated by the two rivers, the Amudarya and the Syrdarya, both of which used to flow into the ABDA. Due to total extraction, no water actually flows into what was once the Aral Sea.
- The channelized water network for irrigation is damaged and leaks ~50% of the water it transports
- Water shortages are common. In 2000, 2001 and 2008, many water bodies in Karakalpakstan (KKPS) dried up, with livestock dying, and temporary relocation of settlements
- A key reason for declining agriculture productivity is inappropriate irrigation with blocked or leaking drainage systems (and insufficient water / water channels / sluice gates) to flush salts from the soil. Where land is not level, ponding and water-logging also occurs
- Pastures are overgrazed and degraded, especially if sheep are replaced with goats, which in turn leads to soil erosion, and collapse of these ecosystems

2.3. Description and Strategy

The project objective was to 'develop climate resilience of farming and pastoral communities in the drought-prone parts of Uzbekistan, specifically Karakalpakstan' (Aral Sea region). Within the Project Results Framework (PRF / logframe), there were 4 outcomes and 5 outcome level indicators. The four outcomes:

1. Institutional and technical capacity for drought management and early-warning developed
2. Climate-resilient farming practices established on subsistence dekhan farms[8].
3. Landscape-level adaptation measures for soil conservation and soil moisture retention improves climate resilience for over one million hectares (ha) of land
4. Knowledge of climate-resilient agriculture and pastoral systems in arid lands generated and widely available

Project Location

The project location was primarily set in the Autonomous Region of Karakalpakstan (KKPS), and six of its districts - Bozatau, Muynak, Kegeili, Kanlykul, Chimbay, and Takhtakupir. The project was administered from the capital Tashkent, and the regional KKPS city of Nukus.

Project districts – Number of farmers (small household plot, small farm, commercial farm) with arable area (2021):

	District	No of subsistence farm plot owners	Sowing area (ha)	No of small dekhan farm owners	Sowing area (ha)	No of commercial farmers	Area (ha)	of which sowing	of which irrigated
3	Bozataw	3,413	625	262	98	74	11,932	2,228	2,228
4	Kegeily	13,364	2,848	58	18	349	38,661	20,350	20,350
5	Kanlikul	9,037	1,712	276	83	365	36,667	22,174	22,174
8	Muynak	4,622	156	29	9	103	18,809	3,141	3,141
10	Takhtakupir	6,776	1,372	42	12	259	110,551	19,069	19,069
14	Chimbay	19,467	3,550	68	21	409	56,690	32,578	32,578
	Project	56,679	10,263	735	241	1,559		99,540	
17	Total KKPS	342,335	46,866	3,004	735	5,217	803,009	289,450	289,443

Source – Project records; Note – Arable land only - excludes pasture and other areas

Note - Outcome 2 targets included 80% of project small farmers (subsistence and dekhan) would benefit from the project and adopt CA and SWC measures; as well as 20% of larger sized farms (taken to be the commercial farms). The Outcome 2 target also indicated that the coverage would be 80,000 ha, however the smaller farmers in the 6 project districts only have just over 10,000 ha of arable land in total. At project design (2013), it was calculated that there were 51,208 small farmers and pastoralists in the project area. The figure in 2019 was 57,414 small farmers (56,679 + 735)

Project districts – 2020 population, total with number of rural residents:

District 2020 population	Total	of which rural residents

[8] Household plots were re-classified as 'dekhan farms' in 1998, at which time the law of dekhan farms was passed

Buzataw	21,550	16,170
Kegeyli	72,465	43,245
Qonlikul	50,973	38,346
Muynak	31,820	17,910
Takhtakupir	40,152	23,284
Chimbay	112,337	54,952
Project	329,297	193,907
Total KKPS	1,898,351	967,817

The two tables provide details of the number of smallholders and the rural population in the target districts. To note with 57,414 smallholders and a total rural population of 193,907 persons, (and ignoring that some will be farm labourers on the commercial farms), this equates to only 3.4 persons per smallholder family. These figures are useful when interpreting the project statistics concerning numbers of beneficiaries.

Project Timing & Milestones

The project timing was from May 2014 until end November 2021. This includes an extension from May 2020. The project document mentions project assurance support by UNDP. Milestones themselves are given as both a number of key dates (project start, MTR, TE and project close) as well as the logframe targets themselves.

Comparative Advantage

UNDP had a comparative advantage in capacity building, and in the provision of technical support in the design and implementation of the project. UNDP also had an advantage working with government especially in strengthening institutional, policy and mechanisms, in undertaking risk assessments, in mainstreaming climate change adaptation (CCA) into development planning and harnessing best practices across the thematic area.

2.4. Implementation Arrangements

Project Management Structure

The project was steered by a Project Board (PB), chaired by CHS. The project established a Project Implementation Unit (PIU) which was led by a UNDP-appointed Project Manager, who reported to CHS and UNDP on a monthly basis. The project was under UNDP-supported NIM, which specifically included financial control of project funds[9]

2.5 Key Partners & Stakeholders

The project outlined its partnership strategy (prodoc p67) to include:

- Centre of Hydro-meteorological Services under the Cabinet of Ministers – as the National Implementing Partner
- Crop and livestock farmers, rural communities, dehkans, households in KKPS
- Council of Ministers of the Republic KKPS; district level local authorities in KKPS; Council of Farmers in KKPS
- Hydro-meteorological Department of KKPS
- State Committee for Nature Protection; State Committee for Land, Geodesy, Cartography & State Cadastry
- Ministry of Agriculture; Ministry of Water Resources; Ministry of Economy; Ministry of Finance

A description of the set of Terminal Evaluation stakeholders – those who were responsible for implementation of the project and those associated with the project – is provided as **Annex 8**.

3. FINDINGS

3.1. Project Strategy

3.1.1 Project Barriers / Baseline

The stress on ecological systems remains high. Climate change is described as acute. According to the UN WMO, Uzbekistan is warming-up and there is a marked change in rainfall pattern. Water supply is a major issue, especially with farming systems that are horticulture-based, and / or largely irrigated. However, water-use efficiency is low (hence project provision of drip irrigation for example), and squabbles often break-out, not only within Uzbekistan, but also with neighbouring countries. Before the project, for the farmers in the Amudarya river

[9] The letter of agreement between UNDP and CHS outlined the arrangement, the services provided by UNDP, and the chargeable unit rates for particular services.

downstream area, there wasn't a river water supply forecast, nor were weather forecasts particularly accurate for KKPS districts. This resulted in farmers deciding to irrigate, when there was no need, which was just increasing cycles of water scarcity[10].

The soils of Karakalpakstan are solonchaks (which in Russian means wetland depression or salt marsh), which means the soils are saline and possess a high content of soluble salts[11] [12]. Also the soil in this arid region lacks sufficient rainfall to dissolve salts and leach them out of crop root zones, thus they accumulate, (and are added to from the ABDA duststorms) to create salt-affected soils. The salts are from the river and its delta, and also accumulate due to waterlogging, although during the dry season, there are significant changes in the depth of the water table. When the concentration of salts in the soil is greater than in plant roots, the plants can't uptake water. The issue, is that in the delta, the water table tends to be near the surface, thus it is not possible to leach the soil, without artificial drainage ditches. These can be cut below the water table level to drain away water to remove the waterlogging, and allow the salts to leach out. Thus these soils often require both irrigation and drainage if they are to be used for agriculture.

Component 1 Barriers - Before-project scenario in drought early-warning system (DEWS) capacity

Despite the capacity of CHS, location-specific, tailored weather forecasts are not available to sector ministries, local government line agencies or farmers. There isn't an effective early-warning system (EWS) to guide water allocation for crop / pasture management, nor the institutional coordination mechanisms to undertake this.

The coverage of meteorological & hydrological (hydromet) stations is insufficient. A wide range of data is needed to monitor weather and water supply (precipitation, temperature, river / canal flow, groundwater, reservoir levels). Seasonal forecasts, warning systems and climate change impacts are needed by extension services, water user / farmer groups

Component 2 Barriers – CCA in farming

- Despite pilots of best-practice agriculture, there isn't a government policy or financial incentives for the large-scale adoption CCA measures
- Water is a limiting factor in KKPS's arid climate. Fears of scarcity often result in over-irrigation (by upstream / downstream farmers), leaving less or no water for downstream agriculture / livestock farmers. Over-irrigation is also detrimental for crops and can cause secondary salinization[13]. This over reliance on the irrigation system diverts attention from SWC measures that can offer greater resilience to drought and increase land productivity.
- The government is aware of human pressure on the over-exploitation of water, exacerbated by lack of rainfall and climate change. In response to drought in 2008-09, the government issued a policy to reduce losses (through fodder production, and supporting horticulture). Since 2008 it has invested in agriculture, and improving land use. In KKPS, the 9,000 farms in 2007, have been clustered to become 3,000 now. Whilst this provides impetus for CCA measures, the process is slow.

Component 3 Barriers – Landscape-level soil & water conservation (SWC)

- There is a lack of integrated landscape-level land-use planning policies for rehabilitation and sustainable management to restore the functional integrity of arid areas and thus their resilience to CC
- There have been unsuccessful attempts to stabilize desert sands and prevent their encroachment onto farm and pasture land. With human-induced climate change aridification and change in intensity of wind, the movement of sand is increasing. Salt also migrates with the sand, making soils and salt-affected.

Component 4 Barriers – Knowledge of climate resilient agriculture / pastoral systems in arid lands

- Agriculture lacks an effective extension service. Also the service that exists, doesn't take a CCA perspective. While the government and communities are aware of increasing weather variability, there is little knowledge how to move towards climate resilience. The take-up of demonstrated water-saving agriculture methods is low
- The transfer of knowledge is limited to within the scientific community, and is not tailored / systematic or having a clear delivery outreach approach. Moreover, lessons learned are not captured in a way that allows broader sharing

(source prodoc logframe - edit)

3.1.2 Project Design, Objective & Approach

KKPS (and its 15 districts) is the most vulnerable region of Uzbekistan, due to its arid conditions and being located at the end of the Amudarya river. It often receives little or no water and of low quality from this river due to

[10] Across Uzbekistan, CHS have 131 hydro-stations and measure water levels against critical norms for drought / floods with an early-warning system (EWS) reported to the cabinet of ministers, but this doesn't stop the fact that too much water is being used, and that demand is greater than supply. Also the system is not tailored for KKPS

[11] Solonchaks are formed from parent material with high salt level, under conditions of high evaporation, such as where there are closed basins with hot climates and a well-defined dry season E.g. arid zones, such as the Aral Sea basin in KKPS

[12] A soil with excess salts where sodium chloride predominates.

[13] Salts then rise to the surface due to evaporation

upstream extraction. Climate change impacts are present and increasing, including high temperature days over 40^0 C are twice the national average. Land productivity is falling, and thus needing CCA measures as a priority. As such, the objective of the project was to develop climate resilience for farming and pastoral communities in the drought prone areas of KKPS.

The project identified six districts that were the most vulnerable to human impact and climate change[14]. The aim was to create livelihood security and build resilience, for agriculture communities against climate change impacts.

The detailed rationale for the component outcomes was:

- Through Outcome 1, an improved hydromet monitoring infrastructure will be put in place, which will serve as the backbone for a drought early warning system (DEWS). This will provide timely localized weather forecasts, but also provide for monitoring weather patterns, through which modeling of climate change impacts can be informed
- This service will be complemented by a suite of CCA farming practices for crops and livestock for the targeted (80% small, 20% medium size) farmers under Outcome 2. These measures include conservation agriculture (CA), horticulture hothouses, and pasture management, will help farmers manage the CC impacts to diversify their livelihoods
- Outcomes 1 and 2 will support a landscape-wide functional ecology approach to create Outcome 3, which seeks to reduce the impacts of higher temperatures, lower rainfall, and windblown sand onto farmland. The latter will be addressed through community-engaged tree plantations
- Finally the key lessons from the project will be documented and disseminated with respect to Outcome 4

3.1.3 Design Assumptions & Risks

A risk analysis was undertaken (prodoc, Annex 12) with three risks outlined. Those that proved to be correct / incorrect:

Assumption / Risk with Mitigation	TE comment
Project executing and partner institutions don't cooperate - As the project works on multiple levels, it requires the leadership of CHS, MoA and MWR, who will be part of the PB	- The support of CHS and government was good. The difficulty was more with the project needing to find an intervention delivery mechanism, because the project management mode was akin to direct (UNDP) implementation from Tashkent, with the needed local government decision-making support in KKPS in Nukus. The project adapted to this over time
Farmers won't stop over-irrigation and over exploitation of resources in favour of conservation agriculture (CA) - Identify lead farmers who have already demonstrated innovation, especially in low input / high output CA and SWC methods	- The issue is more one of over-exploitive Amudarya river upstream water extraction. The downstream farmers have no choice but to adopt CA and other measures - With the project having successfully supported horticulture and hydroponic fodder production, farmers are now calling for more aquifer water extraction, which will lead to exacerbated problems in the future
Drought - high risk - The project directly addresses water scarcity through CA, SWC, and fodder production	- The interventions need to be integrated and at scale to address a severe and increasing problem

The risk register in the UNDP 'Atlas' management system contained seven risks, including the three above in the prodoc, as well as a more recent covid risk / mitigation from 2020. These are mirrored in the project performance report (PPR) with a summary presented in **Annex 5**.

3.1.4 AF and Project Result Frameworks

Rio-marker

If the project needs to be recorded under the OECD Rio markers, then the CRS code would be 31130 for 'agricultural land resources' (which includes: soil degradation control; soil improvement; drainage of water logged areas; soil desalination; agriculture land surveys; land reclamation; erosion control, and desertification control)

Adaptation Fund Results Framework

The prodoc provided information on the AF baseline (before and without project scenario), and the Adaptation Alternative. The AF Results Framework[15], and the AF indicators were linked to the project indicators (two for the project objective and five for the project outcomes). They were contained in two tables in the prodoc, and are

[14] Selection criteria: reliance on agriculture; small area of irrigated land; salt-affected area; per capita drinking water. Added criteria: local authority interest; drought-affected; poverty; and communities with more women than men

[15] AF. 2010. Project-Level Result Frameworks and Baseline Guidance Document. AFB/EFC.2/3

copied in **Annex 5**[16]. The results are presented in Section 3.3 Results.

Project Results Framework - Indicators & Targets

One or two of the indicator targets were not so 'SMART' (Specific, Measurable, Attributable, Realistic / Relative, Timebound). The AWS / hydro-post network was to cover 40,000 km^2, however the accuracy of forecasts just degrades the further away from a station that you are. Siting is more a matter of maintenance and having a mobile signal (i.e. near a cell tower). For the tree planting it was assumed that communities would have the mandate to manage the plantations, however as is so often the case, if they are on government-owned land, then this isn't so, plus in this instance, there was the sheer remoteness of the sites in the Aral Basin Desert Area (ABDA).

The main issue was not with the targets, which were based on the number of smallholders in the six project districts (~50,000), and percentage of them to reach, but rather with the project reporting, switching to individual direct and indirect beneficiary numbers, and all put together. Thus it was very difficult to determine how many smallholder households the project actually reached[17]. The separation of CA and SWC measures, and horticulture is not easy in design terms, but at higher levels usually focusses on on-farm as opposed to off-farm wider ecological landscape measures. This design distinction was not fully written-in for this project, due in part to the pasture (and tree planting) elements.

Project Results Framework

The prodoc project results framework (PRF) contained 14 outputs, with 15 indicators (listed as targets / milestones). The prodoc provides information on the baseline (or before project situation) for each outcome and the detail of project support for each of the outputs. **Annex 1** contains indicators with assessment against the indicator and TE rating provided; and **Annex 2** contains Outputs with achievement reported by the PIU, with TE comment. For brevity here, 'Output Activities under the four Outcome / Component structure' is presented:

1.1	Weather monitoring infrastructure (8 automatic weather stations (AWS), 2 hydro-stations) with effective data transmission
1.2	Multi-module platform for integration of data from the hydro-meteorological (hydromet) infrastructure for end users
1.3	Drought early-warning system (DEWS) (indicators, gauges, EW delivery system) to minimize the impact of droughts
1.4	Science-based extension services for subsistence dekhan farmers to assist in climate risk management, including sub-district, community-level farmer field schools / extension for direct outreach and training in adaptation practices
2.1	40,000 smallholder / dekhan farmers adopt climate-resilient conservation agriculture (CA) practices (low till, crop rotation, residue mulching, and fodder production) on 80,000 ha of farmland
2.2	40,000 smallholder / dekhan farmers adopt soil & water conservation (SWC) practices (land-levelling, furrows, borehole management, drip irrigation) on 80,000 ha of farmland to improve farmland drainage and reduce salinization
2.3	40% of smallholder / dekhan farmers establish horticulture hothouses on 20,000 ha to reduce the impact of drought
2.4	Regulatory framework to support best practice agriculture adaptation measures for replication and upscaling
3.1	Saxaul tree plantations on 1,042,094 ha of land for soil stabilization based on a landscape rehabilitation plan
3.2	Community planting & maintenance, with local employment for landscape-level adaptation
3.3	Cooperative management for landscape rehabilitation created to enhance community control and ownership
4.1	Inventory of all tested agriculture and water-saving measures to identify best practices
4.2	Lessons learned for climate-resilient agriculture and livestock pasture production systems in arid lands documented and disseminated through print and internet channels
4.3	Regular farm and pasture meetings with participation of farmers, government and the media

3.1.5 Gender Design

The project was described during the LPAC meeting, as having Gender marker (GEN-1) – outputs contribute to gender equality, but not significantly. It was suggested during inception to strengthen gender mainstreaming. The prodoc mentioned gender 12 times, mostly in template ToRs for project staff, but importantly with regard to the following:

- project management: requiring the IP (CHS) to ensure that the PB should be balanced with 50% women's representation; and to consider gender in mainstreaming actions

[16] The linkage is a requirement in the AF Evaluation Guideline

[17] The TE guidelines require the evaluation to report against the logframe targets, but it this case it was not really possible, which rather let down the ability to present the project in its full positive light.

- project manager – should ensure that the project equally benefits women

There were a number of gender dis-aggregated indicators / targets (which are described in the gender analysis and / or the results section)

3.2. Project Implementation

3.2.1 IA and EA Coordination & Operational Management

The overall quality of implementation / execution was rated as **Highly Satisfactory**. The quality of UNDP Implementation was rated as **Satisfactory**. The quality of the IP (CHS) Execution was rated as **Highly Satisfactory**

Summary Arrangement

The prodoc was signed between UNDP and CHS in May 2014. CHS were described in the prodoc as the Executive and Implementing Partner (IP) and provided oversight as joint chair of the Project Board (PB). UNDP were described as the multi-lateral implementing entity (senior supplier) on behalf of AF. The prodoc describes the UNDP fee of $424,000 (8.5% of project cost) for acting as the AF implementing entity[18].

The prodoc also described the working arrangement for the UNDP-supported NIM, which meant that UNDP administered the project, and a UNDP-appointed Project Implementation Unit (PIU) implemented and managed the project. Thus apart from the fixed indirect services fee (i.e. the 8.5% fee), that UNDP direct services to the project would also be charged. The unit rates for these were outlined in a December 2016 standard letter of agreement between UNDP and CHS and costed at no more than $145,000 for the project[19].

Thus whilst decision-making lay with CHS and the PIU (i.e. the Project Manager), the actual management control (of authorisation of fund use and release to the project) lay with UNDP in project staff selection, purchase of equipment / services, training events, and allowing staff to visit the field. Thus the PM needed to work closely with UNDP, and follow all UNDP project procurement and implementation procedures. Whilst the role of a national project coordinator was described in the prodoc, in reality it was not separated out from the role of CHS as the executive and PB chair.[20]

Coordination & Operational Management by Implementing Agency (UNDP)

In 2016, delivery remained low, especially for components 2 and 3. This resulted in UNDP's Sustainable Development Cluster (SDC) proposing a revised project management structure with added oversight of these components by the UN Joint Program Aral Region (UNJPAR) manager, alongside existing work. This was approved by the PB in December 2016. Whilst project administration remained with UNDP and the PM in Tashkent, a key part of decision-making shifted to Nukus. A further management change was made in February 2018, with the Nukus-based field coordinator position replaced by a specific component 2 task manager position, which was already a *de facto* role for Component 3. The specialists for agro / water-saving and for landscape-level activities took-up these positions. Thus implementation of components 2 and 3, was strengthened in two steps during 2017 – early 2018.

In June 2019, the AF board approved an 18-month project extension from 31 May 2020 to 30 November 2021. UNDP requested this in April 2019, which was partly a result of an MTR recommendation. So the project moved from a 6-year to a 7.5-year project.

In 2020, UNDP's SDC was divided into two clusters: Inclusive Growth Cluster (economy); and Environment & Climate Action cluster (ECAC), with the project then going under ECAC.[21] The RR / DRR were shuffled three times during the project life cycle, which possibly had an impact during the early years. Countering this, the early establishment of the NIAWG and sub-national IAWG, especially the latter improved project operational functionality. These changes, together with the establishment of the SNIAWG in particular (who screened intervention proposals), the project demonstrated effective adaptive management[22].

[18] The prodoc annex 4 provides an indicative breakdown of these UNDP fees, which are also detailed by year in its annex 3 under the project budget

[19] UNDP administration support services for the project include: recruitment of project staff / consultants; facilitation of training activities (workshops etc); procurement of goods & services; financial transactions including the processing of payments & disbursements; and administrative services, including travel authorisation. All services were unit-costed.

[20] The position was taken by a director general of CHS, and with the PM seconded from CHS, it was felt that there was no clear role for such an extra post

[21] The previous UNJPAR lead changed position at this time to become the ECAC lead

[22] If the project had only been 3-4 years in duration, the adaptive measures by UNDP may have been too slow to be effective

Project Board

There was a PB ToR (prodoc Annex 10). Seven PB meetings have been held so far, i.e. once a year. The membership of the PB was not sanctioned by official letter, but rather taken as agreed from the prodoc (which was officially signed). According to the prodoc, the PB consisted of the senior supplier (UNDP), executive (CHS)[23], and senior beneficiaries (CHS, KKPS Government, and their resident farmers / people). The PIU acted as the secretariat to the PB. Some insights from the PB meetings:

- 2nd PB (2015) meeting mentioned some delay in the release of the 2nd AF tranche, which resulted in some implementation delays as a consequence
- 3rd PB (2016) meeting considered for decision the change to a more programmatic project structure in KKPS to integrate the project (management & technical) approach with the UNJPAR (Phase II). This was partly as a result of a limited disbursement rate of 60% for the project's KKPS activities to date (December 2016). The decision for a UN JPAR project manager to oversee Components 2 and 3 was approved by the PB during the meeting
- 3rd meeting – the slow pace of activities was in part due to UNDP and its own re-structuring in establishing a new SDC / appointment of its leader. (which in turn has been restructured since, with the project now under ECAC)
- 3rd – Critical concerns were raised regarding tree seed collection for nurseries, and if not achieved on time, would miss the 2017 spring nursery planting season; and that landscape restoration works could also miss the preparation season
- 4th PB meeting (2017) – UNJPAR and AF project synergies / joint activities were outlined
- 5th PB meeting (2018) UNDP SDC informed the KKPS SCF that there were issues with the seed nursery establishment at Takhtakupyr district – they had a contract from March 2018, which would be terminated in December 2018, if the conditions were not fulfilled. The KKPS SCF agreed to collect tree seed to begin with
- 5th PB – The government plan for tree planting in the Aral area until 2021 was outlined – tree planting for 500,000 ha (100,000 ha in 2019; 160,000 ha in 2020; 240,000 ha in 2021)[24]
- 6th PB meeting (2019) – AF fund release of 4th tranche only in November 2019; the project extension for 18 months was agreed between UNDP and AF
- 7th PB meeting (2020) - there were 33 participants, including: CHS and UNDP representing the PB as chair and co-chair; a KKPS government representative; six members of the NIAWG represented by five ministries and CHS; nine members of the SNIAWG. The meeting was also attended by 15 others including UNDP and project staff
- 7th – now have ECAC. The PM is titled – 'overall coordinator / PM of project team in Tashkent'
- 8th PB meeting is planned for November 2021

Coordination & Operational Management by the Implementing Partner (CHS)

Apart from their role as executive, CHS were also described as the project's main beneficiary, and representative of all key stakeholders. CHS provided PB oversight and monthly meetings with the PM for example. They were also the recipient of most of the Component 1 hydromet infrastructure and equipment, and responsible for its operation and maintenance. CHS were also the host recipient of the hydromet services delivery platform - for the weather and river water forecasts in the various forms.

Project Implementation Unit (PIU))

The project was implemented by a Project Implementation Unit (PIU), who coordinated closely with both UNDP and CHS. UNDP support and supervision to the PIU / project was primarily from the UNDP Environment & Climate Action Cluster (Lead[25], and a Climate Change Specialist), and a member from the Resources Management Unit.

The staffing of the PIU (as hired by UNDP) included seven members - Project Manager (PM), Administrative / Financial Assistant, Field Assistant, Procurement Assistant, Public Relations Specialist, and two task managers responsible for project components 2 and 3 (i.e. conservation agriculture and landscape-level specialists). The PM was seconded from senior position from within CHS, which obviously helped in project communication with CHS as both the executive and senior beneficiary. It should also be noted that the PM has now been involved with the project for 10 years, having been one of the members of the project preparation leading group[26]. The PIU was located in two offices inside CHS, in Tashkent and in Nukus, where it was nested in the UNJPAR office. The PM managed the project with particular responsibility for components 1 and 4, whereas the Nukus office was primarily staffed by the two task managers for components 2 and 3, with oversight by the UNJPAR manager.

[23] The Executing Agency was the Implementing Partner – see prodoc legal context (p86), which refers back to the 1993 agreement between UNDP and the Uzbekistan Government

[24] Three million ha of Aral Sea area out of 6 m ha is in KKPS

[25] The Lead had previously held a senior position in the UNJPAR office in Nukus, which increased local knowledge of the Aral Basin Area environmental & social issues and in facilitating communications for the PM in particular

[26] The PM, Aleksandr Merkushkin was deputy head of service for monitoring of atmosphere air, surface waters and soils pollution

Covid

In real terms, the 1st lockdown was from April – September 2020, thereafter with restrictions on UNDP and government staff movement / ability to work from the office or in the field. Thus it became difficult to meet local stakeholders in the regions in particular. In 2021, the situation eased and the PIU managed to meet more often directly with farmers[27] and conduct other business via remote meetings (on Zoom for example). During the covid period, the project was also restricted in organizing public awareness events and some training events[28]. Despite covid, the project has been able to undertake most planned activities and effectively utilize project funds. UNDP were considered as helpful in allowing the project to 'continue with caution'[29].

3.2.2 Institutional Mechanisms - Local Partnerships / Stakeholder Engagement

National Inter-agency Working Group (NIAWG) / Sub-national Inter-agency Working Group (SNIAWG)

In 2014, the NIAWG in Tashkent and SNIAWG in KKPS were approved and set up as an institutional mechanism to support project implementation[30]. In fact, the members had previously been supporting development of the prodoc, but were not formalized until this time. The NIAWG was established by government resolution and was aimed at facilitating project implementation and strengthening project ownership in the government agencies. NIAWG comprised of officials representing government: Ministry of Finance; Ministry of Economy; Ministry of Agriculture & Water Resources (now MoA and MWR); State Committee for Nature Protection; and CHS. The total number of NIAWG's members was seven, among which five are representatives of the line ministries but two others are NIAWG's secretariat members. The SNIAWG in KKPS included: the Governor as chair, Department of Agriculture (DoA); Department of Water Resources; Council of Ministers; Council of Farmers & Smallholders (CFS), State Committee Forestry (SCF), SC Ecology & Environmental Protection, Department of Economic Development & Poverty Reduction. The same ministries were represented on the PB, however their independent status allowed them to meet when required and solve *ad hoc* problems. Their establishment and mandate allows them to continue post-project, as they were set-up for all on-going and future international donor projects.

Production & Pasture Cooperatives (PPCs)

Originally ten, but now 13 Production & Pasture Cooperatives (PPCs) were established with project support. They were instrumental in working with the project in terms of CA / SWC, horticulture, hydroponic fodder production, pasture restoration, saxaul tree nursery production and in tree planting in the Aral Basin Desert Area (ABDA)

Production Pasture Cooperatives Women's Task Force (PPCWTF)

There were ten women's groups (with ~10 members in each) established within the PPCs to work with the project. They ensured parity in women's involvement in work opportunities, and in cooperative income distribution. The groups initiated and established a cooperatives-owned stock of: desert-drought-tolerant plant seed (5,000 kg) to enrich the pasture reclamation process; and cereal seed (4,000 kg) for the cooperatives to grow fodder.

Association of Production Pasture Cooperatives (APPC)

The project established the APPCs in February 2020. The APPC is developing to provide a number of services to the PPCs, including methods to improve the supply chain efficiency and added-value (e.g. in primary processing), and in marketing / product sale – introduction of buyers.

Centre for Hydrometeorological Services (CHS, a.k.a. Uzhydromet)

CHS was the IP working with the PIU. It was a major recipient of weather forecasting equipment and a hydromet platform to provide improved localised weather and agromet / disaster early-warning services. As part of the platform, the project also produced a drought early-warning system (DEWS) module, which is shared with the Ministry of Water Resources (MWR). The key recipients of the hydromet / DEWS platform are MoA, MWR, KKPS government, Ministry of Emergencies.

As CHS has traditionally worked on a regional level forecast for KKPS, and not district or sub-district, the forecasts have lacked granularity or accuracy. The project installation of ten AWSs directly addressed this granularity issue,

[27] Whilst UNDP were able to give 'permission' and authorize expenses for PIU travel and activities, UNDP staff themselves were under directives from UN Headquarters in USA, and were unable to travel.

[28] Due to covid, awareness raising and field extension / outreach, such as farmer-to-farmer exchange was limited, but this was also because of the timing of the installations (& software) and horticulture projects only coming in 2020-21

[29] For this TE, there were UNDP restrictions on travel for the international expert, as per the directive from UNDP headquarters. The ToR was written taking covid into account, and to rely on a remote mission.

[30] They were sanctioned respectively by the President and KKPS Prime Minister, with the latter chairing the SNIAWG

in providing the opportunity to provide more accurate localized weather forecasts.

General background on CHS country-wide

- Countrywide, CHS has 84 automatic weather stations (AWSs), 50 of which have recently been provided by World Bank. A number of these provide synoptic transmission (every 3 hours) to the UN WMO's Global Telecom System (GTS) for global and national weather forecasting. Uzbekistan is part of North Eurasian Climate Outlook Forum (NEACOF) which provides (long-range) seasonal forecasts.
- CHS has an agrometeorology department, with the main users of weather forecast information being the MoA, and MWR. Their 10-day forecast is most widely used, particularly for vegetable / fodder crops from March – August, and then for grain crops from November – April. The (medium-range) 10-day bulletin (last 5 days and forecast for the next 5 days) includes agriculture advice for regions, with the line agencies (DoA) to provide to district level. Advice is on crops (especially grain & cotton), horticulture, insect pest assessment, and seasonal tasks[31]. During the main crop watering period (July-August), and main crop harvesting periods, additional bulletin information is provided to MoA.
- CHS also produces an annual climate change data analysis report, although not as part of the project

State Committee for Science

The Committee for Science was instrumental in the development of the DEWS software model, which was specific to downstream Amudarya, for the prediction of water availability to farming areas

Ministry of Water Resources (MWR)

MWR decide how much water to allocate each area, then the MoA decide which crops need the water most, then the state committee of famers, decide how much water per farm, then water users association update their water use plans (farm – for crop / livestock)

State Committee for Forestry (SCF KKPS)

SCF are responsible for implementing the ABDA saxaul tree planting program. SCF has a capacity of ~15 staff, with two vehicles. Their district offices have 15-80 staff, and ~3 vehicles. The project mobilised the PPCs to support the SCF in this endeavour, and in doing so, created a strong model for scaling-up to reach government targets

Science-based Agriculture Extension Centres

The project supported the development and worked with three such centres: Nukus branch Agrarian University; Kegeyli Agro-industrial college; and Konsawt Markaz company. The centres were provided with scientific equipment for agriculture to test and demonstrate project interventions, which they were then responsible for promoting primarily to smallhold farmers.

Nukus Research Institute for Natural Sciences

The project worked with the institute in the collection, nursery replication, and demonstration of drought-tolerant pasture forage and fodder wild plant species with the aim to restore degraded pastures

Nukus Academy of Science

The academy worked with the project in the identification of glauconite mineral as a soil amelioration agent, that improves soil structure, in its water-holding capacity, and in reducing soil salinity

Department of Agriculture

The DoA are a key recipient of the CHS hydromet / DEWS forecast bulletins, and from these support the preparation of agromet bulletins for the KKPS district line agencies.

The list of key stakeholders is described in **Annex 8**.

3.2.3 Gender Equality & Empowerment of Women - Analysis

The prodoc didn't include a gender section, partly because it wasn't a requirement from AF, when the project was designed. There were a few indicators / targets in the PRF which were gender-disaggregated, which are reported in the results section. Additionally the project kept all gender-disaggregated statistics whenever possible. E.g. for all training events. Some of the main targets in the PRF were:

Indicator / target	TE comment
At least 20% of smallholders receiving extension services will be women	The overall target was that 40% of smallholders would receive such services, thus it is assumed that 50% would be women

[31] In cases, where severe weather is forecast, a SMS message is sent to ministries three days beforehand. Also CHS have five agrometeorologists, and for the last few years have had links with MoA in order to produce the agromet bulletins.

Women-led horticulture hothouses	There wasn't a target attached
Five out of 10 community organizations will be women-based with the mandate / capacity to manage saxaul plantations	The project established the women's task forces within each PPC to ensure equitable sharing of profits, including from tree seedling production / planting. However the ownership of the trees is with SCF

The Project Performance Reports (PPRs) mention environmental & social policy - principle 5 – gender equality & women's empowerment – 'no social risk, and currently no impacts that require management action'. The PPRs include a 'gender policy compliance' section. In the PPR to Nov-2020 for example, this section mainly included the gender disaggregated data.

During the project, AF policy was updated to include gender reporting. This meant that IP (CHS) was then required to monitor if activities were aligned with gender policy, such as with equal rights for women, and if not to recommend remedial measures. This meant that their role was also to ensure: women's voices could be heard at PB level; that the composition of the IAWGs was gender-balanced[32]; mainstreaming of gender-responsive activities / events; and that their own involvement in the project was gender balanced. Two results of this policy were that the CHS representatives on the IAWG board and it secretariat were women, and that 10 of the CHS staff trained on DEWS were women.

Importantly, within each of the PPCs, the project created a PPC Women's Task Force. The Association of Pasture Cooperatives (APPC) was led by a woman, as was the PPC in Muynak District. Concerning, the landscape-level desert tree planting, the 2019-20 MoU between the PPCs and UNDP indicated the involvement of 11,565 persons, of which 50% were women (~2,919 households).

The development of the three extension service centres involved five consultants, including two women, who supported the preparation of training programs and business planning. From 2017-21, the centres benefited 6,021 women (out of 21,200 beneficiaries) through provision of advice, training, hydromet information and materials.

Report - Gender in agriculture business & CCA measures in northern regions of KKPS (2021) 44pp, Russian, English

The report was detailed and of high quality. Its recommendations were:

- Expand awareness-raising / training for women in income-generating activities
- Expand outreach on financial banking services for women, promoting entrepreneurship in CCA
- Improve women's financial literacy, support by Chamber of Commerce & Industry and Women's Business Association
- Support CCA projects developed by women through loans - Enhance a gender framework of participating banks to include a 30% quota for women (farmers) in the loan portfolio
- Awareness-raising activities in addressing gender stereotypes in education and employment

3.2.4 Finance & Co-finance

UNDP Financial management and Finance

The financial management and implementation modality was according to standard operating procedures for administration & finance services, and for project management (UNDP Uzbekistan CO, 2021), which conforms to UNDP program & operations policies & procedures (POPP). Under the UNDP-supported financial arrangement, UNDP managed the book-keeping under their standard systems, with no separate bank account required. All spending could be and was presented in annual combined delivery reports (CDR), which could separate out the project expenditure under standard UNDP Atlas codes. The CDRs don't show cumulative numbers, they do however give a breakdown by the four components and project management The breakdown of planned and actual expenditures by year is provided in **Annex 4**.

The funding provided by the Adaptation Fund was $5,415,103 which included project implementation cost of $4,990,878, and a UNDP Headquarters General Management Service (GMS) fee of $424,225 (8.5%), which included all indirect UNDP support services[33]. These were outlined in the prodoc annexes 3 and 4 respectively[34].

The rationale and cost of this UNDP (as the Implementing Entity) management fee, was also outlined in letters from the AF Board (February 2014) confirming this total amount, and a letter from UNDP / GEF (May 2014) to UNDP Country Office confirming that the project would receive $4,990,878. This UNDP / GEF letter went on to indicate that UNDP CO would receive $149,726 of the GMS as their contribution to these indirect services.

[32] Could not be verified

[33] GMS fee - Identification, sourcing / screen activities - $21,211; Feasibility assessment / due diligence - $42,423; Technical support, project development, expert sourcing - $106,056; Implementation (monitor AWPB) - $212,113; Evaluation / reporting - $42,423

[34] Confusingly, the prodoc first page indicates the AF fund with the GMS already taken, but with the UNDP co-financing included

Furthermore it indicated that for direct UNDP CO services to the project (in the case of UNDP-supported NIM), that these should be reimbursed by the IP / government, in effect meaning additionally 'charged to the project'. These direct costs were re-iterated and agreed under a UNDP – CHS letter of agreement (December 2016), with a total not to exceed $145,000, and that they would be 'paid for from the UNDP co-financing TRAC funds of $200,000[35].

UNDP and its projects were exempt from VAT until January 2020, but thereafter needed to apply for a VAT (at 15%) reimbursement, with the actual payment and reimbursement handled by UNDP HQ. Thus the VAT cost to the project has remained on an exemption basis. i.e. zero, although any cost / recovery by UNDP HQ from this date was not verified.

UNDP payments (fund transfer) for project costs / services were authorized following PM 'requests for direct payment', which usually entailed a 10-15 day period to receiving funds. Purchase orders were used for amounts >$5,000. In the early years of the project, there were some delays in obtaining project payments, which were largely solved through SNIAWG selecting and approving project interventions.

The release of AF tranches was:

AF Tranche #	1	2	3	4	5	6	Total
Received	05/2014	09/2015	08/2017	01/2019	03/2020	12/2020	
Tranche value	164,863	1,029,163	1,375,163	1,004,763	863,963	552,963	4,990,878

AF tranches were released based on 80% utilization of the previous tranche

Audits

UNDP-supported NIM projects do not require a financial audit, thus the project was not separately audited. The country office audit of August 2020, was rated satisfactory, and 85% of the audit's recommendations have now been implemented. There were two recommendations, one of which concerned a VAT refund process not being in place from January 2020 when VAT became chargeable at source by the government.

Asset List

A list of assets was maintained. For goods over $5,000, there were three vehicles described with a combined purchase price of ~$81,000, however two of these were purchased by UNDP in 2008, and assumed to be given to the project for zero dollars, as their net book value indicated as such. The other vehicle bought in 2015, now only has a book value of ~$11,000. For goods under $5,000, the list just contains six laptops and a camera

Co-financing

Co-financing to date, was $558,127, which included UNDP TRAC funds $287,245, UNDP Climate Promise $119,995, UK FCDO $124,336, and Canada Fund $26,551. (A breakdown of co-financing is provided as **Annex 3).** In detail, co-financing secured included UNDP TRAC funds $200,000, with an additional $88,238 granted as a result of the project extension. In 2019 the Canada fund provided $26,551 for 'CA for women in the Aral Sea region'. In 2020-21, the UNDP Climate Promise Initiative to support the preparation of nationally determined contributions (NDCs) provided $130,000. In 2020-21, UK - FCDO - Actions to ensure climate security in Central Asia provided $170,000, for commitments under the Paris Agreement, and COP-26 preparation.

3.2.5 M&E Systems – Design & Implementation

The M&E system design and the implementation of the M&E system was rated as **Moderately Satisfactory**.

The prodoc management arrangements, described the Executive (CHS) as responsible for M&E, however, under UNDP-supported NIM, this was clearly the role of UNDP and their designated PIU. CHS and the IAWGs were more directly responsible for general project oversight and direction. The arrangements were however clear that UNDP were accountable for effective implementation of the project. In terms of project supervision, UNDP held the prime position, with CHS co-chairing the PB, and joining supervision missions to the field, and liaising with SNIAWG, and 'their' respective line agency staff in the district khokimiyats.

The project's M&E plan was presented in the prodoc. The Executive's role in M&E was described as signing-off on PB meetings, PPRs, and the Terminal Evaluation report. Concerning monitoring, annual audits and updating the risk log were mentioned. There were a number of standard M&E reporting tools, which were mostly present in the PPRs, which included: results tracking; risk management; environmental & social compliance, lessons reporting; and gender compliance. As there were no project audits, and apart from the main annual PPR presentations, and PB meetings, the main external M&E was through the MTR and this Terminal Evaluation.

[35] To end-October 2020, the project had been charged $192,347 for these direct services.

In terms of the results tracking, the Inception Report outlined five prominent indicators, which the project expected to monitor, and were then presented in the PPRs. These related to the project's subject matter, its present status and where the project expected to move forward to (with TE edit):

- 1/ Automatization of the hydromet infrastructure and its data platform being used to deliver hydromet information to end-users. This included not only collecting hydromet data for historic purposes, for early-warning farming bulletins, but also directly added data for early-warning on drought calculation models (See next – DEWS)
- Drought Early-warning system (DEWS) / hydromet products data sharing platform and delivery of bulletins
- Extension Centres being used as a delivery mechanism for hydromet / agromet bulletins
- The overall aim here was to develop an multi-module platform
- 2/ Extent in which hydromet services are able to meet the expanding demand of farmers and smallholders
- This meant not only the design of the data platform, but a host for it, and software with algorithms to analyze the data, and software / apps to present the analyzed data in user-friendly weather bulletins for farmers
- DEWS to go from a 10-day manual data-logger download system to automatic telemetric system, with water flow and drought indicators for water-sharing predictions and risk / early-warning advice
- 3/ DEWS algorithmic model forecasting – to be adapted to longer-term to allow seasonal drought measures / mitigation; and take account of both river water and channelized downstream system
- 4/ CA / SWC measures – Drip irrigation, laser, low-till – but also measuring farm water consumptive efficiency
- Soil fertility depends on a pH balance, however project soils are salt-affected, meaning the pH is too high. Land restoration can be measured by testing the pH after levelling, leaching, applying amelioration agents, such as glauconite
- 5/ Efficiency of sand stabilization / soil retention (from tree planting) – measure using GPS location markers

The insight here is the PM looking forward to impacts and how to monitor them, but also in the high expectation of delivering a multi-module platform, with both hydromet and drought early-warning forecasting. The former with data coming from the new AWSs, and the latter from the new hydro-posts, with added upstream rain / snowfall data. By project end, DEWS was running as a self-contained module, and the multi-module platform was operating as an information-sharing and delivery platform for the key line agency users.

