Concept for restoration/rehabilitation of degraded forests in Uzbekistan
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## Abbreviations and acronyms

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<th>Description</th>
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<tbody>
<tr>
<td>AMSL</td>
<td>Above mean sea level</td>
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<tr>
<td>ANR</td>
<td>Assisted Natural Regeneration</td>
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<tr>
<td>BD</td>
<td>BioDiversity (focal area of the GEF)</td>
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<td>BPF I</td>
<td>Bagong Pagasa Foundation Inc.</td>
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<td>CC-M</td>
<td>Climate Change Mitigation (focal area of the GEF)</td>
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<td>CSO</td>
<td>Civil Society Organization</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<tr>
<td>FLR</td>
<td>Forest Landscape Restoration</td>
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<td>FMNR</td>
<td>Farmer Managed Natural Regeneration</td>
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<tr>
<td>FO</td>
<td>forest organization (<em>leshoze</em>)</td>
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<td>GEF</td>
<td>Global Environment Facility</td>
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<td>GG</td>
<td>Global Guidelines for the restoration of degraded forests and landscapes in drylands – building resilience and benefiting livelihoods</td>
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<tr>
<td>GoU</td>
<td>Government of Uzbekistan</td>
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<tr>
<td>HPG</td>
<td>Holistic Planned Grazing</td>
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<td>KCB</td>
<td>Konya Closed Basin (in Turkey)</td>
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<tr>
<td>LD</td>
<td>Land Degradation (focal area of the GEF)</td>
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<tr>
<td>NPK</td>
<td>Nitrum, Phosphoros, Kalium (nitrogen, phosphorus, potassium)</td>
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<tr>
<td>NR</td>
<td>Natural Regeneration</td>
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<tr>
<td>NWFP</td>
<td>Non-Wood Forest Products</td>
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<tr>
<td>PES</td>
<td>Payment for Environmental Services</td>
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<tr>
<td>PMT</td>
<td>Project Management Team (PMT)</td>
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<td>PSC</td>
<td>Project Steering Committee</td>
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<td>SCF</td>
<td>State Committee for Forestry (of Uzbekistan)</td>
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<td>SFM</td>
<td>Sustainable Forest Management (focal area of the GEF)</td>
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<td>SGP</td>
<td>GEF Small Grants Programme</td>
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<td>VGGT</td>
<td>Voluntary Guidelines on the Governance of Tenure</td>
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<td>WRM</td>
<td>Water Resource Management</td>
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Executive Summary

The purpose of this concept is to establish the guidelines and suggest options to enable reaching the project objectives in Component 2, related to carbon sequestration, restoring protective functions of forests, reducing soil, wind and water erosion, with the active engagement of farmers and communities. The restoration/regeneration activities focus on pistachio orchards/agroforestry, mountain juniper-based forests, shelterbelts, small firewood plantations, and reducing degradation rates in mixed forests.

Four pilot sites serve the purpose of demonstration, training, social cohesion between community members, and community incentivization (with PES options and through participation in trainings with forestry officials) for them to upscale sustainable forest management in lands leased from the state. The demonstration sites cover just over 58 hectares. This base is the stepping-stone that will build capacities, and forge partnerships between communities and with forestry organizations. The demonstration sites can be used actively and continuously for field trainings and technical support that will go through the full cycle of forest restoration, regeneration, and tree planting activities from nursery to success monitoring. The sites are also designed to incentivize at least 500 farmers and households (with 30 % of the participants being women) to further lease lands and undertake sustainable forest management. This is done through Payment for environmental services approaches to reward community members for their participation, work, and for incentivizing others through their example and collaboration. The demonstration sites will also allow forestry organizations to mainstream the GEF objectives and local livelihood objectives in the co-financing sites.
Introduction

The objective of the activities in this concept to restore/rehabilitate the degraded forests in selected ecosystems in Uzbekistan under the Sustainable management of forests in mountain and valley areas of Uzbekistan project is to restore carbon sequestration and protective functions of forests mainly regarding soil and water conservation through engagement of local communities. The project pilot sites for restoration/rehabilitation of degraded forests described in this concept are designed to function as learning sites for local communities as well as for local foresters. The activities will also support capacity building of local communities’ learning-by-doing restoration/regeneration activities in-situ and be inspired by these approaches and amelioration to their livelihoods. They will also improve peer learning and information sharing of best practices between the project stakeholders. The pilot sites represent different types of ecosystems in a) valleys and b) mountainous areas.

The valley sites in Sirdaryo focus on restoration of shelterbelts as well as agroforestry and the required underlying infrastructure. The technical knowledge and participatory planning processes are no longer available in the forest enterprises, communities, cooperatives, or private businesses to do this.

The mountain sites with a combination of degraded mountain slopes, micro-watershed catchments, and upland flatlands in Dehkanabad, Kitab and Pop in the Ferghana valley will focus on tree planting, innovative and cost-efficient terracing, agroforestry and orchards especially with the key native tree crop pistachio as well as other key native nut and fruit trees as well as ameliorative trees.

There is a great deal of local knowledge on the management of nut and fruit tree restoration/regeneration in the valleys. For mountain forests, mainly juniper restoration, the capacities and resources are patchy. Communities have been collecting juniper forest resources for firewood, without paying attention for replanting and regeneration. In addition, forest organizations (FOs) have had scant resources and knowledge to restore and regenerate mountain (juniper etc.) forests. The main reason here is that junipers are difficult to either plant or regenerate. Therefore, this concept about mountain areas focuses on restoration of junipers etc. with the help of terracing. Here, the priority is in heavily degraded micro-watershed catchments that show signs of soil and water erosion.

In addition, participatory planning skills as well as gender mainstreaming skills require attention through capacity building. Hence, capacity building of local implementers and the inclusion of the local population in forest restoration activities will be be ensured throughout the process at all four-project locations. Thus, at each location, a community engagement participatory process will be supported, through payment for environmental services (PES) mechanisms, training of community members, and joint trainings with FOs and communities.
1. Main barriers for degraded forest restoration - and suggested solutions

Nationwide, about 90% of mountainous areas are eroded in Uzbekistan, because there is insufficient numbers of trees or other vegetation on sloping lands to hold the soil and stop erosion. This is also evident in the project sites and most urgently, it is visible as eroded gullies in small watershed catchments. It can also be seen in the valley areas such as in Sirdaryo where shelterbelts are degraded and agricultural productivity is affected as a result. In mountainous sites such as Dehkanabad, native juniper forest ecosystems are degraded to the extent that they are able to perform their natural function of soil stabilization on slopes.

The knowledge is missing on how to manage shelterbelts and watersheds. Therefore, extensive on-the-job training is required for new approaches. This is needed especially for agroforestry type approaches, for local communities to participate in sustainable activities, and on participatory and gender mainstreaming activities for local stakeholders. The recent extension of the land lease period from 10 to 49 years is expected to boost the management of degraded forests considerably. The project will support village volunteers to act as monitoring support and reward this with free planting material from the GEF fund as a model that can be up-scaled. It is also suggested to explore improving access to rural credit, which can further support the objectives of the project.

Considering the rate of erosion, tree and woody shrub cover (as well as grasses and medicinal plants in agroforestry) has to be restored everywhere in our pilot sites. However, such restoration work will also need to include soil preparation, especially in very sloping lands in terraces. Terracing can be done in small level 1m x 1m terraces, in bunds over trenches, or in milder slopes without terracing or trenches through direct planting, and supported by assisted natural regeneration whenever feasible, as well as through supporting natural regeneration and measures to ensure the conservation of existing trees. In the case of the Matmon site in Kitab, it is recommended to conserve the old apricot tree gardens although they produce very little fruit, and there may be interest to use the land for production purposes. However, it is a best practice to plant other trees, mainly Juniperus saraefshaniaca around the apricot trees (Botman, 2019). The roots of the apricot trees are still useful in storing carbon and binding soil.