M&E Technical Field Reports

Project monitoring also had a technical role, with for example the following reports produced:

- Identification of tree seedling nurseries in Takhtakupyr, Chimbay, & Karauzyak districts for (2018) 7pp, Russian
- Use of water-absorbent material for growing saxaul seeds in the nursery of PPC Muynak Ajiniyaz Jaylawlari, and then for planting in the ABDA (2020) 3pp, English
- Progress of saxaul seedlings in nurseries by PPC Bozatau Aspantay; by PPC Bozatau Shaxaman Jaylawi; by PPC Takhtakupir Mulk Jaylaw; by PPC Muynak Khakim Ata – all (2020) 4pp, Russian
- Checking the germination of black saxaul in forest nurseries of PPCs (2020) 4pp, Russian
- Training in rational land use in all pilot districts of the project (2019) 56pp, Russian
- Results of preparatory work on 5 ha of agricultural land using laser-levelling and ensuing irrigation and following agreed agro-reclamation standards (2019) 11 pp, Russian
- Improvement of soils for fodder production / reclamation – before / after comparison of 5 ha (2019) 15pp, Russian
- Growing liquorice for 80% seed germination (2019) 12pps, Russian; Sowing liquorice on a 5 ha (2019) 7pp, Russian; Liquorice cultivation to improve root systems, soil fertility & fodder on salt-affected soils (2019) 18pp, Russian

Social & environmental safeguards

The original SES plan was not available, however the LPAC mentioned Environmental & Social Screening – project was assigned as Category 1 (i.e. with sufficient activities to mainstream environment and social aspects)

Mid-term review (MTR, 2018, pp107)

The MTR made one or two useful points. It indicated: components 2 & 3 lacked an outreach strategy to scale-up to make activities institutionalized / sustainable; and with such a volume of activities based in KKPS, the project needed to amend its management structure to have a stronger representation there.

Scorecards

There weren't any scorecards utilized for the project.

Exit Strategy

The project produced an exit strategy (draft, 2021) with details of expected completion and handover of activities (see **Annex 5**) - a few insights can be drawn from the strategy:

- It provides confirmation of the hydromet / DEWS platform is not quite finalised
- The inference for PPCs, is that local VCCs should 'endorse' the PPC annual plans, which would be fine, however, there is risk, that the APPC would also want to 'stamp' the plans as well, which is beyond their remit, and is not acceptable. The APPC is to support the PPCs and not control them.
- The project extension centres are weak financially and in terms of staffing. Thus, they are likely to need on-going support in implementing their agreed outputs to district government, VCCs, and smallholders
- Concerning the pasture restoration demonstrations (river irrigation & re-seeding with added fodder species), a request was made to monitor the success of this activity, but also so it can be refined. It is a good example of applied research
- The PPCs with hydroponic fodder production, need business plans, not only so they are transparent for their members, but also equitable in providing the fodder products at a fair price for their members, before any outside sales
- Monitoring the tree nurseries is essential, because technical efficiencies need to found for the scaling-up and supporting planting success. Plantation survival rates need checking for lessons and on the impact on reducing sandstorms.
- For zero till - direct drill, it was mentioned that agri-business will not support this CA method. This is often true, because of grain crop contamination with weed-seed. The influence of agribusiness may need to be curtailed, as soil conservation is more importance / sustainable. Local legislation to support / protect the zero till fields may be needed[36].

Analysis of M&E

The UNDP GEF AF standard systems for M&E are predominantly report-based, and designed for fund release systems, whereas for monitoring project inputs / outputs for evaluations, spreadsheets of all the project 'numbers' are needed. It is often missing and a common failure of projects. In the case of this project, there were various spreadsheets of equipment supplied, sub-contractors hired etc, but the project lacked a clear excel-format listing of beneficiary smallholder farmers and target population beneficiaries. Instead the project design considered the former, and the project reported on the latter. So for example, a school receiving equipment for a hotbed, would be listed by the total number of pupils in that school. Thus the rating for M&E being moderately satisfactory.

3.2.6 Adaptive Management (Work planning, Reporting & Communications)

Work planning

Local Project Appraisal Committee (LPAC)

An LPAC meeting was held in April 2014. UNDP requested CHS to appoint a national project coordinator. A request to place the project office within CHS – both were agreed upon by Director General of CHS on receipt of letter from UNDP. UNDP noted it was the first AF project in Uzbekistan. The project was AF-approved in 2013, with fund allocation in February 2014. Membership of the PB was to be determined by the LPAC meeting.

Inception Phase

The project, which started with a 6-month inception phase was initiated through the approval of national procedures for international donor-funded projects (Prime Minister order #03/5-885, August 2014; and KKPS Council of Ministers decree #213, September 2014). This allowed in September 2014, the designation of a National Project Coordinator from CHS, and the UNDP hire of a Project Manager (PM) to lead the PIU. An Inception Workshop was held in October 2014. The inception report was dated March 2015 (pp99), which was 11 months after project start, however this was only six months after the PM was officially hired. The project's working method was adopted, essentially being: PM to prepare the AWPBs with the national project coordinator (CHS)[37], for approval by the RR and PB; and the national implementing agency (CHS) to coordinate the workplan schedule with the Ministry of Finance, bearing in mind the IAWG.

The workshop (with its 54 participants) considered a number of impact monitoring methods: change in income / productivity as a result of CA / SWC (Outputs 2.1 and 2.2); return on horticulture investments; impact of tree planting in the ABDA on sandstorm movement[38]; and an analysis of Amudarya river water flow (upstream extraction / downstream availability). However, none of these were added to the project design.

Annual Workplans & Budget (AWPBs)

The prodoc included a 6-year workplan with budget breakdown by year and by component (the four outcomes and outputs) and project management. However, due to project extension, there were actually eight AWPBs from

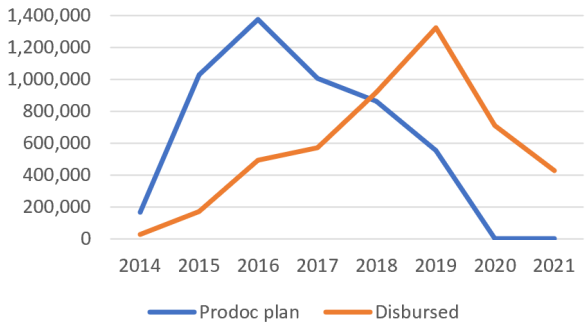
[36] The relevant government partner did not feel that this was an issue, and cited wheat planting, which crowds out weeds, however, the farmers grow different crops, some of which are not able to supress weeds so easily. Furthermore the project supplied backpack sprayers to kill weeds

[37] CHS General Director was the NPC, PB chair, and NIAWG chair. He was also the UNFCCC national focal point, and authority for AF

[38] In part because clear evidence is often needed for GEF - SCCF or GCF proposals for example

2014 to 2021. The AWPBs were prepared by the PM and cleared by the UNDP Cluster Lead on Environment & Climate Action[39]. The AWBPs were broken-down by outcome and UNDP accounting code[40]. There were many revisions of the AWPBs, as it was difficult to roll-over committed funds to a following year, and also due to revisions when extra donor funds were received.

	2014	2015	2016	2017	2018	2019	2020	2021	Total
Prodoc plan	164,863	1,029,163	1,375,163	1,004,763	863,963	552,963	0	0	4,990,878
Disbursed	26,545	170,386	490,844	569,175	918,228	1,321,450	710,908	429,671	4,637,209



With AF ground funds of $4,990,878 and AF ground fund disbursement of $4,637,209 by 15th October 2021, this represents a spend of 93%.

Reporting

The primary reporting method for fund release was an annual PPR, which up on clearance from the UNDP Istanbul regional office and its GEF / AF representative, and on an 80% spend of the previous tranche, the following annual workplan funds could be released

Communications

The project PM held weekly meetings with CHS in their office. There were also *ad hoc* meetings as necessary, and formal (quarterly) progress meetings. As a result of covid, the project also adapted in going 'on-line', when 'face to face' meetings could not be held. For example, the PM / Task Managers weekly meeting went online as did 2020 PB meeting. The project's telegram group messages proved to be especially useful during covid.

3.3. Project Results

In terms of results, the TE assessed two levels of the project results framework - Outcome and Output[41]. This was guided by the indicators and targets set at each level. Project success is also built upon achievement of the outputs, according to 'framework logic.' UNDP were provided with two tables: Progress towards Objective and Outcomes (Indicator-based) which is described in **Annex 1**; and Progress towards Outputs which is described in **Annex 2**. These tables were rated and commented on (with the rating structure in **Annex 9**). A detailed result-level analysis follows firstly of the Outcomes with their Indicators, and then the corresponding Outputs.

3.3.1 Effectiveness - Achievement of the Results Overall

Effectiveness of the Objective and Outcome-level results based on AF Indicators

[39] They didn't appear to be endorsed by the RR / DRR or CHS

[40] Contractual services companies (72100); Miscellaneous expenses (74500); Audio visual & print costs (74200); Travel (71600); Local consultants (71300); Contractual services Individuals (71400); Training workshops & conferences (75700); Equipment & furniture (72200); Professional services (74100); International consultants (71200)

[41] There were no objective-level indicators

Higher level Indicators that align project objective / outcomes with the AF Results Framework

Project Objective Indicator	AF Outcome Indicator	Result
% of population with improved adaptive capacity & vulnerability to drought reduced	# and type of institution with increased capacity to minimize climate change risk (AF 2.1)	- The project records indicated that there were 118,672 direct and indirect beneficiaries from the activities, which was equivalent to ~50% of the target population. [Total based on activity x beneficiary, and beneficiaries could be part of more than one activity] - There were 24 main institutions of which 14 were government; five individual / civil society organizations, including householder, dekhan farmer, and Production Pasture Cooperative (PPC); and five academic [(1)]
	# of people with reduced risk to extreme weather (AF 2.2)	- The project indicated that just over 40,000 direct and indirect beneficiaries adopted either CA and / or SWC practices. This equates to ~20% of the rural population (193,907 persons) in the six project districts.
% of population adopted climate- resilient farming	% of population aware of predicted CC impacts, and of needed responses (AF 3.1)	- The project established three science-based extension service centres, which provided agriculture support to 21,200 smallholders - The number of government officials and smallholders who have received the seasonal drought early-warning system (DEWS) bulletin is 5,157 persons (i.e. the number of hard copies distributed by the project)
	Modification in behaviour of population (AF 3.2)	- Under the CA activities, there were 41,194 direct / indirect beneficiaries adopting the measures - Under the SWC activities, there were 43,750 direct / indirect beneficiaries adopting the measures - Under the horticulture activities, there were 57,875 direct / indirect beneficiaries adopting the measures
Project Outcome Indicators	**AF Output Indicators**	**Result**
# / quality of forecasts and drought early-warnings	# of staff trained to respond to, and mitigate impacts of climate change (AF 2.1.1)	- There were 44 different training courses by type, which were replicated across the 6 districts, but the number of institutional staff trained was not calculated
% of farmers / receiving science-based extension services on drought risk	Institutional capacity increased to respond to climate change impacts (AF 2.1.2)	- There were 14 government and five academic institutions with improved capacity in hydromet, agromet, EWSs, and with capacity improved in CA, SWC and awareness actions - The number of participants attending training events was 10,476, out of which there were 2,415 women (23%)
% of population adopted climate resilient CA and water-saving measures at the farm level	# and type of risk reduction actions or strategies introduced at local level (AF 3.1.1)	- The type of CA and SWC actions taken included zero-till / direct drill, mulching, crop rotation, plough-pan breaking, plant disease control, fodder production, horticulture, hotbeds, drip irrigation, laser land-levelling, & borehole water supply - covering 10,610 ha - For horticulture, the main activity was the creation of 2,674 small hotbeds provided to 2,581 smallholders. Larger hotbeds were also created for / by seven PPCs and 83 schools - To reduce grazing pressure, eight hydroponic fodder production units were constructed, with the provision of purified water from boreholes. They produce 7,240 kg / day of fodder for 5,083 people's ruminant livestock - Clean drinking water systems were also installed in schools
Coverage of landscape-level CCA measures for sand stabilization / moisture retention	% of population covered by adequate risk-reduction systems (AF 2.2.1)	- The project planted 75,800 ha of young saxaul trees in the Aral Basin Desert Area (ABDA). The trees were from 30 million seedlings produced by pasture production cooperatives (PPCs), who also planted the trees - For pasture restoration, the project undertook: saturation flooding to allow seed bank germination (~3,000 ha so far); and the collection of fodder seed for stock nurseries; The 13 PPCs also have 'pasture rotation rational use plans' for their 27,000 ha
	# of people affected by climate variability (AF 2.2.2)	- The target was the rural residents in the six districts. In 2020, there were 193,907 persons who are all affected by climate change
Population % aware of and practicing climate-resilient agriculture	# of press releases that have covered the topic (AF 3.1.2)	- The project produced 38 knowledge products (bulletins, guides) delivered to 15,525 end users - Of these products, the project created ten national press releases and 28 social media posts

(1) Type of institution

At the national level, there was:
- CHS – IP; host of the hydromet / DEWS early-warning platform
- Ministry of Water resources (MWR), Ministry of Agriculture (MoA) – direct recipients of DEWS bulletins
- Ministry of Economic Development & Poverty Reduction (MEDPR), Ministry of Finance – all PB members
- State Committee for Ecology & Environmental Protection – advisors for the ABDA tree planting

At the KKPS regional level, there was:
- CHS regional office – management of the AWS and hydro-posts
- Council of Ministers, MWR, MoA - members of the SNIAWG, direct recipients of the DEWS bulletins
- State Committee for Forestry (SCF) – recipients of the saxaul tree seedlings; supervisors of the ABDA tree planting
- State Committee for Ecology & Environmental Protection - advisors for the ABDA tree planting
- Association of Production Pasture Cooperatives (APPC) – established by the project to represent the PPCs

At the district level
- Household farm plot owners / dekhan farmers (80% of the target group)[42] and medium-sized farmers (20%) – direct beneficiaries of project demonstration practices, including CA, SWC, horticulture hotbed & hothouse production
- Production pasture cooperatives (PPCs) – direct recipients of project equipment / demonstration practices, including tractors with laser-guided land-levelling tools; *ex-situ* hydroponic fodder production with boreholes and water purification technology; and *in-situ* pasture restoration measures
- Production Pasture Cooperatives Women's Task Force (PPCWTF) – ensured equitable sharing of profits from the PPCs and employment from tree production and planting
- Village Councils of Citizens (VCC, Mahallas) in the project's six districts
- Schools – direct recipients of boreholes and water purification technology, and hotbeds for vegetable production

Other direct (academic) stakeholders
- State Committee for Science – upgraded software to create DEWS focused on Amudarya downstream water scarcity
- Tashkent Agrarian university, Nukus campus; & Agro-industrial college, Kegeyli District – both hosted science-based extension centres
- Nukus Academy of Science - supported CA through soil amelioration using the glauconite mineral
- Nukus Research Institute for Natural Sciences – supported pasture rehabilitation using drought-tolerant fodder seed collection & multiplication

(2) Beneficiary numbers

CA / SWC measure	Coverage (ha)	Beneficiaries	Of which Women
Zero seeding	1,580	5,834	2,235
Mulching	303	1,518	382
Crop rotation	400	2,000	980
Deep soil loosening	188	984	482
Plant biosecurity	562	3,794	986
Total of above 5 measures	*3,033*	*14,130*	*5,065*
Fodder production	*ex-situ*	2,917	1,429
Hotbeds and hothouses	4.6	57,875	27,709
Intensive gardening	24	11,085	3,326
Laser field-levelling	7,512	7,000	840
Drip irrigation	37	16,527	8,221
Aquifer borehole water supply	n/a	9,138	3,564
Total	10,610 ha	118,672	50,154

Source – Project records - Gender study (2021)

The higher level AF rating for the project was **Satisfactory**.

3.3.2 Effectiveness – Achievement of the Outcome Indicators and Outputs

Effectiveness of Outcomes at the Indicator and Output Level

Outcome 1 - Institutional & technical capacity for drought management and early-warning (2 indicators)

The overall grading for Outcome 1 is **Satisfactory.** There were two indicators attached to the Outcome 1 level,

[42] Usually referred to in this report as smallholders

which were both rated as: satisfactory (S). The justification for these ratings, were that: the project developed an hydromet early-warning system, which in particular contained a river drought early-warning module, that was designed especially for farmers living in the lower reaches of the Amudarya river; and the project-established three agriculture extension service centres (see **Annex 1**).

Under Outcome 1, there were five sub-indicators which referred to: establishing a weather forecasting & hydromet infrastructure network with a coverage of 40,000 km^2, and with the delivery of early-warning forecasts; and to the provision of extension service facilities with over 20,000 farmers accessing these facilities.

Forecasts & drought early-warning for Karakalpakstan (KKPS)

Result against Indicator

A reliable long-term forecast of water availability for the Amudarya river downstream areas was needed for decision-making to mitigate against no / low water and drought occasions in KKPS. Ten automatic weather stations (AWS) with telemetry were installed for CHS to improve local weather forecasting services. To support both weather and water availability forecasting, the project developed a multi-module hydromet platform to deliver weather, agromet and drought early-warning forecasts, with CHS as the host.

Summary Analysis

The hydromet platform will remain in testing phase until end of project, when it will be adopted by government for use by CHS and others. As part of the system to provide water flow data, five water gauge stations were positioned in the Amudarya river downstream area. The data is analysed to become part of the project Drought Early-Warning System (DEWS), specifically adapted to this region of the Amudarya river, where water scarcity is a major issue. The accuracy of 6-months ahead water availability forecasts has been modelled / estimated at 70% correct.

Output 1.1 - Hydromet infrastructure with automatic telemetry (HS)

(Target: Eight AWSs and two waterflow meters installed and transmitting data)

Result

Ten AWSs were installed (2017), which made up the entire weather monitoring network for CHS in the KKPS region. The AWSs were equipped with telecom masts and transmitting equipment, which linked the data loggers via SIMs card to the telephone and internet network, i.e. making them 'automatic'.

Five hydro-stations with waterflow gauges were installed in the downstream (channelized) basin of the Amudarya river. Two of the hydro-posts were equipped with water profilers to measure waterflow, volume and depth. The waterflow meters were linked to data loggers and a power supply. Other equipment included: two motorboats, 12 laptops and 4 portable radios for data access and monitoring

Analysis

The AWSs were to UN World Meteorological Organisation (WMO) standard, and are in use. However, in order to become fully part of the WMO Global Telecommunication System (GTS) synoptic grid, they are undergoing a 3-year calibration period. Since installation, due to dust storm damage, the project has lost five sensors and three data loggers, of which one has been repaired and two are new models, so the 3-year calibration period for these has been re-started. Only two of the five hydro-posts and their gauges are telemetric. The others rely on manual download of data from their loggers.

Output 1.2 - Software platform of hydromet data with analysed information / access for end-users (S)

(Target – hydromet stations -AWS + hydro-posts - cover 40,000 km^2)

Result against Indicator

The project created a new hydromet information platform, for early-warning and forecasting of hydromet / agromet information. The hydromet early-warning platform (server) is hosted by CHS, with master access for CHS, MWR, MoA, and Ministry of Emergencies. The early-warning alerts / bulletins (hydromet, agromet, and drought early-warning) are sent to 15 (software licensed) primary government agency users, in the form of mobile telephone voice message, or email text message. The recipients include: KKPS council and government administration, and its relevant districts, water user association for Amudarya river downstream, and the farmers council. The expected future coverage is 50,000 farmers. The system is now in the final stages of operational testing.

The drought early-warning system (DEWS) is a component part (but self-standing module) of the hydromet

platform. The DEWS module itself, is capable to provide a water availability prediction each October – i.e. 6-8 months in advance of the growing season the following year, and for each month during the farmer growing season itself from April to September.

Analysis

The hydromet platform is set to become operational by November 2021. CHS have government agreement to integrate the platform into their systems, once the project testing is complete. The aim is for CHS to upgrade localised seasonal forecasts, emergency / disaster forecasts, and provide hydromet forecasts, which have an agromet element. The DEWS module is working, but the extent to which the data from the ten new AWSs are going to become part of the platform was not clear.

Output 1.3 - Drought early-warning system (DEWS) to minimize the impact of drought (S)

(Target: Seasonal forecasts and 2 weeks-ahead forecasts for early-warning)

Data from the water meters, historical data, and upstream mountain rain / snow data, and data from the AWSs, is used to predict water availability, thus DEWS is used to forecast low water / drought, for 6-8 months in advance.

The DEWS software model is licensed Delphi software. The State Committee for Science used the software and extended / re-coded part of it using Mathlab software to focus on Amudarya downstream. CHS staff were then trained in the used of this new DEWS software system. The hydromet platform is being used as the delivery mechanism for DEWS. After testing with CHS, the package is now able to provide a both a early-warning seasonal forecast and a monthly forecast during the crop growing season from April – September[43].

Since 2018, the project has prepared DEWS 'October' forecasts and issued hard-copy bulletins for the 6-month advance early-warning on water availability for the downstream Amudarya river area, for farmers. The accuracy of the model is considered as very good, and can be fine-tuned. To date, the end-users have received 5,157 copies of these drought early-warning bulletins. (see **Annex 5** for a copy of the October 2020 bulletin)

Analysis

The DEWS software algorithm partly relies on historical water flow data, but also weather data, for example if the temperature rises, then evaporation increases and water flow availability falls. It also relies on upstream rain and snowfall in the higher mountain valleys.

Within DEWS, MWR undertake some data interpretation, to be able to present an 'expected river water deficit' in MWR bulletins. The hydromet platform with the DEWS module is shared by CHS and MWR[44]. For the recipients, the early-warnings are qualitative (expected drought / low water / medium flow / high volume), and quantitative - e.g. for the October 2020, bulletin, the prediction was a 30% reduction in water volume against the norm, with m^3 / per second flow rates given for two stations.

The DEWS system is expected to become fully operational together under the multi-user hydromet platform in November 2021. At present the system is a project pilot, but will be government approved to be fully integrated into national systems, once the project ends.

Farmers & pastoralists receiving scientific extension services to reduce drought risk

Output 1.4 - Extension services for smallholders to support them in CCA (S)

(Target - Three extension centres to deliver training /access to 40% of farmers / pastoralists (of which 20% women)

Result against Indicator

Three extension centres have been created within: Tashkent State Agrarian University, Nukus Campus; Agrarian-Industrial College, Kegeyli District; and Konsawt Markaz Company. The Nukus and Kegeyli-based centres have been provided with demonstration equipment, in the form of high-tech greenhouses, and micro-climate agromet stations[45]. The three centres have also received soil & water analysis equipment for laboratory and field work:

For the two academic centres

- Two high-tech greenhouses (400 m^2 for Nukus Agrarian University; and 144 m^2 for Kegeyli Agrarian college)
- Two automatic micro-climate agromet stations for localized weather and soil information

[43] Before the project, there was only water volume / drainage data being collected, and no early-warning forecast of water scarcity for water coming into the delta in the Amudarya downstream area.

[44] Water monitoring system is on two levels – hydro-posts on main rivers / trunk waterways are managed by CHS; whereas the water transport system of canals and channels for irrigation and drainage is managed by MWR / MoA.

[45] Agromet data is available through the telegram @FieldClimateBot – 3 & 7 day forecasts accessible, as well as archived data

Shared between the three centres
- 3 sets of soil & water equipment (pH / conductivity / moisture meters, drying ovens, precision scales, soil sampling kit)
- 3 photometric stations (to determine soil & water chemical elements); 25 thermometers; 25 air humidity meters

The extension centres provided services to 21,200 farmers (of which 28% were women), on the subjects of CA / SWC, horticulture and CCA.

Analysis

The value in working with these institutions lay in their remit to undertake research, test, pilot and disseminate new advances in arid zone farming, and in horticulture nursery production in particular. The services provided by the three centres are: plant breeding & plant protection; hothouse horticulture; drip irrigation; laser levelling & zero tillage; soil & water analysis; livestock breeding & vet service (Tashkent Agrarian University only); and agriculture business planning. The project introduced a micro-climate agromet services platform and app called FieldClimate, which uses the weather data from global online weather forecast services, and the micro-climate data from the agromet stations, which provides more specific information for modelling expected plant disease and pest problems for example.

Outcome 2 - Climate-resilient farming established on smallholder farms (1 indicator)

The overall grading for Outcome 2 is **Highly Satisfactory.** There was one indicator attached to the Outcome 1 level, which was rated as: highly satisfactory (HS). The justification for the this rating, was that the project was able to fully demonstrate a variety of CA / SWC, horticulture hotbed and hydroponic measures, and create a high level of uptake and adoption by the smallholders and other stakeholders.

Under Outcome 2, there were four sub-indicators / targets, which concerned: the % of smallholders (40,000 dekhan farmers, covering 80,000 ha) adopting CA measures (low till, mixed cropping, fodder production, crop residue for mulching) and SWC measures (land levelling, channels and furrows for irrigation and saline water drainage, drip irrigation) to improve water use and reduce soil salinity; women-led horticulture hothouses created; and mainstreaming CA / SWC practices into agriculture and water policy / regulations.

Farmers adopting climate-resilient conservation agriculture / water-saving measures

Result against Indicator

Overall 41,194 beneficiaries, of which 34% were women have adopted CA / SWC practices.

Summary Analysis

The project invested in a significant basket of proven, but innovative CA / SWC practices, with a significant amount of new equipment to support the adoption of these new techniques. These included: laser-guided land levelling; drainage ditching and furrow-forming to reduce waterlogging and soil salinity; deep cultivation and plough-pan breaking to improve soil drainage and aeration; and mulching residues to build-up of soil organic matter (SOM). These measures allowed for a reduced volume of scarce irrigation water to be used, with drainage in order to lower salinity levels. Thus, through better management of salt-affected soils, the productivity of the soils for cropping was improved.

<u>DEWS bulletin – CA / SWC / cropping advice using less irrigation water</u>

One of the key outputs, was the technical solutions within the DEWS bulletins. Apart from providing a forecast of water deficit against the norm, the bulletins provided a basket of solutions for treating and working with salt-affected soils, with reduced water availability, and how to use less water to produce crops These were the soil treatments and CA / SWC solutions under irrigation conditions with a water deficit of 25-50% against the norm (October 2020 bulletin, with a 30% water deficit forecast) for the April – May planting in 2021:

Recommendations to overcome water deficiency	Water saving
Crop composition	
Withdraw from rice cultivation	25-30,000 m^3/ha
Organize crop composition (a crop compatibility scheme was provided): - **Highly drought-tolerant crops** - millet, sorghum, chickpea, vetchling, cucurbits, melon, sunflower, yellow lucerne, sudan grass, safflower; trees - oleaster, apricot, cherry, almond - **Medium drought-tolerant crops** - cotton, wheat, barley, rye, maize, pumpkin, lentil, bean, peanut, vetch, alfalfa purple, potato, tomato, root crops - carrot, beet; and - **Combined drought & salt-tolerant** - sorghum, sudan grass, sorghum-sudan grass hybrid, safflower	

Irrigation	
Soil leaching using chemical 'biosolvent' (8 litres / ha) to ensure water-saving & soil desalinization[46]	30%
Apply drip irrigation on 25-50% of irrigation area, and hotbeds equipped with drip irrigation	30-60%
Apply advanced 'ridge & furrow' irrigation on the rest of 75-50% of irrigation area:	
• irrigation through short furrow	12-22%
• irrigation through furrow	33%
• cross irrigation	15-25%
• pulse irrigation	10%
• irrigation through furrows covered with perforated black polythene film	30-40%
• irrigation using equipment (siphon, flexible hose, mobile portable tray)	15-25
Irrigation with drainage whilst monitoring the soil salt content, bearing in mind the crop salt-tolerance: - on loam soil with a soluble salt content of < 0.5 g / litre – can irrigate up to 4 g / litre - on sandy-loam soil a with soluble salt content 0.5 – 1.0 g / litre) – can irrigate up to 4 - 6 g / litre	
Agrotechnical techniques for outdoor growing	
Chiselling (up to 60 cm) every 4-6 years	20%
Laser-levelling	30%
Deep inter-tillage before the 1st irrigation & applying organic fertilizers or organic minerals	Up to 10%
Sowing under a cover	Up to 30%
Production of hydroponic green fodder for livestock animal	

The above table considers soil preparation techniques, that improve soil drainage, which allows the soluble salts to be leached out of the soil, when it is irrigated. This includes chiselling, deep tillage to begin with to break-up the plough-pan. Then using 'ridge and furrow' for example for the irrigation water to run along the furrows, with planting on the ridges, to draw salts out of the soil[47]. It also considers using a chemical (biosolvent) that causes the sodium ion to be released during cation exchange, and therefore be able to be leached from the soil when it is irrigated[48]. The irrigation in general will also leach sodium chloride, which is the main salt concentration issue in saline soils. The table also considers water channels with drainage can be used for irrigation, based on a maximum limit of soluble salts in the soil – i.e. the limit for particular crops to be able to grow to produce a harvest[49]. Lastly it gives an indication, of which crops are drought-tolerant and / or salt-tolerant, and recommending to stop rice production, because it just needs too much water that isn't available, and makes the whole farming system unsustainable.

Treatment of Saline Soils

A saline field can only be reclaimed by removing salts from the plant root zone. In some cases, selecting salt-tolerant crops may be needed in addition to managing soils[50]. There are three main ways to manage saline soils:

- Salts can be moved below the root zone by applying more water than the plant needs. This method is called leaching
- Where soil moisture conditions dictate, combining, leaching with artificial drainage
- Salts can be moved away from the root zone to other locations in the soil area, where they are not harmful. This is called managed accumulation (such as alternate wet / dry furrow irrigation)
- Other – soil organic matter (SOM) build-up from crop mulching-residues where the saline water table is close to the surface, this reduces surface water evaporation (so it is useful for Amudarya delta soils which can be waterlogged)

These are four of the CA / SWC measures that the project demonstrated.

Salt-affected soils – secondary salination

[46] The biosolvent is a deflocculating polymer called 'Flospherse' that breaks up soil's clay particles allowing the sodium to be released and thus leached from the soil.

[47] Alternate 'irrigation furrow - dry furrow' is one method – the salts are either drawn away with the water, or accumulate as dry salts in the dry furrow. Thus, plant roots can breathe, and not have water drawn out of them due to dissolved salts. (see **Annex 5**)

[48] This would be most appropriate if the soils were sodic, however they appear mostly saline.

[49] Yields of most crops are not significantly affected where salt levels are 0 to 2 dS / m. Generally, a level of 2 - 4 dS / m affects some crops. Levels of 4 - 5 dS / m affect many crops, and above 8 dS / m affect all but the very salt-tolerant crops (Soil Electrical Conductivity (EC) measured in deciSiemens per meter) Crop losses may occur with irrigation water containing >0.77 g / litre TDS (total dissolved salts) or EC >1.2 dS / m. Losses / stunting are on a percentage scale against the concentration of the dissolved salts

[50] Saline soils cannot be reclaimed by chemical amendments, conditioners or fertilizers.

Soils become dryer with low rainfall and a lowering of the groundwater table. This has in places been caused by water depletion due to permanent drainage into the Aral basin desert area, with a lack of replenishment from the Amudarya river delta. Thus, with a lack of irrigation, and soil moisture evaporation, salts accumulate towards the soil surface. It is then difficult to grow crops, as the salts draw water out of plant roots, due to osmosis[51]. The problem then is how to irrigate to leach the salts down through the soil profile again, when there is insufficient water to irrigate.

Output 2.1 - Conservation Agriculture (CA) (HS / S)

Target - 40,000 smallholders (covering 80,000 ha) have adopted CA (low till, crop residue mulching, & fodder production)

Result against Indicator

Overall 41,194 beneficiaries have adopted CA practices. The main practices were *[with equipment approximately matched]*:

- The smallholders / PPCs received tractors, mounted 3-share ploughs, trailers, boom & backpack sprayers, disc harrow, subsoiler, chisel soil-rolling, and portable water pumps
- plough-pan breaking using deep tines - 188 ha (984 people, 49% female) *[One soil-breaking chisel – deep tines (for soil aeration of cropland / pasture; One subsoiler for soil decompaction below the plough-pan depth[52]]*
- zero tillage – 1,580 ha (4,934 people, of which 38% women in 5 districts) *[Five zero-till / direct-drill seeders – they cut crop residue below soil and plant seed]*
- biological pest control and organic fertilizers - 562 ha (3,694 people, 26% women) / crop residue mulching – 303 ha (1,418, of which 25% women) *[1 plant residue chopper]*
- crop rotation - 400 ha (1,900 people, 49% women) *[10 ploughs for 5 districts; 1 disc harrow for moisture closure, field leveling, weed control, stubble ploughing & pre-sowing treatment; 3 plant bed furrow formers]*
- eight hydroponic units producing livestock fodder (7,240 kg / day) - in five districts (5,083 people, 49%)
- field fodder production including one using hydroponic technology

Analysis

In 2013, when the project was designed, the number of farmers in the project area was 51,208. The target was to reach 80%, who were taken to be the subsistence or smallhold farmers. This equates to 41,194 smallholders[53]. Thus the target number was set at 40,000 smallholders. However, the project calculated that they reached this 80% figure in terms of 41,194 direct and indirect beneficiaries (which is not the same as farmer households). The rural population of the six districts is now ~194,000 (2021), which would equate with the project reaching ~20%. The actual number of smallholders who adopted these CA measures is also difficult to determine. In terms of the land coverage target for CA measures, 2,471 ha were recorded, which is far below the 80,000 ha target, and less than 5% of the target, thus the intervention should be viewed more as a demonstration.

Hydroponic units

The units were established to grow grass / fodder / cereal protein plant species, from which three products were produced – vegetation biomass, a granulated bulk, and a liquid feed with a high protein content (as a milk substitute for young livestock). A local company designed the production unit, starting with smaller units, before enlarging the scale up to 200 m^2 / unit. The obvious benefit is the reduced stress on pastures, with one unit able to produce products equivalent to 1,000 ha of pasture. Hydroponic fodder production useful due to the volume of fodder that the livestock consume. The hydroponic fodder has a longer growing season (all year round if production houses are heated)[54]. In terms of beneficiaries, there were 1,081 direct producers / consumers, and 4,002 indirect / outsider buyers of the fodder products.

Output 2.2 – Soil & Water Conservation (SWC) (HS / S)

(Target - 40,000 smallholders, covering 80,000 ha, adopt water-saving practices (e.g. land levelling, and drip irrigation) to

[51] The main salts are sodium chloride, sodium sulphate, magnesium sulphate, sodium bicarbonate, sodium carbonate, calcium sulphate, and calcium carbonate

[52] The plough-pan is the depth the plough cuts into the soil, and after a number of years, the soil, especially if clayey, becomes smeared and compacted at this level, which results in poor drainage, and a build-up of salts for example, which will become toxic after time. Thus pan-breaking every 3-4 years can be undertaken, if heavy ploughs are being used, or less often once the initial compaction is removed, and zero-till methods are being used instead.

[53] In 2021, the number of smallholders was 57,414

[54] Interview quote - Munyak - 'Another remarkable thing is installation of hydroponic unit with capacity to produce 500 kg/day of green fodder that demonstrates water, energy and raw product saving, while reducing load on the natural pasture.'

improve water use and reduce salinization)

Result against Indicator

43,750 people (15,951 women) adopted water-saving measures on 80,000 ha *[with equipment approx. matched]*:

- laser-guided land leveling with a grader (7,512 ha in 6 districts with 7,000 people with 12% women) *[16 machines]*
- drip irrigation for smallholders - 6 districts on 37 ha (16,527 people, with 50% women) [2,106 sets of gravity drip irrigation systems, to cover 100 m^2; and 630 sets of irrigation systems to 250 m^2 (6 districts)
- nine sets of solar-powered drip-irrigation for 24 ha of horticulture gardens in 5 districts (11,085 people, with 3273 women) [with the provision of 21,610 seedlings for creating intensive orchards (6 districts)]
- 18 boreholes & 13 solar pumps for aquifer water extraction; 18 reverse osmosis systems[55] for water purification (inc. removal of salt, metals, fluorine, sodium) in 5 districts (9,138 people, with 39% women)
- Seven hydrolysis units for the conversion of brine emitted from the purification process, into a disinfectant - sodium hypochlorite (3 districts) [Daily production of 1,000 liters of the disinfectant for use by 112 institutions in 5 districts]
- ten solar water heaters for 10 schools (5 districts), for 7,673 students (3,759 girls)[56] - Installed for hygiene
- Introduction of glauconite mineral as a soil amelioration agent

Analysis

The number direct and indirect beneficiaries was presented as 43,750, however it was difficult to verify this figure, or calculate the actual number of smallholders involved, or the area of land undergoing these soil & water conservation (SWC) measures.

Laser land-levelling

The activity has been successful and will be replicated / scaled-up as the equipment can continue to be used for upcoming seasons. Laser-guided levelled land is irrigated if possible and used for grain and livestock feed crops[57]. The use of such project farm equipment has been decided by the PPCs with transparent rotation lists for PPC members. There is also an agriculture machine fleet maintenance service available to the farmers.

Drip irrigation

The project demonstrated drip irrigation (from purified water), with the larger hotbeds with which was successfully adopted and replicated. As a result, horticulture production increased and improved the availability of home-grown produce and improved socio-economic livelihoods[58]

Water boreholes[59]

The salt content of the water extracted from the 18 boreholes required a reverse osmosis and hydrolysing process to produce potable water and sodium hydrochloride as a disinfectant by-product[60]. Due to the success of making potable water, more boreholes are being requested, however the extent that the State Geodesy & Cadastry monitors aquifer levels was not determined. The disinfectant produced was also useful at the height of covid.

Glauconite mineral

Research shows that more than 95 percent (475,000 ha) of irrigated lands in KKPS have raised levels of salinity. Working with the Nukus Academy of Science, the project introduced the use of the glauconite mineral as a soil amelioration agent. The demonstration in Chimbay district of adding the pulverized glauconite mineral to soils, was successful with cotton yields improving[61]. Apart from the project-supported demonstration, there is on-going research on 21 farms growing wheat and other crops[62].

The mineral glauconite holds water (and absorbs atmospheric moisture) in part due to its clay-mica structure, therefore 20% less irrigation water is required. It improves soil structure through binding and speeding up the production of soil organic matter by soil organisms. It also reduces soil salinity (lowers soil pH); and allows mineral

[55] with a capacity of 0.5 m^3 / hour and one reverse osmosis system 6 m^3 / hour

[56] the pupils are also on the list of greenhouse users

[57] Land is often required to be leached of salts before crop planting

[58] Interview quote from Muynak – 'The farmers didn't trust the drip irrigation systems due to high salinity of water, but project has demonstrated its efficiency with clean water. ~200 extra seasonal jobs created though preparing hotbeds with drip irrigation systems.

[59] 200 mm boring bit with 168 mm of tubing; depth of hole 25-50 m

[60] It was noted that deeper boreholes also had salinity issues, so they were not drilled by the project

[61] Application 800 kg / ha for cotton once every 3 years

[62] Results indicated adding glauconite to loam / clay soils increased water-holding properties. Loams showed 1.5 times (anecdotal)

potassium release[63]. Not only has KKPS known deposits of the mineral, the project changed the conventional wisdom that glauconite wasn't good for soils.

Output 2.3 - Horticulture greenhouses for smallhold farms established to minimize impacts of droughts (HS)

(Target – 40% of 40,000 target farmers on 20,000 ha of farms)

Result against Indicator

57,875 people (48% women) benefitted from 2,674 hotbeds of three sizes, sowing under polythene and hothouse heating systems[64]

- 28 x 115 m^2 hotbeds for horticulture /seedling / cuttings production
- 112 x 100 m^2 hotbeds for horticulture / seedling / cuttings production (6 districts + Nukus)
- 2,534 x 12 m2 hotbeds
- 75,000 meters of plastic pipe for the frames, and polythene (6 districts)
- 18,767 ha - sowing under polythene for higher soil temperature / moisture leading to early growth (with 2 units of arc-film-layer to make the poly tunnels (Kegeili, Bozatau)
- Hothouse heating systems in five schools (3,233 pupils)

Analysis

The target of 40% equated to 16,000 smallholders benefiting from establishing hothouses of one form or another. In practice, the main type was a polytunnel system, with undersoil mulching for added heat generation, known as a hotbed. The project records indicate 55,182 users benefitting from hotbeds which were mainly of three sizes (115 m^2, 100 m^2, and 12 m^2)[65].

However, these beneficiary numbers are total direct and indirect beneficiaries[66], In perspective, in terms of smallholders, PPCs and schools:

- 2,534 smallholders created 2,534 hotbeds, each of 12 m^2 size
- 34 smallholders, and 78 schools created 112 hotbeds, each of 100 m^2 size
- 13 smallholders, 7 PPCs, and 5 schools created 28 hotbeds, each of of 115 m^2 size

Thus, in total the direct beneficiaries of the hotbeds were 2,581 smallholders, seven PPCs and 84 schools, thus the target of 16,000 smallholders was not attained, however the basic area of hotbed / poly-tunnel covered was presented as 18,767 ha, compared with a target of 20,000 ha. In short, the project intervention, was highly successful, especially in terms of widespread take-up by project smallholders, PPCs, and schools.

The hotbed system is one where a mulch of straw and manure is laid under the soil, and a plastic sheeting is laid in above the soil. Heat is then generated from below as the manure decomposes, with the seedling plants not being exposed to cold soil temperatures. Heat is also generated from sunlight and wind protection under the plastic sheet.[67] Thus, the system is more sophisticated than a basic 'cold frame' , and allows vegetable growth to start and end earlier in the season, which is needed when the growing season is short and the drop in autumn temperatures comes earlier (in part due to climate change).

Output 2.4 - Regulatory framework to support farmer CCA measures for replication and upscale (S)

(Target - # of legal acts to support CCA measures in agriculture and water use)

Result against Indicator

The project supported the regulatory framework through a number of recommendations to ministries of agriculture, finance and economic development on CCA and sustainable development of agriculture:

- Agriculture development strategy 2020-30 (Presidential decree, 2019, UP-5853)[68]
- Water economy development 2020-30 (Presidential decree, 2020, UP-6024)

[63] It releases potassium as it breaks down from it structure $(K,Na)(Fe^{3+},Al,Mg)_2(Si,Al)_4O_{10}(OH)_2$

[64] There were also two permanent greenhouses provided for two institutes / extension centres – see relevant section – Output 1.4

[65] Includes 661 students at the Kegeli Agro college with the 114 m^2 greenhouse for learning & extension; and the many school pupils

[66] In taking a smallholder to become a number of family persons, & counting all pupils of a school receiving one hotbed for the school.

[67] https://cdn.permaculturenews.org/resources_files/farmers_handbook/volume_3/7_hot_bed.pdf

[68] Ministry of Economic Development & Poverty Reduction are part of the administration on structural reform in the agriculture sector, and also a member of NIAWG

- Knowledge & innovation development in agriculture 2021-25, (Presidential decree, 20121, UP-6159)
- Food security law (draft) - drafting to include CCA and mitigation measures

Analysis

In the last five years the natural resources / agriculture legislative framework has drastically changed and improved (including the land law, with land tenure securable, and the cooperatives law – promoting the development of collective legal entities under the farm cluster system). These have increased the interest in investing in agriculture, and as a result the government has been upgrading a number of policies and legislation in the sectors. The project supported the above listed policies and laws, which were mutually beneficial to the project, and in effect facilitated it to a certain extent. The support was a good example of CCA / mitigation legislation mainstreaming.

Outcome 3 – Landscape-level CCA measures for soil conservation covering one million hectares (ha) of land

The overall grading for Outcome 3 is **Highly Satisfactory.** There was one indicator attached to the Outcome 1 level, which was rated as: highly satisfactory (HS). The justification for the 'HS' rating, was that the project was able to undertake extensive tree planting in the ABDA having developed an effective model for seedling production and mobilization for planting. The success of the model was clear with the national and regional government of KKPS are now following it, in scaling-up activities. Of arguably greater success was the on-going rehabilitation of the PPC's 27,000 ha of pasture land, with their applied fodder species regeneration methods and their new 'pasture rotation rational-use plans'.

Under Outcome 3, there were three sub-indicators concerning: 70,000 ha of arid land saxaul tree plantations for sand stabilization; 20,000 people in 10 cooperatives participate in this tree planting; and ten community organizations (50% women's groups) have the mandate / capacity to manage the tree plantations.

Result against Indicator

In the ABDA, 65,500 ha has been planted with saxaul (*Haloxylon ammodendron*) tree seedlings, with a clear plan to cover 75,800 ha by the end of project[69]. All seedlings have or are being given to KKPS State Committee of Forestry (as per MoU signed between SCF and UNDP). The last batch of seedlings will be planted on the remaining 10,300 ha by December 2021. Whilst the PPCs, their members and others planted the trees, they are not the owners or managers of the trees, which remains with government.

Summary Analysis

As the following three outputs describe, apart from tree production and tree planting, the outcome was also about the PPCs and regeneration of their pastures, described hereafter. To note perhaps, was the one million hectare (ha) target mentioned in the outcome title itself. Such a target has or is expected to work, based on the project institutional and operational model, now with KKPS and national government to adopt these methods to scale up under the latest Aral Sea development plan.

<u>Output 3.1 - Saxaul tree plantation for sand stabilisation on 1 ,042,094 ha of land, based on a landscape rehabilitation plan</u> (HS)

(Target - 70,000 ha of saxaul and tamarix plantation)

Result against Indicator

- Saxaul seedlings planted within the Aral Basin Desert Area (ABDA) will cover 75,800 ha. 30 million seedlings were grown by the project PPCs
- KKPS State Forestry Committee received 25 units of machinery (4 tractors, planting machines, chisel, ploughs, ditchers, trailers, subsoilers, water tanks & purification reverse osmosis system, solar panels, insecticide (435 liters)

Analysis

The project will soon complete planting of 75,800 ha of drought and salt-tolerant saxaul trees in the ABDA. Five PPCs were engaged to establish field-grown tree nurseries and grow 30 million saxaul seedlings[70], which were then provided to the SCF, who supervised the tree planting in the ABDA[71], and became the state owner of the

[69] The 10 million extra seedlings are already growing in the PPC nurseries

[70] Project signed an MoU with the 5 PPCs to produce 30 million saxaul seedlings (20 m in 2020, and 10 m in 2021)

[71] Over 20 m seedlings have been supplied to date. SCF has its own 30 ha nursery, to also produce seedlings

plantations[72]. In order to achieve such a planting target, it was necessary to enlist brigades of people from different districts. The PPCs mobilized their members for this landscape-level tree planting.

The planting is now in its third season now, but average survival rates have been low at as ~30%, in part due to sandy soil and low moisture. This was despite planting plans being drawn by the Ministry of Geology & Land Cadastry with soil and ecology scientists, and based on soil structure. Tree planting was by machine in sandy areas and by hand in clayey areas. The seedlings were pit planted at a density of 1,000 seedlings / ha[73]. The tree planting camps, which were up to 300 km from the nearest settlements, ran from autumn through to spring (October – March), with ~2,000 seasonal workers engaged to do this.

From 2018-20, as a demonstration on part of the tree planting area, the tree planting preparation methods were improved, with the roots pre-dipped in a planting mixture (soil, manure, water-absorbent additive, & water). Under this method, survival rates have been up to 70% in some areas[74].

In context, 30 million seedlings were contract-grown by the PPCs, which for planting of 75,000 ha would give a density of 400 seedings / ha. Thus the SCF needed to produce the remaining 45 million seedlings on their six nursery sites. However due to mortality and gapping-up, considerably more seedlings would need to have been grown. This SCF production was not verified. The evidence of survival rates was also largely absent. The trees were also planted in very remote areas on the margins of the very large ABDA, which seemed in some respects, more of an experimental exercise. Thus in terms of overall efficacy and effectiveness, it was difficult to verify to a satisfactory degree, or get a good indication of impact at this very early stage of plantation establishment.

The cost-benefit and extent that the tree planting reduces the severity of dust storm damage has not been determined yet, but will need to be in the future. The overall target of ~one million hectares of tree planting needs to be put in context of the government plans – see Impact – scaling-up section.

Output 3.2: Community management in tree planting & maintenance, with employment (MS)

(Target - # of farmers / pastoralists involved in landscape-level CCA measures (i.e. saxaul planting) through employment)

Result against Indicator

- The PPCs are involved annually in the tree planting program. The PPCs support tree nursery and tree planting operations with 20,315 seasonal jobs (8,118 for women); plus 126 permanent jobs (58 women)

Analysis

The management and maintenance of the tree planting scheme is unclear at present. Whilst the SCF are engaged in supervising on-going seasonal tree planting in the ABDA, they should be able to conduct survival rate surveys, and arrange the 'gapping-up' or re-planting works if necessary. Whether the plans current go to this detail is not clear.

Output 3.3: Cooperative management to enhance community ownership and investment in land restoration (HS)

(Target – 10 cooperatives established for community management of sand stabilizing plantations)

Result against Indicator

- Thirteen Production Pasture Cooperatives (PPCs) were established, with 25,889 members (of which 50% women). They united 19 rural hamlets with 64,723 residents
- For degraded pasture restoration (of 27,000 ha), the PPC received nine electric water pumps & transformers for irrigation, ridge formers, – for soil bunding with a drainage system for water conservation, so that Liman[75] irrigation could be demonstrated, and rotary / blade mowers and balers for fodder harvesting
- Pasture rotational rational-use plans have been developed for each PPC

Analysis

The output (as opposed to the actual indicator) is considered here and concerns the PPC's management of their 27,000 ha of land for arable and livestock crops and their pastures.

[72] The project prepared a UNDP – SCF MoU in 2018-19 to undertake this work. This seemed a little slow in missing the opportunity to grow seedlings with the PPCs in 2016-17 for example, three seasons into the project.

[73] The planting was 1 m spacing with 10 meters between rows to allow for tractor planting. The spacing was based on 'Recommendations for planting protective belts on the Aral Sea desiccated bed'

[74] What is the overall cost-benefit ratio, and the cut-off point for % tree survival rates. E.g. if 50% survival rate can be obtained, the cost per ha is double, and is 50% density sufficient enough to reduce sand storm intensity

[75] Israeli term for soil bunding to collect and hold water for fruit tree groves for example

Production & Pasture Cooperatives (PPCs)

The 13 Production & Pasture Cooperatives (PPCs) have ~27,000 ha land that has recently been tenured to them for 30 years, which was an important government move, that encourages long-term and shared investment in their land. The project created and galvanised these 13 PPCs.

They manage 26,238 ha of pasture, plus 386 ha of irrigated land (for crops, livestock cereals, liquorice, reeds). Where needed, the pasture plots have undergone laser-levelling, and soil bunding with drainage works. The creation of soil-bunded basins plots allows for better water retention. They are created due to low water availability, low rainfall, salinity, hot weather, and sandstorms. The PPC also practice other on-farm activities (e.g. in horticulture and hydroponic fodder production)[76]. The fodder grown is alfalfa (lucerne) and cereal which provides protein for livestock, which is also gown under the hydroponic system.

The PPCs undertook pasture management for livestock, with the project development of a 'pasture rotation rational-use management scheme' for each PPC[77]. The project has supported two different pasture restoration demonstrations: pasture irrigation; and grassland seed stock production with the aim to undertake pasture restoration works through re-seeding the grasslands. The aim, together with the soil conservation (bunding) measures is likely to make the 27,000 ha ecologically functional again.

The PPCs were also instrumental in the ABDA tree planting with over 1,500 persons mobilised to undertake this work. In order to do this, they collected the saxaul tree seed, and established nurseries to grow the trees.

Production Pasture Cooperative's Women's Task Force (PPCWTF)

As part of the development of the PPCs, the project established a PPCWTF within each. Ten women's groups were created to ensure a fair distribution of work, income and profits. An important part of their work has been the collection of seed and the establishment of seed stores (cereal seed for fodder & drought-tolerant seed for pasture reclamation). They have been instrumental in mobilizing seasonal task forces for tree planting. The ten groups have been responsible for fodder seed collection. They have also supported the land reclamation – soil bunding / drainage works for pasture restoration using irrigation. From the 10 PPC women's groups, there is a leadership of ~108 women who develop annual workplans, including with micro-finance support. These plans are then synthesized at an association level.

Pasture restoration demonstration No. 1 (drought-tolerant fodder seed collection & multiplication) - with Nukus Research Institute for Natural Sciences

Over 60% of KKPS's livestock meat and dairy are fed with pasture fodder, however the pastures are degraded, and now contain few and unpalatable species, thus the edible species composition needed to be restored

In 2020, the project supported an applied on-farm research demonstration. Experts from the institute / project, with the PPC women collected 20 species drought-tolerant wild plants species with the aim to restore degraded pastures, that currently only have ~3 species present.

The plant species seeds were collected from the Ustyurt Plateau (clay desert area), some of which are endemic, are highly drought-tolerant with medium salinity tolerance[78]. Wild lucerne seed from Eastern part of ABDA was also collected. From the seed of these 20 grassland / pasture species, 33 ha of seed stock multiplication and demonstration (nursery) areas, were established on the PPC farms. To date, the off-farm testing of seed has started to be undertaken, which when planted in furrows to hold rainwater, with good spring / autumn rains, the percentage survival was at 30%, which for a first trial was promising[79]. It is expected that in 2022, 1,300 kg of seed from the stock areas will be collected and sown over 3,250 ha of degraded pastures.

The project also purchased 400 kg of local alfalfa seed (var. KKPS-15), which is drought and salt-tolerant[80]. In 2021, the alfalfa seed was sown on 25 ha of irrigated land as seed multiplication plots. The plan is to collect 1,000 kg of seed from these plots for sowing on 63 ha of degraded pasture in 2023.

Pasture restoration demonstration No.2 (using river water)

[76] Production products – meat, dairy eggs, corn, sorghum, alfalfa, reeds + melon, cucumber, paprika, tomato

[77] Due to water shortage and over-grazing, most pastures have been degraded and unusable for 40 years. The project 'pasture rotation scheme' is mainly to crop fodder to 'cut and carry', but also to rotate livestock (e.g. up to 6 sheep / ha) for a maximum time period dependent on season. For irrigated crop production areas, the model is a 'four fields crop rotation'

[78] Endemic species aimed at improving pasture productivity were collected - *Salsola arbuscula*, biyurgun (*Anabasis salsa*), alfalfa (*Medicago sativa*), *Artemisia terrae albae*, four wing saltbush (*Atriplex cana*)

[79] These furrows were to collect rainwater, and not for drainage of saline soil water

[80] The fodder seedlings can tolerate up to 4 g / litre salt in irrigation water

The project's PPCs own 101,479 head of livestock head (47,830 cattle; 58,860 sheep / goats) (2019). (see **Annex 5** for a breakdown by cooperative). Whilst the numbers of livestock has increased in KKPS (1995-2014), the productivity of its pastures fell by 23%. Rainfall in the area is only 100 mm / year, with a high evaporation rate.

The demonstration was to use delta irrigation to water the soil sufficiently to allow the gemination of perennial fodder and forage plant species[81]. Once this initial re-growth from the seed bank has been established, the dependence on watering in future years is reduced. In order to revive degraded pastures, the project provided four permanent water pumps and pipelines. In order to saturate the pasture soil sufficiently, with a one-time spring flooding, 'liman' irrigation was used, i.e. soil bunding, with a field-based drainage system covering ~500 ha plots. Approximately 10% of the 27,000 ha has been watered this way to date. Before the project, these dried-up degraded pastures were sometimes only exhibiting three plant species, whereas after ~20 species were present.

In November 2018, ~3,000 ha of pasture in Kegeyli and Chimbay districts were irrigated this way. The result was the pasture rejuvenated from 15 to 32 mostly palatable plant species[82]. The recommendation was that in order to facilitate a higher volume of highly nutritious and palatable plants, that enrichment seeding, prior to irrigation, should be undertaken (see project's fodder seed collection / multiplication demonstration).

Pasture Rotational Rational-Use Plans

The success of the pasture restoration pilot (and seed multiplication) resulted in the development of 'pasture rotational rational-use plans'. For example – Shaxaman Jaylawi PPC Pasture Plan (total ~7,000 ha of pasture) – On a demonstration area, pasture productivity was increased from 350 kg / ha to 650 kg / ha after managed irrigation on pasture fields, with species composition increasing from eight to 17 plant species, 12 of which are palatable to livestock. The plan itself included dividing their pastures into eight sections of 880 ha each, of which seven contained standard fodder species, and one with camel thorn and the liquorice herb legume. The plan is for each of the seven areas to be over-seeded with five important fodder species, and then irrigated, with a rotational harvest from each section (area) in May, June, July, August, September, October, and November, and for the liquorice herb to be set aside and cut for winter hay. The plan estimates that pasture productivity under this management scheme will increase productivity by five times. This is a highly successful and significant impact the project has made.

Outcome 4 – Knowledge disseminated of climate-resilient agriculture / pasture systems in arid lands

The overall grading for Outcome 4 is **Highly Satisfactory.** There was one indicator attached to the Outcome 4 level, which was rated as: highly satisfactory (HS). The justification for the 'HS' rating, was that the project made an extensive effort to educate, communicate, disseminate, and ultimately as a result achieve a high uptake and adoption of project interventions, that are likely to be sustainable.

Under Outcome 4, there were two sub-indicators / targets concerning: Two lessons learned bulletins on climate-resilient agronomic and water-saving measures; and five farmer demonstration events covered by the media

% of population aware of and practicing climate resilient agricultural practices

Summary Result against Indicator

- There were 148 training events for 10,476 participants (20% of 51,208 population in the 6 districts, of which 5% women)
- Thirty-eight knowledge products (bulletins, guidelines, mobile apps & video clips) were delivered to 15,525 end users[83].

Summary Analysis

In order reach the farming communities, the project employed a media expert. The project also engaged in twitter and facebook for example, in trying to make the project more accessible and also engaging the younger generation. The project was very active in its dissemination of materials, and in the support for the three extension service centres, which were established to research, pilot, demonstrate the best CA, SWC, horticulture, fodder production, and pasture management techniques[84].

[81] The water supply was ~2,250 m^3/ha, and remained on plots for 2-3 days before draining into the soil

[82] Prior to this, there were 15 plant species growing (11 species preferred by the ruminants, 2 – somewhat palatable, and 2 – not preferred). After irrigation the pasture was not only re-transformed with 32 species growing, but the composition for grazing greatly improved (27 preferred, 3 somewhat palatable, and 2 not preferred)

[83] all available on climatechange.uz/af.climatechange.uz

[84] The project not only provided technical solutions, it founded and strengthened institutional mechanisms, thus providing a sustainable conduit for these solutions. These institutions included the PPCs, their association, and the technical extension centres.

Output 4.1 - Inventory of all tested agronomic and water-saving measures to map out successful practices

(Target - # of documented good practices of agronomic and water saving measures)

Result against Indicator

Knowledge materials were developed in three languages (Karakalpak, Uzbek, & Russian)[85]. They included:

- A guide to environmentally-friendly low-cost resource-saving technologies
- Lessons - Climate-resistant agriculture & environment-sound practices in northern regions of KKPS (Bulletins 1 & 2)
- Eleven lessons agriculture and review of CA / SWC practices used in the northern regions of KKPS

Analysis

The full list of training events and project published materials is provided in the next section 3.3.3 – Training and Awareness, which provides an inventory of all the project / consultant inputs / outputs (i.e. their reports), and all the project training and awareness materials.

Output 4.2: Lessons learned for climate-resilient agriculture and pastoral systems in arid lands documented and disseminated through printed and web-based publications

(Target - # of lessons learned bulletins disseminated through printed and web-based media)

Result against Indicator

- 38 materials prepared, inc. thematic publications, manuals, reference books, brochures, and video clips
- In total, 15,525 pieces of extension materials were distributed

Analysis

A full list is provided in Section 3.3.3.

Output 4.3: Smallholders, livestock keepers, farmers hold regular meetings with support of authorities & media

(Target - # of farm and pasture land meetings attended by local authorities and the media)

Result and analysis

The project established the KKPS Association of Production Pasture Cooperatives (APPC)) in February 2020. The APPC is developing to provide a number of services to the PPCs, including methods to improve the supply-chain efficiency and added-value (e.g. in primary processing), and in marketing / product sale – introduction of buyers[86].

3.3.3 Training, Technical Reports & Awareness

Training

There were 44 training events including two visits to the Fergana Valley, two international study tours and an international conference on climate change in Kazakhstan. The Fergana Valley visits were to understand hydroponic plant production and green biomass production, and to investigate greenhouse designs. The study tours were to Israel to understand agriculture and water management, and to Spain to understand how to develop arid zone salt and drought-tolerant agriculture with irrigation systems. The number of participants attending training events was:

men	women	total
8,076	2,415	10,491

The percentage of women attending was 23%. A complete list of training events is presented in **Annex 5**.

Technical Reports (Consultant Inputs / Outputs)

The project produced 63 technical reports. Under Outcome 1, the project produced 23 technical reports, including 4 on AWS, 14 on DEWS, and 5 on extension; Under Outcome 2, there were 25 reports, including 15 on soil CA, 5 on hothouse production, and 5 on updating the regulatory framework; Under Outcome 3, there were 10 reports, including 5 on tree nurseries / tree planting, 5 on pastures, including the PPC pasture plans; as well as others - 3 on baseline and 2 on gender.

Component 1

[85] available on the project website climatechange.uz

[86]There are no plans to brand the name of products at present, as as the ABDA is an environmental disaster with known pollutants

AWS

- AWS pre-installation and installation works (2017) 20pp, Russian, English– 3 reports by differing authors
- Feasibility study - installation of AWSs in KKPS (2017), 38pp, Russian, English
- Specification for AWS equipment (2015), 60pp, Russian
- Installation of AWSs by CHS in KKPS (2017), 31pp, Russian

DEWS

- Drought early-warning system (DEWS) user guide – water forecasts in lower Amudarya (2017) 26pp, Russian, Uzbek
- Use of Amudarya downstream water volume forecasts from DEWS for stakeholders of KKPS (2017) 33pp, Russian
- Economic efficiency of installing hydro-posts in Karakalpakstan (2018) 19pp, Russian
- Building an information & telecom system for KKPS based on the existing hydromet system (2018) 199pp, Russian
- Data use evaluation for input to the DEWS (2015), 17pp, Russian
- Development of a DEWS for the conditions of the lower reaches of the Amudarya (2016), 24pp, Russian
- Guide of DEWS (2017) 30pp, Russian
- Software design with a user interface and their integration into the DEWS (2016), 16pp, Russian
- Remote sensing data use for DEWS (2015), 29pp, Russian
- Development of DEWS for predicting water scarcity in lower Amudarya using remote sensing (2015), 35pp, Russian
- Accounting for water discharge in irrigation canals using weirs and hydrometric flumes (2015), 54pp, Russian
- Approaches to long-term forecasting of water availability in the rivers of the Aral Sea basin (2017), 44pp, Russian
- Water availability assessment for downstream of Amudarya (2018) 26pp, Russian
- Recommendation of DEWS products (2017) 27pp, Russian

Extension

- Establishment of Extension Advisory Centers, with their operation, services & sustainability (2015), 24pp, Russian
- Project Outreach Model development (2019) 62pp, Russian
- Strategy of action in five priority areas of development in 2017-21 (2017) 32pp, Russian
- Microfinancing for CCA measure on communities level (2019) 41pp, English, Russian
- Business plan for a loan to create a camel farm (2020) 13pp, Russian

Component 2

- Drought-tolerant agriculture and CCA best practices, soil quality, & water availability in KKPS (2018) 18pp, Russian
- Recommendations for farmers on irrigation, agriculture, crops at varying water scarcity (2018) 31pp, Russian
- Water-saving, soil-protecting techniques for use in pilot areas (2015) 90pp; Summary report (2017) 24pp, Russian
- Analysis of the most effective options for land and water use in conditions of water scarcity (2018) 21pp, Russian
- Salt tolerant plants for crop diversification in Karakalpakstan (2016) 38pp, Russian, Uzbek
- Calibration of TDR sensors of water content in the soil under increased electrical conductivity (2018) 20pp, Russian
- Soil salinity issue (2018) 29pp, Russian
- Review of the use of glauconite to improve soil structure and increase soil water retention for agriculture (2015) 20pp, Russian; About glauconite (2015) 33pp, Russian
- Use of enriched glauconite from KKPS as an agriculture fertilizer (2016) 35pp, Russian, Uzbek, Karakalpak,
- Development of the robot-based application for Laser Leveling Practice (2017) 10pp, Russian
- Handbook instructions on use of laser-leveling equipment for planning irrigated land (2019), 7pp Russian,
- Use of satellite image and GIS for creating maps / calculating data for areas with degradation (2016) 20pp, Russian
- Business plan for a loan to purchase and use a laser-guided planner (2020) 11pp, Russian
- Scaling-up - Proposal to ensure dissemination / expansion of the CCA measures in agriculture (2017) 11pp, Russian
- Attracting funds under current legislation to stimulate CCA in the agriculture sector (2019) 13pp, Uzbek

Greenhouses

- Guide to greenhouse and hotbed development in KKPS guide (2015) 26pp, Russian, English, Karakalpak
- Technology of growing vegetables in greenhouses in the northern regions of KKPS (2016) 48pp, Russian

Regulatory Framework

- Approaches to improving the regulatory framework (2019) 28pp, Russian
- Recommendations for the regulatory framework aimed at mitigating the effects of climate change (2020) Russian
- Lessons learned on implementation of CCA measures in developing national regulations (2020) 17pp, Russian
- Recommendations on existing regulations aimed at promoting CCA in agriculture (2019) 40pp, Russian
- Discussions with ministries on recommendations to improve regulations with CCA in agriculture (2019) 18pp, Russian

Component 3

Trees

- Manual of Salt-tolerant plants for KKPS - Part II Trees (2018) 42pp, Russian
- Growing planting material of desert plants in forest nurseries. Part II (2017) 33pp, Russian, Uzbek
- Development of nurseries for cultivating desert tree plants in the arid regions of KKPS (2018) 87pp, Russian

- Guide on establishment of forest seed plots on the dry bed of the Aral Sea. Part I (2017), 48pp, Russian, Uzbek
- Assessment of self-propagation of the ABDA forest plantations (2019) 12pp, Russian

Pastures

- Plans for pasture management by production & pasture cooperatives (2021) 34pp, Russian, Karakalpak
- Allocation of desert drought-tolerant fodder seed multiplication plots (2017) 48pp, Russian
- Identification fodder plant nurseries (2018) 12pp, Russian
- Desert & drought-tolerant plants for fodder production and pasture improvement in KKPS (2019) 56pp Russian
- Application of products of multi-tiered hydroponic installations (2020) 16pp, Russian, Karakalpak

Baseline research

- Socio-economics of farmers in the project area and vulnerable to climate change (2015), 32pp, Russian
- Economic status of stakeholders, with baselines, indicators, & targets for project outcomes (2019) 74pp, Russian
- Socio-economics of smallholders / PPCs, and assessing the initial indicators, baselines & targets (2019) 58pp, Russian

Gender

- Progress report on mainstreaming gender equality in communities - mid-term and final (2020) 40pp, Russian
- Gender in agriculture business and CCA measures in the northern regions of KKPS (2021) 44pp, English, Russian

Awareness Materials (booklets, leaflets)

Apart from social media posts, the product produced 31 awareness materials:

Component 1

- Application of DEWS for forecasting water content in the lower reaches of the Amu Darya, 3pp, Russian
- DEWS, 1p, Russian, English, Karakalpak, Uzbek
- Improving climate & hydromet monitoring – for increasing community resilience to climate change, 3pp, Russian
- How much water will there be in the lower reaches of the Amu Darya in 2016, 2pp Russian
- Forecasting water availability in Amudarya river downstream using a DEWS (2017) 1p, Russian
- Introducing DEWS for early-warning of water scarcity for the lower reaches of the Amudarya River (2016), 1p
- Use of the outputs of the drought early warning system (2017) 1p, Russian

Component 2

- Review of agro- and water-saving practices applied in the northern regions of KKPS (2021) 50pp, Russian
- Laser leveling of fields, 3pp Russian
- Use of milled glauconite in to reclaim agriculture soil (2015) 1p, English
- Summary guide on the development of hothouses / greenhouses in KKPS (2017) 6pp, Russian

Component 3

- Sand stabilization, 1p, Russian, English, Karakalpak
- Planting saxaul on the Aral Sea bed after nursery production - Newsletter 11 (2020) 12pp, Russian, Uzbek, Karakalpak
- Salt tolerant plants for Karakalpakstan. Part II. Trees (2019) 3pp, English
- Restoration & conservation of degraded pastures - innovative approaches / solutions (2019) 1p, Russian, Karakalpak

Component 4

Training

- Training needs assessments (2015) 30pp, Russian, 2pp, English
- CCA Training Needs Assessment (2015) 19pp, Russian
- Training on the operation of the DEWS and its practical use (2017) 16pp, Russian
- Improvement of the regulatory framework to include farm-level CCA measures (2019) 61pp, Russian

Awareness

- Thematic and knowledge products of the project (2017) 36pp, Russian
- Recommendations on how outcomes will reduce beneficiary climate vulnerability (2019), 77pp, Russian
- Stimulation of wider use of agricultural CCA measures (2019) 28pp, Russian, Uzbek
- Information Strategy (2016) 50pp, English, Russian
- Lessons in Climate-resilient, agro-saving & ecological practices in KKPS (2021), Russian, English 25pp – bulletins 1 & 2
- Environmentally friendly low-cost resource-saving technologies (2019), Russian, 150pp - handbook
- We promote water-saving technologies, 5pp Russian
- Newsletters 1 -10 - Climate resilience of farmers in drought-prone areas (2015-19) 10pp, Russian, Uzbek, Karakalpak
- 11 lessons on the development of optimized agriculture in northern KKPS (2019), 22pp Russian,
- Water-saving, soil-conservation agriculture – innovative solutions (2019) 1p, Russian, English, Karakalpak
- Advantages of greenhouses and hotbeds in adaptation to climate change (2020) 1p, Russian, English
- Information guide on the technology of growing vegetables in hotbed in KKPS (2016) 40pp, Russian

See **Annex 5** for a list of social media posts

3.3.4 Efficiency, Relevance and Ownership

Efficiency

The hydromet services, CA / SWC measures, horticulture hotbeds and hydroponics, extension services, tree planting and pasture restoration measures, would not have been undertaken without the project, nor put together in such a cohesive way. The project efficiently utilised funds in procuring and installing a sufficient (and significant) number of pieces of equipment, that met state and smallholder needs on scale to effectively demonstrate, (saturate to a degree) and garner sufficient interest to replicate and scale-up[87].

Despite the lack of costed financial inputs from project government partners and smallholder stakeholders, there was obviously a significant project 'buy-in' with counterpart resources being enabled. These inputs and outputs, including from the collectively-managed and owner decision-making membership of the PPCs, indicated a high project relevance. The project was high value for money. Thus, the (cost) efficiency was rated as **highly satisfactory**.

Relevance

The measures were relevant under AF framework objectives, a number of UN SDGs and under UNDP country programming. The project was in-line with the national agriculture strategy, and a number of farming-based decrees. The project followed and implemented national policy in supporting regional development planning, in improving weather and water early-warning forecasting systems, in CCA in farming through soil and water conservation, in horticulture, and in providing a science-based research and best-practice edge to extension services. The project design remained highly relevant. Relevance was thus graded as **highly satisfactory**.

Ownership

The project worked in close cooperation with CHS as the main implementing partner, who despite not directly managing the funds, played a key role in steering the project, and in actively supporting and leading the process with the IAWGs for the transparent selection of intervention projects. The PPCs were instrumental providing leadership and ownership throughout the project's portfolio of work.

Mainstreaming

In its subject matter, the project supported and / or influenced a number of pieces of policy and legislation:

- Agriculture development strategy 2020-30 (2019) Presidential decree UP-5853
- Development of water management 2020-30 (2020) Presidential decree UP-6024
- Improvement of knowledge & innovation system, & provision of agriculture services (2021) Presidential decree PP-6159
- Food security, use of resources & state support for agriculture during covid (2020) Presidential decree PP-4700

4. SUSTAINABILITY

The overall rating is that sustainability is **Moderately Unlikely**[88]

4.1. Financial Risks to Sustainability

The rating is 'Financial Sustainability is Moderately Unlikely, meaning there are significant risks to sustainability.

From 2020, the Ministry of Finance (MoF), who are also a NIAWG member, introduced a new reporting system, whereby both national and all donor funds are put before parliament, with budgets approved by law. Plans are also divided by subject, so changes in sector funding has become more transparent.

Planting in the ABDA has become a government priority, however it could become a 'black hole' for state and donor funds, without a cost-benefit analysis, and without independent monitoring of survival rates and the impact

[87] The lack of wastage of project funds was clear to see

[88] Sustainability is considered to be the likelihood of continued benefits post funding. Under UNDP criteria each sustainability dimension is critical, i.e. the overall ranking cannot be higher than the lowest one.

on controlling sandstorms[89].

4.2 Socio-economic Risks to Sustainability

The rating is 'Socio-economic Sustainability is Moderately Unlikely'

There are future plans to rationalize the production of crops and livestock under the farm cluster system / PPC system. However, officials in some cases, are still reluctant to turn away from cotton production, despite its recent removal from government stipulated quota system. This is because of its export income, but the downside is these 'old' state producers are a major users of river water, which impacts the many smallholders, and efforts to restore ecological functionality of the ecosystems, including the pastures[90]. As a partial alternative, the project has supported low water-demand crops such as liquorice, which Uzbekistan is a major producer / exporter of.

Each PPC has its own management plan, which requires local administration support, in checking feasibility, affordability, and if eligible for financial support. These require continued support and fine-tuning, especially in light of the many successful project interventions and particularly the two newer demonstrations of assisted natural regeneration of pastures, and their ensuing pasture production plans. With the PPCs already planning to sink more boreholes, to produce more clean water for hydroponic fodder production for livestock, there is a risk of socio-economic sustainability compromising environmental sustainability, at a far higher cost in both respects – i.e. once the aquifer water is gone – there is no more water to live.

Due to the project, smallholder income has increased by 35%, bringing farmers a higher level of livelihood security. The income of PPCs is increasing due to measures such as land-levelling / bunding, and from hydroponics[91]. Through the use of boreholes and filtration units, the project provided a new supply of clean water to over 10,000 people[92]. This included providing a supply to a number of schools which also had a significant impact.

4.3. Institutional & Governance Risks to Sustainability

The rating is 'Institutional & Governance Sustainability is Moderately Likely', which means that there are moderate risks to sustainability.

There were a number of existing and created institutions that the project worked with. Such institutions are the backbone to not only for project success, but also for uptake, adoption and sustainability of project actions. In terms of introducing best-practice scientific advances, the project did well to work with these institutes, especially in applied research in KKPS in introducing drought-tolerant wild & improved fodder species to restore degraded pastures, in the development of hydroponic fodder production to augment livestock feed, and in using glauconite for crop soil amelioration. The value, testing and scaling-up of these activities needs to built upon. In 2020, the KKPS government declared it will use the project achievements, as a basis for its larger-scale programs aimed in particular at socio-economic development. The governance of pasture land has also been improved due to the new land and cooperatives laws[93].

4.4. Environmental Risks to Sustainability

The rating is 'Environmental Sustainability is Moderately Unlikely'

In the northern regions of KKPS, farmers irrigate their lands mainly through surface water from the lower

[89] The government under the Ministry of Emergencies does conduct internal monitoring. A number of project partners and the PM felt that the rating for 'Financial Risks to Sustainability' should have been raised to Moderately Satisfactory, however, the TE was unable to independently verify the results of the tree planting or the financial inputs to the activity, either to SCF nurseries or sea bed planting. Thus the TE considered that 'significant risks' remain, which equates to a grading of Moderately Unlikely for Financial Sustainability. The project partners and PM views / evidence are now also presented in **Annex 5**

[90] A number of key project partners felt that the rating should be 'Moderately Likely', based on the Agriculture Development Strategy which has moved the focus away from cotton, and towards sustainable production. However the strategy is new and it effectiveness in implementation is as yet unknown'

[91] These were both anecdotal quotes

[92] In Kostruba VCC (Takhtakupir) for example, the remote area lacked drinking water and had a poor power supply. The project installed a borehole and solar-powered water pump with a water purification unit. The result has been reduced kidney, liver and urinogenital disease, as well as provided for salt-free water supply for drip irrigation of hotbeds.

[93] For example, in Erkindarya VCC (Bozataw), the population has ~8,000 ha pasture in ten locations, with around 2,800 cattle & 5,000 sheep. In 2018 the PPC Erkindarya Jaylawi was created based on an open election meeting. After government registration, a KKPS State registration certificate was issued, with a 49-year tenure for 7,916 ha, based on the cooperatives law (2019)

Amudarya river and its channelized system. The water is managed by government decision who pass the decisions to water consumer associations, who allow distribution according to this and local farm needs. However, due to over-extraction and insufficient supply, and due to the recent transition to the farm cluster and cooperative systems, the clusters and cooperatives themselves have begun to sink more boreholes to supply water, for drinking and horticulture. Such boreholes are subject to drilling permission, and maintaining a sustainable flow rate, however, it was not evident if this water is metered and ultimately also aquifer re-charge levels and therefore being sustainable or not[94].

5. IMPACT & CATALYTIC EFFECT

5.1. Impact

Stress on ecological systems

Impact of farming patterns on the environment

Due to land levelling and early-warning forecasts, in Takhtakupir for example, cotton productivity has increased, but the result of this is a tendency (by officials) to increase again the coverage of land under cotton, which would be a regressive step. It is here that the SNIAWG and their planning teams need to fully understand the holistic nature of the CCA lessons learned and apply them, and not turn to old habits that just generate a short-term cash income for the state treasury.

Impact of hydromet / drought EWS on farming patterns and the environment

District administrations receive CHS warnings on low water or drought-risk with recommendations on mitigating crop loss. They are now regularly sent to farmers, by official telegram channel. The project through its hydromet platform with the DEWS module, hosted by CHS, has been providing these warnings via bulletins on expected water deficit with pursuant recommendations since 2018. The advance warnings are six months ahead of time, which allows for farm planning on which crops to plant, which is very useful. Also if the early warnings, forecast an up-coming water deficit, then this 'allows' farming communities to apply Amudarya river delta irrigation (if sufficient water) in the autumn ahead of the spring planting season[95]. The issue here is one where using more water at the wrong time of the year, may just exacerbate the river water shortage problem. In Chimbay, due to water scarcity and crop loss – the district administration has designated a staff member to disseminate the water scarcity early-warning via social media (telegram) to the smallholders and others. Concerning the hydromet platform, the Chimbay and Bozataw district governments are looking forward to accessing it and DEWS. Until then the telegram bulletins are in use.

The impact for farmers was to improve their trust in local early-warnings forecasts on river water supply, and weather forecasts, especially when they are directly linked to agriculture advice bulletins on farming activities. This has been happening since 2018, but the scale of the impact to date is difficult to measure.

5.2. Catalytic Effect & Theory of Change

[94] A key project partner felt that the rating should be 'Moderately Likely', based on project supply of clean water. However, there are significant risks to attaining environmental sustainability, with issues that are far wider as presented in the text.

[95] In Bozataw district, an official indicated estuary irrigation is applied to over 24,000 ha, a season early if there is a deficit warning

Theory of Change

Parameter	Hydromet and drought EWS	CA, SWC & horticulture projects	Pasture restoration
Concept	Using weather data with upstream / downstream river water flow data to predict water availability for irrigation, for seasonal and monthly advance warning for crop planting	Demonstrations of CCA measures using conservation agriculture (CA), soil & water conservation (SWC), and drip irrigation in horticulture projects	To identify measures to restore the functionality of pastures, and then manage more effectively / scientifically
Root causes & threats	Quality and timing of early-warning water availability to downstream Amudarya river in KKPS needed upgrading, especially in the context of salt-affected soils, which require irrigation to leach the salts down through the soil, and drainage to remove them in high groundwater table conditions	River water supply is far less than demand; rainfall is low and not easily predicable; cropping season is already short, and becoming shorter; soils are salt-affected; and aquifer water is saline and needs purification for drinking & horticulture use; cropping system too dependent on unavailable river water for irrigation	Pastures are heavily degraded, salt-affected, over-grazed, and lack soil moisture. Soil organic matter and top-soil is being lost. The heavier the degradation, the more difficult and more time it takes to restore the pastures and their soils
Solution (Input to Output)	To install AWSs and hydro-posts; to create a hydromet / drought EWS platform with software for agrometeorologists to provide local government and farmers with season-ahead and in-season monthly early-warning farming advice	Demonstrate CA, SWC and horticulture projects using various techniques; to sink boreholes and purify water for household and horticulture use (in drip irrigation)	Creation of production pasture cooperatives (PPCs) as collective management entities to test and demonstrate pasture rehabilitation and restoration techniques, with the support of scientists and a science-based extension service To also grow fodder *ex-situ* using hydroponic nurseries with purified water, to alleviate grazing on the pastures
Outcome required	To promote the use of early warning hydromet advice, together with CCA agriculture and pasture management measures, through regional government and via a science-based extension service	To raise CCA in agriculture higher on the political agenda, so that the systems can be refined and scaled-up to more areas; to move further away from the state dependency on unsustainable cotton income	Pasture ecosystem functionality restored on all soil types if possible To keep livestock numbers within the pasture ecosystem carrying capacity
Result	Pilot farmers are getting river water scarcity / agromet bulletins, called 'drought early-warning system (DEWS), 6 months in advance. These bulletins and the hydromet platform will be adopted by government and the state Centre for Hydrometeorological Services (CHS), to use also to provide more accurate localized weather forecasting, based on the installation of the 10 new AWSs	Various SWC measures have been adopted, including laser-guided land levelling, soil-bunding, plough-pan breaking, no-till / direct-drill machine use, and the extensive uptake of hotbeds / poly-tunnels with undersoil mulching to generate heat and an earlier vegetable production cycle	The demonstrations of one-time water saturation of pastures, to open up the seed bank, and the field nursery production and field testing of especially-collected drought / salt-tolerant fodder species seed has been successful. The project produced 'pasture rotational rational-use plans' which need testing and refinement The *ex-situ* production of fodder using hydroponics to alleviate pressure on the pastures has been highly successful
Impact	Drought early-warning, especially ahead of the main crop planting season is now possible, and is timely due to climate change impacts on agriculture becoming greater, and the land degradation issue becoming more acute. The improved hydromet forecasting complements the physical CCA agriculture and pastoral activities of the farmers	The project established a KKPS inter-governmental working group, who are beginning to understand the holistic nature of the CCA agriculture measures, and that they are sustainable for the future	The fodder seed-bank production, and assisted pasture regeneration (with over-seeding, soil bunding & initial irrigation) pilots are being scaled-up Hydroponic fodder production alleviates pasture pressure, but if significantly expanded, it will add to depleting aquifers

Scaling-up and Replication

Tree planting

- For ABDA tree planting, the project has tested an operational system, which technically and institutionally has now been demonstrated to be effective. This has included: soil survey with plantation site identification; tree seed collection and nursery production by PPCs; supply of tree planting equipment; mass mobilization / deployment of tree planters from the PPCs[96]; and 75,000 ha of tree plantation established
- Based on this, the government has taken up the methods and set very ambitious targets. The 5-year ABDA state tree planting program is for 5.5 million ha with 1.5 million ha in 2022, and 1.6 m ha in 2023. This is a very large plan with funds allocated through differing stakeholders include the Ministry of Emergencies. The state program is going to work with the PPCs to produce tree seed and the SCF will physically continue to set up the planting operations. The model is now also being looked at regionally by Turkmenistan for example.

Pasture Restoration

- Fodder seed for pasture restoration - Wild pasture seed collected from the Ustyurt plateau. The value of this needs to be captured, and demonstrations / piloting expanded. Already pasture desert-tolerant plant seed is being provided to Kazakhstan for their researchers to experiment with.