Over-irrigation causes salinization of soils. Globally, thousands of hectares of soils are over-salinized. Drip irrigation is an approach that can be used in the conditions (such as Sirdaryo and Qashqadaria) to avoid and stop over-irrigation and waterlogging. Salinization occurs because irrigation waters contain salts. Normally, crops and tree seedlings take up nearly pure water for transpiration although roots absorb nutrients and some specific salts. Therefore, salts remain in the soil. The evaporation of water from the soil surface is another cause of salinization, as pure water is evaporated, salts are left behind – evaporation can be mitigated with shelterbelts. In addition, intercropping or rotating endemic halophytic plants (e.g. Atriplex spp. such as Atriplex tatarica or A. hastata; or Climacoptera spp. such as Climacoptera turcomanica, C. ferganica) with tree crops or annual crops could be trialed to absorb excessive salt content.
Drip irrigation allows supplying water to tree seedlings in correct quantities and precisely when and where the tree seedlings (or aromatic and medicinal plants or agricultural crops) need it. This means fewer salts enter the soils and soil evaporation can be limited. Periodically, areas with drip irrigation may need to be complimented with periodic heavy rainfall or if this is not available, with surface irrigation or sprinklers to wash away any extra salt buildup.

However, in areas where drip irrigation is not feasible due to, inter alia, cost reasons, effective drainage engineering is useful to avoid over-irrigation. Agroforestry also helps in avoiding over-irrigation.

Over-irrigation also wastes water resources through evapotranspiration. Climate change is expected to result in higher temperatures, irregular rainfall, longer dry spells without rain, and higher rainfall in some years. Hence, climate smart agricultural techniques including drip irrigation and mulching (naturally in agroforestry or artificially) to protect soil will help in soil amelioration, reduce erosion, assist in seed germination, and therefore support the GEF CC-M, BD and LD objectives.

Overgrazing is a problem in many areas of Uzbekistan. The project pilot sites show less threat to this regard, and visual observations did not show any potential conflicts during the field visit. However, it is good to be proactive in mitigating this potential threat. Here, participation with local communities who live close to the sites is key. The forest restoration work has to a) bring improvements to their livelihoods and b) they need to understand that improvements also bring requirements such as abiding by the law.

Hence, for example fodder production as cut-and-carry hay is important in order to provide food for livestock away from recently forested areas.

This can be done in the firebreak livestock corridors that are left between plots of trees. The project will also engage local volunteers to report any livestock/plantation conflicts that may occur and train them in participatory land use planning. Such volunteers will be provided with in-kind incentives to reward their volunteering. Fencing has been ruled out in participatory discussions due to i) cost, and ii) most sites are purposefully planned to be away from grazing areas. Compliance on this will have to be monitored by the FOs (leshozes).

Although legal timber and construction wood is on sale including in markets, many forest-dependent communities cannot afford the sales prices due to poverty. This leads them to fell trees illegally from natural environments in some cases, especially poplars and junipers that are suitable for fuel wood and construction purposes (Botman, 2010). This is a challenge to the FOs (leshozes) as the pilot sites are far away from the offices and from each other and there are insufficient resources to monitor activities. This will be ameliorated in the project by forging participation and negotiation of the staff and the local communities. Hence, the project will plant juniper and other fuel wood species to rehabilitate natural forest stands of juniper. In more degraded soils, more resilient species (inter alia, Crataegus spp.) will be planted.
As mentioned above, the project will also support village volunteers with free planting material. This can be used for both nut as well as timber species. Having a domestic planted fuel wood supply will surely support FO (leshoze) efforts in stopping illegal activities.

To reiterate, there is a great deal of untapped potential in engaging local communities to act as agents of management and succession monitoring. Besides untapped potential in engaging local communities, there is also potential to harness CSOs such as the Makhallya foundation as participants to support the work (planning, planting and succession monitoring) of forest and agro-forest landscapes. However, training is needed for communities as well as the FOs on how to participate in the interest of common goals.

These communities will also need income and alternative livelihoods at both the short and the long term. Now there is great interest in Qashqaradiya in the form of Ferula asafoetida (ferula smelly) as a source of income in the short term. In Sirdaryo, windbreaks will improve agricultural production in the long term. Nut and fruit tree orchards bring income in the long term while the orchards in agroforestry format bring both short and long-term benefits. All of the plantations (at 6m x 8m) will also bring some short-term benefit in the form of some aromatic and medicinal plants as well as flowers. Although not necessary for pollination of e.g. pistachios, apiculture will be another form of in-kind benefit for farmers; they can choose a combination of beehives and planting material based on the advice of the FOs.

In Pop, for example, the current survival rates of pistachios are low in one of the sites. Here, nut and fuel wood (mainly pistachio and poplar) tree orchards and agro-forests will be created both through ameliorative plantings as well as through enrichment planting (and facilitating natural regeneration).

Due to low survival rates, the project will provide field training at nurseries1 and mother plantations to FO staffs in all four pilot sites to enable up-scaling and improve survival rates (i.e. improve carbon sequestration) in both GEF-funded and in co-financed sites. For example, FO staff are not used to planting seedlings in plastic containers. Through learning by doing, staff will learn practically the global best practices combined with the realities and needs on the ground.

Capacities are low in all the project sites regarding site-specific silvicultural techniques from nursery to harvesting; especially related to applying skills on new techniques, planting, and managing new species varieties. Hence, training is needed in many silvicultural aspects, including (i) seed preparation, nursery techniques, (ii) planting techniques of seedlings (closed or open root systems, use of plastic containers etc.), (iii) site establishment (including soil preparation, application of NPK, etc.), (iv) participatory land and resource use planning, especially the mainstreaming of important plants to the local communities, such as aromatic and medicinal plants, flowers that serve an ecosystem service (pollinations etc.), conserving existing shrubs.

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1 Please see nursery concept for training activities related to nurseries.
and grasses that serve a function in terms of carbon sequestration and maintaining soil health, etc.

2. Use

This concept is designed to be the guideline for the implementation of restoration/rehabilitation activities in the degraded forest and agro-forest landscape areas in the four pilot sites. As the four pilot sites themselves cover a relatively small area, the sites themselves are developed with the twin objective of:

a) Training, engaging and incentivizing local men and women in communities on all silvicultural aspects, and build capacities to lease state lands in order to plant, manage and restore degraded lands, together with local foresters:
   - Participation with foresters to protect and enhance public natural resources and to raise awareness of communities to partake in restore communal resources (such as juniper forest landscapes).
   - Orchards
   - Agroforestry (including with aromatic and medicinal plant) mainstreaming
   - Shelterbelts establishment and management
   - Participatory techniques such as PRA (+MA&D and PNTD if needed) and gender mainstreaming (linking with building awareness for the voluntary guidelines on the governance of tenure (VGGT).

b) learning-by-doing training sites for local foresters to:
   - Adopt climate smart and innovative approaches and technologies, and:
   - Mainstream underutilized species when appropriate to enhance diversity, mitigate erosion and diseases, support (gender-sensitive) local livelihoods, etc.
   - Learn to build trust and harness local communities as a resource to perform succession monitoring, fire control, and curb other encroachment for maximum survival rates of trees on state lands.
   - Mainstream participation and gender in land use planning and forest restoration (linking with building awareness for VGGT).

The project work will be sourced from both GEF funds as well as through co-financing.

3. Concepts used currently in Turkey and their relevance to Uzbekistan

The guiding principle of concepts used in Turkey in similar dryland degraded forest landscapes is that the interventions can result in multifunctional and sustainable agro-ecosystems to local communities, while enhancing the global benefits of carbon sequestration, combating erosion, and mainstreaming biodiversity and ecosystem services into such land uses.