Land levelling

- Land levelling – 12 machines – further 38,000 ha planned to be levelled and planted with crops / trees
- Chimbay - For instance, now land laser leveling is practicing over 1,980 ha and we are planning further extension of this technology

Horticulture, hotbeds, hydroponics

- Hotbeds - successful with some smallholders having taken out start-up loans to expand this way of production. Hothouse cultivation is also being increased as a result of the project
- Chimbay district DoA indicated that 416 smallholders now have hotbeds, and that 850 ha of hotbeds is planned for 2021-22 seasons under the planned order of the district Khokimiyat
- Chimbay - borehole pumped / cleaned water for drip irrigation – 200 ha at present, planned for 1,000 ha in 2022
- Munyak - Future plans to attract more investors in the hydroponic fodder production system, so that livestock numbers and poultry can be increased

Demonstration

- An international off-the-shelf micro-climate agromet forecasting system was deployed and demonstrated together with an app that predicts plant disease and pest problems
- Value of using drip irrigation
- Ecological functionality of pastures restored based on ecology and *ex-situ* livestock carrying capacity – 'pasture rotation rational-use plans' – with hay baling production
- The inclusion of climate change adaptation measures into government programs

Production of a new technologies / approaches

- Use of 20 drought-tolerant wild fodder species to restore degraded pastures, with the establishment of seed stock multiplication and demonstration test areas
- The identification of glauconite mineral as a soil amelioration agent. It reduces soil salinity; reduces the volume of water needed for irrigating crops; binds soil and supports soil organisms build-up of soil organic matter; and fertilizes with potassium release

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Weather and water forecasting

CHS is expected to maintain the AWSs and hydro-posts, and host the hydromet platform and DEWS module, which can provide early-warning weather and water scarcity notifications. One concern is whether it will be used to its full potential. Whilst the DEWS early-warnings on drought, and agromet cropping actions, have been prepared to date with project support, it now requires CHS, MWR and MoA to work together without the project.

[96] Using PPCs to produce the nursery seedlings for the first time, and to provide their members to enlist for seasonal tree planting camps, with added women's teams

Additionally, the hydromet data from the ten AWSs in KKPS needs to be utilized, and fed back into the forecasting system, for which the platform can be used. DEWS is a seasonal forecast on water availability prepared in October for a long-term forecast in April the following year – for the crop planting season, but also monthly thereafter during the season until September. CHS also need to ensure that the AWSs complete their calibration period so that they can be added to the global synoptic grid. This will also allow others to produce and improve long and short-term weather forecasting for KKPS. At present, the AWSs in KKPS are used for standard weather forecasting.

This was the original expectation of delivering a multi-module information platform, with hydromet and drought early-warning, and agromet forecasting. The former with data coming from the new AWSs, and the latter from the new hydro-posts, with added upstream rain / snowfall data. By project end, DEWS was running as a self-contained module, and the multi-module platform was operating as a early-warning notification system for CHS, MWR, MoA, Ministry of Emergencies, and KKPS government, and others in KKPS.

Soil improvement measures

Soil problems include water scarcity, high salinity, and low soil organic matter (SOM). There is still an over production (reliance for export income) on cotton which is dependent on irrigated water, however government quotas have recently been rescinded. Thus there is a change, which the project has generally supported, from cotton / wheat production to to lucerne / bean crops, which also both fix soil nitrogen as an added benefit. In order to address the low SOM, the project introduced 'zero till' machinery which cuts the roots of residue crops below the soil surface, aiding plant material decomposition and thus the build-up of SOM / soil nutrients the following season. Also not having a surface residue also reduces the incidence of plant pathogens and plant insect pests.

The project succeeded in popularizing the combined adoption of conservation agriculture (CA) and of soil and water conservation (SWC) measures, such as zero till / direct drill, crop residue mulching, plough-pan-breaking, and laser-guided land levelling.

Pasture restoration, and hydroponic fodder

KKPS has over one million ha of pasture land, with over 90% heavily degraded due to upstream water extraction from the Amudarya river. In no-water years, there is virtually no vegetation growth. The pastures are on sand / silt alluvial soils or on clay-pans (~50% each). These old pasture areas need to flood to get seeds to germinate, but don't receive it. Smallholders keep livestock, which in the absence of gazing land, need fodder.

The challenge has been to bring back degraded pasture area, which then need to be nurtured with a machine harvesting 'hay-making' method and / or with limited livestock rotation[97], and to experiment on stocking rates and timing, and then to replicate and scale-up.

The project has begun this with: a 'pasture seed stock & multiplication demonstration', for future enrichment re-seeding works; with saturation irrigation of bunded pasture areas to germinate the dormant seed bank; and now also importantly pasture rotation rational-use plans for fodder and hay production. Whilst this is underway, the project has been supporting intensive fodder production of cereals and lucerne using hydroponics (growing in water with added plant nutrients, but without soil).

From saline to clean water, but aquifers need replenishment

Extracted aquifer water is saline and needs to be purified, if it is to be used for drinking, for hydroponics, or for drip irrigation in horticulture. However, if there is over extraction from these aquifers (more borehole drilling is being requested by the PPCs with local official support), then they are unlikely to be replenished, and the result will be a permanent water shortage, which is likely to make more areas uninhabitable. Due to drought, some areas have been temporarily uninhabitable, and settlements have had to move with state support. Thus the project's water purification technology on its own is not a panacea.

Horticulture

Low spring temperatures and then early frost in the autumn impedes on the production of horticulture crops. The intervention solution was hotbeds prepared in the soil, with bio-organic stimulators (straw / manure under the soil) to raise soil temperature. The below-ground system was augmented by above ground polythene tunnels to trap sunlight heat, and also raise the soil surface temperature. The result of this is earlier seed germination / seedling growth, and it allows for a quicker plant flowering and fruiting cycle to mature earlier before autumn frost. Demonstration farmers with farmer field days were used to expand the uptake of the technology, which was very successful.

New legislation, including the Cooperative & Land laws

[97] Need the animals for manure / organic matter to fertilize and built the soil structure

The project supported agriculture policy change, however the building blocks for this were the change in the land ownership law[98], plus the Cooperatives Law, which together provided much greater livelihood security. The project also directly supported a number of production pasture cooperatives (PPCs). The model for this institutional change, in cooperatives becoming self-governing and working with district affiliates / associations, was partly adapted from experiences in the Fergana Valley, Korea, and Israel.

In 2019, the farm cluster system started. The farmers elected a cluster or enterprise leader who holds the land tenure certificate, however as cooperatives become legal entities, the entity with its membership should be able to hold the land tenure certificate (making the system transparent and less open to corruption). Under the farm-cluster initiative, the establishment of cooperatives is being encouraged, which is more efficient than individual smallholder dekhan farms[99].

6.2. Lessons Learned

Institutional Structures

The project worked closely with state institutions (e.g. CHS hosting the hydromet / DEWS platform), but also with a number of academic / research institutes (Tashkent Agrarian University in Nukus, and the Kegeyli Agrarian-industrial College in the demonstration of high-tech greenhouses, and agromet stations; Nukus Natural Sciences Research Institute in fodder seed multiplication, and ecologically-based pasture rehabilitation; and Nukus Science Academy in using glauconite mineral as a soil amelioration agent). The value in working with these institutions lay in their remit to undertake research, test, pilot and disseminate new advances in arid zone farming. The solutions needed by the project were not just the obvious CA / SWC measures (no till – direct drill, mulching, soil bunding), but were activities that needed both new and efficient technologies such as laser-levelling and hydroponics, but also technologies based on ecological principles to begin the process of pasture restoration.

Extension and access to agromet information

For joining up the agriculture information network, from a farmers point of view, there is no plan at present. CHS provide hydromet services, directly to MoA who pass on to their Departments of Agriculture, especially seasonal, monthly, and 10-day windows, on a regional level. However the farmers at present have to rather hunt down this information separately. Thus, there is a need for a clearer model in not only how on a farmer-level to access hydromet / agromet DEWS information, but in the general outreach model to farmers. The further use of smart-phone apps and telegram groups needs to be explored.

Aquifer extraction

Due to the success of making potable water, more boreholes are being requested, however the extent that either the extraction or if the monitoring of aquifer levels is being undertaken needs to be addressed. This is based on the importance of the water scarcity problem, and the issue needing to rise on the political agenda of MWR in KKPS.

Pasture restoration & Tree planting in the ABDA

The cost-benefit of the impressive now working pasture restoration efforts needs to be assessed, for a number of reasons: there is a clear community vested interest; livelihoods should improve as a result, and in terms of a (climate change mitigation measure) carbon-sink, there should also be benefits, if much larger areas of pasture can be restored.

The cost-benefit of nursery production and planting of saxaul trees needs to be assessed, to see how improvements can be made. The extent that the ABDA tree planting reduces the severity of dust storm damage is also difficult to determine in the short-term, but needs longer-term monitoring.

Glauconite

The glauconite mineral needs to be tested, mainly based on soil structure (sand, silt, clay content), which largely

[98] This took land allocation out of control of local administrations; allowed auction of land and cooperative ownership, which stopped local administrations (khokimiyat governors) re-apportioning people's land, so now there is an incentive to invest in their land.

Land is being allocated / auctioned to farmers (small, medium and large). To date 5,217 registered farms have been issued with land tenure certificates covering 289,000 ha (~55 ha per farm)

[99] The cluster structure has also been partly retained in KKPS with the encouragement of some cotton production to continue, for structural / economic reasons.

determines the soil's water-holding capacity, and not based on crop type[100].

6.3. Recommendations

The recommendations are listed [with the responsible party identified in brackets].

1. The multi-module early-warning platform for hydromet / drought / agromet needs to be finalized [CHS / UNDP]
2. In light of the project's successful achievements in demonstrating CCA measures, it would be useful to now assess them against, the Aral Sea Basin Programme 2021-30, and make any recommendations. This would be especially useful, in assessing the four project components in a holistic way, and where overall impacts were greater when a number of activities were implemented together [PIU / UNDP with KKPS government]
3. The CA activity 'zero till - direct drill' may not be supported by agribusiness, because of grain crop contamination with weed seed. However, the long-term conservation of the soil is of higher importance and is sustainable. Local legislation to incentivize and / or protect the CA direct-drill areas may be needed. [PIU / UNDP with KKPS government]
4. The PPCs (and their umbrella APPC) to update their annual and 5-year technical business development plans, with the uptake of project activities, including the tree nursery production and hydroponic fodder production, so they are transparent for their PPC members, but also equitable in providing the fodder products at a fair price for their members, before any outside sales [PPCs, APPC]
5. The project developed a 'pasture rotation rational use scheme' for each PPC, however, these tailored plans need to be supported and monitored, to assess their on-going quality in achieving desired aims. Records need keeping of livestock numbers, rotations of fodder crop baling and volumes from pasture areas [KKPS DoA with the VCCs and PPCs]
6. Concerning the pasture restoration demonstrations (delta irrigation, pasture seed multiplication & re-seeding with added fodder species), it is an example of applied research, and there is a need to monitor and refine methods [Nukus Research Institute for Natural Sciences with the PPCs]
7. Monitoring of the tree nurseries is important, because technical improvement and efficiencies should be found for the large scaling-up of production and planting by government. Also not least, because the seedling producing PPCs profit twice, once from the seedlings, and again from acting as seasonal planters for the young trees, so the vested interest in a professional operation is high. [Nukus Research Institute for Natural Sciences with the PPCs, with the KKPS State Committee for Forestry, and the PPCs]
8. It is also important to monitor the saxaul tree plantations, to identify lessons to improve tree survival rates, and the impact on reducing sand / dust storms. It is important that the lead monitor is an independent institution [Nukus Research Institute for Natural Sciences with the PPCs, with the KKPS State Committee for Forestry, and the PPCs]

[100] TE comment – due to its clay content, the application of glauconite may not work with sandy soils. The difference in particle size is too great for efficient soil binding, so the result would be the sandy soil becoming sticky, with the glauconite eventually just washing through the sandy soil when it rains. This was partly confirmed by the testing on 21 farms where only clay or loam soils were selected

7. ANNEXES

Annex 1: Delivery of Project Objective and Outcomes against Performance Indicators

Assessment Key:

Green: Completed / Achieved	**Yellow:** On target to be completed / achieved	**Red:** Not on target to be completed / achieved

Extracted from TE ToR - IP indicate if there have been approved changes			IP to fill with detail text on achievement	TE team	TE fills out
Indicator	**Baseline**	**End of Project target**	**2021 End term Level & Assessment**	**Achievement Rating**	**Justification for Rating**
Objective: To develop climate resilience of farming and pastoral communities in the drought prone parts of Uzbekistan					
Outcome 1: Institutional and technical capacity for drought management and early-warning developed					
1.1: Number and quality of forecasts and drought early warnings for Karakalpakstan region	The Uzhydromet provides a full coverage throughout the country. However, for a comprehensive and well-functioning drought early warning system new technical skill, hardware and institutional coordination and feedback mechanisms are necessary. The density of meteorological and hydrological stations is insufficient to provide adequate coverage for drought monitoring. A wide range of data is necessary to adequately monitor climate and water supply status (i.e., precipitation, temperature, stream flow, ground water and reservoir levels, soil moisture, snow pack). These data are often not available at the density required for accurate assessments. With climate change, seasonal forecasts and warning systems should be also linked with water user and farmer groups as well as extension services for the warnings to be effectively and timely delivered. The role of extension service becomes critically important in the context of climate change adaptation worldwide, but Uzbekistan does not yet have the extension system in place	Instalment of 2 Doppler water meters and 8 automated meteorological stations; At least 40,000 km2 of the Karakalpakstan region will be covered by automated hydro-meteorological observation network; Season ahead forecasts and 2 weeks ahead temperature forecasts for effective warnings will be practiced;	Reliable long-term forecast of water availability for downstream of Amudarya river is key input into decision making process related to mitigation the drought or low water implications for Karakalpakstan. Long-term assessment of the water availability (vegetation period and monthly within vegetation period) by the data measured at 5 key water gauge stations located in downstream of Amudarya river are produced with help of Drought Early Warning System (DEWS) adapted to Amudarya downstream condition by the project. Validity of the water availability forecasts/assessments is ranged 70-100% and lead time 6-8 months. Forecasts are issued yearly in October of previous to forecasted year since 2018. Information/warnings were delivering to end users via project informational bulletins and notes with water availability assessment. 5157 people (876 women) were informed. Recently the project is working on deployment of the multifunctional informational platform (MIP)based on use of the ground and mobile phone facilities as well e-mailing to deliver	S	The project was unable to fully demonstrate the extent of the development of the hydromet platform with DEWS, or its near operational status

			warnings and other hydrometeorological information to end users. It's expected that MIP will be ready at the end of Oct 2021. Then stakeholder coverage will be at least 50 000 people including decision makers, local administration, technical staff and end land and water users.		
1.2: % of vulnerable farmers & pastoralists receiving science-based extension services to promote drought risk reduction among vulnerable farmers & pastoralists	-"-	At least 40% of Dekhkan farmers and pastoralists of Karakalpak region will be served by science-based extension; At least 3 Field School/Extension established to deliver training in adaptation practices to farmers and pastoralists; At least 20% of targeted Dekhkan beneficiaries will be female.	Since the inception period 21 200 (41% of 51,208 as the total number of Dekhkan farmers and pastoralists in 6 project pilot districts in Karakalpakstan, of which 28% female) representatives of local communities trained or consulted on available and innovative agro-conservation and water saving practices by the 3 Extension Services Centers established with technical and thematic assistance of the project. Due to COVID-19 lockdown restrictions almost all activities were mainly delivered through telecommuting mode.	S	The project established 3 agriculture extension service centres
Outcome 2: Climate-resilient farming practices established on subsistence dekhkan farms of Karakalpakstan					
2.1: Percentage of population adopted climate resilient conservation agriculture and water saving measures at the farm level	Water is the most limiting factor in the arid lands of Uzbekistan. Especially the regions that are located downstream suffer the most. Fears of scarcity often results in over-irrigation by upstream farmers, leaving very limited amounts of water for the downstream farmer and pastoral communities. Over-irrigation is often detrimental for the crops and cause secondary salinization. This over reliance on irrigation system diverts the attention from water and soil conservation measures that can offer greater land and water productivity as well as greater resilience to droughts. The government is becoming increasingly aware of pressures posed by drought and climate change induced reductions in water flows. In response to severe droughts of 2008/09 the government has issued the policy measures to help minimise the	At least 40,000 Dekhkan farmers have adopted climate resilient conservation agriculture practices (e.g. low till, mixed cropping, fodder production, and residue crop soil covering adopted measures adopted at 80,000 ha of dekhkan farms) by end of the project; At least 40,000 Dekhan farmers have adopted water saving irrigation practices (e.g. land levelling, furrow, drip irrigation systems adopted at 80,000 ha dekhkan farms to improve farm-level drainage	Since the inception: 41194 people (80% of 51,208 as the total number of Dekhkan farmers and pastoralists in 6 project pilot districts in Karakalpakstan, of which 34% female) adopted and are benefited from use of various conservation agriculture practices, including combined use of land and water resources (1819 people, 5% female) zero tillage with crops residue retention at soil and mulching (6352 people, 28 % female), crop rotation (1900 people, 49% female), pan breaking (984 people, 48% female) water sorbent use (100 people , 40% women), bio-protection of crops and improvement of land fertility (3694 people, 26% female), fodder production including one based on hydroponic tech (26445 people, 49% female) in 6	HS	The outcome included both CA and SWC measures, with a high uptake, however measuring the number beneficiaries was often based on total numbers (e.g. one smallholder became 5 household members; 1 school became 500 users), which made it difficult to determine how may smallholders the project actually reached as a

	losses (such as fodder production, establishment of greenhouses, etc.). Since 2002 it has invested $1,000,000 million in agricultural modernisation, land consolidation and infrastructure upgrade. This however mainly covered private, commercial farms that replaced inefficient shirkats after the two phase reform since 2003 and more recently since 2008, when the government launched its new 'land optimisation' policy. As a result of this policy, currently, there are over 3,000 private farmers in Karakalpakstan, compared to over 9,000 farmers in 2007. The government is seeking for the options to optimise agricultural production and minimise the adverse impacts of droughts both in short and long term. The reform processes, however slow, provide positive political impetus towards the adaptation solutions	and minimise salinization) by end of the project; Female lead horticulture greenhouses will be established by 2016; Laws on agricultural practices and water management will be amended by to integrate regulations on the adoption of conservation agriculture and water saving techniques and technologies on the farms by end of 2016.	project pilot districts through technical assistance provided. 43750 people (85% of 51,208 as the total number of Dekhkan farmers and pastoralists in 6 project pilot districts in Karakalpakstan, of which 31% female) adopted and are benefited from use of various water saving agriculture practices, including land laser levelling (7000 people, 12% female), drip irrigation water saving practices and pastures estuary irrigation (16 527 people, 49% female), intensive gardening equipped with solar-powered drip irrigation systems (11,085 people, 30% female), ground water use from shallow wells with reverse osmosis purification systems (9138 people, 39% female)		percentage of the total number of smallholders in a district
Outcome 3: Landscape-level adaptation measures for soil conservation and soil moisture retention improves climate resilience for over 1,000,000 hectares (ha) of land					
3.1: Coverage (in ha) of landscape level adaptation measures implemented for sand stabilization and moisture retention	There have been sporadic and largely unsuccessful attempts to stabilise sands and prevent their detrimental encroachment to the farm and pasture lands. With climate change induced aridification and change in intensity, direction and speed of the winds, sand movement will be augmented and productivity of farm lands further derailed. It will activate the salt migration processes. The main reasons for failed attempts to encourage larger scale rehabilitation of vegetation cover and maintenance of plantations relate to the ad-hoc nature of such efforts that are not linked with broader view of landscape functions, poorly planned coverage that do not have perceived effects on farm and pasture lands in their function of windbreaks or sand fixing barriers. Previous efforts of plantations are not planned and implemented based on climate change scenarios and wind models that are to show the dynamic of change of hysteresis line where the future plantations need to be moved and expanded.	Over 70,000 ha of arid land of Karakalpakstan is covered with saksaul and tamarix plantations to deliver sand stabilization and soil desalinization function; At least 20,000 people organized in at least 10 cooperatives at the khokimiyat and makhalla levels to participate in sand stabilization plantation scheme; At least 10 community organizations (at least 5 female groups and village organizations) at khokimiyat and makhalla level have clear mandates, institutional capacities and skills to	As of September 2021 , 65 500 ha are planted with saksaul seedlings and productivity of 27 000 ha of degraded natural pastures is raised with assistance of the project. Till end of the project it's expected to have at least 75 500 ha planted with saksaul seedlings that are growing (10 mln seedlings) in nurseries established with technical assistance of the project. All seedlings will be granted (free of charge) to State Committee of Forestry of the Republic of Karakalpakstan as per MOU signed between UNDP and Sate Committee and seedlings will be planted over area 10 000 ha within Nov-Dec 2021.	HS	The tree planting in the ABDA was a effective model that the national and regional government of KKPS are now following to scale up

		manage saksaul and tamarix plantations			
Outcome 4: Knowledge of climate-resilient agricultural and pastoral production systems in arid lands generated and widely available					
4.1: % of population aware of and practicing well tested, climate resilient agricultural practices	While the government and rural communities are very well aware of increasing variability that is negatively affecting agricultural production and people's livelihoods there is little awareness and knowledge how to move towards climate resilient solutions. This is an underlying cause of the current situation when despite some sporadically demonstrated water saving irrigation and agronomic methods take up rates are very low and the farmers continue the same inefficient and unsustainable practices that increase their vulnerability to drought and climate change risks. Existing good practices have largely been demonstrated at the scale that makes the justification for broader application difficult. Khorezm University definitely represents a strong knowledge centre in agronomic and agricultural research. However outreach mechanism, transmission of knowledge is limited in scope (within the scientific community), not well tailored or systematic. Moreover, any lessons learned are not being captured in a fashion that facilitates broader sharing, or that casts light on ways to address an aggravation of the food security situation during the droughts and as a result of climate change	At least two sets of lessons learned bulletins produced to cover successful climate resilient agronomic and water saving measures; At least 5 farmland demonstration meetings covered by the local and national media for adaptation advocacy	80% of 51,208 as the total number of Dekhkan farmers and pastoralists in 6 project pilot districts in Karakalpakstan, of which 34% female adopted and are benefited from use of various conservation agriculture practices. 85% of 51,208 as the total number of Dekhkan farmers and pastoralists in 6 project pilot districts in Karakalpakstan, of which 31% female adopted and are benefited from use of various water saving agriculture practices. The project developed 38 units of the informational materials/knowledge products including thematic publications, guidance and handbooks, informational bulletins, mobile applications and video reels. Total amount of the informational materials that was delivered to end user is 15 525. All products are available on climatechange.uz/af.climatechange.uz 148 informational workshops and field hand on trainings were conducted with coverage of 10 476 people, 20 % of 51,208 as the total number of Dekhkan farmers and pastoralists in 6 project pilot districts in Karakalpakstan, of which 5% female. 21200 end users, 41 % of 51,208 as the total number of Dekhkan farmers and pastoralists in 6 project pilot districts in Karakalpakstan, of which 12 % female were consulted on climate resilient agriculture practices by three Extension Service Centers established with technical and thematic assistance by the project.	HS	The project made an extensive effort to educate, communicate, disseminate, and ultimately achieve a high uptake and adoption of project interventions

Annex 2: Delivery of Outputs

Outputs	Achievements Reported by IP	TE Comment
Project Objective: 'To develop climate resilience of farming and pastoral communities in the drought-prone parts of Uzbekistan, specifically Karakalpakstan' (Aral Sea region)		
Outcome 1: Institutional and technical capacity for drought management and early-warning developed		
1.1: Upgraded observation and monitoring infrastructure (8 Automatic Weather Stations (AWS), 2 Doppler water meters) for effective data receiving and transmission	In 2017, equipment was installed for 10 AWS in the Republic of Karakalpakstan (the entire observational network of the Karakalpak Hydro meteorological Department). Two key hydrological posts are equipped with Doppler profilers (measurement of flow velocity and depth as well as water discharge). The following equipment has been transferred: 10 sets of AWS equipment for measuring the main meteorological characteristics (manufacturer SIAP MICROS, Italy); 11 KV radio stations, 10 sets of mast equipment; 12 automatic terminals VIP MK (provides communication with the data logger); 12 personal computers and 2 multifunction printers; 2 M9 systems for automatic measurement of depth and flow rate, as well as water flow (manufactured by SonTek, USA); 2 advanced power supplies for the M9 system; 2 motorboats; 4 portable radio stations.	▪ The project provided and installed an extensive list of equipment ▪ AWS in Muynak has been dismantled because the site turned out to be on the territory of a new airport under construction. AWS will be restored during September-October 2021.
1.2: Multi-module platform for integration of data flow from hydro-meteorological (hydromet) observation network to end users	The TOR has been developed for the creation of a multimodal information platform (MIP). A contract was signed with a national company for the deployment of MIP in Uzhydromet, the Ministry of Agriculture, the Ministry of Water Resources, the Ministry of Emergency Situations, the Ministry of Agriculture of the Republic of Kazakhstan, the Ministry of Water Resources of the Republic of Kazakhstan, the Khokimiyats (Government Authority) of the pilot regions, the Councils of farms and owners of household plots. The following equipment and software has been transferred: 4 workstations (high performance PC); 4 licensed software packages; 15 personal computers with audio and video peripherals; 15 multifunction printers.	▪ The commissioning of the MIP is planned until October 30, 2021. ▪ Evidence of the system becoming operationally 'live' was lacking
1.3: Drought early warning mechanisms (indicators, gauges, warning distribution mechanisms etc.) to minimize impacts of droughts in place and functional	An early information system has been developed about the risk of low water and drought occurrence 6-8 months in advance for the lower reaches of the Amu Darya. Information will be disseminated through the MIP. Before the MIP was put into operation, information was communicated to users through information bulletins and references with long-term estimates of water content for the lower reaches of the Amu Darya. 5157 people (876 women) received information. 1 package of licensed software (MatLab) and software "Early warning system about the risk of low water and drought in the lower reaches of the Amu Darya" has been purchased. Information about the water content in the lower reaches of the Amu Darya was received by: 462 people (83 women) in Muynak district; 992 people (173 women) in Kegeyli district; 1378 people (241 women) in Chimbay district; 967 people (161 women) in Kanlykul district; 944 people (143 women) in Takhtakupir district; 414 people (75 women) in Bozatausky district.	▪ The system will be put into operation together with the MIP until October 30, 2021. ▪ Evidence of the system becoming operationally 'live' was lacking – until then bulletins are presented via telegram groups

Outputs	Achievements Reported by IP	TE Comment
1.4: Science-based extension services for subsistence dekhan farmers established to assist in farm-based climate risk management, including sub-district, community level Climate Field School / Extension (CFS/E) for direct outreach to farmers and localized training in adaptation practices	With the assistance of the project, three Consulting and Information Centers (CIC) have been created: 1. CIC at the Nukus branch of the Tashkent State Agrarian University (NBTSAU) in Nukus; 2. CIC at the Agrarian-Industrial College of the Kegeyli region; 3. CIC at "Konsawt Markaz" LLC. During the operation of the CIC, their services were used by 21200 users, 6021 of them women. CIC consulting services were used by: 1,356 people (384 women) in the Muynak district; 4376 people (1312 women) in the Kegeyli district; 5887 people (1672 women) in Chimbay district; 4301 people. (1153 women) in Kanlykul district; 4146 people (1177 women) in the Takhtakupir district; 1134 people (323 women) in Bozatausky district. Transferred equipment, materials and preparations: High-tech greenhouse (400 m2 in NBTSAU); High-tech greenhouse (144 m2 CIC in Kegeyli region); Equipment for 2 automatic agrometeorological stations for determining the main meteorological characteristics and soil characteristics. The stations are on the balance sheet of the NBTSAU, installed in the Kegeili and Kanlykul regions. The data is available through the telegram bot (You can test it: @FieldClimateBot); 3 sets of equipment for determining the physical and mechanical properties of soil and water (pH meters, conduct meters, meters of moisture reserves in the soil (TDR and FDR technologies) water distillers, drying ovens, high-precision scales, soil sampling kit); 1 stationary photometric station (determination of chemical elements in water and soil); 2- portable photometric stations; 25 thermometers (no mercury); 25 air humidity meter; 1,500 copies of educational and special publications.	▪ Two centres were based in academic institutions, and one with a commercial company
Outcome 2: Climate-resilient farming practices established on subsistence dekhkan farms		
2.1: 40,000 Dekhkan farmers have adopted climate-resilient conservation agriculture practices (e.g. low till, mixed cropping, fodder production, and residue crop soil covering adopted measures adopted at 80,000 ha of dekhkan farms)	41,194 people (17,663 women) use climate-resilient resource-saving agriculture practices (for example, minimum tillage, mixed cultivation of crops, fodder production, soil covering with crop residues) in 6 districts, namely Bozatau, Kegeyli, Takhtakupir, Chimbay, Kanlykul and Muynak: ▪ As a result of the project activities to disseminate the best agricultural practices, the total number of farmers and dekhkans who applied the integrated use of land and water resources amounted to 1819 people, including 90 women (5%). ▪ Zero sowing used on an area of 1580 hectares, benefitting 4934 people, including 1892 women (38.3%) ▪ Mulching was carried out on 303 hectares, 1418 people receive benefits, including 356 women (25.1%) ▪ Crop rotation was carried out on 400 hectares, 1900 people get benefits, including 932 women (49%) ▪ Deep loosening was carried out on 188 hectares, 984 people has benefited, including 482 women (48.9%) ▪ The biosecurity and bioorganic fertilizers was carried out on 562 hectares, 3694 people received benefits including 960 women (26%) ▪ The production of fodder feed on 2294 hectares, 21362 people, including 10,466 women (49%)	▪ CA measures with agriculture equipment and advice was provided

Outputs	Achievements Reported by IP	TE Comment
	▪ Hydroponic feed production was carried out in 3 cooperatives and 6 households in Bozatau, Takhtakupir, Chimbay, Kanlykul and Muynak districts, where 5083 people benefit, including 2485 women (48.9%) Transferred equipment, materials and preparations: 10 plows for plowing (Bozatau, Takhtakupir, Chimbay, Kanlykul and Muynak) 1 unit of combined disc harrow (Model DBK-4) for moisture closure, field leveling, weed control, stubble plowing after harvesting crops, pre-sowing treatment (Bozatau); One unit of soil-pressing chisel, combined (Model ChPK-3) for deep moldboard-free chisel-growing of the soil, deepening the arable layer without turning the layer of soils of different textures and for decompaction of meadows, pastures (Bozatau); Agroperlite 100 m^3 for planting, transplanting, grafting of all types of plants, shrubs, and tree seedlings; Five units of the ATMASA zero seeder for direct sowing of various crops without preliminary soil treatment. Cutting off plant residues provides penetration into the soil at the required sowing depth and embedding seeds into the ground (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul); Three bed former for the formation of row furrows up to 25 cm high (Bozatau); 1584 kg of agrofibre (Bozatau, Muynak, Kegeili, Kanlykul, Chimbay, Takhtakupir); 1 unit of a chopper of plant residues (Model RIRO-3) (Bozatau); 1 unit of subsoiler (Model GRP-1,8) for loosening untouched soil during plowing, thereby destroying the plow sole to improve aeration and permeability of soils (Bozatau); 320 liters Agroflorin (Агрофлорин) - an enzyme preparation that restores the fertile properties of soils (Bozatau, Kanlykul, Muynak, Takhtakupir); 20 units of knapsack sprayers for spraying plants with liquid fertilizers for leaf nutrition and preparations for protecting plants from pests, diseases, and weeds (Bozatau, Muynak, Kanlykul, Takhtakupir); Systemic insecticide entolucho 435 l to protect forage seeds from insect pests (Bozatau, Muynak, Takhtakupir); 30 units of propane pumps for small fields irrigation; Hydroponic plants for growing green hydroponic forage: Two units of 40 kg per day (Muynak, Chimbay); 2 units of 80 kg per day (Muynak, Kegeili); Two units of 120 kg per day (Bozatau, Takhtakupir); 2 units of 500 kg per day (Bozatau, Muynak); 1 unit 6500 kg per day (Bozatau).	
2.2: 40,000 Dekhan farmers have adopted water-saving irrigation practices (e.g. land leveling, well management, furrow and drip irrigation systems) at 80,000 ha dekhkan farms to improve farm-level drainage and minimize salinization	43,750 people (15,951 women) use the practices of water-saving irrigation of land (for example, on 80,000 hectares of land, laser land leveling, management of the use of water resources of artesian wells, siphon, and drip irrigation systems are used to improve drainage at the level of: ▪ Laser leveling of fields was carried out in Bozatau, Kegeili, Takhtakupir, Chimbay, Kanlykul, and Muynak districts on an area of 7512 hectares, 7000 people received benefits, including 840 women (12%) ▪ Drip irrigation of household lands is carried out in Bozatausky, Kegeili, Takhtakupir, Chimbai, Kanlykul, and Muynak districts on 36.8 hectares; 16,527 people received benefits, including 8221 women (49.7%)	▪ Water-saving and soil & water conservation measures ▪ These were augmented with drip irrigation systems (see next 2.3 horticulture output), and ex-situ fodder

Outputs	Achievements Reported by IP	TE Comment
	▪ Intensive solar-powered drip-irrigated gardens have been created on 24 hectares of Bozatau, Kegeili, Takhtakupir, Kanlykul, and Muynak districts, from which 11,085 people benefited, including 3273 women ▪ The use of well water after purification using a reverse osmosis system is carried out in 18 places in Bozatausky, Takhtakupirsky, Chimbaysky, Kanlykulsky, and Muynaksky districts, 9138 people benefited, including 3564 women (39%); ▪ The daily use of 1000 liters of sodium hypochlorite disinfectant by 112 institutions (medical institutions, catering establishments, markets, shops, schools, kindergartens, government agencies) in Bozatausky, Takhtakupirsky, Chimbai, Kanlykulsky, and Muynaksky districts; ▪ Installed for sanitary and hygienic purposes ten solar water heaters for students of 10 schools in Bozatausky, Takhtakupirsky, Chimbai, Kanlykulsky, and Muynaksky districts, coverage of 7673 students (3759 girls) (these figures are duplicated since the same students are in the list of greenhouse users); ▪ Liman irrigation was carried out on an area of 27,000 hectares of pastures in the Bozatau & Takhtakupir districts Transferred equipment, materials and preparations: Seven sets of laser equipment (without a scraper) for leveling fields, also for installation on a scraper or the purpose of leveling agricultural fields; 16 sets of laser equipment with a scraper for cutting, transporting, and dumping soil with the formation of a planned field (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul, Muynak); 2106 sets of gravity drip irrigation systems, 100 sq. m for irrigation of plants on household lands, greenhouses, and greenhouses on an area of 100 sq.m. (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul, Muynak); 630 sets of gravity drip irrigation systems, 250 sq. m for irrigation of plants on household lands, greenhouses, and greenhouses on an area of 230 sq.m. (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul, Muynak); 21610 pieces of seedlings for creating intensive orchards (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul, Muynak); Nine sets of solar-powered drip irrigation systems to provide drip irrigation for intensive gardens using solar energy (Bozatau, Kegeili, Takhtakupir, Kanlykul, Muynak); Garden toolset (Model ZH-6278) - 130 pcs. for work on the care of plants, flowers, fruit, and ornamental plantations (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul, Muynak); 18 boreholes with 13 solar pumps for technical aquifer water use; 18 reverse osmosis systems with a capacity of 0.5 m3 / hour and one reverse osmosis system 6 m3 / hour for complete purification, disinfection of water, removal of salt, metals, fluorine, and sodium from its composition; Installed seven units of hydrolysis units for the disposal of brine emitted from the reverse osmosis system by the transformation of brine in the process of an electrochemical reaction into a disinfectant - sodium hypochlorite (Bozatau 4 units, Chimbay 1 unit, Muynak 2 units); Ten solar water heaters for domestic hot water using solar energy (Takhtakupir 2 sets, Muynak 2 sets, Kegaley 1 set, Kanlykul 1 set, Chimbai 2 sets, Bozatau 2 sets); Nine transformers and nine electric pumps to provide estuary irrigation (Bozatau, Takhtakupir).	production using hydroponic systems ▪ There were also boreholes and water purification equipment which was used both for the fodder hydroponics but also for others, such as the PPC and schools

Outputs	Achievements Reported by IP	TE Comment
2.3: 40% of targeted dekhan farmers have established horticulture greenhouses on 20,000 ha of farms to minimize impacts of droughts on farm production	57875 people (27709 women) use 2679 greenhouses, greenhouses: ▪ Cultivation of crops in closed ground on 4.58 hectares, 57875 people received benefits, including 27709 (47.8%); ▪ Sowing under the film was carried out on 18767 hectares; ▪ Installed 5 split systems for heating greenhouses in schools, coverage of 3233 students (1584 girls) 5 schools. 30 greenhouses of 115 m^2 each to protect cultivated plants from adverse weather conditions and to grow cabbage, tomatoes, cucumbers, ornamental plants, rooting cuttings for subsequent planting in open ground. 113 greenhouses of 100 m^2 each to protect cultivated plants from adverse weather conditions and grow seedlings of cabbage, tomatoes, cucumbers, ornamental plants, rooting cuttings for subsequent planting in open ground (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul, Muynak, Nukus). Two greenhouses 480 and 144 m^2 for growing vegetables, fruits, herbs, and seedlings (Nukus, Kegeyli). 75,000 meters of plastic pipe for the frame of greenhouses, fittings, and film for 2,000 greenhouses of 12 m^2 to create frames for small greenhouses (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul, Muynak). Films for covering 534 greenhouses of 12 m^2 (Bozatau, Chimbay, Kegeili, Takhtakupir, Kanlykul, Muynak). Two units of arc-film-layer for the formation of greenhouses (film tunnels) on the arcs in one pass (Kegeili, Bozatau).	▪
2.4: Legal and regulatory framework put in place to support well tested farm-based adaptation measures for replication and upscale	Recommendations have been developed aimed at improving the existing regulatory framework in order to promote well-proven practices for adaptation to climate change and for further sustainable development of the agricultural complex. The recommendations were included in the following regulatory documents: ▪ The Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030, approved by (Decree of the President of the Republic of Uzbekistan dated October 23, 2019 No. UP-5853); ▪ Concept for the development of the water economy of the Republic of Uzbekistan for 2020-2030 (Decree of the President of the Republic of Uzbekistan dated July 10, 2020 No. UP-6024); ▪ The concept of the priority development of the knowledge and innovation system in agriculture in 2021-2025, (Decree of the President of the Republic of Uzbekistan dated 03.02.2021 No. UP-6159); ▪ Draft Law of the Republic of Uzbekistan "On Food Security". Based on the results of the studies carried out to improve the existing regulatory documents on adaptation to climate change and the implementation of actions in the agricultural sector, recommendations have been developed aimed at further development of the agricultural sector. These recommendations were discussed with specialists from the relevant departments of the Ministry of Agriculture, the Ministry of Finance, as well as the Ministry of Economic Development of the Republic of Uzbekistan, and following the results of the discussions, individual proposals were included in a number of regulatory legal acts aimed at the development of agriculture and water management of the Republic of Uzbekistan. In particular, in: The Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030, approved by the Decree of the President of the Republic of Uzbekistan dated October 23, 2019 No. UP-5853;	▪

Outputs	Achievements Reported by IP	TE Comment
	The Concept for the Development of the Water Economy of the Republic of Uzbekistan for 2020-2030, approved by the Decree of the President of the Republic of Uzbekistan dated July 10, 2020 No. UP-6024; The concept of the priority development of the knowledge and innovation system in agriculture in 2021-2025, approved by the Decree of the President of the Republic of Uzbekistan dated 03.02.2021 No. UP-6159. Based on the results of work carried out in previous years within the framework of the UNDP / Adaptation Fund project and the Government of Uzbekistan, the draft Law of the Republic of Uzbekistan "On Food Security" includes appropriate measures to adapt to climate change and mitigate its consequences.	
Outcome 3: Landscape-level adaptation measures for soil conservation and soil moisture retention improves climate resilience for over 1,000,000 hectares (ha) of land		
3.1: Local saksaul and tamarix plantations deliver sand stabilization and soil desalinization functions for 1,042,094 ha of farm and adjacent farmlands, based on wind models and comprehensive landscape rehabilitation and management plan	▪ Saxaul seedlings were planted on the drained bottom of the Aral Sea with technical assistance from the project, on an area of 75 800 hectares. Improved previously degraded pastures on an area of 27,000 hectares. To the State Forestry Committee of the Republic of Karakalpakstan: ▪ 25 units of machines, mechanisms and equipment (tractors, forest planting machines, chisel, digging plows, ditchers, transport carts, subsoilers, water tanks, a reverse osmosis system for water purification and a photovoltaic station), systemic insecticide (Entolucho 435 liters), 20 million seedlings of saxaul. Pasture cooperatives are devoted to: ▪ 131 units of machines and mechanisms (tractors, mounted 3-body plows, tractor trailers, forage equipment, ridge formers, laser leveling devices with a grader, mounted boom sprayer, manual backpack sprayers, disc harrow, subsoiler, chisel soil-rolling, electric water pumps , current transformers, portable propane water pumps, rotary and segment finger mowers, balers).	▪
3.2: Community management scheme for planting and maintenance established as community employment scheme for landscape level adaptation	▪ A community management scheme has been developed and is being implemented to ensure cooperative members' seasonal and permanent employment through participation in reforestation work. ▪ 20,441 jobs were created, of which 126 are permanent jobs (58 women), 20,315 seasonal jobs (8118 for women). ▪ The following technical assistance was provided to pasture cooperatives: 131 units of machines and mechanisms were provided (tractors, mounted 3-body plows, tractor-trailers, forage equipment, ridge formers, laser planners with a grader, mounted boom sprayer, manual knapsack sprayers, disc harrow, subsoiler, soil-rolling chisel, electric water pumps, current transformers, portable water pumps, rotary and segment-finger mowers, balers).	▪
3.3: Cooperative management for landscape rehabilitation and management established to enhance community control and ownership arrangements	▪ 13 pasture cooperatives have been created, uniting residents of 19 rural citizens' gatherings with a total number of 64,723 people, of which 32,535 are women (50.3%); ▪ Members of pasture cooperatives are 25889 people, of which 13,014 women (50.3%) ▪ Based on project, the Association of Pasture Cooperatives of Karakalpakstan was established. ▪ Annually 25889 people are involved in forest reclamation work, 13,014 of them are women. ▪ The following technical assistance was provided to pasture cooperatives: 131 units of machines and mechanisms (tractors, mounted 3-body plows, tractor-trailers, feed equipment, ridge formers, laser levelers	▪