In the Anatolia region of Turkey, for example, watersheds have been protected from soil erosion through an integrated approach combining afforestation and enhanced agricultural and grazing practices as well as product value adding for agricultural products for forest dependent communities.
In the Konya closed basin (KCB) for instance, the landscape consists of patches of forested areas, compartments of recently afforested coniferous and deciduous patches, larger natural forest stands in higher mountain reaches, and natural forests at varying degrees of sustenance or degradation in the middle to high mountain areas, as well as scattered trees in rangelands, and planted rows of trees on hill slopes to control erosion or as wind breaks in agricultural areas.

Concepts used in the KCB promote farmer participation with a mix of natural regeneration and participatory (state, communities and research organizations) restoration through planting, as well as supporting crosscutting approaches that facilitate generation of ecosystem services. Examples of crosscutting approaches include mainstreaming apiculture with tree and crop management, and into agroforestry to support natural regeneration, and improve tree/crop production while supporting an important traditional livelihood (apiculture) (FAO, 2017b). Turkey projects also separate, when locally deemed necessary, grazing areas from forestry patches to protect trees, and identify “biodiversity corridors”, or “ecological corridors” to support regeneration between forest patches and tree clusters.

Planting trees, regenerating forests, windbreaks and agroforestry - the whole chain from nursery to succession monitoring form the core of the restoration physical activities in Turkey as well as in Uzbekistan. Furthermore, pollination and overgrazing have been identified as issues in the Uzbekistan project as well. Grazing pilot sites are dealt with the rangeland activities of this same project. The nexus of grazing/tree plantations is best combined with awareness and advocacy to engage local communities as well as CSOs to act as local “supervisors” who report to the FOs. If this proves difficult, fencing may be trialed.

In Turkey, the activities have also reached out to the private sector to promote the use of windbreaks to improve crop yields.

FMNR is also supported in Turkey. FMNR around the world has proven useful for, inter alia, getting farmers better acquainted with integrating trees in agricultural landscapes. Through the FMNR tree cluster, forest regeneration, and planting processes locals can increase understanding on the benefits of agroforestry and tree/crop/livestock interaction. Besides improved crop and tree crop yields there are linkages of trees providing shade for livestock, reduced soil erosion through tree leaves providing a source of mulch, fodder, medicine and other uses (resin, etc.), and improved crop pollination. FMNR also saves costs for official stakeholders by building trust with local women and men and making use of their traditional knowledge and availability to do forest restoration work. In many remote forest-dependent communities, income from such work may be a key factor that ensures their support to officials’ forest restoration targets.

In sloping lands, Turkey projects apply, inter alia, soil erosion control in sloping lands by planting trees on bunds over trenches that collect soil and water. Aromatic and medicinal plants can be planted in the areas between such rows.

Woodlots are also planted in Turkey for the specific purpose of creating a fuel wood
source. This approach can also be combined with the promotion of other alternative fuel sources as well as fuel wood efficiency measures such as improved cook stoves that reduce the amount of fuel wood needed. Wood palletization is also an option as a modern fuel wood source.

Biodiversity and regeneration hotspots are used in some parts of Turkey as sources of seeds, as well as potential ecotourism or environmental education sites. For example hiking routes and tourism infrastructure (e.g. guesthouses, homestays, and restaurants) can be established in forest areas that have scenic and recreational value to locals or tourists.

In the KCB area, projects have also combined woody shrubs and forage grasses with trees. For example, Kochia prostata, which is native to Eurasia, has been used in degraded land rehabilitation. It is drought-tolerant, climate-hardy, and is beneficial to livestock. It can be planted or allowed to naturally regenerate as a first stage in degraded area restoration. Kochia may reduce the risk of overgrazing of grasses and tree seedlings. However, K. prostata is not known at the Uzbekistan forest sites.

4. Concepts currently used and suggested in Uzbekistan in similar environments as the project pilot sites.

Forest rehabilitation/restoration activities in the mountain areas of Uzbekistan have included for example the following approaches:

- Terracing of mountain slopes with creation of forest, nut-bearing and fruit plantations, orchards and vineyards;
- Creation of erosion-preventive plantations along ravines, riversides, water storage reservoirs and mudflow reservoirs; and
- Afforestation in the riverbeds of permanent and temporary streams.

For the mountainous zone of the country research projects on protective afforestation/restoration has been conducted on the following types of activities:

- Riparian water-regulating plantations;
- Plantations along permanent and temporary watercourses, on slopes and bottoms of ravines in eroded catchment areas;
- Large-scale plantations on slopes with a steepness gradient of over 15°;
- Plantations on mountain slopes of over a 20° steepness gradient enabling the capture of additional precipitation in the catchment area; and
- Plantations on steep, eroded slopes with poor site conditions, especially in the upper catchments.

For these types of activities, guidelines have been developed in the past, prescribing the following aspects:

- Range of suitable species for appropriate zones based on growth rates and site conditions;
- Methods of mixing species in plantations and planting densities;
- Principles of spatial distribution of protective plantings;
- Methods of soil preparation, methods of plantation establishment such as sowing, planting, and use of vegetative reproduction material, as well as planting techniques;
- Effective construction and width suggestions for shelterbelts; and
- Agro-technologies for the maintenance of plantations/regenerated areas.

In addition to forest plantation guidelines, a set of torrent control facilities for the mountain zone and rules of final harvest and sanitary felling have been developed. In addition, various measures on facilitating NR have been identified and a pest and disease control systems developed.

Forest plantation activities in the valley zone have been practiced with the aim to improve timber production, for recreational purposes, as well as for sanitary-hygienic purposes. The most important objective for irrigated lands in the arid zone has been the creation/restoration of shelterbelt forest plantations as they help stabilize the fragile and vulnerable anthropogenic valley landscapes through an improvement of the microclimate, controlling soil erosion, while also performing aesthetic and recreational functions. Forest plantations on irrigated lands have higher productivity and thus high carbon sequestration ability.

In the valley zones of the country, research projects especially on protective afforestation and restoration on irrigated and rain-fed dry lands has focused on the following aspects:

- Forest plantation/restoration as shelterbelts in primarily agricultural lands;
- Shelterbelts around gardens;
- Windbreaks along channels and roads, and around water storage reservoirs;
- Large-scale forest plantations, including plantations of fast-growing species;
- Species selection and technology of establishing plantations on saline soils;
- Detailed growth and yield research on cultivation of forest plantations using irrigation by mineralized waters;
- Afforestation on rocky soils; and
- Establishment of industrial plantations of walnut, pistachio, poplars and willows.

Research activities on forest seed orchards and nursery techniques have included:
- Technology on the collection, storage, and preparation of seeds for sowing;
- Principles of creating permanent forest seed stands and seed orchards;
- Studies of crop rotations in nurseries;
- Reclamation and rehabilitation of soils;
- Irrigation regimes;
- Use of mineral and organic fertilizers;
- Site preparation for sowing and planting;
- Nursery techniques of various sown species;
- Nursery techniques for seedlings and cuttings in seed and transplanting beds; and
- Development of guidelines on the temporary storage, transportation and planting of seedlings and saplings (Botman, 2010).

These activities and information is mainstreamed into the activities of this project when feasible and relevant and used for capacity building and project implementation that will be modified and used in this project with a focus on the global benefits of
carbon sequestration, land degradation control, SFM, as well as community engagement.

The ongoing Central Asian Desert Initiative (CADI) project focuses on desert areas including on alternative income development concepts as well as best-practice lease-agreements in the project pilot areas. The project also works on establishing approaches and best practices on climate- and biodiversity integrated natural resource management in temperate desert areas with the farmer field school concept and improvement of WRM through construction and restoration of wells and watering holes in Uzbekistan.

The Central Asian Countries Initiative for Land Management (CACILM) project in Uzbekistan works on conservation agriculture, including organic fertilizers (manure) and crop rotation, as well as – in Sirdaryo province – on preventing soil salinity and improving soil fertility with crop rotation. The project pilot sites focus on agriculture but also include farms – in Qashqadarya province – in typical agro-silvo-pastoral landscapes with scattered trees as well as nut and fruit tree orchards. In Kyrgyzstan, the project also works on improving soils with high-quality pistachio plantations in an agroforestry approach and the use of local irrigation systems. In Tajikistan, the project works also on leguminous crop gardens applying drip irrigation.

With reference to this project, output 3.2 “Establish more sustainable levels of forest use with engagement of local communities” of the UNDP GEF project “Sustainable natural resource use and forest management in key mountainous areas important for globally significant biodiversity” focuses inter alia on i) establishing and maintaining tree nurseries, ii) supplementing local fuel and construction wood for local use, and iii) assisting NR in degraded high altitude forests.

The UNDP GEF Small grants programme (SGP) in Uzbekistan works on pistachio nursery development, developing a future project proposal on the rehabilitation, protection and further expansion of remaining relict pistachio forest stands around Kuruksay village in Qashqadarya province. The result of the project will be a developed project application, engaged villagers, and prepared ground for an SGP project. The SGP also works on restoring degraded bee keeping practices near Tashkent. In the Tashkent region, the SGP also works on pistachio restoration. In the Ferghana valley, the SGP also works on drip irrigation, and on the creation of a biotechnology laboratory that will produce tree seedlings with in-vitro technologies. In Tashkent, the SGP also works on developing a central database on plant diversity. This project works closely on information exchange with these (past, ongoing and future) projects.

5. Concept restoration work activities:

All land is currently being utilized by both FOs (leshozes) or by local communities (as leased or private lands), most of the project areas are remote and are not well integrated into the national economy.
5.1. Prioritization criteria for restoration

1. Procurement of planting material and identification of farmers/household members to participate in trainings with leshozes. The participants should include 30% female trainees.

2. Irrigation system procurement is the second priority, especially in the drier areas of Sirdaryo, Kitab, and Dehkanabad. The irrigation systems will be established in Sirdaryo, Kitab and Dehkanabad.

3. As a third priority, all other procurement items not yet procured (Kitab Training Center, trailers, etc.)

4. Training on GEF project requirements, M&E, this forest restoration concept, participation approaches (PRA, including gender mainstreaming, and PNTD/MA&D when appropriate) and PES to enable engagement of farmers and community members in the technical support and training process and for up-scaling carbon sequestration, and linking with the VGGT.

5. Establishment of appropriate seedling production methods in all the nurseries; establishment and management of mother plantations.²

6. Restoration / enrichment planting of nut and fruit tree sites, juniper (etc.) terracing, shelterbelt, and agroforestry sites. All with in-situ training of farmers/households and FO members.

7. Identify participants for PES options such as to participate in success monitoring, patrolling, etc.

8. Outreach and awareness to all at least 500 households of the four pilot site areas (including mainstreamed in trainings).

9. Continuous training on silviculture and participation approach successes; continuous monitoring throughout all previous steps to enable reaching project targets on carbon sequestration, land degradation control, and alignment with SFM.

10. Proactive preparation (workshops and field workshops) for mid-term reviews before GEF missions.

An important priority has already been achieved: the extent of land leases for community members and private sector has been extended from 10 to 49 years. This is an important step to incentivize communities and companies to invest in orchards, woodlots and agroforestry. This will help the project to reach the CC-M goals but this also requires training communities and FOs in negotiation and participatory tools to co-develop climate-smart land uses with best outcomes on global, national and local land use development.

Some farmers currently lease land from the state forest committee for either livestock grazing purposes in grasslands, for planting trees and or to plant and collect the seeds of shrubs such as ferula smelly. All of the project villages have large areas available that have potential for forestry and agroforestry. The extension of the leasing period is expected to increase the interest of communities to invest in land resources to create incomes while serving a wider public purpose of bringing degraded forest

² For nursery activities, please see the related nursery concept.
landscape areas under sustainable conditions\textsuperscript{3}. The PES options will further support this and the VGGT goals.

Hence, to kick-start up scaling and make use of the longer lease period immediately, it is strongly suggested the project to apply participatory, gender mainstreaming, as well as PES options. It is also suggested that these models be communicated widely in the area, also with the specific purpose of attracting private sector (including private farmers) to further invest in similar schemes.

Institutional capacity building in the form of training on-the-job for FO staff and interested community members (private land lessees) on all species-specific silvicultural aspects related to all sites establishment and management: site selection, soil preparation, mother plantations and nurseries management, planting, cutting/grafting/pruning, mainstreaming ecosystem services into site selection (ecological corridors etc.), management of irrigation systems etc. is mainstreamed into all the activities.

Training to farmers together with foresters (if appropriate, to women and men groups separately) on participation/negotiation skills with potential private investors, training on how to mainstream their local knowledge in land use planning (site selection that supports both CC-M and local livelihood preferences), training on site establishment and management including both state lands and especially privately leased state lands.

5.2. Globally Known Best Practices for Biological Restoration

The FAO Global guidelines for restoration of degraded forests and landscapes in drylands (GG) – Building resilience and benefiting livelihoods is the product of the FAO Drylands Restoration Initiative (FDRI) following member countries requests to make a comprehensive analysis and recommendations on best practices that can be adapted and up-scaled in various contexts.

The FLR Mechanism of FAO was launched in 2014 with the realization that between 2000 and 2010, 13 million hectares of forests were converted to other land uses or lost through other reasons. However, it was also realized that over 2 billion hectares of the world’s forests have potential for FLR. Please also refer to Annex 1: Case studies for success stories described in other countries.

These best practices include:

- \textbf{Farmer managed natural regeneration,} which refers to the restoration of trees from seedlings, stumps, and seeds in the ground by farmers (The Guardian, 2018). FMNR can be used as a standalone procedure when there are

\textsuperscript{3} Although beyond the scope of this project, it is suggested to build large reservoirs in the area to capture the water released in winter from hydropower reservoirs in the region. This is important as only up to 20 % of water in Uzbekistan originates from within its borders.
sufficient numbers of seedlings, stumps and seeds but in more degraded areas it is often integrated as a part of tree planting. FMNR accelerates regeneration (and therefore carbon sequestration) when root systems are already in place.

- **Participation:** Lessons learned in recent decades on natural resource-based community development show that land degradation trends can only be reversed successfully with the participation of local actors, i.e. through engaging local communities as closely as possible in restoration and regeneration of degraded forests and landscapes. After all, the reason these areas are degraded reflect i) an overexploitation of the resources by communities and ii) insufficient monitoring by authorities (reasons include low capacities or resources). Local and national-level institutions must support local-level processes by providing technical and financial assistance and adequate governance structures and policies. Bottom-up and participatory decision-making processes should be encouraged, as well as social dialogue and partnerships among actors at a landscape scale. Negotiation and prioritization among actors and institutions should be promoted as a way of harmonizing diverse interests and finding common ground for land development strategies. The participation of local communities is always a major benefit for forest organizations. Reduced communication or participation with local communities – especially if some community members are leasing lands in the area – might result in laws not being adhered to. Although local participation is important in protection of forest resources, there are circumstances in which it is necessary, for example in areas with high population, pressures and resource use conflicts, and in small forest patches and in areas that are more vulnerable. Nevertheless, participation in itself provides no guarantee of success. The outcome of participatory processes often depends on additional factors such as institutional or legal frameworks, and the education or interests of local people and other stakeholders. Governments and their agencies play a significant role in participatory processes by providing - or not providing – an “enabling environment” (FAO, 2001). Restoration can be facilitated with the active participation of all key stakeholders. Analyses of social networks can be done to identify champions who can catalyze such change. Even when there is conflict between stakeholders, it is a good idea for project management to try to bring people together to facilitate solving disagreements, to avoid resource conflicts that can hamper achieving national, district and local restoration goals and people’s livelihoods.