Outputs	Achievements Reported by IP	TE Comment
	with a grader, mounted boom sprayer, hand-held knapsack sprayers, disc harrow, subsoiler, soil-rolling chisel, electric water pumps, current transformers, portable water pumps, rotary and segment-finger mowers, balers). ▪ Production pasture cooperatives own 26238 ha of natural non-irrigated pastures and 386 ha of irrigated land.	
Outcome 4: Knowledge of climate-resilient agricultural and pastoral production systems in arid lands generated and widely available		
4.1: Inventory of all tested agronomic and water saving measures to map out successful practices	Educational materials have been developed in three languages (Karakalpak, Uzbek, and Russian): 1. A guide to environmentally friendly low-cost. Resource-saving technologies. 2. 11 lessons on the development of optimized agriculture in northern Karakalpakstan. 3. Bulletin 1 “Lessons learned during the implementation of the AF / UNDP / Uzhydromet project of climate-resistant agricultural and environmentally sound practices in the northern regions of Karakalpakstan BULLETIN 2 “Lessons learned during the implementation by the AF / UNDP / Uzhydromet project of climate-resistant water-saving practitioner in the northern regions Karakalpakstan. 4. Review of agro- and water-saving Practices used in the northern regions of Karakalpakstan. Available on the project website climatechange.uz	
4.2: Lessons learned for climate resilient agriculture / pastoral production systems in arid lands documented and disseminated	▪ In total, 38 information materials have been prepared, including thematic publications, manuals, reference books, information brochures, APP annex, video clips. ▪ Total distributed and demonstrated 15 525 information materials.	
4.3: Quarterly farm and pasture land demonstration meetings with participation of national, local authorities, media and communities delivered	▪ In total, 148 training, informational, practical field workshops were held in all pilot districts and in Nukus. ▪ The total audience coverage is 10 476 people, including 2415 women (23%). In total, 15 525 information materials were distributed and demonstrated	

Annex 3: Co-financing Table

Note – this table includes all funding for the purposes of clarity

Sources of Co-financing[1]	Co-financer	Description of Co-financing	Type of Co-financing[2]	Confirmed at CEO Endorsement (US$)	Amount Contributed at Stage of MTR (USD)	Expected Amount by Project Closure	New Investment or Recurrent Expenditure	Actual % of Expected Amount USD
UNDP, Co-financing signatories	**AF (with GMS)**	Basic fund	Grant	5,415,103	5,415,103	5,415,103	New	100
	UNDP	TRAC co-financing	Grant	200,000	200,000	287,245	New	144
	Canada Fund		Grant	0	0	26,551	New	n/a
	UK / FCDO		Grant	0	0	124,336	New	
	UNDP	Other	Grant	0	0	119,995	New	
UNDP & Partner Sub-Total				**$5,615,103**	**5,615,103**	**5,973,230**		**106**
National Government	**Uzhydromet**		In-kind			n/a	n/a	#VALUE!
Local Government	**Karakalpakstan government**		In-kind			n/a	n/a	#VALUE!
Government / Other Sub-Total				**0**	**0**	**0**		**#DIV/0!**
Total				**5,615,103**	**5,615,103**	**5,973,230**	**n/a**	**106**

1. Sources of co-financing include: Bilateral Aid Agencies, Foundation, Partner Agency, Local Government, National Government, Civil Society Organization, Multi-lateral agencies, Private Sector, Other
2. Type of Co-financing may include: Grant, Soft Loan, Hard Loan, Guarantee, In-Kind, Other
3. Government funding was not audited by the project

Annex 4: AF Planned Budget and Expenditures at End-term

Outcome	2014	2015	2016	2017	2018	2019	2020	2021	Total
Indicative Breakdown of Project Budget in Project Document:									
Outcome 1	**$19,448**	**$63,931**	**$331,802**	**$209,008**	**$151,107**	**$100,064**	**$113,829**	**$116,620**	**$1,105,810**
Outcome 2	**$0**	**$10,501**	**$24,032**	**$140,993**	**$334,078**	**$439,808**	**$272,831**	**$291,199**	**$1,513,442**
Outcome 3	**$0**	**$8,011**	**$13,076**	**$64,646**	**$343,913**	**$645,090**	**$289,412**	**$134,598**	**$1,498,747**
Outcome 4	**$100**	**$20,934**	**$34,185**	**$70,618**	**$56,658**	**$83,094**	**$32,346**	**$0**	**$297,935**
Project Management	**$6,997**	**$67,009**	**$87,749**	**$83,909**	**$32,472**	**$53,394**	**$2,490**	**$9,703**	**$343,724**
Expenses without components (depreciation costs)	-	**$9,852**	**$3,029**	**$3,867**	**$4,705**	**$6,384**	**$8,572**	**$1,389**	**$37,798**
Total	**$26,545**	**$180,238**	**$493,873**	**$573,043**	**$922,934**	**$1,327,834**	**$719,480**	**$553,509**	**$4,797,456**
Outcome	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**15/10/2021**
Annual Work Plan Budgets and Actual Expenditures Incurred through Endterm:									
Outcome 1:									
Annual Work Plan	$23,151	$656,765	$631,192	$174,504	$155,258	$149,331	$192,743	$251,305	**$2,234,249**
Disbursed	$19,448	$63,931	$331,802	$209,008	$151,107	$100,064	$113,829	$87,657	**$1,076,847**
Balance (AWP-Disbursed)	$3,703	$592,834	$299,390	-$34,505	$4,151	$49,267	$78,914	$163,648	**$1,157,402**
Outcome 2:									
Annual Work Plan	$0	$405,052	$396,348	$162,078	$379,072	$482,654	$272,815	$281,507	**$2,379,525**
Disbursed	$0	$10,501	$24,032	$140,993	$334,078	$439,808	$272,831	$203,649	**$1,425,892**
Balance (AWP-Disbursed)	$0	$394,551	$372,316	$21,084	$44,994	$42,846	-$16	$77,858	**$953,633**
Outcome 3:									
Annual Work Plan	$0	$44,400	$60,921	$49,677	$520,070	$529,141	$336,038	$176,273	**$1,716,520**
Disbursed	$0	$8,011	$13,076	$64,646	$343,913	$645,090	$289,412	$130,041	**$1,494,190**
Balance (AWP-Disbursed)	$0	$36,389	$47,844	-$14,969	$176,157	-$115,949	$46,626	$46,232	**$222,330**
Outcome 4:									
Annual Work Plan	$0	$16,540	$41,130	$55,107	$91,448	$108,381	$47,700	$0	**$360,306**
Disbursed	$100	$20,934	$34,185	$70,618	$56,658	$83,094	$32,346	$0	**$297,935**
Balance (AWP-Disbursed)	-$100	-$4,394	$6,945	-$15,511	$34,790	$25,287	$15,354	$0	**$62,371**
Project Management Cost:									
Annual Work Plan	$17,754	$65,363	$87,550	$80,731	$57,726	$28,237	$27,300	$25,000	**$389,661**
Disbursed	$6,997	$67,009	$87,749	$83,909	$32,472	$53,394	$2,490	$8,325	**$342,346**
Balance (AWP-Disbursed)	$10,757	-$1,646	-$199	-$3,179	$25,254	-$25,157	$24,810	$16,675	**$47,315**
Grand Totals:									
Annual Work Plan	$40,906	$1,188,120	$1,217,141	$522,096	$1,203,574	$1,297,744	$876,596	$734,084	**$7,080,260**
Total Disbursed	$26,545	$170,386	$490,844	$569,175	$918,228	$1,321,450	$710,908	$429,671	**$4,637,209**
Balance (AWP-Disbursed)	**$14,360**	**$1,017,734**	**$726,296**	**-$47,079**	**$285,346**	**-$23,706**	**$165,688**	**$304,413**	**$2,443,051**

Note – Figures to 15th October 2021

Annex 5: Extra information - Technical reports, Training materials, Misc.

Contents

Project Board

Now - 7.5 year project

Seven PB meetings have been held so far, i.e. once a year. The eighth meeting is planned for November 2021.

Project Board Attendance - 2020 (33 persons): CHS x 1, UNDP x 1 – as representing the PB; KKPS government x 1; NIAWG (MoA, MEDPR, MoF, MWR, CHS, SCEEP); SNIAWG (KKPS – DoA x 2; DWR, Council of Minister, other, Council of Farmers & Smallholders (CFS), State Committee Forestry, SC Ecology & Environmental Protection, Dept EDPR); UNDP x 3; Project staff x 7; Others x 5 (inc. Association of Pasture Coops, CFS)

The three UNDP support staff were UNDP Environment & Climate Action Cluster x 2; and Resource Management Unit. The seven PIU staff attending were - Project Manager, Administrative / Financial Assistant; Field Assistant; Procurement Assistant, Public Relations Specialist; Landscape Level Adaptation Specialist, Agro / Water Saving Specialist

Of interest from 2020 PB meeting

Approval / resolution of points from 7th PB meeting

- Action to address MTR recommendations
- Admin / financial issues relating to extra leveraged funds (I.e added co-financing from UNDP, Canada and UK FCDO)

Points from meeting

- Mr. Khabibullaev noted that at the Summit of the Heads of the States-founders of the International Fund for Saving the Aral Sea (IFAS) (in Turkmenistan in 2018) and at the 75th UN General Assembly, the President of Uzbekistan put forward an initiative to pay particular attention to the Aral Sea zone and declared this region as a zone of environmental innovation. He mentioned that the current project is the first AF project implemented in Uzbekistan, which is specifically focused on adaptation to adverse effects of climate change in the Aral Sea region of the Republic of Karakalpakstan

How the project managed Risk

Selected (edited) risks from Atlas:

Description	Countermeasure (Interventions) / Management response	TE Comment	Date logged / updated / status
Farmers continue to over-irrigate and over use resources and not accept CA, SWC methods	The project created 10 pasture cooperatives (43,522 member in 5 districts – they are reclaiming pasture, and changing land use to new pasture (15,307 ha.) Project ownership is good – e.g pasture cooperatives; tree planting with the SCF links with their gov't targets and involves communities / provides income	The impact of changing water use patterns has not been assessed, but anecdotally, the local official 'sea change' away from cotton is not highly evident	2014
Drought	The process of the development of the more powerful and effective drought preparedness tools will be crowned with establishment of the multi-functional information platform enabling wider and fast delivery to end users of the precise warnings on potential drought risk with lead time ample to implement drought risk mitigation actions duly and timely.	Outside project control, but was not an issue during the project, which would have affected the uptake of CA and SWC measures in particular	2014
Institutions don't cooperate	The two Inter-Agency Working Groups (national and sub-national levels) established by the particular government resolutions to strengthen coordination and cooperation of all national partners involved in the Adaptation Project were supplemented with five initiative groups (each group includes 5-7 persons representing the rural communities) in each project pilot district. The practice of in situ field meetings aimed at strengthening of liaisons between national and regional decision makers and farmers/pastoralists through conduction of such meetings in format of "Open Farmers' Days" and "Open Field Day" will be resumed upon covid restrictions lifted.	Cooperation was good	2014
A loss of political willpower for CCA in agriculture	The current political trends in promoting and mainstreaming adaptation measures are regularly tracked and analyzed by the project. The formulated recommendations on relevant improvements of the existing legislative framework to facilitate mainstreaming CCA in the national policy agenda updated to reflect the on-going reforms in agriculture sector and are a part project supported legislation	Political willpower was evident through the establishment of the IAWGs	2017
Insufficient capacity built within institutions affects sustainability of interventions	Interaction between the project and IAWGs establish sound enabling environment for piloting and demonstration of implementation of adaptation measures. As well the project exit strategy where lessons learnt, best practices and relevant findings related to project implementation process are collected and analyzed to promote of project's achievements up scaling beyond the end of project life developed that significantly reduces the risk.	The delivery mechanism for sustainable extension services should have been developed further. The DoA extension service didn't appear sufficiently involved (to be verified)	2014
Implement legislative changes that are required to develop CCA measures	The formulated recommendations on improvements of the legislative framework to facilitate mainstreaming CCA in the national policy agenda updated to reflect the on-going reforms in agriculture sector	Yes, the project supported mainstreaming of CCA into policy / legislation	2017
Adaptive strategies working under covid need to be developed to avoid delay	Project staff efficiently work home-based with using such telecommuting tools such as DocuSign, conducting meeting using Zoom, etc. Project re-phased its field activities and is focusing on analytical studies and preparations for procurement cases to be stand-by to start its adaptation activities immediately as soon covid restrictions lifted	Yes	2020

Alignment of Project Objectives / Outcomes with AF Results Framework

Any project funded through the AF must align with the Fund's results framework and directly contribute to the Fund's overall objective and outcomes. At least one outcome and output indicator from the AF's Strategic Results Framework must be included at the project design stage[1]. The project linkage:

Project Objective(s)	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
to develop climate resilience of farming and pastoral communities in the drought prone parts of Uzbekistan	Percentage of population with improved adaptive capacity and reduced vulnerability to drought impacts;	**Outcome 2:** Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	**Indicator 2.1:** No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks **Indicator 2.2:** Number of people with reduced risk to extreme weather events	$2,980,900
to develop climate resilience of farming and pastoral communities in the drought prone parts of Uzbekistan	Percentage of population that adopted climate resilient farming and pastoral practices	**Outcome 3:** Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	**Indicator 3.1:** Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses **Indicator 3.2:** Modification in behavior of targeted population	$1,650,800
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	
Institutional and technical capacity for drought management and early warning developed	Number and quality of forecasts and drought early warnings for Karakalpakistan regionl;	***Output 2.1***: Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events	***Indicator 2.1.1:*** No. of staff trained to respond to, and mitigate impacts of, climate-related events	$1,039,000
Institutional and technical capacity for drought management and early warning developed	Percentage of vulnerable farmers and pastoralists receiving science-based extension services to promote drought risk	***Output 2.2:*** Targeted population groups covered by adequate risk reduction systems	***Indicator 2.1.2:*** Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	$218,000
Climate resilient farming practices established on subsistence dekhkan farms of Karakalpakistan	Percentage of population adopted climate resilient conservation agriculture and water saving measures at the farm level	***Output 3***: Targeted population groups participating in adaptation and risk reduction awareness activities	***Indicator 3.1.1:*** No. and type of risk reduction actions or strategies introduced at local level	$1,377,400
Landscape level adaptation measures for soil conservation and moisture retention improves climate resilience of 1,042,094ha of land	Coverage (in ha) of landscape level adaptation measures implemented for sand stabilization and moisture retention	***Output 2.2:*** Targeted population groups covered by adequate risk reduction systems	***Indicator 2.2.1:*** Percentage of population covered by adequate risk-reduction systems ***Indicator 2.2.2:*** No of people affected by climate variability	$1,723,900
Knowledge of climate resilient agricultural and pastoral production systems in arid lands generated and widely available	Percentage of population aware of and practicing well tested, climate resilient agricultural practices	***Output 3***: Targeted population groups participating in adaptation and risk reduction awareness activities	***Indicator 3.1.2:*** No. of news outlets in the local press and media that have covered the topic	$273,400

[1] There is currently, no place within the project document where an explicit link to the AF's results framework is delineated. As such, the secretariat requested project proponents to fill out the table presented to directly link, project objectives and outcomes to the Fund level outcome and outputs.

Training Data

Subject	Content focus	Men	Women	Total	No. of Days	Location	Date
National							
1.	Training seminar "Ways to increase resilience of farms and dekhkan farms to climate change in the northern districts of the Republic of Karakalpakstan".	40	20	60	1	Nukus	10.11.2015
2.	Practical demonstration field workshop on the operation of water control devices installed within the framework of the project in the farms of the Kegeyli district	25	5	30	1	Kegeyli	11.11.2015
3.	Training seminar "Extension Service Centers in rural areas"	60	20	80	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	24/11-20/12/2016
4.	Field workshops to identify training needs on adaptation to climate change in rural communities in pilot districts	81	35	116	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	28/03-02/04/2016
5.	Field workshops on application of laser land leveling	125	5	130	3	Takhatakupir, Chimbay, Kanlikul	29/03-31/03/2016
6.	Establishment of demonstration sites for the application of CA practices based on the concept proposed by the Consulting Center "Kelajak Shahri Rivoji"	59	1	60	2	Kegeyli, Chimbay	1-2/03/2018
7.	Seminar - Managed agribusiness as a means of increasing the climate resilience: the possibility of preventing drought and widespread application of practical measures for agro and water conservation"	50	20	70	1	Nukus	20.12.2016
8.	Demonstration field seminar - Iinteraction between forestry enterprises and local communities in order to ensure measures for the implementation of adaptation measures at the landscape level	52	45	97	2	Muynak, Takhtakupir	10-11/03/2017
9.	Climate change & adaptation measures at the landscape level in the pilot districts	35	7	42	1	Nukus	05.03.2017
10.	Field training - Implementation of CCA measures with the rural population, the value / basics of systems of field-protective forest belts for agricultural lands from adverse environmental factors	12	23	35	1	Kanlikul	15.04.2017
11.	Training seminar - Sustainable development by expanding sources of income to ensure year-round employment through the development of livestock and other industries in pasture areas."	44	24	68	2	Kegeyli, Chimbay	16-17.04.2017
12.	Field seminar- Development of a management scheme for planting / restoration of degraded pastures / forests, for employment of the local population in adaptation measures at the landscape level."	96	17	113	7	Chimbay, Kegeyli, Kanlikul	15-20.05.2017 13/06/2017
13.	Practical field seminar "Piloting of CA technologies with demonstration of the advantages of the technology of laser leveling of fields in Karakalpakstan."	111	13	124	6	Chimbay	1-6.08.2017
14.	Training seminar on Drought Early Warning System in the lower reaches of the Amudarya river as a measure of adaptation to climate change	46	4	50	1	Nukus	24.08.2017
15.	Demonstration seminar "Application of resource-saving technologies in agriculture to ensure climate resilience of rural communities in the northern districts of Uzbekistan"	66	14	80	1	Nukus	24.11.2017
16.	Demonstration field seminar - Creating desert shrub pastures on overgrown sandy sediments by the coulisse planting of seeds of fodder plants by applying of a water-retaining polymer"	12	23	35	1	Muynak	15.12.2017
17.	Field workshop "Creating a pasture-protective and pasture safeguarding foresting on degraded pastures by planting seedlings of Saxaul & fodder plants by applying of a water-retaining polymer	17	10	27	1	Chimbay	16.12.2017
18.	Field workshop "agrotechnical practices confirmed by the results of the project's demonstration plots "	58	2	60	4	Kegeyli, Chimbay	14-16.03.2018
19.	Field workshop "Interaction between local authorities and local communities in order to ensure measures for the implementation of CCA measures at the landscape level."	171	39	210	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	12-16.03.2018
20.	Seminar "Adaptation at the landscape level - improving the resilience of communities to climate change by implementing agro- amelioration and afforestation practices"	36	6	42	1	Nukus	20.04.2018
21.	Field workshop "Demonstration of the best practices for the use of land and water resources that ensure adaptation of agriculture to climate change."	822	198	1020	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	3-7.07.2018

22.	Field workshop "Innovative approaches of cultivation in dry climate conditions"	238	84	322	6	Nukus, Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	23-28.07.2018
23.	Joint seminar with a national project on water management in Uzbekistan "Adaptation of farms to the conditions of a lack of water by applying water-saving technologies"	62	6	68	1	Karauzyak	08.08.2018
24.	Field workshop "Sustainable development of rural areas by developing pasture animal husbandry in climate change"	652	349	1001	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	25-29.08.2018
25.	Seminar "Agro-water saving with Foundation for the socially significant initiatives (Kazakhstan)	29	25	54	4	Nukus	6-9.09.2018
26.	Seminar - Climate box" a set of educational and gaming materials for schoolchildren on "Climate change"	29	35	64	1	Nukus	26.10.2018
27.	Workshop "Recommendations on the practical use of drought early warning systems for stakeholders and local communities of the Republic of Karakalpakstan"	504	16	520	6	Nukus, Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	29.11-4.12.2018
28.	Field workshop "Seed farming of sand and wood forage crops"	57	43	100	2	Takhtakupir, Muynak	5-6.12.2018
29.	Workshops "Laser leveling of the land "	803	141	944	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	14-18.05.2018
30.	Workshop "Water-saving methods for watering, use of zero tillage, mulching of soil surface, chiselling and biological protection of plants"	1146	202	1348	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	21-25.05.2018
31.	Training "Advanced and efficient methods for irrigation" MASHAV	40	8	48	3	Nukus	27-29.11.2018
32.	Workshop "Measures on the rational use of land resources for the northern districts of Karakalpakstan"	343	164	507	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	15-19.11.2019
33.	Workshop "The cultivation of Saksaul seedlings in the conditions of greenhouse farms and sowing Saksaul seeds by applying innovative techniques on degraded pasture lands"	21	5	26	2	Chimbay, Kegeyli	23-24.2019
34.	Field training - Planning and adopting specific agrotechnical adaptation measures at the landscape level, establishing demo plots of pasture	214	12	226	8	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	10-24-29-30 jan, 5-11; feb,13-28 march 2019
35.	Demonstration field training "Field Day" on the topic: "Climate change and adaptation measures at the landscape level and conservation agriculture practices"	354	154	508	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	13-17.05.2019
36.	Demonstration field training "Field Day" on the topic: "Measures for adaptation of the rural population to climate change in the northern districts of Karakalpakstan"	303	198	501	4	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	28-31.05.2019
37.	Workshop Expert knowledge / assistance in the improvement of a regulatory framework for stimulating the widespread use of well-tested CCA agricultural measures	461	119	580	5	Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul	22-27.08.2019
38.	Field workshop - CA and application of water saving technologies and CCA measures at the landscape level"	75	6	81	2	Takhatakupir	23-24.10.2020
39.	Field workshop "Integrating climate resistant conservation agriculture, water-saving technologies and adaptation measures at the landscape level"	697	309	1006	10	Bozataw, Takhatakupir, Kegeyli, Chimbay, Muynak, Kanlikul,	20-29.04.2021
Region							
1	Field workshop "Capacities of a multi-level hydroponic plant for the production of green bio mass"	15	8	23	1	Tashkent region	22.09.2018
2	Study of the suitability of greenhouses in Namangan) for climate conditions in Karakalpakstan	1		1	4	Namangan region	8-11.07.2015
Int'l							
1	Sustainable agriculture and water management- Israel technologies	7		7	7	Israel	16-23.03 2016
2	Central Asia Conference on Climate Change	2		2	2	Almaty, Kazakhstan	24-25.01,2018
3	Study Tour on learning the Spain experience in developing the salt and drought tolerant agriculture and irrigation systems for arid zones	5		5	5	WES company - Madrid, Lerida, Murcia, Albacete, Spain	23-28.06, 2019

DEWS bulletin – October 2020 - Information on the expected water content for 2021, with the recommendations for rural communities on the optimal irrigation regime, the best agrotechnical practices and diversification of crops at different levels of water deficiency

Evaluation of water content for the growing season for 2021. The Information was released on October 21, 2020.

This Information has been issued since 2017 with an evaluation of the water supply for two hydraulic sections: Darganata (Tuyamuyn reservoir inflow) and Tuyamuyn- narrow gorge. Three independent methods are used for the evaluation of Darganata. Average value of which is given as a final evaluation. Estimates are made with advance for at least 6 months.

Annual forecast	Hydraulic section	Method			Average m^3/s	Standard, m^3/s	Deficiency, %
		1	2	3			
2020	Darganata	1007	1263	1562	**1277**	1629	**-21**
2020	Tuyamuyn	869	-	-	**869**	1199	**-28**

According to water content evaluations for the growing season in 2021, it is expected that the discharge deficiency for the growing season will be up to 30%

Recommendations for land users during irrigation water deficiency of 25-50%

Recommendations to overcome water deficiency	Water saving
I. Composition of crops	
1. Withdraw from rice cultivation	25-30,000 m^3/ha
1. Organize composition of crops (a crop compatibility scheme was attached) - Highly drought-tolerant crops (cereal / legume - millet, sorghum, chickpea, vetchling, cucurbits, melon, sunflower, yellow lucerne, sudan grass, safflower, Fruit trees - oleaster, apricot, cherry, almond - Medium drought-tolerant crops (cotton, wheat, barley, rye, corn, pumpkin, lentils, beans, peanuts, vetch, alfalfa purple, potatoes, tomatoes, root crops - carrots, beets); and - Combining drought & salt-tolerant (sorghum, sudan grass, sorghum-sudan grass hybrid, safflower)	
II. Irrigation	
1. Soil leaching using chemical 'biosolvent (8 litres / ha) to ensure water-saving & soil desalinization.	30%
1. Apply drip irrigation on 25-50% of irrigation area and hotbeds equipped with drip irrigation	30-60%
2. Apply advanced 'ridge & furrow' irrigation on the rest of 75-50% of irrigation area:	
• irrigation through short furrow	12-22%
• irrigation through furrow	33%
• cross irrigation	15-25%
• simple impulse irrigation	10%
• Irrigation through furrows covered with perforated black polyethylene film	30-40%
• Irrigation by applying irrigation equipment (siphons, flexible hoses, mobile portable trays)	15-25
Irrigation by drainage water under monitoring of the salt content of the soil and taking into account salt tolerant level of crops, adhering to the following mineralization limits: *) - on loam soil up to 4 g/l (with chlorine content less than 0.5 g / l) - on sandy-loam soil up to 4-6 g/l, (with chlorine content 0,5-1,0 g/l). (rate should be raised 5-7% at the water mineralization 2 g/ l, by 20% at 3 g / l and by 30-50% at 4 g / l)	
III. Agrotechnical techniques for outdoor growing	
Chiselling (up to 60 см) once every 4-6 years	20%
Laser levelling	30%
Deep inter-tillage before the 1st irrigation by applying organic fertilizers or organic-mineral mixtures	Up to 10%
Sowing under a cover	Up t 30%
Production of hydroponic green fodder for livestock animal	

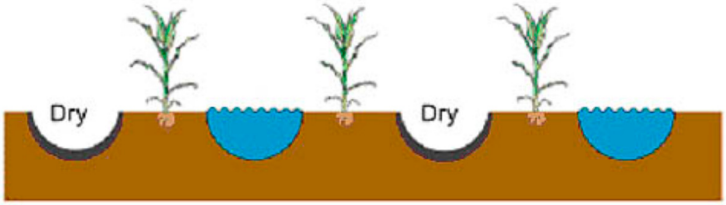
a) on heavy soil with close occurrence of mineralized groundwater, it is impossible to use water with mineralization above 2-2.5 g/l;

b) Melon, watermelon, millet, sorghum, Sudan grass, ajonjoli can be irrigated with drainage water without loss of the yield.

c) In the conditions of 2ndry salinization of soil, application of drip irrigation on a regular basis may result in increasing salinization. In this regard, areas on drip irrigation should be alternated with areas of ridge-and-furrow irrigation to ensure a decrease of soil salinization, or carry out the autumn-winter-spring soil washing in the traditional way.

d) Salinized degraded arable land, which can be formed in water deficit conditions, can be restored through bio-desalinization by gallophyte cultivation (sea purslane, climacoptera, Salsla orientalis, Kochia, licorice, seedweed, lambsquarter goosefoot, glasswort, sagebrush and others)

Figure 1. Salt management in double-row bed system.



Uniform, healthy plants with alternate furrow irrigation (salt accumulates in the dry furrows).

Awareness using social media

Posts in Social networks

- FaceBook page for the Aral Sea Programme & UNDP in Uzbekistan;
- Joint initiative with with SES to stop the spread of COVID19 in AralSea region https://www.facebook.com/UNDPUzbekistan/videos/574699673144758/
- Children study Climate change processes online https://www.facebook.com/AralSeaProgramme/posts/2954309271328407?__tn__=-R
- Message from the schoolchildren on the world environment day: https://www.facebook.com/318537724905588/videos/2599664266940652/?__so__=channel_tab&__rv__=all_videos_card
- Nafisa Bayniyazova's story from Karakalpakstan https://twitter.com/UNDP_Uzbekistan/status/1273132055006773248
- Work at dried-up bed of Aral Sea https://www.facebook.com/AralSeaProgramme/posts/3252670661492265
- Delivery of technical equipment for planting process on dried-up bed of Aral Sea https://www.facebook.com/AralSeaProgramme/posts/3233381700087828
- Climate box information https://www.facebook.com/AralSeaProgramme/posts/3226873470738651
- Safe feed for cattle during the pandemic https://www.facebook.com/AralSeaProgramme/posts/3203336866425645
- Use of hydroponics in Karakalpakstan https://www.facebook.com/AralSeaProgramme/posts/3179631342129531

Twitter for UNDP in Uzbekistan:

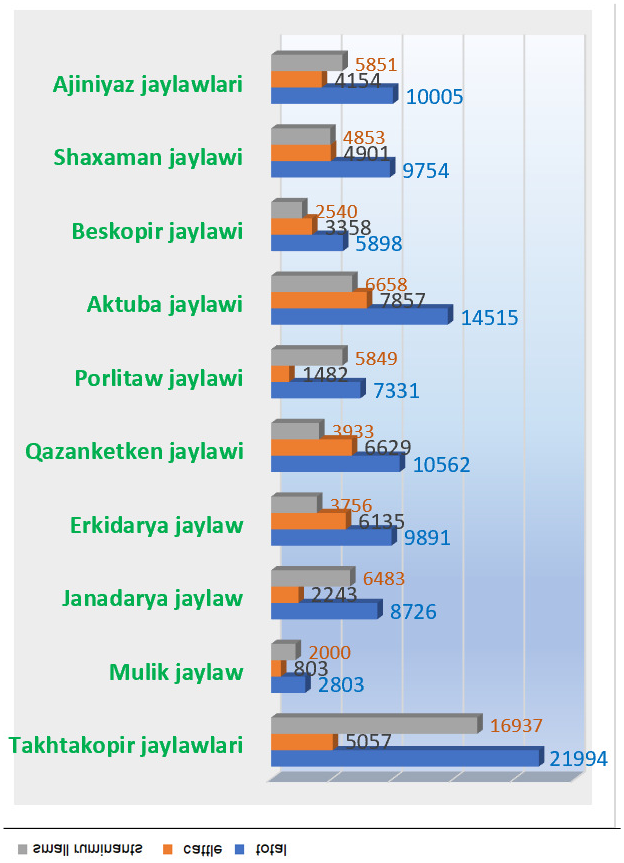
- We teamed with SESs to stop the spread of #COVID19 in #AralSea region https://twitter.com/UNDP_Uzbekistan/status/1247797749891739649
- We provide food security during the lockdown https://twitter.com/UNDP_Uzbekistan/status/1250730856303468544
- We taught farmers in Karakalpakstan to use hydroponic systems https://twitter.com/UNDP_Uzbekistan/status/1251050083765936128
- How can we ensure safe feed for cattle during the #pandemic? https://twitter.com/UNDP_Uzbekistan/status/1293179381288857600
- how the AF project in #Karakalpakstan is helping the farmers to fight draughts and desertification https://twitter.com/adaptationfund/status/1273611334077349888 [AF Twitter]
- Learning for #ClimateAction continue under #COVID19 quarantine https://twitter.com/adaptationfund/status/1262765870096539648 [AF Twitter]
- Tree watering week https://twitter.com/UNDP_Uzbekistan/status/1288471758027227137
- How to achieve adaptation to #ClimateChange & resilience of dekhkan farms https://twitter.com/UNDP_Uzbekistan/status/1280801515838504960
-

Press Releases in Mass media & Project's Web page & at UNDP in Uzbekistan

- AF.CLIMATECHANGE.UZ "The Canada Fund for Local Initiatives will assist in adaptation to climate change in the Aral Sea region"
- UZ.UNDP.ORG Training on "Basic principles and methods of organic and biological farming"
- AF.CLIMATECHANGE.UZ "Innovative approaches to agriculture discussed in Nukus"
- AF.CLIMATECHANGE.UZ "Organic agriculture is a measure to increase the yield of agricultural crops yields"
- UzDaily.com: Climate change adaptation measures ensure food security in Karakalpakstan
- UZ.UNDP.ORG: During the total quarantine, residents of the five northern districts of Karakalpakstan have constant access to agricultural products
- GLOBAL CENTER ON ADAPTATION: Families in Uzbekistan are growing their own food in quarantine
- UZ.UNDP.ORG: Farmers of Karakalpakstan receive on-line support

- UNV.ORG: Fortifying farming communities in drought-prone parts of Uzbekistan
- UZ.UNDP.ORG: Better health, employment and land-use in Karakalpakstan, through livestock development

Livestock Numbers in the 10 PPCs



Sowing works carried out by the 13 Production Pasture Cooperatives (September 1, 2021)

Cooperative	Sorghum	Maize	Alfalfa	Pumpkin	Melon	Vege table	Cereal	Wheat	Nursery (saxaul)	Total ha
«TAXTAKUPIR JAYLAWLARI»	10	10	20	-	1	-	-	20	-	61
«MULK JAYLAW»	10	1	-	-	1	-	-		10	22
«JANADARYA-JAYLAW»	5	-	10	-	1	-	2	-	-	18
“ERKINDARYA JAYLAW”	10	-	5	1	-	-	-	-	-	16
«BOZATAW JAYLAWI»	2	2	2	1	1	1	-	2	10	21
«PORLITAW JAYLAWI»	3	-	3	-	-	-	-	-		6
«AKTUBA JAILAWI»	7	-	-	-	--	-	3	5	10	25
«SHAXAMAN JAYLAWI»	20	-	6	-	6	0,5	10	-	10	52,5
«BESKOPIR JAYLAW»	3		5	5	1		5	5		24
«ALTINKOLSHI SHARWA JAYLAWLARI»	-	-	-	-	-	-	-	-	-	-
“AJINIYAZ JAYLAWLARI”	3	1	10	2	10	3	5	5	10	49
«AYDIN KELESEK JAILAWLARI»	8	12	10		1	1	1	10		43
«GOBDIR OY»	10	1	7		1	1	2			22
Total	91	27	78	9	23	6,5	28	47	50	359,5

Liman irrigation is a one-time spring flooding of the degraded pasture with water pumped from the river channel network. Approximately 10% of the 27,000 ha is watered this way (i.e. ~2,700 ha) Before the project, these dried-up degraded pastures were only exhibiting three plant species (*Halimodendron halodendron, Halostachys capsica,* and *Lycium rutcheum*), whereas

after ~20 species were present[1].

Exit Strategy – edited excerpt

Intervention	Required activity for exit
Hydromet platform and its Drought Early Warning System (DEWS) component	- AWSs and its platform software – need 100% commissioning; & training of hydromet staff - Functionality of DEWS for predicting water scarcity in the lower reaches of the Amudarya - Prepare a delivery mechanism for early-warning and recommendations to reduce impact
Establishment of sustainable functioning of Agricultural Extension Service Centres (AES)	- Assist in undertaking the AES development roadmap (2021-25), inc. capacity of members - Conclude agreements between AES, district khokimiyats, and VCCs on extension support to smallholders - (there is a risk of insufficient extension specialists, as well as weak financial stability)
Production pasture cooperatives (PPCs) – pasture management	- Support development of annual plans using the practical pasture management scheme, indicating specific goals to improve pasture productivity - Assisting the APPCs in concluding agreements to support the annual plans of cooperatives by Village Council of Citizens (VCC) and the local administrations
Pasture restoration (delta irrigation & re-seeding with added pasture species)	- Conduct monitoring of pastures – for end of project 'new baseline' - Provide this monitoring report for the Terminal Evaluation
Production of fodder with hydroponic system	- Assist in the development of a detailed business plans - Complete capacity building for the operation of hydroponic systems
Use of a water absorbent for saxaul seedlings planting	- Monitoring of the nurseries for the TE - Report by specialists of the success of the tree planting
Zero till	- Capacity raising for farms in the field of zero till - Inventory of no-till equipment and transfer to the PPCs / smallholders - Final monitoring of fields after zero till for the TE / final reporting - (there are risks of rejection of the technology by agriculture business; and there is a risk of a shortage the necessary equipment)
Laser levelling of fields	- Assistance in business planning for owners of agriculture machines - Complete of capacity raising activities for farms in the field of laser leveling - Inventory of laser-leveling equipment and transfer to the PPCs
Plough-pan breaking	- Capacity raising activities for farmers in the field of deep ploughing - Final monitoring of fields after deep ploughing for the TE
Drip irrigation & crop residue mulching	- Final monitoring of drip irrigation and mulching were applied for the TE
Hotbeds with drip irrigation	- Final monitoring of greenhouses for the final evaluation of the achieved results
Heating greenhouses with heat released from liquorice waste processing	- Capacity raising activities for farmers in the field of energy-efficient greenhouses - (there is a risk of insufficient provision of households with liquorice waste)

Partner Comments

PIU / PM comment

Comments on Financial Risks to Sustainability

State program on forestry-meliorative activities for desiccated Aral Sea bed is being implemented in Karakalpakstan since 2018. The program is personally overseeing by the President and Ministry of Emergency Situation (MES) takes a lead on implementation. 1.55 mln ha are afforested with sakasul and tamarix plantations with help of avia seeds sowing and seedlings planting. Twice per year independent board is convened to proceed with in field monitoring aimed at assessing of the seeds and seedlings germination rate and need in replenishment of died plants. The composition of the board above is consisted of representatives of the President Administration, Academy of Sciences, Sate Committee of Ecology and Environment Protection, Institute of Forestry and Decorative Gardening, State Committee of Forestry. The results of field monitoring are compiled as a report. Staff of Finance Department of MES issue the financial report on cost of deliverables and next fiscal year budget planned

[1] *Tamarix hispida, Tamarix laxa, Tamarix pentandra, Tamarix androssowii, Glycyrrhiza glabra, Alhagi pseudoalhagi, Phragmites australis, Aeluropus litoralis, Eremopyrum orientale, Karelinia caspia, Zygophyllum oxianum, Chenopodium album, Peganum harmala, Capparis spinose, Climacoptera brachiate, Atriplex cana, Halostachys capsica, Glycyrrhiza aspera, Lycium rutcheum, Halimodendron halodendron*

(this information is not available, MES is semi-military organization) as being based on cost-benefit assessment.

It's obvious that ABDA is an area where convective instability resulting from cooler air riding over heated ground can maintain the dust storm initiated at the front and afforestation is a way to avoid such instability. 3-4 years old plants are not able to produce seeds and initiate self-planting process but getting older they in more and more extent play preventive of dust storm role. As per assessment by the project the maximum positive impact will be ensured within 10-20 years after planting of the saksaul plantation. Those 1.5 mln ha where 75 000 ha is the project contribution will reduce or even fully prevent of dust storm origination.

Based on mentioned above there are moderate risks for sustainability and, thus rating for the concerned risk could be changed to ML

Ministry of Finance

Within the programme of conducting forest reclamation works on the drained bottom of the Aral Sea, which is supervised personally by the President of the country and all implemented activities are under coordination of the Ministry of Emergency Situations, an independent monitoring of plants condition and their habitability is carried out on regular basis. Budgeting for the programme is based on a cost-benefit analysis. Taking into account the above, we believe that the assessment of the financial risks to sustainability should be higher.

Ministry of Agriculture

Regarding the Socio-economic Risks to Sustainability:

The modern strategy for the development of agriculture (Presidential Decree on Approval of the Agriculture Development Strategy of Uzbekistan for 2020-2030 No. 5853 dated October 23, 2019) provides for a further reduction in areas for cotton cultivation, however, more attention is paid to mitigating the main risks to the conservation and development of ecosystems, which include:

• narrowly focused development and management of agricultural irrigation infrastructure; • unsustainable forms of management and use of natural resources in fisheries; • low productivity of irrigated agriculture and unsustainable rain-fed agriculture.

Deliberate policies conducted to reduce the area under cotton and measures to mitigate the main risks to ecosystem conservation and development release additional water resources that become accessible for household needs and pasture restoration.

Taking into account the above, we believe that the assessment of the socio-economic risks to sustainability should be higher.

Regarding Recommendation 1 - the equipment to support the operation of the multi-module early-warning platform (MMEWP) has been installed and placed on the balance sheet of our Ministry. Responsible specialists have undergone appropriate training in working with MMEWP.

Regarding Recommendation 3: 'Zero till-direct drill' can be supported by agribusiness as there are not many weeds on wheat sowing, and the number of weeds is the same in both regular-drill and 'zero till-direct drill'. Weed infestation does not occur because dense crops of wheat inhibit the growth and development of weeds. The use of 'zero till-direct drill' is relevant now, when soil fertility in Karakalpakstan is steadily declining, as a technology that reduces water and wind erosion of soil, salt accumulation in the rhizosphere, water consumption for irrigation, energy and labor costs, and increases soil fertility, microbiological soil activity, and supports restoration of soil biodiversity.

Taking into account the need to increase soil fertility of agricultural land, the Decree of the President of the Republic of Uzbekistan No. UP-5742 dated June 17, 2019, adopted the Concept on the efficient use of land and water resources in agriculture, which provides, in particular:

- Introduction of soil efficiency technologies in agriculture. At the same time, pay special attention to minimizing the number of agrotechnical measures through the consistent implementation of advanced innovative land-processing and plant-care technologies (Mini till, No till and others); - Acceleration of scientific research aimed at increasing fertility, preventing soil erosion and degradation.

Ministry of Water Resources

Regarding Recommendation 1 - the equipment to support the operation of the multi-module early-warning platform (MMEWP) has been installed and placed on the balance sheet of our Ministry. Responsible specialists have undergone appropriate training in working with MMEWP.

Regarding the Socio-economic Risks to Sustainability:

The modern strategy for the development of agriculture (Presidential Decree on the Agriculture Development Strategy of Uzbekistan for 2020-30 No. 5853, 2019) provides for a further reduction in areas for cotton cultivation, however, more attention is paid to mitigating the main risks to the conservation and development of ecosystems, which include:

• narrowly focused development and management of agricultural irrigation infrastructure; • unsustainable forms of management and use of natural resources in fisheries; • low productivity of irrigated agriculture and unsustainable rain-fed agriculture.

Deliberate policies conducted to reduce the area under cotton and measures to mitigate the main risks to ecosystem conservation and development release additional water resources that become accessible for household needs and pasture restoration.

Taking into account the above, we believe that the assessment of the socio-economic risks to sustainability should be higher.

State Committee for Ecology and Environment Protection

Regarding the assessment of the Socio-economic Risks to Sustainability:

The executive summary of the Terminal Evaluation report identifies the risks that impede further growth in agricultural production. In particular, such risks include: narrowly focused development and management of agricultural irrigation infrastructure; unsustainable forms of management and use of natural resources in fisheries; low productivity of irrigated agriculture and unsustainable rain-fed agriculture.

At the same time, in recent years, a number of government decisions have been adopted to address these gaps. For instance, the Presidential Decree on Approval of the Agriculture Development Strategy of Uzbekistan for 2020-2030 No. 5853 dated October 23, 2019.