- Establishing an **enabling environment** through cross-sectoral dialogue, capacity assessments, improving the quality and quantity of plant reproductive material, and through governance and policy amendments.

- **Assisted natural regeneration** (ANR), a process linked closely with FMNR, which focuses on regenerating naturally occurring tree seedlings and suppressing grasses and other weeds. The process of ANR involves the steps of i) building social support for ANR, ii) protection of vegetation from fire – establishment of fire breaks, iii) selection of preferred natural growth and omitting immediate competition (mainly weeding and pressing down grasses), iv) maintenance and protection of the natural regeneration that follows from
ANR (BPFI, 2015) – this means controlling fire breaks and a reiterative process of identifying, weeding, and suppression of grasses around further desired vegetation.

- **Natural Regeneration** (NR) involves setting aside areas allowing nature to take its course and restore the natural functions of an area. When there are naturally sprouting tree seedlings mere NR can be used to regenerate tree cover. NR can also be mainstreamed in planting-based approaches to ensure healthy ecosystems. Sometimes, non-degraded NR areas also function as reference sites to compare results of other rehabilitation/restoration activities, such as FMNR, planting, etc. Often as a best practice globally, NR areas are protected from livestock or wildlife grazing by fencing. Sometimes areas are also fenced with signs and surveillance cameras to prevent encroachment. However, participatory processes through participation are often cheaper and prove more lasting results, an approach called “social fencing.” Sometimes signs are enough, in combination with restoration and grazing areas being far away from each other, and community monitoring.

- Global best practices on **water resource management** (WRM) practices include conducting planning, implementation and monitoring of identified activities in a participatory manner, and to adopt flexible approaches that consider the priorities of villagers and allow adaptation and adjusting activities based on new findings. In mountainous drylands, WRM practices often focus on stopping soil and water erosion with restoration and regeneration of tree and vegetation cover, including soil preparation with terracing, trenches, and strip cropping on hillsides.

- **Payment for Environmental Services** (PES) schemes can be very useful in many types of community incentive and participation schemes. One of the most important conditions for efficient PES schemes is their targeting areas where there are real opportunities for improving the delivery of environmental services or where environmental threats would occur in the absence of PES. PES can come in the form of cash rewards as well as through in-kind benefits (such as planting material and beehives) and are an excellent mechanism to a) incentive men and women in communities dependent on trees and natural resources, and b) facilitate participation between state stakeholders and private farmer stakeholders in projects. However, PES is conditional in that the state has to receive a sustained benefit from farmers reciprocating their benefit through performing a service, such as through protecting, restoring, and planting trees in state-owned lands to produce wider ecosystem benefits.

- There are many different types of tree-crop-livestock arrangements that can be labeled **agroforestry**. The official definition of agroforestry is based on the integration or symbiosis of trees with crop and/or livestock in some sort of temporal or spatial agreement. In dryland areas or degraded forest, landscapes

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4 GG, p. 43.
5 GG, p. 71.
6 GG, p. 79
it is also common to see single trees scattered across vast landscapes. These may be useful as shade for sheep, as mother trees, as seed banks, or for medicinal or recreational value. Whether these areas are seen as agroforestry or just landscapes is perhaps an academic discussion. In areas that concentrate on livestock husbandry – when they are close to new agroforestry plantations with little social (participatory agreements) or physical (fencing) infrastructure and a history or current knowledge of conflict - new agroforestry areas usually are protected (socially and/or physically) and monitored until trees reach a sufficient height for them to not be harmed by livestock. Physical protection may be around individual or tree clusters, or an entire area. Goats especially can easily even climb trees with low branches. Live fencing with thorny bushes can be an ever better option as that count towards carbon sequestration as well. Live fences, in addition to providing protection to restored areas, also help to increase biodiversity in the area and produce substantial quantities of biomass. This biomass obtained by pruning the fencing regularly helps in increasing soil moisture retention capacity and increased fertility (FAO, 2004).

- **Alley cropping** is a specific type of agroforestry that involves intercropping annual crops between rows of trees. **Strip cropping** means restoring trees in degraded hillsides in strips to prevent water and soil erosion. The annual crops are usually shade-tolerant when the trees reach a certain height to block the sun. However, the tree leaves can be lopped or coppiced regularly to provide mulching and organic material to enrich soil (such as provided by N-fixing trees). Even natural defoliation will enable the creation of healthy organic matter for use by crops. This mulch will also retain moisture and prevent soil erosion from heavy rainfall that can wash soil particles away, especially on slopes.

- **Dedicated livestock corridors.** Restored forest plot areas or tree plantations are sometimes protected from livestock with mechanical fencing (including electrical fencing), and establishing dedicated livestock corridors in between forest plots. This is a useful practice in areas where there are resource conflicts or overlap between livestock and forestry activities. When fencing is considered too expensive, a best practice includes also establishing a system of permanent guards, who are posted to prevent livestock from wandering from dedicated livestock corridors and to reduce human activities (such as the collection of wood and the cutting of fodder).7

- **Shelterbelts (windbreaks);** Planted in windbreaks and shelterbelts, trees protect soils against wind erosion (FAO, 2017). Shelterbelts reduce wind speeds and therefore reduce evapotranspiration in soils. Therefore, they are also very useful in agroforestry systems in terms of improving both agricultural yields and tree crop yields (FAO, 2017a). Windbreaks can also function as boundary markers, and as live fencing to curb livestock encroachment. Trees in windbreaks can also provide habitat for birds that feed on potential agricultural pests (mice, rats, certain insects). Trees in windbreaks also provide habitats

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7 GG, p. 83
for wild bees and other pollinators.

- **Secure land tenure and rural finance** are particularly important for achieving sustainable land management and boosting livelihoods. Local and national-level institutions should support local-level processes by providing technical and financial assistance and adequate governance structures and policies and by encouraging the equitable participation of stakeholders. Poverty and food insecurity, often coupled with unclear tenure rights over natural resources, drive people to overexploit remaining natural resources⁸, which accelerates land degradation, leading to even greater poverty and malnutrition.

- **Gender mainstreaming.** Gender can be defined as "the relations between men and women, both perceptual and material". Gender is not determined biologically, because of sexual characteristics of either women or men, but is constructed socially. Gender is a central organizing principle of societies, and often governs the processes of production, regeneration, consumption and distribution of forest resources and agricultural products. Despite this definition, gender is often misunderstood as being the promotion of women only (FAO, 2004a).

The appropriate practices to Uzbekistan are described below in section 5.3. Please also refer to Annex 1; case studies for some selected success stories and best practices that are highlighted in the GG.

### 5.3. Overview on biological restoration techniques adaptable for Uzbekistan including those targeting restoration of shelterbelts

**Farmer-managed natural regeneration (FMNR) (and other participatory approaches)**

Farmer-managed natural regeneration (FMNR), with reference to this concept and as described in FGRD means that farmers are active participants in managing their state-leased and state-managed tree/woody shrub resources together with state entities.