The Strategy identifies priority areas, one of which is «Ensuring the Rational Use of Natural Resources and Protection of the Environment". To achieve the goals the following tasks have been identified for this priority: • development and implementation of Good Agricultural and Environmental Practices (GAEP); • development of Guidelines for Good Agricultural and Environmental Practices (GAEP) for agricultural producers; • taking measures to promote the implementation of Good Agricultural and Environmental Practices (GAEP) for agricultural producers, as well as Good Manufacturing Practice (GMP) for agricultural entrepreneurship and other quality standards; • promoting environmentally and climate friendly practices in agriculture; • reduction in water use per hectare of irrigated area by 20 percent by 2030; • improvement of mechanisms of state support for local producers and buyers of water-saving technologies; • adoption of a national action plan to mitigate the climate change impacts; • preservation and improvement of soil fertility through the introduction of the practice of effective use of fertilizers depending on soil and climatic conditions by purchasing mobile laboratories for soil analysis; • improvement of the water resources management system; • improvement of the forest resources management system; • introduction of modern methods of assessment and monitoring of forest resources; • strengthening institutional capacity to ensure biological security, control the use of natural resources, pesticides and chemicals in agriculture;

Regarding other Environmental Risks to Sustainability.

As part of the project activities, 18 shallow wells (25-50 m) were drilled to provide access to drinking and industrial water for schools and households. The water extracted from four wells was mineralized less than 5 g/l, and the water in the remaining wells exceeded this concentration. Therefore, in order to bring the water quality up to the drinking standard, reverse osmosis systems were additionally installed. The systems have a certain capacity (500 l/h), which in turn makes it possible to keep track of water consumption.

It is necessary to note the decision on the disposal of the brine formed as a result of water treatment, which was proposed and implemented by the project. The project installed a hydrolysis unit that processed brine into sodium hypochlorite, an effective disinfectant. Thus, it was possible to avoid contamination of water and soil with brine and produce a substance to prevent the spread of COVID-19.

Taking into account the above, as well as the fact that the project addressed a number of environmental issues, such as the biological method of combating pests and diseases of plants, reducing salinity, planting trees and rational use of water, we believe that the assessments of the socio-economic risks to sustainability and environmental risks to sustainability should be higher.

Ministry of Economic Development and Poverty Reduction

Re. socio-economic risk to sustainability rating should be higher.

The agricultural sector is undergoing an intensive transition from the cultivation of mono-crops to crop rotation, forage production, horticulture, vegeculture and indoor plant cultivation. A number of initiatives aimed at reducing cotton production are supported by regulations and funding: Resolution of the President of the Republic of Uzbekistan 'On measures for realization in 2021 of the tasks determined in the Strategy of development of agricultural industry of the Republic of Uzbekistan for 2020 – 2030' No. PP-5009 dated February 26, 2021; Resolution of the Cabinet of Ministers of the Republic of Uzbekistan 'On measures to improve the structure of sown areas' No. 378 dated November 1, 2016. Thus, the area under cotton and the share of cotton production in the regional GDP are steadily decreasing, thus releasing additional water resources for the needs of households, restoration of pastures and ecosystems.

State Forestry Committee of the Republic of Karakalpakstan

Regarding Financial risks to sustainability:

Under the program of forest reclamation works on the drained bottom of the Aral Sea, the volume and quality of work performed to create plantations of saxaul, tamarisk and other drought-resistant plants is reported directly to the President. The Ministry of Emergency Situations organizes and implements large-scale forest reclamation works. An independent monitoring of the state of plantings is conducted twice a year, in the spring and autumn-winter period, by a commission consisting of representatives of the President's Office, academic institutions, the State Committees of the Republic of Uzbekistan and the Republic of Karakalpakstan on Ecology and Environmental Protection and the Ecological Party. The program budget is planned by MES experts based on a cost-benefit analysis.

On Recommendation 7: During 2019-2021, the committee received 30 million good quality saxaul seedlings from pasture cooperatives, which were planted on ~30,000 hectares in Tigroviy Khvost, Vozrozhdenie, Surgul, Akpetkey, and Akhantai areas of the drained bottom of the Aral Sea.

During the period of seedling growth, the commission consisting of experts from the committee, the project and pasture cooperatives monitored the state of seedlings in each of the 5 nurseries twice a year in the spring and autumn-winter periods. Based on the monitoring results, the expected quantity of seedlings was determined, as well as recommendations were made to the representatives of the cooperatives to increase the productivity of nursery production. Since the cooperatives will continue to grow saxaul seedlings after the project end, a plan for joint monitoring of the state of seedlings in the nurseries by a commission consisting of representatives of the Research Institute for Natural Sciences under the Academy of Sciences of the Republic of Karakalpakstan, the committee, and the pasture cooperatives was developed.

On recommendation 8: The monitoring of the state of saxaul plantations is organized and conducted through field visits to the Tigroviy Khvost, Vozrozhdenie, Surgul, Akpetkey, and Akhantai areas of the drained bottom of the Aral Sea, where saxaul seedlings were planted in the period 2018-2021.

In the Tigroviy Khvost and Vozrozhdenie areas (44°59'27.2"N 59°01'01.6"E), planting was conducted in the autumn-winter and spring periods of 2018-2019 on an area of 13,600 hectares under a 10 m x 1 m layout. The survival rate was 65%. In the spring and autumn of 2019, the dead seedlings were replaced by new ones, and 100% coverage of the area with viable plants was achieved.

In the Tigroviy Khvost and Surgul areas (44°33'54.1"N 58°56'02.8"E), planting was conducted in the autumn-winter period of 2019 and the spring period of 2020 on an area of 21,500 hectares under a 10 m x 1 m layout (the distance between seedlings in a row was 1 m , the distance between

the rows was 10 m). The survival rate was 68%. In the spring and autumn of 2020, the dead seedlings were replaced by new ones, and 100% coverage of the area with viable plants was achieved.

In the Surgul, Akpetkei, and Akhantai areas (44°11'03.9"N 60°18'14.2"E), planting was conducted in the autumn-winter period of 2020 and the spring period of 2021 on an area of 30,700 hectares under a 10 m x 1 m layout. The survival rate was 72%. In the spring of 2021, the dead seedlings were replaced by new ones, and 100% coverage of the area with viable plants was achieved.

In total, planting of seedlings was conducted on an area of 65,800 hectares with full coverage of the area with viable plants.

The plan for joint monitoring of the state of the saxaul plantation was developed with experts from Research Institute for Natural Sciences under the Academy of Sciences of the Republic of Karakalpakstan, the committee and pasture cooperatives.

Uzhydromet (CHS)

Recommendation 1. The equipment supporting the drought early-warning system (DEWS) and the multi-module information platform was accepted on the balance sheet of Uzhydromet. The specialist of the Department of Hydrological Forecasting and Computation took appropriate training in working with DEWS.

Data from 10 automatic meteorological stations installed on the territory of Karakalpakstan are available on the central server and are integrated into data exchange contour to ensure data input for weather and hydrological forecasting facilities designed for the whole country and for the territory of the Republic of Karakalpakstan.

Annex 5a: Project Output Location & Geo-coordinate Table

Due to the possibly sensitive nature of providing exact geo-coordinates for hydromet and other equipment, the TE has provided this as a separate file to UNDP

Region	Village	Item Name	Area (ha)	Geo-coordinates	Delineated boundary map	Responsible Office
Bozataw district	VCC «Kok suw»	Water pump stations and electric transformer	3000	43°12'10.2"N 59°30'21.3"E	DBM 1	Production Cooperative «SHAXAMAN--JAYLAWI»
Bozataw district	VCC «Kok suw»	Water pump stations and electric transformer	3000	43°12'51.1"N 59°29'38.4"E	DBM 1	Production Cooperative «SHAXAMAN-JAYLAWI»
Bozataw district	VCC «Kok suw»	Water pump stations and electric transformer	3000	43°13'35.8"N 59°29'55.5"E	DBM 1	Production Cooperative «SHAXAMAN-JAYLAWI»
Bozataw district	VCC «Bozataw»	Water pump stations and electric transformer	3000	43°05'50.8"N 59°29'16.4"E	DBM 1	Production Cooperative «BOZATAW-JAYLAWI»
Bozataw district	VCC «Bozataw»	Water pump stations and electric transformer	3000	42°56'00.4"N 59°18'15.6"E	DBM 1	Production Cooperative «BOZATAW-JAYLAWI»
Bozataw district	VCC «Erkindarya»	Water pump stations and electric transformer	3000	42°48'39.1"N 59°26'27.4"E	DBM 1	Production Cooperative "ERKINDARY AJAYLAW"
Bozataw district	VCC «Kuskhanataw»	Water pump stations and electric transformer	3000	42°55'45.7"N 59°18'05.7"E	DBM 1	Production Cooperative «AKTUBA JAILAWI»
Bozataw district	VCC «Aspantay»	Water pump stations and electric transformer	3000	43°05'24.9"N 59°10'13.9"E	DBM 1	Production Cooperative «PORLITAW-JAYLAWI»
Takhtakupir district	VCC «Kara oy»	Water pump stations and electric transformer	3000	43°06'07.5"N 60°14'29.8"E	DBM 5	Production Cooperative «TAXTAKUPIR JAYLAWLARI»
Bozataw district	VCC Bozataw	Intensive garden equipped with Drip irrigation system and PV station	2	43°01'41.9"N 59°21'31.0"E	DBM 1	PC «QAZANKETKEN -JAYLAWI»
Bozataw district	VCC Bozataw	Intensive garden equipped with Drip irrigation system and PV station	6	42°59'35.3"N 59°20'30.1"E	DBM 1	District Khakimiyat
Bozataw district	VCC Erkindarya	Intensive garden equipped with Drip irrigation system and PV station	6	42°50'29.5"N 59°26'37.7"E	DBM 1	District Khakimiyat
Kegeyli district	VCC «Aqtuba»	Intensive garden equipped with Drip irrigation system and PV station	2	42°48'04.1"N 59°40'27.9"E	DBM 2	FARM «TLEPBAY ESIMBETOV»
Muynak district	VCC «Khakim ata	Intensive garden equipped with Drip irrigation system and PV station	2	43°21'07.4"N 59°03'36.5"E	DBM 4	FARM «BAYNIYAZOVA NAFISA»
Takhtakupir district	VCC «Kara oy»	Intensive garden equipped with Drip irrigation system and PV station	2	43°02'56.1"N 60°14'20.9"E	DBM 5	FARM «BAZARBAY BAGMAN»
Kanlikul district	VCC «Jaykhun»	Intensive garden equipped with Drip irrigation system and PV station	2	42°46'13.7"N 59°04'46.5"E	DBM3	FARM «DAWRON QONLIKOLSHI»
Kegeyli district	VCC «Juzim bag»	Intensive garden equipped with Drip irrigation system and PV station	1	42°39'02.3"N 59°41'24.9"E	DBM 2	FARM «AGROIMPEKS KEGEYLI»
Kegeyli district	VCC «Juzim bag»	Intensive garden equipped with Drip irrigation system and PV station	1	42°39'15.0"N 59°40'50.4"E	DBM 2	FARM «FARM MIRIMPEX»
Chimbay district	VCC «Tazgara»	Intensive garden	1	42°51'59.4"N 59°45'23.4"E	DBM 6	FARM «JUZBASI»
Muynak district	VCC «Bozataw»	Hydroponic equipment 40 kg/day		43°36'17.3"N 59°00'06.3"E	DBM 4	Household of Uteniyazova Sh.
Chimbay district	District center	Hydroponic equipment 40 kg/day		42°56'09.9"N 59°47'58.4"E	DBM 6	Household of Kulbaev A.

Kegeyli district	Village Khalkabad	Hydroponic equipment 80 kg/day		42°40'41.5"N 59°43'15.2"E	DBM 2	Household of Mambetniyazov B
Muynak district	VCC «Bozataw»	Hydroponic equipment 80 kg/day		43°36'16.3"N 59°00'07.0"E	DBM 4	Household of Toktamisov K
Takhtakupir district	VCC «Kara oy»	Hydroponic equipment 120 kg/day		43°04'20.6"N 60°13'19.8"E	DBM 5	Household of Belasarov K
Bozataw district	VCC «Kok Suw»	Hydroponic equipment 120 kg/day		43°12'47.5"N 59°35'56.9"E	DBM 1	Household of Aytkulov M
Bozataw district	VCC «Bozataw»	Hydroponic equipment 500 kg/day		43°01'41.9"N 59°21'31.0"E	DBM 1	PC «BOZATAW-JAYLAWI»
Muynak district	VCC «Khakim ata»	Hydroponic equipment 500 kg/day		43°21'07.4"N 59°03'36.5"E	DBM 4	PC «AJINIYAZ JAYLAWLARI»
Bozataw district	VCC «Bozataw»	Fodder production complex 6500 kg/day		42°55'45.7"N 59°18'05.7"E	DBM 1	PC «AKTUBA-JAILAWI»
Takhatkupir district	VCC Mulik	Reverse osmosis system for water purification		43°07.448'N 59°40.765'E	DBM 5	School #16
Chimbay district	VCC Taza jol	Reverse osmosis system for water purification		43°05'14.0"N 59°42'25.3"E	DBM 6	School #13
Muynak district	VCC Bozataw	Reverse osmosis system for water purification		43°36'14.8"N 59°00'25.9"E	DBM 4	School #9
Bozataw district	VCC Bozataw	Reverse osmosis system for water purification		43°02'38.5"N 59°22'04.3"E	DBM 1	School #3
Bozataw district	VCC Kuskhanataw	Reverse osmosis system for water purification		43°00'05.3"N 59°21'20.6"E	DBM 1	School #4
Bozataw district	VCC Aspantay	Reverse osmosis system for water purification		43°06'21.2"N 59°10'09.9"E	DBM 1	School #12
Bozataw district	VCC Aspantay	Reverse osmosis system for water purification		43°14'22.0"N 59°13'41.7"E	DBM 1	School #11
Bozataw district	VCC Erkindarya	Reverse osmosis system for water purification		42°50'50.5"N 59°25'13.2"E	DBM 1	School #7
Bozataw district	VCC Kok suw	Reverse osmosis system for water purification		43°13'25.0"N 59°35'18.9"E	DBM 1	School #13
Kanlikul district	VCC Beskopir	Reverse osmosis system for water purification		42°54'00.3"N 58°56'43.9"E	DBM3	School #13
Muynak district	Kabakli Ata village	Reverse osmosis system for water purification with PV station 3kW		43°29.434´N 60°15.414´E	DBM 4	State Forestry Committee of RK
Bozataw district	VCC Erkindarya	Reverse osmosis system for water purification and electrolysis		43°20.971'N 59°03.975'E	DBM 1	District Khakimiyat
Bozataw district	VCC Kok suw	Reverse osmosis system for water purification and electrolysis		43°17.710'N 59°30.192'E	DBM 1	District Khakimiyat
Bozataw district	VCC Kuskhanataw	Reverse osmosis system for water purification and electrolysis		43°05.855'N 59°29.265'E	DBM 1	District Khakimiyat
Bozataw district	VCC Erkindarya	Reverse osmosis system for water purification and electrolysis		42°50'255°N 59°24'522'E	DBM 1	District Khakimiyat
Chimbay district	VCC Pashenttaw	Reverse osmosis system for water purification and electrolysis		43°06.805'N 59°34.262'E	DBM 6	District Khakimiyat

Takhtakupir district	VCC Kostruba	Reverse osmosis system for water purification and electrolysis		43°29.196'N 61°35.347'E	DBM 5	School #23
Muynak district	VCC Khakim ata	Reverse osmosis system for water purification and electrolysis		43°49.464'N 58°53.171'E	DBM 4	School #17
Muynak district	VCC Muynak	Reverse osmosis system for water purification and electrolysis		43°49.437'N 58°53.186'E	DBM 4	School #1
Nukus city		Greenhouse (tunnel).	480 sq.m	42°28'30.0"N 59°35'23.9"E	NA	Nukus Branch of Tashkent State Agrarian University
Kegeyli district	Khalkabad Village	Greenhouse	144sq.m.	42°40'08.7"N 59°43'41.3"E	DBM 2	Kegeyli agroindustry college
Kanlikul district	VCC Beskopir	Hotbed	115 sq.m	42°54'09.0"N 58°56'50.9"E	DBM3	Household of Aralbaeva Gulistan
Kanlikul district	VCC Beskopir	Hotbed	115 sq.m	42°54'02.1"N 58°56'49.6"E	DBM3	Household of Aytjanov Pirjan
Chimbay district	VCC «Takjap»	Hotbed	115 sq.m	42°56'50.5"N 59°47'31.9"E	DBM 6	Household of Rakhmatullaeva Oral
Chimbay district	VCC «Kamis-arik»	Hotbed	115 sq.m	42°55'00.7"N 59°42'12.4"E	DBM 6	Household of Makhulbaev Khojambergen
Kegeyli district	VCC «Madeniyat»	Hotbed	115 sq.m	42°46'30.4"N 59°37'07.3"E	DBM 2	Household of Allaniyazov Pirleshbay
Kegeyli district	VCC «Khalkabad»	Hotbed	115 sq.m	42°42'14.5"N 59°44'15.3"E	DBM 2	Household of Berdekeev Berdakh
Takhtakupir district	VCC Karaoy	Hotbed	115 sq.m	43°01'15.2"N 60°19'51.5"E	DBM 5	School #7
Muynak district	VCC «Bozataw»	Hotbed	115 sq.m	43°36'22.5"N 59°00'14.0"E	DBM 4	Household of Toktamisov Kenesbay
Muynak district	VCC «Bozataw»	Hotbed	115 sq.m	43°36'10.4"N 59°00'12.0"E	DBM 4	Household of Toreshov Berkinbay
Bozataw district	VCC «Bozataw»	Hotbed	115 sq.m	43°02'38.5"N 59°22'04.3"E	DBM 1	School # 3
Bozataw district	VCC «Kok Suw»	Hotbed	115 sq.m	43°13'25.0"N 59°35'18.9"E	DBM 1	School # 13
Chimbay district	VCC «Taza jol»	Hotbed	115 sq.m	43°05'14.0"N 59°42'25.3"E	DBM 6	School # 13
Chimbay district	District center	Hotbed	115 sq.m	42°55'33.3"N 59°46'43.9"E	DBM 6	School # 38
Kegeyli district	VCC «Juzim bag».	Hotbed	115 sq.m	42°40'54.0"N 59°43'10.3"E	DBM 2	Household of Ayekeev Ilyas
Kegeyli district	VCC «Aqtuba»	Hotbed	115 sq.m	42°47'56.4"N 59°40'38.9"E	DBM 2	Household of Abdimuratova Gulnara
Kegeyli district	VCC Khalkabad	Hotbed	115 sq.m	42°41'19.5"N 59°43'08.3"E	DBM 2	FARM QallijagisKegeylishi
Kegeyli district	Kegeyli village	Hotbed	115 sq.m	42°46'27.1"N 59°35'51.8"E	DBM 2	Household of Pirmanova Nigarkhan
Kegeyli district	VCC «Kumshungul»	Hotbed	115 sq.m	42°41'13.7"N 59°44'22.7"E	DBM 2	Household of Abatova Gulzira
Muynak district	VCC «Bozataw»	Hotbed	115 sq.m	43°36'28.9"N	DBM 4	Household of Orazbaeva Totigul

				59°00'18.0"E		
Chimbay district	VCC Jambasjap	Hotbed	115 sq.m	42°58'24.4"N 59°48'41.4"E	DBM 6	Republican House of Mercy
Nukus district	VCC Samanbay	Hotbed	115 sq.m	42°31'15.0"N 59°34'56.6"E	NA	IICAS (Innovation Center)
Takhtakupir district	VCC «Mulik»	Hotbed	115 sq.m	42°59'41.4"N 60°25'44.8"E	DBM 5	PC "MULIK JAYLAW"
Takhtakupir district	Takhtakupir VCC	Hotbed	115 sq.m	43°01'43.5"N 60°16'51.0"E	DBM 5	Household of Igilikova Bishegul
Bozataw district	VCC «Kok suw»	Hotbed	115 sq.m	43°13'04.8"N 59°36'20.9"E	DBM 1	PC "SHAHAMAN -JAYLAWI"
Bozataw district	VCC «Bozataw»	Hotbed	115 sq.m	43°01'39.3"N 59°21'31.2"E	DBM 1	PC "QAZANKETKEN -JAYLAWI"
Muynak district	VCC «Khakim ata»	Hotbed	115 sq.m	43°21'12.7"N 59°03'36.5"E	DBM 4	PC "AJINIYAZ JAYLAWLARI"
Bozataw district	VCC « Erkindarya»	Hotbed	115 sq.m	42°50'56.2"N 59°25'48.6"E	DBM 1	PC "ERKINDARYA -JAYLAWI"
Bozataw district	VCC «Aspantay»	Hotbed	115 sq.m	43°06'29.4"N 59°10'22.4"E	DBM 1	PC "PORLITAW JAYLAW"
Bozataw district	VCC «Aqtuba»	Hotbed	115 sq.m	42°50'56.2"N 59°25'48.6"E	DBM 1	PC "AQTUBA JAYLAW"
Kanlikul district	VCC «Beskopir»	Hotbed	115 sq.m	42°53'47.2"N 58°57'04.8"E	DBM3	PC"BESKOPIR JAYLAW"
Muynak district	VCC Khakim ata	Hotbed	100 sq.m	N43°49.464' E058°53.171'	DBM 4	School# 17
Muynak district	VCC Bozataw	Hotbed	100 sq.m	43°36'14.8"N 59°00'25.9E	DBM 4	School#9,
Muynak district	VCC Muynak	Hotbed	100 sq.m	N43°49.437' E058°53.186'	DBM 4	School#1
Muynak district	VCC Talli ozek	Hotbed	100 sq.m	43°45'37.6"N 59°01'34.0"E	DBM 4	School#2
Muynak district	VCC Doslik	Hotbed	100 sq.m	43°46'03.1"N 59°01'52.2"E	DBM 4	School#3
Muynak district	VCC Muynak	Hotbed	100 sq.m	43°47'22.5"N 59°01'28.1"E	DBM 4	School#4
Muynak district	VCC Tik ozek	Hotbed	100 sq.m	43°34'17.3"N 59°08'42.9"E	DBM 4	School#11
Muynak district	VCC Madeli	Hotbed	100 sq.m	43°25'35.8"N 59°39'52.5"E	DBM 4	School#15
Muynak district	VCC«Tikozek»	Hotbed	100 sq.m	43°41'23.1"N 59°03'05.9"E	DBM 4	Household of Karlibaev Bakhtiyar
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°49'46.8"N 59°00'29.6"E	DBM3	School#1
Kanlikul district	Nawriz VCC	Hotbed	100 sq.m	42°47'20.1"N 59°00'40.7"E	DBM3	School# 2
Kanlikul district	Madeniyat VCC	Hotbed	100 sq.m	42°50'02.0"N 59°02'00.9"E	DBM3	School#3

Kanlikul district	Bostan VCC	Hotbed	100 sq.m	42°39'48.3"N 59°09'59.8"E	DBM3	School#4
Kanlikul district	Janakala VCC	Hotbed	100 sq.m	42°48'11.0"N 58°54'49.1"E	DBM3	School#5
Kanlikul district	Kosjap VCC	Hotbed	100 sq.m	42°52'52.4"N 59°11'27.9"E	DBM3	School#6
Kanlikul district	Beskopir VCC	Hotbed	100 sq.m	42°39'58.4"N 59°06'53.1"E	DBM3	School#7
Kanlikul district	Jaykhun VCC	Hotbed	100 sq.m	42°47'04.3"N 59°02'16.7"E	DBM3	School#8
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°54'00.3"N 58°56'43.9"E	DBM3	School#13
Kanlikul district	Doslik VCC	Hotbed	100 sq.m	42°49'57.3"N 59°00'47.2"E	DBM3	School#18
Kanlikul district	Arzimbetkum VCC	Hotbed	100 sq.m	42°52'47.7"N 58°57'17.0"E	DBM3	School #9
Kanlikul district	Bostan VCC	Hotbed	100 sq.m	42°48'09.5"N 58°54'47.8"E	DBM3	School#20
Kanlikul district	Nawriz VCC	Hotbed	100 sq.m	42°47'02.7"N 59°02'15.4"E	DBM3	School#21
Kanlikul district	Janakala VCC	Hotbed	100 sq.m	42°40'01.7"N 59°12'00.8"E	DBM3	School#22
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°49'30.4"N 58°58'13.6"E	DBM3	School #17
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°50'18.1"N 59°01'02.9"E	DBM3	Household of Yusupov Daribay
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°50'38.7"N 59°00'21.6"E	DBM3	Household of Abdimajitov Abat
Kanlikul district	VCC Bostan	Hotbed	100 sq.m	42°44'14.3"N 59°04'50.6"E	DBM3	Household of Begdullaev Kuralbay
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°50'12.4"N 59°00'50.6"E	DBM3	Household of Ismailova Ayman
Kanlikul district	VCC Bostan	Hotbed	100 sq.m	42°44'05.8"N 59°05'14.4"E	DBM3	Household of Ajiniyazov Bakhtiyar
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°49'50.6"N 59°01'59.4"E	DBM3	Household of Bayniyazov Tolibay
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°50'14.3"N 59°00'46.5"E	DBM3	Household of Tajimuratov Kilishbay
Kanlikul district	Kanlikul VCC	Hotbed	100 sq.m	42°50'19.3"N 59°01'07.9"E	DBM3	Household of Uteuliev Audanbay
Kegeyli district	VCC Juzim bag	Hotbed	100 sq.m	42.775144, 59.605258	DBM 2	School#1
Kegeyli district	VCC Kumshungul	Hotbed	100 sq.m	42.675835, 59.728803	DBM 2	School#2
Kegeyli district	VCC «Jalpak jap»	Hotbed	100 sq.m	42.825178, 59.517941	DBM 2	School#3
Kegeyli district	VCC «Janabazar»	Hotbed	100 sq.m	42.746372,	DBM 2	School#4

				59.827955		
Kegeyli district	VCC Aqtuba	Hotbed	100 sq.m	42.779241, 59.616645	DBM 2	School#5
Kegeyli district	VCC Abat	Hotbed	100 sq.m	42.693741, 59.729793	DBM 2	School#8
Kegeyli district	VCC Nurli Bostan	Hotbed	100 sq.m	42.774242, 59.610276	DBM 2	School#9
Kegeyli district	VCC Madenityat	Hotbed	100 sq.m	42.801744, 59.633490	DBM 2	School#10
Kegeyli district	VCC Abat makan	Hotbed	100 sq.m	42.768022, 59.620918	DBM 2	School#14
Kegeyli district	VCC Jiluan jap	Hotbed	100 sq.m	42.685246, 59.726953	DBM 2	School#19
Kegeyli district	VCC Gujim terek	Hotbed	100 sq.m	42.614968, 59.682169	DBM 2	School#21
Kegeyli district	VCC Kuyashli	Hotbed	100 sq.m	42.748426, 59.734750	DBM 2	School#22
Kegeyli district	VCC Altin tala	Hotbed	100 sq.m	42.708481, 59.822477	DBM 2	School#33
Kegeyli district	«Bakhitli» VCC	Hotbed	100 sq.m	42.743193, 59.876626	DBM 2	School# 38
Kegeyli district	VCC «Janabazar»	Hotbed	100 sq.m	42.745008, 59.569726	DBM 2	School#41
Kegeyli district	VCC Kumshungul	Hotbed	100 sq.m	42.774697, 59.605814	DBM 2	School#55
Kegeyli district	VCC Juzim bag	Hotbed	100 sq.m	42°36'47.7"N 59°41'08.8"E	DBM 2	Household of Saparimbetova Azima
Kegeyli district	Kegeyli	Hotbed	100 sq.m	42°46'01.0"N 59°36'19.2"E	DBM 2	Household of Razov Zinatdin
Kegeyli district	Khalkabad	Hotbed	100 sq.m	42°40'11.7"N 59°43'07.5"E	DBM 2	Household of Kurbanazarov Dauletnazar
Kegeyli district	Kegeyli	Hotbed	100 sq.m	42°46'19.0"N 59°37'17.0"E	DBM 2	Household of Matekov Berdakh
Kegeyli district	VCC «Janabazar»	Hotbed	100 sq.m	42°44'17.5"N 59°33'41.2"E	DBM 2	Household of Akimbetov Kaypnazar
Kegeyli district	ոoc Khalkabad	Hotbed	100 sq.m	42°41'19.3"N 59°43'09.3"E	DBM 2	Household of Embergenova Gulchekhra
Kegeyli district	VCC «Jalpak jap»	Hotbed	100 sq.m	42°45'13.5"N 59°48'59.6"E	DBM 2	Household of Ismetov Pamir
Kegeyli district	VCC Juzim bag	Hotbed	100 sq.m	42°37'43.3"N 59°41'32.5"E	DBM 2	Household of Aralbaev Jalgasbay
Kegeyli district	Khalkabad	Hotbed	100 sq.m	42°41'24.6"N 59°44'27.4"E	DBM 2	Household of Shrazov Sadatdin
Kegeyli district	Kegeyli	Hotbed	100 sq.m	42°46'06.9"N 59°37'21.8"E	DBM 2	Household of Nurmanov Jumabay
Kegeyli district	VCC Juzim bag	Hotbed	100 sq.m	42°38'27.6"N 59°47'03.0"E	DBM 2	Household of Imamalikov Muratbay

Kegeyli district	VCC Juzim bag	Hotbed	100 sq.m	42°41'04.3"N 59°44'22.5"E	DBM 2	Household of Mukhanova Juldizkhan
Bozataw district	VCC Bozataw	Hotbed	100 sq.m	43°00'04.9»N 59°21'18.4»E	DBM 1	School#1
Bozataw district	VCC Bozataw	Hotbed	100 sq.m	43°00'05.3»N 59°21'20.6»E	DBM 1	School#4
Bozataw district	VCC Erkindarya	Hotbed	100 sq.m	42°50'50.5»N 59°25'13.2»E	DBM 1	School#7
Bozataw district	VCC Bozataw	Hotbed	100 sq.m	43°02'38.5»N 59°22'04.3»E	DBM 1	School#3
Bozataw district	VCC Aspantay	Hotbed	100 sq.m	43°13'18.8"N 59°35'50.5"E	DBM 1	School#14
Takhtakupir district	Takhtakupir VCC	Hotbed	100 sq.m	43°00'50.1"N 60°16'44.9"E	DBM 5	School#1
Takhtakupir district	Garezsizlik VCC	Hotbed	100 sq.m	43°01'30.7"N 60°17'28.8"E	DBM 5	School#2
Takhtakupir district	Dauir VCC	Hotbed	100 sq.m	43°01'30.6"N 60°16'38.1"E	DBM 5	School# 3
Takhtakupir district	Aydin jol VCC	Hotbed	100 sq.m	43°01'09.6"N 60°18'00.5"E	DBM 5	School# 5
Takhtakupir district	Atakol VCC	Hotbed	100 sq.m	43°01'48.9"N 60°15'56.9"E	DBM 5	School#6
Takhtakupir district	Kara oy VCC	Hotbed	100 sq.m	42°58'24.8"N 60°14'51.1"E	DBM 5	School#8
Takhtakupir district	OzbekstanVCC	Hotbed	100 sq.m	43°03'37.9"N 60°13'19.7"E	DBM 5	School#10
Takhtakupir district	Janadarya VCC	Hotbed	100 sq.m	43°08'59.5"N 60°21'45.1"E	DBM 5	School#13
Takhtakupir district	VCC Mulik	Hotbed	100 sq.m	43°07.448'N 059°40.765'E	DBM 5	School#16
Takhtakupir district	Takhtakupir VCC	Hotbed	100 sq.m	43°01'43.5"N 60°16'51.0"E	DBM 5	Igilikova Bishegul 973491955
Chimbay district	VCC Gujimli	Hotbed	100 sq.m	43°01'53.7"N 59°50'48.6"E	DBM 6	School#4
Chimbay district	VCC Abat makan	Hotbed	100 sq.m	42°53'34.9"N 59°47'21.6"E	DBM 6	School# 5
Chimbay district	VCC Doslik	Hotbed	100 sq.m	42°52'00.6"N 59°52'12.3"E	DBM 6	School#6
Chimbay district	VCC Orjap	Hotbed	100 sq.m	42°57'31.0"N 59°51'40.4"E	DBM 6	School#7
Chimbay district	VCC Shakhtemir	Hotbed	100 sq.m	43°03'33.4"N 59°51'44.1"E	DBM 6	School#9
Chimbay district	VCC Jipek Joli	Hotbed	100 sq.m	42°57'34.4"N 59°45'31.5"E	DBM 6	School#10
Chimbay district	VCC Kokshikala	Hotbed	100 sq.m	42°54'51.7"N 59°47'11.5"E	DBM 6	School#14

Chimbay district	VCC Berdakh	Hotbed	100 sq.m	43°05'14.9"N 59°42'24.2"E	DBM 6	School#15
Chimbay district	VCC Karakol	Hotbed	100 sq.m	43°02'48.3"N 59°36'07.7"E	DBM 6	School#16
Chimbay district	VCC Temirjol	Hotbed	100 sq.m	42°56'12.7"N 59°37'05.6"E	DBM 6	School#17
Chimbay district	VCC Konshi	Hotbed	100 sq.m	42°59'14.7"N 59°41'00.7"E	DBM 6	School# 19
Chimbay district	VCC Tazgara	Hotbed	100 sq.m	42°55'54.6"N 59°44'51.3"E	DBM 6	School#32
Chimbay district	VCC Tagjap	Hotbed	100 sq.m	42°56'01.7"N 59°45'46.5"E	DBM 6	School#36
Chimbay district	VCC Kenes	Hotbed	100 sq.m	42°56'17.2"N 59°45'57.8"E	DBM 6	School#37
Chimbay district	VCC Gujimli	Hotbed	100 sq.m	42°55'33.9"N 59°46'43.9"E	DBM 6	School#38
Chimbay district	VCC Tazajol	Hotbed	100 sq.m	42°55'56.6"N 59°46'58.1"E	DBM 6	School#40
Chimbay district	VCC Pashenttaw	Hotbed	100 sq.m	42°55'31.1"N 59°46'35.0"E	DBM 6	School#41
Chimbay district	VCC May jap	Hotbed	100 sq.m	42°56'34.1"N 59°48'19.7"E	DBM 6	School#42
Chimbay district	VCC Bakhitli	Hotbed	100 sq.m	42°56'26.5"N 59°46'20.7"E	DBM 6	School#43
Chimbay district	VCC Kizilozek	Hotbed	100 sq.m	42°55'33.5"N 59°47'39.5"E	DBM 6	School#44
Chimbay district	VCC Kamis arik	Hotbed	100 sq.m	42°56'29.3"N 59°47'24.5"E	DBM 6	School#48
Chimbay district	VCC Kosterek	Hotbed	100 sq.m	42°54'39.1"N 59°39'53.3"E	DBM 6	School#45
Chimbay district	VCC Taza jol	Hotbed	100 sq.m	43°04'56.3"N 59°41'51.1"E	DBM 6	Household of Tayirvoa Minaykhan
Chimbay district	VCC Tazgara	Hotbed	100 sq.m	42°53'38.7"N 59°47'16.6"E	DBM 6	Household of Khudaybergenov Marat
Chimbay district	VCC Tagjap	Hotbed	100 sq.m	42°56'03.6"N 59°46'31.8"E	DBM 6	Household of Seytirzaev Bekbay
Chimbay district	VCC Konshi	Hotbed	100 sq.m	42°55'45.2"N 59°45'39.8"E	DBM 6	Household of Dauletmuratova T
Chimbay district	VCC “Orjap”	Hotbed	100 sq.m	42°55'36.5"N 59°45'43.7"E	DBM 6	Household of Abatov Dastan
Chimbay district	VCC Berdakh	Hotbed	100 sq.m	42°56'18.5"N 59°45'32.1"E	DBM 6	Household of Izimbetova Gulimkhan
Chimbay district	VCC Takjap	Hotbed	100 sq.m	42°57'36.3"N 59°52'14.5"E	DBM 6	Household of Ajibaeva Kamila
Chimbay district	VCC “Bakhitli”	Hotbed	100 sq.m	42°57'31.1"N 59°45'40.1"E	DBM 6	Household of Jandauletov Abatbay

Muynak district	VCC Muynak	Hotbed	100 sq.m	N43°49.437' E058°53.186'	DBM 4	Household of Bekjanova Amina
Bozataw district	VCC Kok Suw	Hotbed	100 sq.m	43°13'25.0"N 59°35'18.9"E	DBM 1	Kindergarten #7
Chimbay district	VCC Gujimli	Hotbed	100 sq.m	43°56'37"N 59°45'56"E	DBM 6	Household of Berdikeev Baymurza
Chimbay district	VCC Bakhitli	Hotbed	100 sq.m	43°55'36"N 59°45'58"E	DBM 6	Household of Saypnazarov Genjebay
Takhtakupir district	VCC Kostruba	Hotbed	100 sq.m	N 43°29.196' E061°35.347'	DBM 5	School #23
Kegeyli district	VCC Kuyash	Hotbed	100 sq.m	42°40'32.0"N 59°43'05.9"E	DBM 2	Household of Ermanova Zinaida
Kegeyli district	VCC Ishankala	Hotbed	100 sq.m	43°39'05.8"N 59°44'03.9"E	DBM 2	Household of Taubaldieva Ayjamal
Muynak district	District center	Hotbed 200 set	12 sq.m.	43°46.998'N 58°12.834'E	DBM 4	District Khakimiyat
Chimbay district	District center	Hotbed 600 set	12 sq.m.	42°57.100'N 59°46.332'E	DBM 6	District Khakimiyat
Kegeyli district	VCC Juzim bag	Hotbed 50 set	12 sq.m.	42°37'48.49"N 59°41'41.61"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Kumshungul	Hotbed 46 set	12 sq.m.	42°44'57.45"N 59°44'5.45"E	DBM 2	District Khakimiyat
Kegeyli district	VCC «Jalpak jap»	Hotbed 38 set	12 sq.m.	42°44'43.45"N 59°49'56.55"E	DBM 2	District Khakimiyat
Kegeyli district	VCC «Janabazar»	Hotbed 44 set	12 sq.m.	42°44'21.19"N 59°33'46.38"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Aqtuba	Hotbed 24 set	12 sq.m.	42°47'13.41"N 59°37'4.86"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Abat	Hotbed 40 set	12 sq.m.	42°49'24.87"N 59°31'40.33"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Nurli Bostan	Hotbed 30 set	12 sq.m.	42°46'14.11"N 59°36'54.65"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Madenityat	Hotbed 38 set	12 sq.m.	42°46'24.14"N 59°36'55.60"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Abat makan	Hotbed 30 set	12 sq.m.	42°45'58.40"N 59°35'56.55"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Jiluan jap	Hotbed 37 set	12 sq.m.	42°46'48.83"N 59°36'26.54"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Gujim terek	Hotbed 26 set	12 sq.m.	42°41'32.79"N 59°43'36.82"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Kuyashli	Hotbed 25set	12 sq.m.	42°40'58.88"N 59°43'41.86"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Altin tala	Hotbed 32 set	12 sq.m.	42°41'12.36"N 59°43'39.02"E	DBM 2	District Khakimiyat
Kegeyli district	«Bakhitli» VCC	Hotbed 35 set	12 sq.m.	42°41'3.66"N 59°43'36.95"E	DBM 2	District Khakimiyat
Bozataw district	District center	Hotbed 132 set	12 sq.m.	43°00'25.73"N	DBM 1	District Khakimiyat

				59°21'09.10"E		
Takhtakupir district	Takhtakupir VCC	Hotbed 30 set	12 sq.m.	43°00'53.8"N 60°17'32.3"E	DBM 5	District Khakimiyat
Takhtakupir district	Garezsizlik VCC	Hotbed 27 set	12 sq.m.	43°01'34.9"N 60°16'05.4"E	DBM 5	District Khakimiyat
Takhtakupir district	Dauir VCC	Hotbed 26 set	12 sq.m.	43°01'39.2"N 60°17'47.0"E	DBM 5	District Khakimiyat
Takhtakupir district	Aydin jol VCC	Hotbed 26 set	12 sq.m.	43°01'55.2"N 60°16'46.5"E	DBM 5	District Khakimiyat
Takhtakupir district	Atakol VCC	Hotbed 20 set	12 sq.m.	42°58'23.8"N 60°14'49.3"E	DBM 5	District Khakimiyat
Takhtakupir district	Kara oy VCC	Hotbed 20 set	12 sq.m.	43°03'31.6"N 60°13'18.0"E	DBM 5	District Khakimiyat
Takhtakupir district	OzbekstanVCC	Hotbed 20 set	12 sq.m.	43°03'38.8"N 60°12'01.2"E	DBM 5	District Khakimiyat
Takhtakupir district	Daukara VCC	Hotbed 20 set	12 sq.m.	43°08'54.2"N 60°21'40.9"E	DBM 5	District Khakimiyat
Takhtakupir district	Karateren VCC	Hotbed 15 set	12 sq.m.	43°09'27.5"N 60°22'06.7"E	DBM 5	District Khakimiyat
Takhtakupir district	Beltaw VCC	Hotbed 10 set	12 sq.m.	43°08'57.7"N 60°30'27.5"E	DBM 5	District Khakimiyat
Takhtakupir district	Koniratkol VCC	Hotbed 15 set	12 sq.m.	43°04'24.6"N 60°27'55.4"E	DBM 5	District Khakimiyat
Takhtakupir district	Mulik VCC	Hotbed 15 set	12 sq.m.	42°59'51.9"N 60°25'37.5"E	DBM 5	District Khakimiyat
Takhtakupir district	Dauit say VCC	Hotbed 10 set	12 sq.m.	43°01'18.0"N 60°26'25.6"E	DBM 5	District Khakimiyat
Takhtakupir district	Janadarya VCC	Hotbed 10 set	12 sq.m.	42°57'40.3"N 60°23'28.8"E	DBM 5	District Khakimiyat
Takhtakupir district	Marjankol VCC	Hotbed 10 set	12 sq.m.	42°54'19.9"N 60°26'28.3"E	DBM 5	District Khakimiyat
Takhtakupir district	Takhtakupir VCC	Hotbed 20 set	12 sq.m.	43°01'05.6"N 60°19'54.7"E	DBM 5	District Khakimiyat
Kanliku district l	Kanlikul VCC	Hotbed 18 set	12 sq.m.	42°45'55.98"N 59° 8'41.19"E	DBM3	District Khakimiyat
Kanlikul district	Nawriz VCC	Hotbed 27 set	12 sq.m.	42°52'42.84"N 59°11'28.41"E	DBM3	District Khakimiyat
Kanlikul district	Beskopir VCC	Hotbed 32 set	12 sq.m.	42°54'4.06"N 58°56'35.98"E	DBM3	District Khakimiyat
Kanlikul district	Madeniyat VCC	Hotbed 36 set	12 sq.m.	42°49'48.46"N 59° 0'23.36"E	DBM3	District Khakimiyat
Kanlikul district	Bostan VCC	Hotbed 39 set	12 sq.m.	42°47'1.16"N 59° 2'22.42"E	DBM3	District Khakimiyat
Kanlikul district	Janakala VCC	Hotbed 23 set	12 sq.m.	42°43'40.44"N 59° 4'33.71"E	DBM3	District Khakimiyat
Kanlikul district	Kosjap VCC	Hotbed 17 set	12 sq.m.	42°40'11.92"N 59°11'56.31"E	DBM3	District Khakimiyat