Often farmers need convincing (training, participatory processes, and information products) in order to rely on FMNR as a part of the solution (The Guardian, 2018). Farmers’ interest is usually related to increasing the value or quantity of woody vegetation on farmland” (Haglund et al., 2011) as well as improving their tenure to these land resources. FMNR does not exclude planting trees; it means that existing trees are included in plantation/regeneration sites to the extent possible. It also means that un-productive trees are not automatically felled but new seedlings are planted/regenerated around them, or in adjacent plots. This is one of the key tenements also in Uzbekistan, and necessary to meet the GEF targets. It must also be accompanied with training to forestry staff so they can work together with the farmers.

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⁸ GG, p.12.
Farmers usually select the healthiest, tallest and straightest stems of native trees and shrubs sprouting from the soil, stumps or roots that they then protect. Growth of wanted trees may be supported by removing unwanted seedlings or stems and side branches to reduce water competition and facilitate the growth of selected trees and stems. However, FMNR usually involves protecting and managing seedlings growing spontaneously from seed banks in the soil in connection with planting trees in dry environments such as the Uzbekistan sites.

Excluding enrichment planting, the main costs associated with FMNR are the time it takes farmers to protect and prune the regrowth and those associated with promoting and teaching FMNR practices (where this is necessary). FMNR is simple to implement and can be scaled up quickly, provided that latent seeds and living tree stumps and roots are present at the site. In more degraded areas the difference can always made up with increasing the number of seedlings that are planted rather than allowed to grow naturally. The goal is to reach an ecosystem that produces both benefits for local livelihoods, and supports national reforestation objectives9.

In micro-watershed catchments such as in the project’s mountainous sites on significantly sloping lands, trees can be planted in terraces, rows, or over trenches to support retention of soil on slopes. Whenever possible, naturally occurring seedlings will be left on site and regenerated.

Trees also reduce wind-speeds, reduce evapotranspiration, which, in turn, supports NR and support the establishment of other vegetation10. This is the objective in the valley areas through the restoration and planting of shelterbelts (windbreaks).

FMNR can also involve leaving firebreaks between forest plots. Such biological corridors support maintaining conductivity across the landscape by reducing fragmentation, restoring lost habitats, maintaining functional diversity and eliminating the conversion of diverse natural forest to monotypic or reduced-species forest landscape that may be prone to diseases11. This is also the idea in the pilot sites in this project. Enhancing habitat diversity also supports pollination and wildlife movement and therefore natural regeneration through seed dispersal. However, wildlife may be also a threat to trees and close monitoring by FO (leshoze) and communities is therefore required.

The FMNR process in Uzbekistan can be facilitated with combining elements of locally appropriate participation tools. These include i) Participatory rural appraisal (PRA), ii) Participatory negotiated territorial development (PNTD) and Market analysis and development (MA&D). PRA involves assessing current situation of land and resource uses through building trust with local communities and thus collecting accurate information on opportunities and threats. Participatory and negotiated territorial development (PNTD) is an approach that aims to promote a systemic territorial

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9 In the case of GEF projects such as this one, the criteria have to correspond with the GEF results framework criteria. They are usually very well aligned in the project document already.
10 GG, p. 16.
11 GG, p.55.
development by improving trust among social actors and strengthening social cohesion (FAO, 2005). MA&D is a participatory training approach designed to assist local people in developing income-generating enterprises while conserving tree and forest resources (FAO, 2011). Elements of all these three approaches are needed.

**Restoration of shelterbelts**

*Populus* and *Ulmus* species have been identified in this concept as the appropriate species in windbreaks. These two species are suitable for shelterbelts in Uzbekistan. In the past 20 years the importance and maintenance of shelterbelts has been forgotten and there are large areas of degraded shelterbelts in the valley areas that are suitable for shelterbelt regeneration and reconstruction. *Populus* species grow fast in the valley areas and they are expected to be able to form shelterbelt functions in 1-2 years. The nurseries are designed to be close to the pilot sites to allow for easy transfer of planting material. It will be important to train *leshoze* (FOs) and communities together learning by doing the process of generating planting material, their transfer to the sites, planting, maintenance, and monitoring. This will allow the participants to go through the full cycle related to shelterbelt restoration work.

**Agroforestry**

It is useful to alternate between planting spacing in drylands. Even if there are calculations on existing ground water resources that can be used for irrigation in Uzbekistan, restoring nut and fruit trees will increase the requirements locally for water and nutrients. Additionally, irrigation will increase the danger of salinization. Spacing variations are also useful when mainstreaming existing medicinal/aromatic plants into the design, which are important to the communities in Uzbekistan. Spacing variations can also be used to include halophytic plants in irrigated areas. Halophytic plants absorb salts left behind when roots absorb water and some of the nutrients, leaving concentrations of salt in the root zone areas. The most common spacing applied in restoring and regenerating nut and fruit tree orchard areas in the project sites is 6m x 8m in the flat lands; in mountain sites such as with terracing or in shelterbelts the spacing varies, and is often done in rows to prevent or stop water or wind erosion. Some alterations to this spacing is suggested and already practiced) depending on the soil, rainfall, AMSL, and species/variety requirements. Here, participation with local men and women is key (to include their wishes and existing traditional knowledge in the design).

Local investors such as private farmers may wish to try to maximize profit without considering with scientific requirements and consulting with foresters and research institutes. Hence, there should be a compromise and a best practice that everyone can agree to and this requires training in participation skills, and working together especially on the monitoring (FO and communities doing participatory monitoring in both FO-managed and privately managed forest areas). Since the funding source is GEF, the CC-M/LD and SFM requirements must be met in the end; this is

12 The extent of existing vegetation, such as natural tree sprouts, and especially aromatic and medicinal plants should also play a key role in deciding spacing, and whether to use a more agro-forest type orchard or a denser plantation type.

13 This is important especially as the private and state managed lands show considerable differences depending on management style.
Global best practices apply local or scientific knowledge on trees that can also have the capacity to fix nitrogen. Upon defoliation, the litter ameliorates soil. Such trees should be considered, when feasible locally. For example, intercropping *Eleagnus angustifolia* with *Populus* and *Ulmus* has been found to result in plant-available soil N to a significantly higher degree than in mere *P. euphratica* and *U. pumila* plots (Khamzina et al, 2009). This could be trialled in the Uzbekistan project sites.

In the case of the project sites, the sites are not close to livestock rearing areas, which means that there is no need for fencing. However, it is suggested to consider fencing in one small (>1 ha) area where livestock grazing is an issue such as through wildlife or village conflicts. In addition, in the project sites the FOs did not see adding trees onto grazing sites as a priority. An often used practice in areas that require extensive areas of planting such as in very neglected and degraded areas is to separate plots from each other to leave ecological corridors to facilitate wildlife migration, prevent spread of diseases, and to have firebreaks. Such corridors may also be used for producing cut-and-carry hay for livestock, or as areas for medicinal/aromatic plants, as mainstreamed in this concept.

Pistachio is the native plant for the foothills and hills of Central Asia and Uzbekistan in particular. Nowadays pistachios` natural habitat is fragmented largely. According to official information, in 1934 pistachios occupied more than 64 000 ha on the Babatag mountain range (main pistachio area in Uzbekistan). The current state is that they remained at some higher elevations and occupying less than 23 000 ha at the whole territory of Uzbekistan. The main reason for the degradation is a continuously increasing anthropogenic impact. Pistachio light forests were logged and replaced by pastures or dry farming agriculture. Livestock breeding and crop cultivation was for some time the most suitable way for people to survive under these harsh climatic conditions (Michael Succow Foundation, 2014). Hence, pistachio forestry development relying on the agroforestry approach has been identified in the project document as a key activity. Pistachio agroforestry production shows promising results in Uzbekistan; pistachio has been shown to be fast growing in the project sites by co-financing and development partner projects and the communities have shown interest towards regeneration relying on planting in an agroforestry approach. Spacing should facilitate avoiding a competition for resources – here variations of the 6x8 m spacing (wider or closer spacing) may be trialed to compare success, yields, and impacts. Although pistachios are hardy and drought-tolerant they do require water especially during the time of the development of the nut; this will require trials on irrigation or relying on rainfall as planned in this concept, based on the existing conditions (existing rainfall, access to ground water, surface water, AMSL, etc.). However, groundwater salinity should be checked and monitored. In areas with lower rainfall and higher salinity, an intercropping or alley cropping trial could be made with N-fixing species (such as *E. angustifolia*) salt-tolerant species such as licorice, or halophytic species such as *Climacoptera lanata* and endemic *Atriplex* spp. such as *Atriplex nitens* (PEER, 2014).