Kanlikul district	Jaykhun VCC	Hotbed 16 set	12 sq.m.	42°52'42.84"N 59°11'28.41"E	DBM3	District Khakimiyat
Kanlikul district	Kanlikul VCC	Hotbed 25 set	12 sq.m.	42°49'18.94"N 58°59'30.24"E	DBM3	District Khakimiyat
Kanlikul district	Doslik VCC	Hotbed 26 set	12 sq.m.	42°49'48.33"N 59° 0'26.00"E	DBM3	District Khakimiyat
Kanlikul district	Arzimbetkum VCC	Hotbed 20 set	12 sq.m.	42°51'1.74"N 58°58'9.77"E	DBM3	District Khakimiyat
Muynak district	District center	Drip irrigation systems 210 set	100 sq.m.	43°46.998'N 58°12.834'E	DBM 4	District Khakimiyat
Chimbay district	District center	Drip irrigation systems 630 set	100 sq.m.	42°57.100'N 59°46.332'E	DBM 6	District Khakimiyat
Kegeyli district	VCC Juzim bag	Drip irrigation systems 42 set	100 sq.m.	42°37'48.49"N 59°41'41.61"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Kumshungil	Drip irrigation systems 51 set	100 sq.m.	42°44'57.45"N 59°44'5.45"E	DBM 2	District Khakimiyat
Kegeyli district	VCC «Jalpak jap»,	Drip irrigation systems 43 set	100 sq.m.	42°44'43.45"N 59°49'56.55"E	DBM 2	District Khakimiyat
Kegeyli district	VCC «Janabazar»,	Drip irrigation systems 43set	100 sq.m.	42°44'21.19"N 59°33'46.38"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Aqtuba,	Drip irrigation systems 30 set	100 sq.m.	42°47'13.41"N 59°37'4.86"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Abat	Drip irrigation systems 46 set	100 sq.m.	42°49'24.87"N 59°31'40.33"E	DBM 2	District Khakimiyat
Kegeyli district	Nurli Bostan VCC	Drip irrigation systems 36 set	100 sq.m.	42°46'14.11"N 59°36'54.65"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Madeniyat,	Drip irrigation systems 38 set	100 sq.m.	42°46'24.14"N 59°36'55.60"E	DBM 2	District Khakimiyat
Kegeyli district	«Abat makan» VCC,	Drip irrigation systems 33 set	100 sq.m.	42°45'58.40"N 59°35'56.55"E	DBM 2	District Khakimiyat
Kegeyli district	«Jiluan jap» VCC,	Drip irrigation systems 38 set	100 sq.m.	42°46'48.83"N 59°36'26.54"E	DBM 2	District Khakimiyat
Kegeyli district	«Gujim terek» VCC,	Drip irrigation systems 28 set	100 sq.m.	42°41'32.79"N 59°43'36.82"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Kuyashli,	Drip irrigation systems 30 set	100 sq.m.	42°40'58.88"N 59°43'41.86"E	DBM 2	District Khakimiyat
Kegeyli district	VCC Altin tala,	Drip irrigation systems 29 set	100 sq.m.	42°41'12.36"N 59°43'39.02"E	DBM 2	District Khakimiyat
Kegeyli district	«Bakhitli» VCC,	Drip irrigation systems 30 set	100 sq.m.	42°41'3.66"N 59°43'36.95"E	DBM 2	District Khakimiyat
Bozataw district	District center	Drip irrigation systems 137 set	100 sq.m.	43°00'25.73"N 59°21'09.10"E	DBM 1	District Khakimiyat
Takhtakupir district	Takhtakupir VCC	Drip irrigation systems 34 set	100 sq.m.	43°00'53.8"N 60°17'32.3"E	DBM 5	District Khakimiyat
Takhtakupir district	Garezsizlik VCC	Drip irrigation systems 30 set	100 sq.m.	43°01'34.9"N 60°16'05.4"E	DBM 5	District Khakimiyat

Takhtakupir district	Dauir VCC	Drip irrigation systems 30 set	100 sq.m.	43°01'39.2"N 60°17'47.0"E	DBM 5	District Khakimiyat
Takhtakupir district	Aydin jol VCC,	Drip irrigation systems 31 set	100 sq.m.	43°01'55.2"N 60°16'46.5"E	DBM 5	District Khakimiyat
Takhtakupir district	Atakol VCC,	Drip irrigation systems 20 set	100 sq.m.	42°58'23.8"N 60°14'49.3"E	DBM 5	District Khakimiyat
Takhtakupir district	Kara oy VCC,	Drip irrigation systems 15 set	100 sq.m.	43°03'31.6"N 60°13'18.0"E	DBM 5	District Khakimiyat
Takhtakupir district	Ozbekstan VCC	Drip irrigation systems 15 set	100 sq.m.	43°03'38.8"N 60°12'01.2"E	DBM 5	District Khakimiyat
Takhtakupir district	Daukara VCC,	Drip irrigation systems 15 set	100 sq.m.	43°08'54.2"N 60°21'40.9"E	DBM 5	District Khakimiyat
Takhtakupir district	Karateren VCC	Drip irrigation systems 15 set	100 sq.m.	43°09'27.5"N 60°22'06.7"E	DBM 5	District Khakimiyat
Takhtakupir district	Beltaw VCC,	Drip irrigation systems 10 set	100 sq.m.	43°08'57.7"N 60°30'27.5"E	DBM 5	District Khakimiyat
Takhtakupir district	Koniratkol VCC	Drip irrigation systems 15 set	100 sq.m.	43°04'24.6"N 60°27'55.4"E	DBM 5	District Khakimiyat
Takhtakupir district	Mulik VCC	Drip irrigation systems 15 set	100 sq.m.	42°59'51.9"N 60°25'37.5"E	DBM 5	District Khakimiyat
Takhtakupir district	Dauit say VCC,	Drip irrigation systems 10 set	100 sq.m.	43°01'18.0"N 60°26'25.6"E	DBM 5	District Khakimiyat
Takhtakupir district	Janadarya VCC	Drip irrigation systems 15 set	100 sq.m.	42°57'40.3"N 60°23'28.8"E	DBM 5	District Khakimiyat
Takhtakupir district	Marjankol VCC	Drip irrigation systems 10 set	100 sq.m.	42°54'19.9"N 60°26'28.3"E	DBM 5	District Khakimiyat
Takhtakupir district	Takhtakupir VCC	Drip irrigation systems 24 set	100 sq.m.	43°01'05.6"N 60°19'54.7"E	DBM 5	District Khakimiyat
Kanlikul district	Kanlikul VCC	Drip irrigation systems 25 set	100 sq.m.	42°45'55.98"N 59° 8'41.19"E	DBM3	District Khakimiyat
Kanlikul district	Nawriz VCC	Drip irrigation systems 31 set	100 sq.m.	42°50'5.45"N 59° 2'49.14"E	DBM3	District Khakimiyat
Kanlikul district	Beskopir VCC	Drip irrigation systems 34 set	100 sq.m.	42°54'4.06"N 58°56'35.98"E	DBM3	District Khakimiyat
Kanlikul district	Madeniyat VCC	Drip irrigation systems 38 set	100 sq.m.	42°49'48.46"N 59° 0'23.36"E	DBM3	District Khakimiyat
Kanlikul district	Bostan VCC	Drip irrigation systems 41 set	100 sq.m.	42°47'1.16"N 59° 2'22.42"E	DBM3	District Khakimiyat
Kanlikul district	Janakala VCC	Drip irrigation systems 25 set	100 sq.m.	42°43'40.44"N 59° 4'33.71"E	DBM3	District Khakimiyat
Kanlikul district	Kosjap VCC	Drip irrigation systems 19 set	100 sq.m.	42°40'11.92"N 59°11'56.31"E	DBM3	District Khakimiyat
Kanlikul district	Jaykhun VCC	Drip irrigation systems 18 set	100 sq.m.	42°52'42.84"N 59°11'28.41"E	DBM3	District Khakimiyat
Kanlikul district	Kanlikul VCC	Drip irrigation systems 27 set	100 sq.m.	42°49'18.94"N 58°59'30.24"E	DBM3	District Khakimiyat
Kanlikul district	Doslik VCC	Drip irrigation systems 28 set	100 sq.m.	42°49'48.33"N	DBM3	District Khakimiyat

				59° 0'26.00"E		
Kanlikul district	Arzimbetkum VCC	Drip irrigation systems 22 set	100 sq.m.	42°51'1.74"N 58°58'9.77"E	DBM3	District Khakimiyat
Bozataw District	VCC «Kok suw»	Tractor 60 hp SF-604		43°12'10.2"N 59°30'21.3"E	DBM 1	Production Cooperative «SHAXAMAN-JAYLAWI
		Mounted 3-trunk plough				
		Tractor trailer «2ПТС-4-793-03А»				
		Land laser leveler with bucket(RL-SV2S, Topcon и 1.JNR.250)				
		Mounted mower (segmental-finger) KSP-2.1				
		Mounted rotary mower FRD 210				
		Square baler Mdel 8747S				
		Combined universal seederATMACA 13				
		Fodder equipment				
		Propane powered water pump 2 units				
		Knapsack sprayer 4 units				
Bozataw District	VCC «Bozataw»	Tractor 80 hp SF-804		42°56'00.4"N 59°18'15.6"E	DBM 1	Production Cooperative «BOZATAW JAYLAWI»
		Mounted reversible plough 3+1 MD-100				
		Tractor trailer «2ПТС-4-793-03А»				
		Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)				
		Rotary shredder RIRO-3				
		Mounted mower (segmental-finger) KSP-2.1				
		Mounted rotary mower FRD 210				
		Square baler Mdel 8747S				
		Fodder equipment				
		Bed former				
		Propane powered water pump 1 unit				
		Knapsack sprayer 4 units				
Bozataw District	VCC «Erkindarya»	Tractor 80 hp SF-804		42°48'39.1"N 59°26'27.4"E	DBM 1	Production Cooperative «ERKINDARYA JAYLAWI»
		Mounted 3-trunk plough				
		Tractor trailer «2ПТС-4-793-03А»				
		Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)				
		Mounted rotary mower				
		Mounted sprayer 600 l				
		Propane powered water pump 2 units				
		Knapsack sprayer 4 units				
Bozataw District	VCC «Kuskhanataw»	Tractor 80 hp SF-604		42°55'45.7"N 59°18'05.7"E	DBM 1	Production Cooperative «AKTUBA JAILAWI»
		Mounted 3-trunk plough				
		Tractor trailer «2ПТС-4-793-03А»				
		Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)				
		Mounted sprayer 600 l				
		Pan-breaker GRP-1,8				
		Disc harrow DBK-4				
		Combined chisel ChPK-3				
		Propane powered water pump 3 units				
		Mounted mower (segmental-finger) KSP-2.1				
		Mounted rotary mower FRD 210				
		Square baler Model 8747S				

		Fodder equipment				
		Bed former				
Bozataw District	VCC «Aspantay»	Tractor 80 hp SF-804		43°05'24.9"N 59°10'13.9"E	DBM 1	Production Cooperative «PORLITAW JAYLAWI»
		Mounted 3-trunk plough				
		Tractor trailer «2ПТС-4-793-03А»				
		Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)				
		Mounted rotary mower				
		Propane powered water pump 2 units				
Takhtakupir District	VCC «Mulik»	Tractor 60 hp SF-604		42°59'41.4"N 60°25'44.8"E	DBM 5	Production Cooperative "MULIK JAYLAW"
		Mounted 3-trunk plough				
		Tractor trailer «2ПТС-4-793-03А»				
		Mounted mower (segmental-finger) KSP-2.1				
		Mounted rotary mower				
		Fodder equipment				
		Propane powered water pump 2 units				
		Knapsack sprayer 4 units				
Takhtakupir District	VCC «Janadarya»	Tractor 80 hp SF-804		42°57'36.0"N 60°23'35.0"E	DBM 5	Production Cooperative «JANADARYA-JAYLAW»
		Mounted 3-trunk plough				
		Mounted rotary mower				
		Tractor trailer «2ПТС-4-793-03А»				
		Propane powered water pump 2 units				
Muynak District	VCC «Khakim ata»	Tractor 60 hp SF-604		43°21'11.3"N 59°03'33.5"E	DBM 4	Production Cooperative «AJINIYAZ JAYLAWLARI»
		Mounted 3-trunk plough				
		Tractor trailer «2ПТС-4-793-03А»				
		Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)				
		Mounted mower (segmental-finger) KSP-2.1				
		Mounted rotary mower FRD 210				
		Square baler Model 8747S				
		Fodder equipment				
		Mounted sprayer 600 l				
		Bed former				
		Propane powered water pump 3 units				
		Knapsack sprayer 4 units				
Kanlikul District	VCC «Beskopir»	Tractor 35 hp SF-354		42°54'03.8"N 58°56'36.8"E	DBM3	Production Cooperative «BESKOPIR JAYLAW»
		Mounted 3-trunk plough				
		Tractor trailer «2ПТС-4-793-03А»				
		Propane powered water pump 1 unit				
		Mounted mower (segmental-finger) KSP-2.1				
		Mounted rotary mower				
		Fodder equipment				
Takhtakup District	VCC «Kara oy»	Mounted rotary mower		43°04'20.4"N 60°13'18.9"E	DBM 5	Production Cooperative «TAXTAKUPIR-JAYLAWLARI»
		Mounted 3-trunk plough				
		Tractor trailer «2ПТС-4-793-03А»				
		Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)				
Bozataw district	VCC «Kuskhanataw»	Tractor 150 hpMTZ 1532		42°55'45.7"N 59°18'05.7"E	DBM 1	Association of Pasture Cooperatives of RK

Kanlikul district	District center	Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)	1784	42°49'22.2"N 59°00'00.7"E	DBM3	LLC "Kanlykul MTP"
		Combined universal seederATMACA 13	370			
Chimbay District	District center	Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)	1979	42°53'37.3"N 59°47'23.8"E	DBM 6	LLC "Chimbay MTP"
		Combined universal seederATMACA 13	353			
Takhtakupir district	District center	Land laser leveler with bucket (RL-SV2S, Topcon и 1.JNR.250)	1394	43°01'08.6"N 60°20'15.1"E	DBM 5	LLC "Adilet-Tahta MTP"
		Combined universal seederATMACA 17	382			
Kegeyli district	District center	Combined universal seederATMACA 17	1596	42°45'55.0"N 59°35'53.1"E	DBM 2	LLC "Kegeyli Agroservice MTP"
		Mounted mower (segmental-finger) KSP-2.1				
Takhtakupir district	VCC «Kara oy	Tractor 200 hp SF-2004		43°03'08.5"N 60°10'52.8"E	DBM 5	State Forestry Committee of the Republic of Karakalpakstan
Chimbay District	District center	Tractor 150 hp SF-1504		42°53'59.7"N 59°46'21.7"E	DBM 6	State Forestry Committee of the Republic of Karakalpakstan
Bozataw district	VCC «Bozataw»	Tractor 80 hp SF-804		42°59'22.3"N 59°20'22.2"E	DBM 1	State Forestry Committee of the Republic of Karakalpakstan
Nukus district	District center	Tractor 80 hp SF-804		42°28'10.0"N 59°34'29.8"E	NA	State Forestry Committee of the Republic of Karakalpakstan
Muynak district	District center	Tree-planting machine (LPM-1)- 4 units.		43°46'32.1"N 59°01'34.8"E	DBM 4	State Forestry Committee of the Republic of Karakalpakstan
Muynak district	District center	Deep tillage chisel (ChKG-3) - 4 units		43°46'32.1"N 59°01'34.8"E	DBM 4	State Forestry Committee of the Republic of Karakalpakstan
Muynak district	District center	Trenching plough (KK-0,45) - 4 units.		43°46'32.1"N 59°01'34.8"E	DBM 4	State Forestry Committee of the Republic of Karakalpakstan
Muynak district	District center	Excavating plow (PV-1) - 4 units		43°46'32.1"N 59°01'34.8"E	DBM 4	State Forestry Committee of the Republic of Karakalpakstan
Nukus district	District center	Water tank		42°28'10.0"N 59°34'29.8"E	NA	State Forestry Committee of the Republic of Karakalpakstan
Bozataw district	VCC «Bozataw»	Water tank		42°59'22.3"N 59°20'22.2"E	DBM 1	State Forestry Committee of the Republic of Karakalpakstan
Nukus district	District center	Tractor trailer		42°28'10.0"N 59°34'29.8"E	NA	State Forestry Committee of the Republic of Karakalpakstan
Bozataw district	VCC «Bozataw»	Tractor trailer		42°59'22.3"N 59°20'22.2"E	DBM 1	State Forestry Committee of the Republic of Karakalpakstan
Muynak district	Areas on the dried bottom of the Aral Sea	Joint afforestation amelioration works aimed at fixing moving sands, reclamation and improving pastures	18000	44°59'27.2"N 59°01'01.6"E	DBM 4	State Forestry Committee of the Republic of Karakalpakstan
			20800	44°33'54.1"N 58°56'02.8"E	DBM 4	
			27000	44°07'25.3"N 59°22'55.2"E	DBM 4	
			10000	44°11'03.9"N 60°18'14.2"E	DBM 4	
Muynak district	Areas on the dried bottom of the Aral Sea	demonstration plot on planting seedlings of saxaul by applying water absorbent Zeba on the dried bottom of the Aral Sea	2	44°33'54.2"N 58°56'02.8"E	DBM 4	State Forestry Committee of the Republic of Karakalpakstan
Muynak district	VCC Khakim Ata	demonstration plot on water absorbent Zeba in the nursery of saxaul seedlings by PC«AJINIYAZ JAILAWLARI» in Muynak district	1	43°21'36.1"N 59°03'37.7"E	DBM 4	State Forestry Committee of the Republic of Karakalpakstan
Muynak district	Areas on the dried bottom of the Aral Sea	demonstration plot on planting seedlings of saxaul by applying water absorbent SNF on the dried bottom of the Aral Sea	1	N 44°12.105' E 058°51.432'	DBM 4	State Forestry Committee of the Republic of Karakalpakstan

Nukus district	VCC Samanbay	demonstration plot on water absorbent SNFin establishment of the nursery of saxaul seedlings by Nukus Forestry in Nukus	0.5	42°24'08.8"N 59°36'15.4"E	NA	State Forestry Committee of the Republic of Karakalpakstan
Muynak district	Areas on the dried bottom of the Aral Sea	Demonstration plot for fixing moving sands by mechanical protection	32	N 44°12.292' E 058°51.510'	DBM 4	State Forestry Committee of the Republic of Karakalpakstan
Kegeyli district	District center	Set of gardening tools (Model ZH-6278) - 30 pcs.		42°46'32.3"N 59°36'28.4"E	DBM 2	Council of Farmers and Owners of household plots of Kegeyli district
Chimbay district	District center	Set of gardening tools (Model ZH-6278)- 30 pcs.		42°55'24.2"N 59°46'43.0"E	DBM 6	Council of Farmers and Owners of household plots of Chimbay district
Takhtakupir district	District center	Set of gardening tools (Model ZH-6278)- 25 pcs.		43°01'16.4"N 60°17'01.4"E	DBM 5	Council of Farmers and Owners of household plots of Takhtakupir district
Kanlikul district	District center	Set of gardening tools (Model ZH-6278)- 35 pcs.		42°49'35.6"N 59°01'02.1"E	DBM3	Council of Farmers and Owners of household plots of Kanlikul district
Muynak district	District center	Set of gardening tools (Model ZH-6278) - 10 pcs.		43°46'01.7"N 59°01'34.3"E	DBM 4	Council of Farmers and Owners of household plots of Muynak district
Takhtakupir district	District center	Automatic weather station		43°01'56.0"N 60°17'45.7"E	DBM 5	Meteorological station Takhtakupir
		Photovoltaic station 1 kW				
Chimbay district	District center	Automatic weather station		42°55'52.3"N 59°47'43.0"E	DBM 6	Meteorological station Chimbay
		Photovoltaic station 1 kW				
Kungrad district	District center	Automatic weather station		43°03'39.2"N 58°53'20.0"E	NA	Meteorological station Kungrad
		Photovoltaic station 1 kW				
		Invertor 24 V				
		Accumulator battery 12 V				
Kungrad district	Arkhipelago Aktumsuk	Автоматическая Meteorological station		45°08'09.6"N 58°17'33.7"E	NA	Meteorological station Aktumsuk
		Invertor 24 V				
		Accumulator battery 12 V				
Kungrad district	VCC Jaslik	Automatic weather station		43°57'55.9"N 57°29'34.5"E	NA	Meteorological station Jaslik
Kungrad district	VCC Karakalpakstan	Automatic weather station		44°46'18.3"N 56°12'07.1"E	NA	Meteorological station Karakalpakstan
Ellikkala district	VCC Buston	Automatic weather station		41°50'29.9"N 60°56'01.3"E	NA	Meteorological station Buston
		Photovoltaic station 1 kW				
Muynak district	VCC Muynak	Automatic weather station		43°45'23.6"N 59°01'37.5"E	DBM 4	Meteorological station Muynak
		Invertor 24 V				
		Accumulator battery 12 V				
Nukus city	VCC Jeke terek	Automatic weather station		42°26'45.2"N 59°36'12.9"E	NA	Meteorological station Nukus
		Invertor 24 V				
		Accumulator battery 12 V				
Takhiatash district	District center	Automatic weather station		42°20'48.9"N 59°33'25.8"E	NA	Meteorological station Takhiatash
		Photovoltaic station 1 kW				
Khiva district, Khorezm	Khiva	Photovoltaic station 1 kW		41°22'19.5"N 60°23'09.8"E	NA	Meteorological station Khiva
Kegeyli district	VCC Khalkabad	Agrometeorological station		42°40'06.4"N 59°43'37.9"E	DBM 2	Nukus Barnch of Tashkent State Agrarian University
Kanlikul district	VCC Kanlikul	Agrometeorological station		42°50'14.4"N 59°00'32.5"E	DBM3	

Annex 6: List of Persons Interviewed

Summary List

Location	Stakeholder
Tashkent	UNDP, PIU, Center of Hydrometeorological Services (Hydromet & climate change projects) Ministry of Water Resources (Water management & use); Ministry of Agriculture (MoA) (Cotton) State Committee for Ecology & Nature Ministry of Finance (Agriculture, Industry & Ecology) Ministry of Economic Development & Poverty Reduction (Agriculture structural reform)
Karakalpakstan (KKPS)	KKPS Council of Ministries (Department of Ecology of Aral Sea Region); KKPS Hydromet Department; KKPS MoA ; KKPS Department of Forestry (SCF) Council of Farmers and Smallholders (CFS) / Farmers Association; Association of Production Cooperatives; Innovation Center for Aral Sea Region; Research Institute of Natural Sciences (Soil properties & wild plants) ; KKPS branch Academy of Sciences (Glauconite Expert)
KKPS Districts	Local governments in 6 districts (Khokimiyats) - Takhtakupir, Chimbay, Bozataw, Kegeyli, Kanlikul, Muynak - 2 offices for Investment & Trade; 4 offices for Makhalla and Family
Interventions	- 6 Production cooperatives - Mulik Jaylaw; Erkindarya Jaylawi; Aqtuba Jaylawi; Bozataw Jaylawi; Porlitaw Jaylawi; and Shaxaman Jaylawi - Other type of Production Cooperative - Beskopir Jaylaw; Ajiniyaz Jaylawlari - VCCs - Erkindarya; Beskopir; Kostruba - hydroponic fodder production - hotbed and drip irrigation x 4; intensive garden x 2; beekeeper x 2; school x 3

Name	Position / Organization	Location
Mr. Jambul Adilov	Mayor of Takhtakupir district	Takhtakupir district
Mr. Kuuatbay Daribaev	Deputy Mayor of Takhtakupir district on Investment & Foreign Trade	Takhtakupir district
Mr. Millionbay Patov	Chairman of the Production Cooperative “Mulik Jaylaw”	Takhtakupir district
Mr. Alauatdin Serkebaev	Chairman of VCC “Kostruba”	Takhtakupir district
Ms. Bishegul Igilikova	Owner of hotbed	Takhtakupir district
Ms. Kuralay Usenova	Director of School#16	Takhtakupir district
Ms. Oralkhan Jumanazarova	Owner of small hotbed	Takhtakupir district
Mr. Omirbay Allanazarov	Owner of Intensive garden	Takhtakupir district
Mrs. Rasul Utimuratov	Beekeeper	Takhtakupir district
Mrs. Ibragimov Sodik	Deputy Mayor of Chimbay district	Chimbay district
Ms. Gulzar Mambetniyazova	Deputy Mayor of Chimbay district on Support of Makhalla and Family	Chimbay district
Ms. Kamila Ajibaeva	Owner of hotbed	Chimbay district
Mr. Azat Kulbaev	Owner of Hydroponic fodder equipment	Chimbay district
Mr. Abatbay Jandauletov	Owner of hotbed	Chimbay district
Ms. Gaukhar Abdullaeva	Director of School #38	Chimbay district
Mr. Orakbay Aytimbetov,	Chairman of VCC “Erkindarya”	Bozataw district
Mr. Jengisbay Saparbaev	Chairman of Production Cooperative “Erkindarya Jaylawi”	Bozataw district
Erkinbay Ibragimov	Specialist on Investment and Foreign Trade Department	Bozataw district
Mr. Salamat Esimbetov	Chairman of Production Cooperative “Aqtuba Jaylawi”	Bozataw district
Mr. Bektilew Abilov	Chairman of Production Cooperative “Bozataw Jaylawi”	Bozataw district
Mr. Amangeldi Temirov	Chairman of Production Cooperative “Porlitaw Jaylawi”	Bozataw district
Mr. Abdisamat Ablakumov	Chairman of Production Cooperative “Shaxaman Jaylawi”	Bozataw district
Ms. Damegul Kudaybergenova	Owner of Intensive garden	Kegeyli district
Mr. Dauletbay Utemuratov	Mayor of Kegeyli district	Kegeyli district
Mr. Saidkhoji Aliev	Association (Kengesh) of the farmers and dekhkans and land owners	Kanlikul district
Ms. Saltanat Jumanova	Deputy Mayor of Kanlikul district on Support of Makhalla and Family	Kanlikul district
Mr. Mansur Bekmuratov	Chairman of VCC “Beskopir”	Kanlikul district
Ms. Gulistan Aralbaeva	Chairman of Production Cooperative “Beskopir Jaylaw”	
Mr. Tleubergen Sultanov	Owner of hotbed	Kanlikul district
Mr. Pirjan Aytjanov	Owner of hotbed	Kanlikul district
Mr. Osman Orazbaev	Owner of hotbed	Kanlikul district
Ms. Satipaldieva Gulbakhar	Beekeeper	Kanlikul district
Mr. Aydarali Sakhiev	Deputy Mayor of Muynak district on Support of Makhalla and Family	Muynak district

Mr. Salamat Nurjanov	Director of School #1	Muynak district
Ms. Nafisa Bayniyazova	Chairman of Production Cooperative "Ajiniyaz Jaylawlari"	Muynak district
Ms. Yarulina Zulfia	Senior Specialist of the Administration of the ground water control/ the State Committee on Ecology and Nature Protection	Tashkent
Mr. Adbumajitov Shukhrat	Chief of Administration on financing of the Agriculture and Industry Complex and ecology/ the Ministry of Finance	Tashkent
Mr. Djuraev Edgorbek	Specialist Administration on structural reformations in agricultural sector/ the Ministry of Economic Development and Poverty Reduction	Tashkent
Mr. Madiboev Nodirbek	Senior Specialist of the Administration on water management and use/ the Ministry of Water Management	Tashkent
Mr. Shamsiev Akmal	Chief Administration on cotton cultivation/ the Ministry of Agriculture	Tashkent
Mr. Shukurov Rustambek (Someone else interviewed)	Chief of Administration on hydrometeorological and climate change projects/ the Center of Hydrometeorological Service	Tashkent
Mr. Markhabay Nurmanov	Chief of the Department of Ecology and Development of Aral Sea Region/ the Council of Ministries of the Republic of Karakalpakstan	Nukus
Mr. Alisher Yakubov	Minister/ the Ministry of Agriculture	Nukus
Mr. Ernazar Embergenov	Deputy Chairman/ the Council of Farmers and owners of household lands of the Republic of Karakalpakstan	Nukus
Mr. Erniyaz Akimniyazov	Deputy Chairman/ the State Committee for Forestry of the Republic of Karakalpakstan	Nukus
Mr. Azat Tileumuratov	Specialist on landscape level adaptation /Project Staff in Nukus	Nukus
Mr. Bakhitbay Aybergenov	Specialist water saving practices/ the AF/UNDP Project Staff in Nukus	Nukus
Mr. Parakhat Toreshov	Project consultant/International Innovation Center for Aral Sea Region	Nukus
Mr. Rapat Aymuratov	Specialist on soil properties and wild plants/ Research Institute of Natural Sciences	Nukus
Mr. Izzet Aimbetov	Project consultant/the Karakalpak Branch of Academy of Sciences	Nukus

Annex 7: List of Documents Reviewed

1. UNDP Implementing/Executing partner arrangements / contract
2. UNDP Project Document and Logframe (with revisions if any)
3. UNDP Environmental and Social Screening results
4. Project Inception Report
5. Annual Project Reports
6. Minutes of the Project Board Meetings and other meetings (i.e. Project Appraisal Committee meetings)
7. Risk Register
8. Progress reports
9. Annual Work Plans
10. M&E Data management system
11. Audit reports
12. Tracking Tools (if applicable)
13. Oversight mission reports by the project manager, RTA, and others
14. Monitoring reports prepared by the project
15. Financial and Administration guidelines used by Project Team
16. Co-financing realized, itemized according to template provided by TE team
17. Financial expenditures, itemized according to template provided by TE team
18. Project operational guidelines, manuals and systems
19. UNDP Development Assistance Framework (UNDAF)
20. UNDP Country Programme Document (CPD) and Country Programme Action Plan (CPAP)
21. Project site location maps
22. Project activity maps with management actions and intervention
23. Technical consultancy reports
24. Training materials (PPTs etc.)
25. News and Awareness materials

Annex 8: Stakeholder List

Stakeholder	TE Interest
National level	
Center of Hydrometeorological Services (Uzhydromet) under the Cabinet of Ministers of the Republic of Uzbekistan	Main national partner, national priority compliance, project progress reporting and monitor, ensuring close cooperation with UNDP
Ministry of Economic Development and Poverty Reduction of the Republic of Uzbekistan	Ensuring social-economic aspect in project implementation
Ministry of Finance of the Republic of Uzbekistan	Finance reporting monitor, and budget utilization monitoring
Ministry of Water resources of the Republic of Uzbekistan	Drought Early warning mechanism, water-saving technologies and practices, and improvement of legislative basis in terms of climate change adaptation measures mainstreaming
Ministry of Agriculture of the Republic of Uzbekistan	Drought Early warning mechanism, agro conservation technologies and practices, and improvement of legislative basis in terms of climate change adaptation measures mainstreaming
State Committee of the Republic of Uzbekistan for Ecology and Environmental Protection	Ensuring ecological and environmental in project implementation
(oblast) / province	
Council of Ministers of the Republic of Karakalpakstan	Ensuring national priority compliance
Ministry of Agriculture of the Republic of Karakalpakstan	Drought Early warning mechanism, agro conservation technologies and practices, and improvement of legislative basis in terms of climate change adaptation measures mainstreaming
Ministry of Water resources of the Republic of Karakalpakstan	Drought Early warning mechanism, water saving technologies and practices, and improvement of legislative basis in terms of climate change adaptation measures mainstreaming
State Committee of the Republic of Karakalpakstan for Forestry	Key partner for afforestation agenda, practical exercises with saksaul planting on desiccated Aral sea bed, the main beneficiary of technical assistance for afforestation activities
State Committee of the Republic of Karakalpakstan for Ecology and Environmental Protection	Ensuring ecological and environmental in project implementation
Council of Farmers and owners of household lands of the Republic of Karakalpakstan	Key partner for organization measures concerning agro conservation and water-saving activities on the local community level, one of the beneficiaries of the Climate Resilient agriculture implementation
Ministry of Economic Development and Poverty Reduction of the Republic of Karakalpakstan	Ensuring social-economic aspect in project implementation
Office for Hydrometeorology of the Republic of Karakalpakstan	Ensuring equipment installation and maintenance for automatization of the observational meteorological network in Karakalpakstan, as well the hydrometeorological data exchange
Districts	
Khokimiyat of districts of Muynak; Kanlikul; Takhtakupir; Chimbay; Kegeyli; Bozataw	Partner for organization measures concerning agro conservation and water saving activities on local community level, one of beneficiary the Climate Resilient agriculture implementation
Council of Farmers and owners of household lands of the project's pilot districts	Partner for organization measures concerning agro conservation and water saving activities on local community level, one of the beneficiaries of the Climate Resilient agriculture implementation
Production Pasture Cooperative "Bozataw Jaylawi", householders, Bozataw district	Key partners in pasture reclaiming activities, the main beneficiary of the pasture reclaiming agenda and Climate Resilient agriculture implementation on district level
Production Pasture Cooperative "Aqtuba Jaylawi", householders, Bozataw district	"
Production Pasture Cooperative "Shaxaman Jaylawi", householders, Bozataw district	"
Production Pasture Cooperative "Porlitaw Jaylawi", householders, Bozataw district	"
Production Pasture Cooperative "Erkindarya Jaylawi", householders, Bozataw district	

Production Pasture Cooperative “Ajiniyaz Jaylawlarii”, householders, Muynak district	
Production Pasture Cooperative “Beskopir Jaylawi”, householders, Kanlikul district	
Production Pasture Cooperative “Mulik Jaylaw”, householders, Takhtakupir district	
Production Pasture Cooperative “Jana-darya Jaylaw”, householders, Takhtakupir district	
Production Pasture Cooperative “Taxtakupir Jaylawlari”, householders, Takhtakupir district	
Village Councils of Citizens in the project’s pilot districts	Key partners and main beneficiary of Climate Resilient agriculture implementation on district level
Public schools in the project’s pilot districts	The main beneficiary of the portable and technical water provision facility, as well building and greenhouse heating system based on renewable energy
Other	
Nukus Branch of Tashkent State Agrarian University	Extension services provision, the beneficiary of project technical and thematic assistance
Association of Pasture Cooperatives of Karakalpakstan	Production pasture cooperatives’ activities coordinator, the beneficiary of project technical assistance
Ministry of Public Education of the Republic of Uzbekistan	Ensuring of climate change knowledge delivery to urban and rural youth (Climate Box)

Annex 9: Rating Scales

The following UNDP grading scales were applied in the evaluation

Evaluation Criteria

Criteria	Definition
Effectiveness - Objective	- The extent to which an objective has been achieved or how likely it is to be achieved.
Effectiveness - Outcomes	- Results include direct project outputs, short to medium-term outcomes
Relevance	- The extent to which the activity is suited to local and national development priorities and organizational policies, including changes over time. - The extent to which the project is in line with the GEF Operational Programs or the strategic priorities under which the project was funded. (Retrospectively, relevance often becomes a question as to whether the objectives of an intervention or its design are still appropriate given changed circumstances.)
Efficiency	- The extent to which results have been delivered with the least costly resources possible; also called cost effectiveness or efficacy.
Sustainability	- The likely ability of an intervention to continue to deliver benefits for an extended period of time after completion - Projects need to be environmentally, as well as financially and socially sustainable
Impact	- The positive and negative, foreseen and unforeseen changes to and effects produced by a development intervention. - Longer term impact including global environmental benefits, replication effects and other local effects.

Evaluation Indicators[1]

1. Monitoring & Evaluation	Rating	2. Implementing Agency (UNDP) & Executing Entity / Implementing Partner Execution	Rating
Overall quality of M&E	**HS-HU**	**Overall quality of Implementation / Execution**	**HS-HU**
M&E Design at entry	HS-HU	Quality of UNDP Implementation	HS-HU
M&E Implementation	HS-HU	Quality of Partner Execution	HS-HU
3. Assessment of Outcomes	**Rating**	**4. Sustainability**	**Rating**
Overall Project Outcome	**HS-HU**	**Overall Likelihood of Sustainability**	**L-U**
Overall Effectiveness of Results	HS-HU	Financial resources	L-U
- Objective	HS-HU	Socio-economic	L-U
- Outcome 1	HS-HU	Institutional framework & governance	L-U
- Outcome 2 etc	HS-HU	Environmental	L-U
Efficiency (cost)	HS-HU		
Relevance	HS-HU		

NB: Assessment of Overall Project Outcome includes Effectiveness of Results (Objective, Outcomes), Efficiency and Relevance

(For rating definitions – see ToR and Guidance for conducting Terminal Evaluations of UNDP-supported, GEF-financed projects (2020) – Highly Satisfactory is a '6', with the Highly Unsatisfactory is a '1'.

Rating Scales - Description

Rating Scales: for Monitoring & Evaluation; for Implementing Agency (IA) & Executing Agency (EA) Execution; and for Outcomes (Overall, Effectiveness & Efficiency, & Relevance)

Highly Satisfactory (HS)	The project had no shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency

[1] As per the ToR

Satisfactory (S)	There were only minor shortcomings
Moderately Satisfactory (MS)	There were moderate shortcomings
Moderately Unsatisfactory (MU)	The project had significant shortcomings
Unsatisfactory (U)	There were major shortcomings in the achievement of project objectives in terms of relevance, effectiveness, or efficiency
Highly Unsatisfactory (HU)	The project had severe shortcomings

Or Not Applicable (N/A); Unable to Assess (U/A)

Important Note

Overall Outcome: Achievement of the project objective will be rated HS to HU.

Effectiveness: Each of the project's three outcomes will be rated HS to HU. (The colour coding of the individual indicator targets in Annex 1 will partially help determine the grade, however the professional judgement of the FE team will also be a major consideration.

Efficiency: Will be rated HS to HU

Relevance Will be rated HS to HU

Rating Scale for Sustainability

Likely (L)	Negligible risks to sustainability
Moderately Likely (ML)	Moderate risks
Moderately Unlikely (MU)	Significant risks
Unlikely (U)	Severe risks

According to the UNDP evaluation guidelines, all risk dimensions of sustainability are critical: i.e., the overall rating for sustainability is not higher than the lowest-rated dimension.

Ratings should take into account both the probability of a risk materializing and the anticipated magnitude of its effect on the continuance of project benefits.

Risk definitions:

a) whether financial resources will be available to continue activities resulting in continued benefits

b) whether sufficient public stakeholder awareness and support is present for the continuation of activities providing benefit

c) whether required systems for accountability and transparency plus technical know-how are in place

d) whether environmental risks are present that can undermine the future flow of the project benefits.