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14 Discussion with Dehkanabad FO DG
The establishment of strips (or alleys) in degraded mountain slopes in the project areas is an appropriate practice for this project. Restoration of protective forest functions in sloping mountain areas with strip cropping of trees on furrows is an effective measure for improving water infiltration, preventing wind desiccation and soil and water erosion, limiting the loss of soil nutrients, and creating microclimatic conditions conducive to further vegetation growth\(^{15}\). Strips can also be combined with trenches to collect soil, nutrients and moisture to establish permanent, cross-slope barriers to capture water and soil.

**Watershed management approaches**

Dryland mountain forests in the project area show catchment slopes at high risk of soil erosion. Here the regeneration of soils and restoration of trees for protection can be facilitated by watershed management approaches. Importantly, these include, inter alia, capturing and storing rainfall in soils and thus preventing rain or aquifer water flows down slopes with insufficient vegetation cover to stop erosion\(^{16}\). Water can be captured, inter alia, in small terraces or trenches, combined with planting trees and woody shrubs. In the Uzbek pilot plots, as well as globally in degraded areas, soil preparation in small terraces and trenches is necessary especially in higher slope degrees, but is beneficial in all sloping lands that show signs of erosion. In lower degree slopes, planting directly on the slope can be sufficient, but this will usually also require soil preparation. Species selection of course also depends on the quality of the existing soil and the slope gradient.

**Mainstreaming Biodiversity**

Although this project does not measure targets of the GEF-6 biodiversity focal area, the activities in this concept also support biodiversity as a crosscutting element of LD, SFM and CC-M. Men and women in drylands rely on a wide range of plant and animal products for household consumption and sale, and such products often contribute significantly to household economies. The biodiversity of drylands forms the basis of diverse livelihoods, and its conservation and sustainable use is a key to improving livelihoods\(^{17}\). For example, the pilot sites selection process includes participatory processes with farmers and foresters to identify the existing resources in the areas and tapping into their experience in the design of restoration landscapes. In the context of this project, this means e.g. mainstreaming aromatic and medicinal plants into the restoration and regeneration activities. Mainstreaming NR and FMNR whenever feasible with approaches that focus on tree planting is a best practice that is included in this concept.

**Natural Regeneration** – by itself or integrated into tree planting-based restoration.

\(^{15}\) GG, p.46
\(^{16}\) GG, p. 16.
\(^{17}\) GG, p. 33.
In this concept, NR is mainstreamed into the sites; whenever there are existing tree stands, they will be protected rather than removed. In such sites, gaps will be filled with enrichment planting (or FMNR if there are naturally occurring seedlings).

Besides maximizing carbon sequestration and supporting erosion control (with root systems already in place), mixing NR with planting produces different aged stands that are more resilient to climate change and diseases. Managing for structural diversity will help to develop a litter layer and potentially an understorey, which help to limit erosion. Compared to non-forest, degraded land (but not necessarily secondary forests or disturbed habitats) and monoculture plantations, they have the potential to provide a range of NTFPs, including medicinal plants, as well as fuelwood (UNEP, 2014). Structural diversity also creates habitats for birds, beneficial insects, and other pollinators. However, care should be taken to avoid insects causing diseases or wildlife harming crops. Again, community training, participation, and monitoring is key.

In any case, and especially in the case of our project and the new decree allowing longer land leases, very degraded agro-forest landscapes not used for grazing purposes and without possibility of finding sufficient numbers of existing saplings to rely solely on NR or assisted natural regeneration (ANR) can be restored and regenerated through (enrichment) planting in an agroforestry approach. Here, physical requirements such as (native) species specifics and site conditions (rainfall, above mean sea level (AMSL) etc. need careful consideration.

**PES**

PES can be used in this project to pay community members for, inter alia, i) success monitoring, ii) illicit harvesting monitoring, iii) fire monitoring, iv) disease monitoring, v) wildlife or grazing conflicts, etc. The in-kind payments for site “volunteers” can come in the form of planting material, and as reduced forest ticket or land use fees. For the long term, in the after-project scenario, 1) there must be sufficient demand for the environmental service and thus a willingness to pay; and 2) the cost of the restoration activity must either be lower than the cost of an alternative method that achieves the same results, or the (environmental or social) co-benefits of the restoration option must be sufficiently attractive\(^\text{18}\).

**Tenure**

Secure land tenure is particularly important for achieving sustainable land management and incentivizing sustainable livelihood adoption in Uzbekistan. Uncertainty about tenure, or unclear regulations, can reduce interest for sustainable land management among local actors, who do not wish to invest time and resources if they have no guarantee they will be allowed to use the resources when the area becomes productive. The Uzbek extension of the leasing period for state lands to private farmers from 10 to 49 years is a huge incentive for farmers to lease state lands for agroforestry and forestry purposes.

\(^{18}\) GG, p. 37.
Gender and NWFPs/NTFPs

There is high interest of rural women and men in the project communities to improve their skills in the collection, processing and marketing of NWFPs as indicated in the PPG phase. For this, training, participation in decision-making that concerns NTFP areas and access to information for both women and men is important. Developing NWFP management and marketing will provide an underlying community support structure in terms of sustainable forest management, biodiversity mainstreaming, and carbon sequestration. In many countries, rural men and women often play different roles in collecting NTFPs, aromatic and medicinal plants from forests (FAO, 2014), as well as make differentiated decisions on many other household family budget choices.

Planting

A lack of sufficient quantities of high-quality plant reproductive material often constrains restoration programs. Where planting is part of a restoration strategy, genetically appropriate material must be used – in the case of GEF-6 projects, this means native species. This means ensuring a sustainable supply of planting material. Here, nurseries and mother plantations are key to ensuring a supply. There may be a wide range of native species that are suitable when considering appropriate species for restoration through planting. For the selection, both biophysical requirements, and especially the local needs and uses for the trees are extremely important. For the biophysical side, when choosing the right species, the area’s altitude, rainfall patterns, soil condition, and the species drought resistance have to be taken into account. For the success to be sustainable, the socio-economic side of the selection necessitates considering the existing livelihood and resource use patterns of communities in the area. This may necessitate focusing on a few species that have a) high success rates, b) a sustained interest from farmers to cultivate the tree. Suitable dryland species native to Uzbekistan and Central Asia for example include pistachio, almond, and walnut trees. These trees are endemic - and a high interest from farmers increases the chance these farmers will look after such orchards with care and these species were therefore chosen as key crops in the project. It is good to note that planting is not exclusive to other approaches and it can be integrated with NR, FMNR as well as agroforestry. Planting supports natural regeneration and can be practiced alongside with FMNR. Planting approaches can experiment with different endemic genetic seed stock, species varieties, different planting techniques, spacing, as well as irrigation and fertilizer needs.