Rating Scale for Impact

There is no longer a rating for 'Impact', however, project impact will be discussed

Annex 10: Mission Agenda

Friday 3rd Sept documentation complete

Wed 8th Sept draft mission agenda

Friday 10th Sept mission agenda finalised and meeting invitations to stakeholders

Monday 13th Sept Final Inception report

Friday 24th Sept UNDP / Project Manager briefing

Monday 27th Sept Field mission week 1 – national level meetings and Nat'l Expert / project team rep to Karakalpakstan field by end of week

Monday 4th Oct Field mission week 2 – all in Karakalpakstan with Int'l expert to join official meetings by remote; but with Nat'l Expert to work with project staff / farmers on the pilot projects (without Int'l Expert input due to connection / communication issues)

Friday 8th Oct TE Team prepare the powerpoint presentation (ppt)

Friday 8th Oct Project Manager to answer Evaluation Questions

Monday 11th Oct Field mission week 3 – including. Wrap-up workshop (with ppt) on 13th Oct, and DRR sign off meeting on 13th Oct if requested

Monday 18th Oct Write-up week 1

Monday 25th Oct Write-up week 2

Monday 1st Nov Write-up week 3 (send draft TE report by Sunday 7th Nov)

Monday 8th Nov Draft Terminal Evaluation Report to be inbox of UNDP and Project Manager

Wed 17th Nov All comments on draft report returned to TE team

Monday 22nd Nov Final Report to UNDP[1]

Date/time	*Activity / participants*	*Modality*	*Responsible party*
	Monday, September 27, 2021		
14-15:00	Meeting State Committee of the Republic of Uzbekistan on Ecology and Nature Protection Ms. Yarulina Zulfia Senior Specialist of the Administration of the ground water control	Zoom conference	UNDP/AF project staff as organizer
15-16:00	Meeting with responsible representative of the Ministry of Finance Mr. Adbumajitov Shukhrat Chief of Administration on financing of the Agriculture and Industry Complex and ecology		
16-17:00	Meeting Ministry of Economical Development & Poverty Reduction Mr. Djuraev Edgorbek Senior Specialist of the Administration on structural reformations in agricultural sector		
	Tuesday, September 28, 2021		
14-15:00	Meeting Ministry of Water Management Mr. Madiboev Nodirbek Senior Specialist of the Administration on water management and use	Zoom conference	UNDP/AF project staff as organizer

[1] The timing of the Final Report is dependent on UNDP managing the return of comments on the draft report

15-16:00	Meeting with responsible representative of the Ministry of Agriculture Mr. Shamsiev Akmal Chief of the Administration on cotton cultivation		
16-17:00	Meeting Center of Hydrometeorological Service of the Republic of Uzbekistan Mr. Shukurov Rustambek Chief of Administration on hydrometeorological and climate change projects		

Wednesday, September 29, 2021 (AP staff leaves for Karakalpakstan)

Thursday , September 30, 2021 (Nukus)

12:00-13:00	Meeting Council of Ministries of the Republic of Karakalpakstan Mr. Markhabay Nurmanov Chief of the Department of Ecology and Development of Aral Sea Region	Zoom conference	UNDP/AF project staff as organizer
14:00-15:00	Meeting with responsible representative of the Ministry of Agriculture Mr. Alisher Yakubov Minister	Zoom conference	UNDP/AF project staff as organizer
15:00-16:00	Meeting Council of Farmers and owners of household lands of the Republic of Karakalpakstan Mr. Ernazar Embergenov Deputy Chairman	Zoom conference	UNDP/AF project staff as organizer
16:00-17:00	Meeting State Committee for Forestry of the Republic of Karakalpakstan Mr. Erniyaz Akimniyazov Deputy Chairman	Zoom conference	UNDP/AF project staff as organizer

Friday, October 1, 2021 (Takhtakupir district)

10:00-11:00	Meeting with responsible representative of Takhtakupir district Khokimiyat Mr. Jambul Adilov Mayor of Takhtakupir district	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:00-11:30	Meeting with responsible representative of Takhtakupir district Khokimiyat Mr. Kuuatbay Daribaev Deputy Mayor of Takhtakupir district on Investment and Foreign Trade	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:30-12:00	Meeting with the project beneficiary in Takhtakupir district Mr. Millionbay Patov Chairman of the Production Cooperative "Mulik Jaylaw"	Q&A session via National Evaluator	UNDP/AF project staff as organizer
12:30- 13:00	Meeting with the project beneficiary in Takhtakupir district Mr. Alauatdin Serkebaev Chairman of VCC "Kostruba"	Q&A session via National Evaluator	UNDP/AF project staff as organizer
14:30-15:00	Meeting with the project beneficiary in Takhtakupir district Ms. Bishegul Igilikova - Owner of hotbed	Q&A session via National Evaluator	UNDP/AF project staff as organizer
15:30-16:00	Meeting with the project beneficiary in Takhtakupir district Ms. Kuralay Usenova - Director of School#16	Q&A session via National Evaluator	UNDP/AF project staff as organizer

16:30-17:00	Meeting with the project beneficiary in Takhtakupir district Ms. Oralkhan Jumanazarova, owner of small hotbed Mr. Makhset Zaripov, owner of small hotbed	Q&A session via National Evaluator	UNDP/AF project staff as organizer
17:30-18:00	Meeting with the project beneficiary in Takhtakupir district Mr. Omirbay Allanazarov Owner of Intensive garden	Q&A session via National Evaluator	UNDP/AF project staff as organizer
18:00-18:30	Meeting with the project beneficiary in Takhtakupir district Ms. Katshakhan Baymurzaeva - Beekeeper	Q&A session via National Evaluator	UNDP/AF project staff as organizer

Saturday, October 2, 2021 (Chimbay district)

10:00-11:00	Meeting with responsible representative of Chimbay district Khokimiyat Mr. Aybek Tajetdinov Mayor of Chimbay district	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:00-11:30	Meeting with responsible representative of Chimbay district Khokimiyat Ms. Gulzar Mambetniyazova Deputy Mayor of Chimbay district on Support of Makhalla and Family	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:30-12:00	Meeting with the project beneficiary in Chimbay district Ms. Kamila Ajibaeva - Owner of hotbed	Q&A session via National Evaluator	UNDP/AF project staff as organizer
12:30-13:00	Meeting with the project beneficiary in Chimbay district Mr. Azat Kulbaev Owner of Hydroponic fodder equipment	Q&A session via National Evaluator	UNDP/AF project staff as organizer
14:30-15:00	Meeting with the project beneficiary in Chimbay district Mr. Abatbay Jandauletov - Owner of hotbed	Q&A session via National Evaluator	UNDP/AF project staff as organizer
15:00-15:30	Meeting with the project beneficiary in Chimbay district Ms. Gaukhar Abdullaeva - Director of School #38	Q&A session via National Evaluator	UNDP/AF project staff as organizer

Sunday, October 3, 2021 (Bozataw district)

09:00-9:30	Meeting with the project beneficiary in Bozataw district Mr. Orakbay Aytimbetov, Chairman of VCC "Erkindarya" Mr. Jengisbay Saparbaev, Chairman of Production Cooperative "Erkindarya Jaylawi"	Q&A session via National Evaluator	UNDP/AF project staff as organizer
10:00-10:30	Meeting with responsible representative of Bozataw district Khokimiyat Mr. Makhmud Kaypanov Mayor of Bozataw district	Q&A session via National Evaluator	UNDP/AF project staff as organizer
10:30-11:00	Meeting with responsible representative of Bozataw district Khokimiyat Mr. Arslan Uteuliev Deputy Mayor of Bozataw district on Investment and Foreign Trade	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:00-11:30	Meeting with the project beneficiary in Bozataw district Mr. Salamat Esimbetov Chairman of Production Cooperative "Aqtuba Jaylawi"	Q&A session via National Evaluator	UNDP/AF project staff as organizer

11:30-12:00	Meeting with the project beneficiary in Bozataw district Mr. Juginis Nurmanov, Chairman of VCC "Kuskhanataw" Mr. Bektilew Abilov, Chairman of Production Cooperative "Bozataw Jaylawi"	Q&A session via National Evaluator	UNDP/AF project staff as organizer
12:00-13:00	Meeting with the project beneficiary in Bozataw district Mr. Amangeldi Temirov Chairman of Production Cooperative "Porlitaw Jaylawi"	Q&A session via National Evaluator	UNDP/AF project staff as organizer
16:00-18:00	Meeting with the project beneficiary in Bozataw district Mr. Abdisamat Ablakumov Chairman of Production Cooperative "Shaxaman Jaylawi"	Q&A session via National Evaluator	UNDP/AF project staff as organizer

Monday, October 4, 2021 (Kegeyli district)

09:00-9:30	Meeting with the project beneficiary in Kegeyli district Ms. Damegul Kudaybergenova Owner of Intensive garden	Q&A session via National Evaluator	UNDP/AF project staff as organizer
10:00-11:00	Meeting with responsible representative of Kegeyli district Khokimiyat Mr. Dauletbay Utemuratov Mayor of Kegeyli district	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:00-11:30	Meeting with responsible representative of Kegeyli district Khokimiyat Mr. Alisher Seytimbetov Deputy Mayor of Kegeyli district on Support of Makhalla and Family	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:30-12:30	Meeting with the project beneficiary in Kegeyli district Mr. Sadatdin Shrazov - Owner of hotbed	Q&A session via National Evaluator	UNDP/AF project staff as organizer

Tuesday, October 5, 2021 (Kanlikul district)

10:00-11:00	Meeting with responsible representative of Kanlikul district Khokimiyat Mr. Abubakir Ibragimov Mayor of Kanlikul district	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:00-11:30	Meeting with responsible representative of Kanlikul district Khokimiyat Ms. Saltanat Jumanova Deputy Mayor of Kanlikul district on Support of Makhalla and Family	Q&A session via National Evaluator	UNDP/AF project staff as organizer
12:00-13:00	Meeting with the project beneficiary in Kanlikul district Mr. Mansur Bekmuratov, Chairman od VCC "Beskopir" Ms. Gulistan Aralbaeva, Chairman of Production Cooperative "Beskopir Jaylaw"	Q&A session via National Evaluator	UNDP/AF project staff as organizer
14:00-15:00	Meeting with the project beneficiary in Kanlikul district Mr. Tleubergen Sultanov - Owner of hotbed	Q&A session via National Evaluator	UNDP/AF project staff as organizer
15:00-16:00	Meeting with the project beneficiary in Kanlikul district Mr. Pirjan Aytjanov - Owner of hotbed	Q&A session via National Evaluator	UNDP/AF project staff as organizer
16:00-17:00	Meeting with the project beneficiary in Kanlikul district Mr. Osman Orazbaev - Owner of hotbed	Q&A session via National Evaluator	UNDP/AF project staff as organizer

17:00-18:00	Meeting with the project beneficiary in Kanlikul district Ms. Satipaldieva Gulbakhar - Beekeeper	Q&A session via National Evaluator	UNDP/AF project staff as organizer

Wednesday, October 6, 2021 (Muynak district)

10:00-11:00	Meeting with responsible representative of Muynak district Khokimiyat Mr. Erpolat Edenbaev Mayor of Muynak district	Q&A session via National Evaluator	UNDP/AF project staff as organizer
11:00-11:30	Meeting with responsible representative of Muynak district Khokimiyat Mr. Aydarali Sakhiev Deputy Mayor of Muynak district on Support of Makhalla and Family	Q&A session via National Evaluator	UNDP/AF project staff as organizer
12:00-13:00	Meeting with the project beneficiary in Muynak district Mr. Salamat Nurjanov - Director of School #1	Q&A session via National Evaluator	UNDP/AF project staff as organizer
15:00-16:00	Meeting with the project beneficiary in Muynak district Ms. Nafisa Bayniyazova, Chairman of Production Cooperative "Ajiniyaz Jaylawlari"	Q&A session via National Evaluator	UNDP/AF project staff as organizer

Thursday, October 7, 2021 (Nukus)

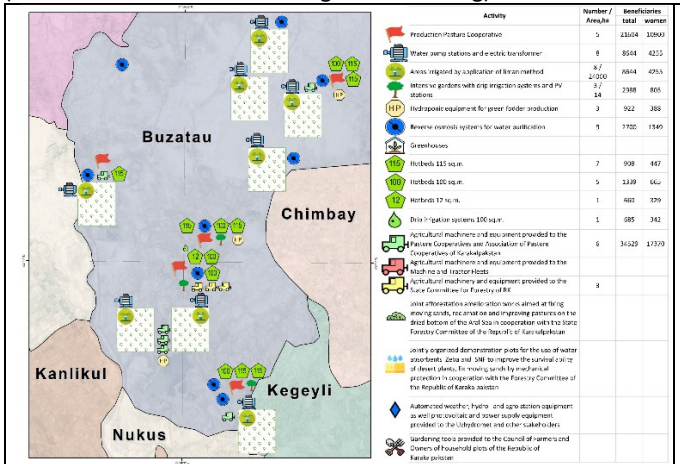
11:00-12:00	Meeting with the Project Staff in Nukus Mr. Azat Tileumuratov Specialist on landscape level adaptation measures	Zoom conference	UNDP/AF project staff as organizer
12:00-13:00	Meeting with the Project Staff in Nukus Mr. Bakhitbay Aybergenov Specialist on agro/water saving practices	Zoom conference	UNDP/AF project staff as organizer
14:00-14:30	Meeting with the project beneficiary in Nukus Mr. Askar Amanbaev / Mr. Polat Kunnazarov Representatives of the Office for Hydrometeorology of the Republic of Karakalpakstan	Zoom conference	UNDP/AF project staff as organizer
14:30-15:00	Meeting with the project consultants in Nukus Mr. Parakhat Toreshov Representative of International Innovation Center for Aral Sea Region	Zoom conference	UNDP/AF project staff as organizer
15:00-15:30	Meeting with the project consultants in Nukus Mr. Rapat Aymuratov Specialist on soil properties and wild plants, Research Institute of Natural Sciences	Zoom conference	UNDP/AF project staff as organizer
15:30-16:00	Meeting with the project consultants in Nukus Mr. Izzet Aimbetov Representative of the Karakalpak Branch of Academy of Sciences of Uzbekistan	Zoom conference	UNDP/AF project staff as organizer

Annex 11: Map


KARAKALPAKSTAN
DISTRICTS
1 - Kungrad
2 - Muynak
3 - Kegeyli
4 - Chimbay
5 - Karauzyak
6 - Takhtakupir
7 - Shumanay
8 - Qanlikol
9 - Nukus
10 - Khodzheyli
11 - Amudarya
12 - Beruniy
13 - Ellikkala
14 - Turtkul
Republic of Kazakhstan
ARAL SEA
Muynak
Kungrad
Kazanketken
Qoraozak
Taxtakopir
Chimbay
Kegeyli
Qanlikol
Shumanay
Akmangit
NUKUS
Khodzheyli
Mangit
Beruni
Bustan
Turtkul
Target districts
Chimbay
Taxtakopir
Kegeyli
Qanlikol
lake Sarikamish
Republic of Turkmenistan
N
56°0'0"E
58°0'0"E
60°0'0"E
62°0'0"E
44°0'0"N
42°0'0"N

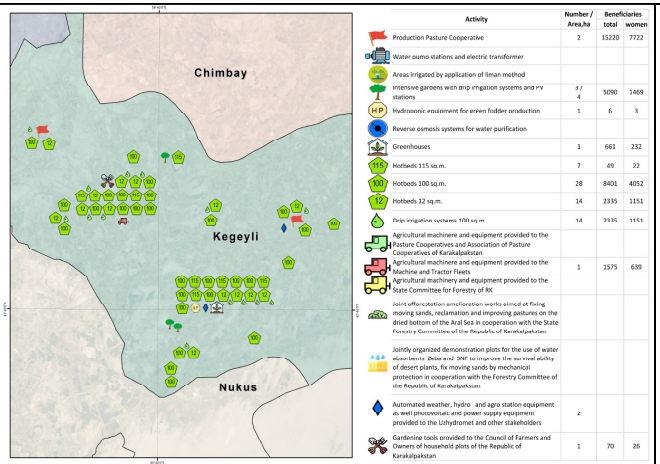
Delineated boundary maps

(see also intervention list with geo-referencing)



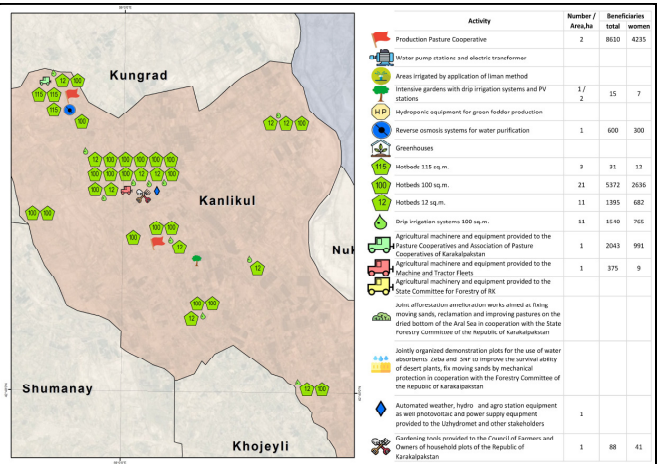
Activity	Number / Area,ha	Beneficiaries total	Beneficiaries women
Production Pasture Cooperative	5	21604	10900
Water pump stations and electric transformer	8	8564	4255
Areas irrigated by application of liman method	8 / 2'200	8844	4253
Intensive gardens with drip irrigation systems and PV stations	8 / 14	2988	865
Hydroponic equipment for green fodder production	3	922	388
Reverse osmosis systems for water purification	9	7720	1349
Greenhouses			
Hotbeds 115 sq.m.	7	908	447
Hotbeds 100 sq.m.	5	1339	642
Hotbeds 12 sq.m.	1	480	199
Drip irrigation systems 100 sq.m.	1	685	342
Agricultural machinere and equipment provided to the Pasture Cooperatives and Association of Pasture Cooperatives of Karakalpakstan	6	34529	17370
Agricultural machinere and equipment provided to the Machine and Tractor Fleets			
Agricultural machinery and equipment provided to the State Committee for Forestry of RK	8		
Joint afforestation amelioration works aimed at fixing moving sands, reclamation and improving pastures on the dried bottom of the Aral Sea in cooperation with the State Forestry Committee of the Republic of Karakalpakstan			
Jointly organized demonstration plots for the use of water absorbents Zeba and SAP to improve the survival ability of desert plants, fix moving sands by mechanical protection in cooperation with the Forestry Committee of the Republic of Karakalpakstan			
Automated weather, hydro and agro station equipment as well photovoltaic and power supply equipment provided to the Uzhydromet and other stakeholders			
Gardening tools provided to the Council of Farmers and Owners of household plots of the Republic of Karakalpakstan			

DBM 1-Placement of the project's objects in Bozatau district



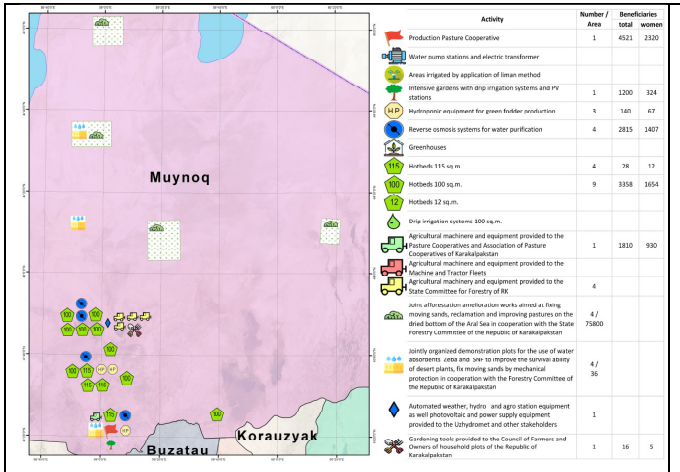
Activity	Number / Area,ha	Beneficiaries total	Beneficiaries women
Production Pasture Cooperative	2	15220	7732
Water pump stations and electric transformer			
Areas irrigated by application of liman method			
Intensive gardens with drip irrigation systems and PV stations	3 / 4	5090	1469
Hydroponic equipment for green fodder production	1	6	3
Reverse osmosis systems for water purification			
Greenhouses	1	661	232
Hotbeds 115 sq.m.	7	49	22
Hotbeds 100 sq.m.	28	8401	4052
Hotbeds 12 sq.m.	14	2335	1151
Drip irrigation systems 100 sq.m.	14	3335	1151
Agricultural machinere and equipment provided to the Pasture Cooperatives and Association of Pasture Cooperatives of Karakalpakstan			
Agricultural machinere and equipment provided to the Machine and Tractor Fleets	1	1575	639
Agricultural machinery and equipment provided to the State Committee for Forestry of RK			
Joint afforestation amelioration works aimed at fixing moving sands, reclamation and improving pastures on the dried bottom of the Aral Sea in cooperation with the State Forestry Committee of the Republic of Karakalpakstan			
Jointly organized demonstration plots for the use of water absorbents Zeba and SAP to improve the survival ability of desert plants, fix moving sands by mechanical protection in cooperation with the Forestry Committee of the Republic of Karakalpakstan			
Automated weather, hydro and agro station equipment as well photovoltaic and power supply equipment provided to the Uzhydromet and other stakeholders	2		
Gardening tools provided to the Council of Farmers and Owners of household plots of the Republic of Karakalpakstan	1	70	26

DBM 2-Placement of the project's objects in Kegeily district



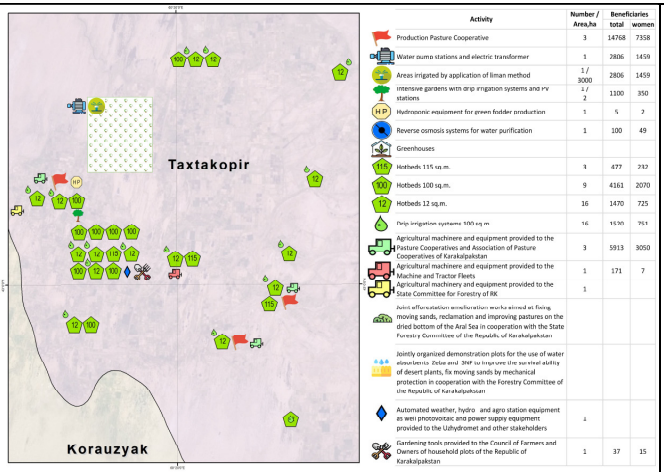
Activity	Number / Area,ha	Beneficiaries total	Beneficiaries women
Production Pasture Cooperative	2	8610	4235
Water pump stations and electric transformer			
Areas irrigated by application of liman method			
Intensive gardens with drip irrigation systems and PV stations	1 / 2	15	7
Hydroponic equipment for green fodder production			
Reverse osmosis systems for water purification	1	600	300
Greenhouses			
Hotbeds 115 sq.m.	3	31	13
Hotbeds 100 sq.m.	21	5372	2636
Hotbeds 12 sq.m.	11	1395	682
Drip irrigation systems 100 sq.m.	11	1540	705
Agricultural machinere and equipment provided to the Pasture Cooperatives and Association of Pasture Cooperatives of Karakalpakstan	1	2043	991
Agricultural machinere and equipment provided to the Machine and Tractor Fleets	1	375	9
Agricultural machinery and equipment provided to the State Committee for Forestry of RK			
Joint afforestation amelioration works aimed at fixing moving sands, reclamation and improving pastures on the dried bottom of the Aral Sea in cooperation with the State Forestry Committee of the Republic of Karakalpakstan			
Jointly organized demonstration plots for the use of water absorbents Zeba and SAP to improve the survival ability of desert plants, fix moving sands by mechanical protection in cooperation with the Forestry Committee of the Republic of Karakalpakstan			
Automated weather, hydro and agro station equipment as well photovoltaic and power supply equipment provided to the Uzhydromet and other stakeholders	1		
Gardening tools provided to the Council of Farmers and Owners of household plots of the Republic of Karakalpakstan	1	88	41

DBM3-Placement of the project's objects in Kanlikul district



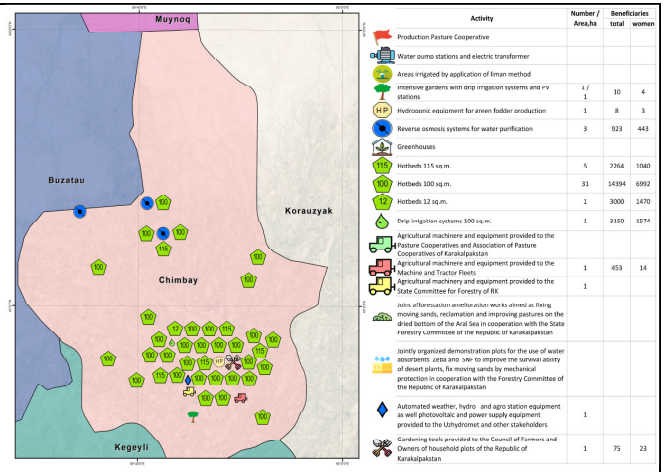
Activity	Number / Area	Beneficiaries total	Beneficiaries women
Production Pasture Cooperative	1	4521	2320
Water pump stations and electric transformer			
Areas irrigated by application of liman method			
Intensive gardens with drip irrigation systems and PV stations	1	1200	324
Hydroponic equipment for green fodder production	3	160	67
Reverse osmosis systems for water purification	4	2815	1407
Greenhouses			
Hotbeds 115 sq.m.	4	78	13
Hotbeds 100 sq.m.	9	3358	1654
Hotbeds 12 sq.m.			
Drip irrigation systems 100 sq.m.			
Agricultural machinere and equipment provided to the Pasture Cooperatives and Association of Pasture Cooperatives of Karakalpakstan	1	1810	930
Agricultural machinere and equipment provided to the Machine and Tractor Fleets			
Agricultural machinery and equipment provided to the State Committee for Forestry of RK	4		
Joint afforestation amelioration works aimed at fixing moving sands, reclamation and improving pastures on the dried bottom of the Aral Sea in cooperation with the State Forestry Committee of the Republic of Karakalpakstan	4 / 75800		
Jointly organized demonstration plots for the use of water absorbents Zeba and SAP to improve the survival ability of desert plants, fix moving sands by mechanical protection in cooperation with the Forestry Committee of the Republic of Karakalpakstan	4 / 36		
Automated weather, hydro and agro station equipment as well photovoltaic and power supply equipment provided to the Uzhydromet and other stakeholders	1		
Gardening tools provided to the Council of Farmers and Owners of household plots of the Republic of Karakalpakstan	1	16	5

DBM 4-Placement of the project's objects in Muynak district



Activity	Number / Area,ha	Beneficiaries total	Beneficiaries women
Production Pasture Cooperative	3	14768	7358
Water pump stations and electric transformer	1	2806	1459
Areas irrigated by application of liman method	1 / 3000	2806	1459
Intensive gardens with drip irrigation systems and PV stations	1 / 2	1100	350
Hydroponic equipment for green fodder production	1	5	2
Reverse osmosis systems for water purification	1	100	49
Greenhouses			
Hotbeds 115 sq.m.	3	477	212
Hotbeds 100 sq.m.	9	4161	2070
Hotbeds 12 sq.m.	16	1470	725
Drip irrigation systems 100 sq.m.	16	1535	753
Agricultural machinere and equipment provided to the Pasture Cooperatives and Association of Pasture Cooperatives of Karakalpakstan	3	5913	3050
Agricultural machinere and equipment provided to the Machine and Tractor Fleets	1	171	7
Agricultural machinery and equipment provided to the State Committee for Forestry of RK	1		
Joint afforestation amelioration works aimed at fixing moving sands, reclamation and improving pastures on the dried bottom of the Aral Sea in cooperation with the State Forestry Committee of the Republic of Karakalpakstan			
Jointly organized demonstration plots for the use of water absorbents Zeba and SAP to improve the survival ability of desert plants, fix moving sands by mechanical protection in cooperation with the Forestry Committee of the Republic of Karakalpakstan			
Automated weather, hydro and agro station equipment as well photovoltaic and power supply equipment provided to the Uzhydromet and other stakeholders	1		
Gardening tools provided to the Council of Farmers and Owners of household plots of the Republic of Karakalpakstan	1	37	15

DBM 5-Placement of the project's objects in Takhtakupir district



Activity	Number / Area,ha	Beneficiaries total	Beneficiaries women
Production Pasture Cooperative			
Water pump stations and electric transformer			
Areas irrigated by application of liman method			
Intensive gardens with drip irrigation systems and PV stations	1 / 1	10	4
Hydroponic equipment for green fodder production	1	8	3
Reverse osmosis systems for water purification	3	923	443
Greenhouses			
Hotbeds 115 sq.m.	5	7764	1040
Hotbeds 100 sq.m.	31	14394	6992
Hotbeds 12 sq.m.	1	3000	1470
Drip irrigation systems 100 sq.m.	1	3150	1574
Agricultural machinere and equipment provided to the Pasture Cooperatives and Association of Pasture Cooperatives of Karakalpakstan			
Agricultural machinere and equipment provided to the Machine and Tractor Fleets	1	453	14
Agricultural machinery and equipment provided to the State Committee for Forestry of RK	1		
Joint afforestation amelioration works aimed at fixing moving sands, reclamation and improving pastures on the dried bottom of the Aral Sea in cooperation with the State Forestry Committee of the Republic of Karakalpakstan			
Jointly organized demonstration plots for the use of water absorbents Zeba and SAP to improve the survival ability of desert plants, fix moving sands by mechanical protection in cooperation with the Forestry Committee of the Republic of Karakalpakstan			
Automated weather, hydro and agro station equipment as well photovoltaic and power supply equipment provided to the Uzhydromet and other stakeholders	1		
Gardening tools provided to the Council of Farmers and Owners of household plots of the Republic of Karakalpakstan	1	75	23

DBM 6-Placement of the project's objects in Chimbay district

Annex 12: Indicative TE Evaluation Matrix

This questionnaire was used as a general aid during the field visit with the results described in section 3. (Note there is no further information to be presented in the blank boxes.)

Evaluation Question	Response / Finding	Conclusion/ Recommend
Relevance: How does the project relate to the main objectives of the FA, and to the environment and development priorities at the local, regional and national levels?		
Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?		
Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?		
Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?		
Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and / or improved ecological status		
Findings discussion – 3 areas - Project formulation, project implementation, and project results.		
Project Strategy		
Project Design Formulation		
To what extent is the project in line with national and local priorities?		
To what extent is the Project aligned to the main objectives of the relevant focal area?		
Have synergies with other projects and initiatives been incorporated in the design?		
Were lessons from other relevant projects properly incorporated into the project design?		
Decision-making processes: were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process, taken into account during project design processes?		
Have issues materialized due to incorrect assumptions or changes to the context to achieving the project results as outlined in the Project Document?		
Were the project's objectives and components clear, practicable and feasible within its time frame? Were the capacities of the executing institution(s) and its counterparts properly considered when the project was designed? Were the partnership arrangements properly identified and roles and responsibilities negotiated prior to project approval? Were counterpart resources (funding, staff, and facilities), enabling legislation, and adequate project management arrangements in place at project entry? Were the project assumptions and risks articulated in the PIF and project document?		
Results Framework:		
Are the project objective / outcomes clear, practicable, & feasible within its time frame?		
Were the project's logframe indicators and targets appropriate? How "SMART" were the midterm and end-of-project targets (Specific, Measurable, Attainable, Relevant, Time-bound)? Any amendments?		
Progress towards Results		
Progress towards Outcomes Analysis:		
Review the logframe indicators against delivery at end-of-project targets using the Results Matrix (see Annex).		
Compare and analyse the Tracking Tools (e.g. METT, PMAT, AMAT, Capacity Dev., Financial) at the Baseline, MTR and End.	**n/a**	**n/a**
Which barriers hindered achievement of the project objective		
ASSUMPTIONS AND RISKS		
As per logframe - Logical and robust, and have helped to determine activities and planned outputs.		
Externalities (i.e. effects of climate change, global economic crisis, etc.) which are relevant to the findings.		
Project Implementation & Adaptive Management		
Partner Agency / Implementing Entity – UNDP		
Has there been an appropriate focus on results?		

Evaluation Question	Response / Finding	Conclusion/ Recommend
Has the UNDP support to the Executing Agency/Implementing Partner and Project Team been adequate?		
Has the quality and timeliness of technical support to the Executing Agency/ Implementing Partner and Project Team been adequate?		
How has the responsiveness of the managing parties to significant implementation problems (if any) been?		
Has overall risk management been proactive, participatory, and effective?		
Are there salient issues regarding project duration, for instance to note project delays? And, how have they affected project outcomes and sustainability?		
Candor and realism in annual reporting		
Executing Agency/ Implementing Partner Execution		
Were the capacities of the executing institution(s) and its counterparts properly considered when the Project was designed?		
Were partnership arrangements properly identified and roles and responsibilities negotiated prior to Project approval?		
Were counterpart resources, enabling legislation, and adequate project management arrangements in place at Project entry?		
Have management inputs and processes, including budgeting and procurement been adequate?		
Has there been adequate mitigation and management of environmental and social risks as identified through the UNDP Environmental and Social screening procedure?		
Whether there was an appropriate focus on results and timeliness? Quality of risk management? Candor and realism in reporting?		
Government ownership or level of support if 'in cooperation with' the IP.		
Work Planning / PROJECT IMPLEMENTATION		
Effective partnerships arrangements established for implementation of the project with relevant stakeholders involved in the country/region, including the formation of a Project Board. Lessons from other relevant projects incorporated into project implementation.		
Feedback from M&E activities used for adaptive management.		
Has the project experienced delays in start-up and/or implementation? What were the causes of the delays? And, have the issues been resolved?		
Were work-planning processes results-based?		
Did the project team use the results framework/ logframe as an M&E and a management tool?		
Were there any changes to the logframe since project start, and have these changes been documented and approved by the project board?		
FINANCE & CO-FINANCE		
<u>Prodoc</u> Did the prodoc identify potential sources of co-financing as well as leveraged and associated financing? Prodoc include strong financial controls that allowed the project management to make informed decisions regarding the budget, allow for the timely flow of funds and for the payment of project deliverables Did the prodoc demonstrate due diligence in the management of funds, including periodic audits.		
Sufficient clarity in the reported co-financing to substantiate in-kind and cash co-financing from all listed sources. The reasons for differences in the level of expected and actual co-financing. The extent to which project components supported by external funders were integrated into the overall project. Effect on project outcomes and/or sustainability from the extent of materialization of co-financing. Evidence of additional, leveraged resources that have been committed as a result of the project. (Leveraged resources can be financial or in-kind and may be from other donors, NGOs, foundations, governments, communities or the private sector)		
<u>Cost-effective factors</u> Compliance with the incremental cost criteria and securing co-funding and associated funding. Project completed the planned activities and met or exceeded the expected outcomes in terms of achievement of Global Environmental and Development Objectives according to schedule, and as cost-effective as initially planned. The project used either a benchmark approach or a comparison approach (did not exceed the costs levels of similar projects in similar contexts)?		
<u>Standard Finance questions</u> Have strong financial controls been established allow the project management to make informed decisions regarding the budget at any time, and allow for the timely flow of funds and the payment of satisfactory project deliverables?		
Are there variances between planned and actual expenditures? If yes, what are the reasons behind these variances?		

Evaluation Question	Response / Finding	Conclusion/ Recommend
Has the project demonstrated due diligence in the management of funds, including annual audits?		
Have there been any changes made to the fund allocations as a result of budget revisions? Assess the appropriateness and relevance of such revisions.		
Has pledged cofinancing materialized? If not, what are the reasons behind the cofinancing not materializing or falling short of targets?		
Project-level Monitoring and Evaluation Systems		
The quality of the Monitoring and Evaluation (M&E) plan's design and implementation: An M&E plan should include a baseline (including data, methodology, etc.), SMART indicators and data analysis systems, MTR, TE, and adequate funding for M&E activities.		
M&E plan at project start up, considering whether baseline conditions, methodology and roles and responsibilities are well articulated. Is the M&E plan appreciated? Is it articulated sufficiently to monitor results and track progress toward achieving objectives?		
Were sufficient resources allocated effectively to M&E?		
Were there changes to project implementation / M&E as a result of the MTR recommendations?		
Are the M&E systems appropriate to the project's specific context? - effectiveness of monitoring indicators from the project document for measuring progress and performance		
Do the monitoring tools provide the necessary information? Do they involve key partners? Are they aligned or mainstreamed with national systems? Do they use existing information? Are they efficient? Are they cost-effective?		
To what extent has the Project Team been using inclusive, innovative, and participatory monitoring systems?		
To what extent have follow-up actions, and/or adaptive management measures, been taken in response to the PIRs? Check to see whether APR/PIR self-evaluation ratings were consistent with the MTR and TE findings. If not, were these discrepancies identified by the project steering committee and addressed?		
Compliance with the progress and financial reporting requirements/ schedule, including quality and timeliness of reports		
The value and effectiveness of the monitoring reports and evidence that these were discussed with stakeholders and project staff		
The extent to which development objectives are built into monitoring systems: How are perspectives of women and men involved and affected by the project monitored and assessed?		
How are relevant groups' (including women, indigenous peoples, children, elderly, disabled, and poor) involvement with the project and the impact on them monitored?		
Has there been adequate mitigation and management of environmental and social risks as identified through the UNDP Environmental and Social screening procedure?		
STAKEHOLDER ENGAGEMENT		
Are the interactions as per the prodoc? Stakeholder interactions include information dissemination, consultation, and active participation in the project.		
Project management: Has the project developed and leveraged the necessary and appropriate partnerships with direct and tangential stakeholders?		
Participation and country-driven processes: Do local and national government stakeholders support the objectives of the project? Do they continue to have an active role in project decision-making that supports efficient and effective project implementation?		
Participation and public awareness: How has stakeholder involvement and public awareness contributed to the progress towards achievement of project objectives?		
Are there any limitations to stakeholder awareness of project outcomes or to stakeholder participation in project activities? Is there invested interest of stakeholders in the project's long-term success and sustainability?		
Reporting:		
How have adaptive management changes been reported by the Project Team and shared with the Project Board?		
How well have the Project Team and partners undertaken and fulfil UNDP reporting requirements (i.e. how have they addressed poorly-rated PIRs?), and suggest trainings etc. if needed?		
How have PIRs been shared with the Project Board and other key stakeholders?		
How have lessons derived from the adaptive management process been documented, shared with key partners and internalized by partners, and incorporated into project implementation?		
Communication:		
Internal project communication with stakeholders: Is communication regular and effective? Are there key stakeholders left out of communication? Are there feedback mechanisms when communication is received? Does this communication with stakeholders contribute to their awareness of project outcomes and activities and long-term investment in the sustainability of project results?		

Evaluation Question	Response / Finding	Conclusion/ Recommend
External project communication: Are proper means of communication established or being established to express the project progress and intended impact to the public (is there a web presence, for example? Or did the project implement appropriate outreach and public awareness campaigns?)		
Are there possibilities for expansion of educational or awareness aspects of the project to solidify a communications program, with mention of proper funding for education and awareness activities? What aspects of the project might yield excellent communications material, if applicable?		
ADAPTIVE MANAGEMENT		
Changes in the environmental and development objectives of the project during implementation, why these changes were made and what was the approval process. Causes for adaptive management: a) original objectives were not sufficiently articulated; b) exogenous conditions changed, due to which a change in objectives was needed; c) project was restructured because original objectives were overambitious; d) project was restructured because of a lack of progress; e) Other (specify).		
How these changes were instigated and how these changes affected project results: - Did the project undergo significant changes as a result of recommendations from the MTR? Or as a result of other review procedures? Explain the process and implications. - If the changes were extensive, did they materially change the expected project outcomes? - Were the project changes articulated in writing and then considered and approved by the project steering committee?		
PROJECT RESULTS		
A 'result' is defined as a describable or measurable development change resulting from a cause-and-effect relationship. In UNDP terms, results include direct project outputs, short- to medium-term outcomes, and longer-term impact including global environmental benefits, replication effects, and other local effects. Assess the results based management (RBM) chain, from inputs to activities, to outputs, outcomes and impacts.		
Assess the project results using indicators and relevant tracking tools		
BROADER ASPECTS OF PROJECT OUTCOMES		
Country Ownership		
Project concept had its origin within the national sectoral and development plans?		
Have Outcomes (or potential outcomes) from the project have been incorporated into the national sectoral and development plans? Has the government enacted legislation and/or developed policies and regulations in line with the project's objectives?		
Relevant country representatives (e.g., governmental official, civil society, etc.) were actively involved in project identification, planning and/or implementation, part of steering committee?		
Was an intergovernmental committee given responsibility to liaise with the project team, recognizing that more than one ministry should be involved?		
The recipient government has maintained financial commitment to the project?		
Mainstreaming (Broader Development and Gender)		
Whether broader development and gender issues had been taken into account in project design and implementation?		
In what way has the project contributed to greater consideration of gender aspects, (i.e. project team composition, gender-related aspects of environmental impacts, stakeholder outreach to women's groups, etc). If so, indicate how.		
Did the MTR recommend improvements to the logframe with SMART 'development' indicators, including sex-disaggregated indicators and indicators that capture development benefits? - Were these taken up?		
1. Whether it is possible to identify and define positive or negative effects of the project on local populations (e.g. income generation/ job creation, improved natural resource management arrangements with local groups, improvement in policy frameworks for resource allocation and distribution, regeneration of natural resources for long term sustainability).		
2. If the project objectives conform to agreed priorities in the UNDP country programme document (CPD) and country programme action plan (CPAP).		
3. Whether there is evidence that the project outcomes have contributed to better preparations to cope with natural disasters.		
The mainstreaming assessment should take note of the points of convergence between UNDP environment-related and other development programming.		
Sustainability		
Risk Management		
Are the risks identified in the Project Document, Annual Project Review/PIRs and the ATLAS Risk Management Module the most important? And, are the risk ratings applied appropriate and up to date? If not, explain why.		

Evaluation Question	Response / Finding	Conclusion/ Recommend
Financial Risks to Sustainability (of the project outcomes)		
What is the likelihood of financial and economic resources not being available once the UNDP assistance ends? (This might include funding through government - in the form of direct subsidies, or tax incentives, it may involve support from other donors, and also the private sector. The analysis could also point to macroeconomic factors.)		
What opportunities for financial sustainability exist?		
What additional factors are needed to create an enabling environment for continued financing?		
Has there been the establishment of financial and economic instruments and mechanisms to ensure the ongoing flow of benefits once the UNDP assistance ends (i.e. from the public and private sectors, income generating activities, and market transformations to promote the project's objectives)?		
Socio-Economic Risks to Sustainability:		
Are there social or political risks that may threaten the sustainability of project outcomes?		
What is the risk that the level of stakeholder ownership (including ownership by governments and other key stakeholders) will be insufficient to allow for the project outcomes/benefits to be sustained? Do the various key stakeholders see that it is in their interest that the project benefits continue to flow?		
Is there sufficient public/ stakeholder awareness in support of the project's long-term objectives?		
Have lessons learned been documented by the Project Team on a continual basis?		
Are the project's successful aspects being transferred to appropriate parties, potential future beneficiaries, and others who could learn from the project and potentially replicate and/or scale it in the future?		
Institutional Framework and Governance Risks to Sustainability:		
Do the legal frameworks, policies, governance structures and processes pose risks that may jeopardize project benefits?		
Has the project put in place frameworks, policies, governance structures and processes that will create mechanisms for accountability, transparency, and technical knowledge transfer after the project's closure?		
How has the project developed appropriate institutional capacity (systems, structures, staff, expertise, etc.) that will be self-sufficient after the project closure date?		
How has the project identified and involved champions (i.e. individuals in government and civil society) who can promote sustainability of project outcomes?		
Has the project achieved stakeholders' (including government stakeholders') consensus regarding courses of action on project activities after the project's closure date?		
Does the project leadership have the ability to respond to future institutional and governance changes (i.e. foreseeable changes to local or national political leadership)? Can the project strategies effectively be incorporated/mainstreamed into future planning?		
Environmental Risks to Sustainability:		
Are there environmental factors that could undermine and reverse the project's outcomes and results, including factors that have been identified by project stakeholders? E.g. climate change risk to biodiversity		
Impact - Progress towards the achievement of impacts		
Verifiable improvements in ecological status (or via process indicators to show it is likely in the future)? Verifiable reductions in stress on ecological systems (via process indicators)? E.g. as a result of the project, there have been regulatory and policy changes at regional, national and/or local levels? (Use tracking tools and indications from baseline to target)		
Identify the mechanisms at work (i.e. the causal links to project outputs and outcomes);		
Assess the extent to which changes are taking place at scales commensurate to natural system boundaries; and		
Assess the likely permanence (long lasting nature) of the impacts.		
On the basis of the outcome and sustainability analyses, identify key missing elements as that are likely to obstruct further progress.		
Theory of Change – Identify project intended impacts – verify logic – analyse project outcome to impact pathway		
Based on the theory of change (building blocks, catalysts etc), has the progress towards impact has been significant, minimal or negligible.		
Catalytic role		
Scaling up - Approaches developed through the project are taken up on a regional / national scale, becoming widely accepted, and perhaps legally required		
Replication - Activities, demonstrations, and/or techniques are repeated within or outside the project, nationally or internationally		
Demonstration - Steps have been taken to catalyze the public good, for instance through the development of demonstration sites, successful information dissemination		

Evaluation Question	Response / Finding	Conclusion/ Recommend
and training		
Producing a public good – (a) Development of new technologies and approaches. (b) No significant actions were taken to build on this achievement, so the catalytic effect is left to 'market forces'		

Annex 13: Signed UNDP Code of Conduct Agreement Form

Evaluators:

1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded.
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and: respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/ or oral presentation of study limitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Evaluation Consultant Agreement Form

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultants: Madina Rajapova, Richard Sobey

We confirm that we have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed 22nd September 2021	Signed 22nd September 2021
Madina Rajapova	**Richard Sobey**
National Consultant / Team Specialist	International Consultant, Team Leader

Annex 14: Signed TE Final Report Clearance Form

Final Evaluation Report Reviewed and Cleared By:	
Commissioning Unit	
Name:	
Signature:	Date:
UNDP Regional Technical Advisor	
Name:	
Signature:	Date:

Annex 15: Terms of Reference

As the presented on the UNDP ERC webpage