Irrigation

Many degraded dryland forest landscape areas in Uzbekistan still possess potential for restoration with tree crops that also provide a clear economic benefit for local men and women farmers. The project areas have potential for nut and fruit agroforestry, nut and fruit orchards, as well as for juniper restoration, especially when provided with the right type of irrigation (as well as soil preparation, and including the local

\[19\] GG, p. 28.
communities in the site development, maintenance and monitoring). Many efficient irrigation systems have been devised to deliver water to planted seedlings cost-efficiently, including techniques such as small water inputs applied by drip irrigation, and condensation capture\textsuperscript{20}. Furrow irrigation can be used on flat land (short, near horizontal furrows), and on mildly sloping land with a slope of maximum 0.5 %. On steeper sloping land, contour furrows can be used up to a maximum land slope of 3 %. A minimum slope of 0.05 % is recommended to assist drainage (FAO, 1990). Furrows can be used on most soil types. However, as with all surface irrigation methods, very coarse sands are not recommended, as percolation losses can be high. Soils that crust easily, such as is often the case in drylands are especially suited to furrow irrigation because the water does not flow over the ridge, and so the soil in which the plants grow remains friable. However, soil salinization should be monitored and if salinization is expected to be high, a shift to drip irrigation should be considered.

**Capacity development**

To upscale activities funded by projects, project pilot sites often serve the purposes of training, including classroom type teaching for managers and “learning on the job” in the field for local staff. New, “climate-smart” activities require on-site site-specific field training for local foresters and communities not familiar with innovative restoration techniques such as ANR, climate-smart planting, terracing, irrigation, nursery management, etc. This usually also includes details on how each species can best be planted (including grafting cuttings to existing rootstocks), as well as site/species-dependent silvicultural techniques on soil preparation, the size and shape of the planting hole, the type of surface water and soil runoff collection measures with description of needed watering during the planting, short after, and application of any fertilizer to ensure sustainability and optimal survival rates. Later, trainings should also be provided on approaches required after planting to maximize survival rates, such as pruning, coppicing, fertilization and pollination, as well as post-harvest issues to cover the entire management cycle. Community members also require such practical trainings as well as trainings to participate in planning their restoration approaches with forester, and to manage their sites with the help of the FOs.

In any case, to ensure maximum survival rates, besides training foresters on innovative new approaches, forest-dependent communities should be harnessed as participants to ensure their compliance to the objective of carbon sequestration, as well as to mitigate the potential of any illicit activities such as overharvesting of NWFPs, to prevent tree-livestock conflicts, etc. Communities will have insight on the type of NWFP, tree crop, and medicinal crop uses they may be interested in conserving, restoring or developing at the sites.

Farmers will need access to rural credit after the project – the project will cover the cost for some pilot sites to be established as a type of PES, but this is just the start. Rural credit can allow poor agro-forest-dependent farmers to further invest in leasing state lands for tree and/or medicinal and aromatic plant cultivation (agroforestry). Regarding land tenure, such as farmers leasing state lands, they will benefit from

\textsuperscript{20} GG, p. 57.
extension services such as training on negotiations with markets to create as beneficial as possible deals for them that also support sustainability objectives of the state. Furthermore, local men and women have extensive knowledge on existing vegetation and know how to use these resources. These skills are best included in their silvicultural trainings as a base.

Existing vegetation resources are important to consider as they may also serve an ecological and global purpose: carbon storage, pollination, wildlife habitats (such as birds, wild bees and other insects that enable pollination and ameliorate soil). These ecosystems can be improved by adding (through planting or allowing regeneration) numbers of trees, and choosing degraded sites with little or no natural regeneration or existing vegetation for tree planting.

5.4. Overview on temporarily needed artificial support structures to support biological restoration practices

A variety of artificial structures (structures constructed with human labor) was considered for this project upon looking at international best practices and the rate of erosion on the pilot sites.

Hence, it is important to present the following structures

- Stone structures
- Wire mesh
- Canvases
- Fencing
- Fog fences/collectors

Stone structures are useful in deep gorges or gullies to stop heavy erosion. Stone structures have been used in GEF projects in Turkey to stop soil and gravel erosion in deep ravines on steep slopes. In this project, stones can be used to build terraces in deep ravines as using only soil or gravel to create terraces is not sufficient. Stones can also be used to make stone barriers to stop erosion in sloping lands and ameliorate soil.

Wire mesh can be used in deep gorges above terraces to prevent gravel, stone and soil erosion onto terraces. Local communities are a good source of information to identify such “hotspots”.

Canvases are useful in valley areas, especially to support shelterbelt restoration and protect agriculture, agroforestry and young orchards. Before partially or fully degraded shelterbelts are old enough to reduce wind speeds, canvases stop wind erosion. However, in some cases canvases can be excluded for reasons of redundancy, cost-efficiency, if fast-growing trees are expected to reach a sufficient maturity in one year (such as was suggested to be the case in Sirdaryo with *Populus* and *Ulmus* species).

Fences can prevent livestock and (young) tree conflicts. However, fences are relatively expensive and should be used if there is a history of such conflicts. Local communities
are a good source to obtain such information. The restoration sites are chosen to be away from grazing areas. It is suggested to reserve the option in the budget to provide fencing should there be any such conflicts. However, fencing can be redundant when local communities are included in the activities and they have a clear stake and interest in the success of the sites. The term “social fencing” has been used for this\(^{21}\). Villagers may require some additional PES like payments to monitor actively the conflicts in the early years before yields from leased lands accrue to them. Live fencing is also recommended in areas with threat of grazing.

Fog fences and fog collectors are simple devices usually made of large vertical pieces of canvas in various shapes that collect liquid water from fog. They do not require external sources of energy but can only be used in favorable climatic conditions.

The “Groasis Waterbox” is a device in the shape of a plastic “smart bucket” designed to capture condensation (at night, when the air is cooler) as well as rainfall. The water is then stored, protected from evaporation, and slowly released to seedlings\(^{22}\).

### 5.5. List of suitable native species to be used:

The list below is a list of the suitable species that can be used in the restoration and planting works. More indication on the use of these species is included in the work activities.

#### 5.5.1 Suitable tree species

*Acacia* spp. (endemic species of *Acacia* spp.)

Maple:
- *Acer tataricum semenovii* – Tatarian maple
- *Acer regelii*
- *Acer pubescens*
- *Acer turcestanicum*
- *Acer xerophilum*

Almond:
- *Amygdalus bucharica* K. (syn. *Prunus bucharica*)
- *Amygdalus communis* (syn. *Prunus amygdalus*)
- *Amygdalus petunnikovii*
- *Amygdalus spinosissima* Bge. (Syn. *Prunus spinosissima*)

Birch:
- *Betula tianshanica* Rupr.
- *Betula procura* Litv.
- *Betula turkestanica* Litv.

*Celtis caucasica* – Caucasian hackberry

\(^{21}\) GG, p. 92.
\(^{22}\) www.groasis.com
Redbud:  
*Cercis griffithii* – Afghan redbud

Hawthorn:  
*Crataegus altaica* Lange  
*Crataegus songarica* C. Koch.  
*Crataegus pontica* C. Koch.  
*Crataegus turkestana* A. pojark.

*Diospyros lotus* – Caucasian persimmon

Oleaster:  
*Elaeagnus angustifolia* – Russian olive  
*Elaeagnus orientalis*

Common fig:  
*Ficus carica*

*Fraxinus sogdiana* Bunge (syn. *F. potamophila* Herder) – Tianshan ash  
*Fraxinus raibocarpa*

Walnut:  
*Juglans regia* L. – Persian walnut

Juniper:  
*Juniperus serafshanica* Kom.  
*Juniperus semiglobosa* Rgl.  
*Juniperus turkestanica* Kom. (Syn. *Juniperus pseudosabina*)

Apple:  
*Malus sieversii* (Ledeb.) Roem. \(^{23}\) - European wild apple  
*Malus niedzwetzkyana* Dieck. – Niedzwetzky’s apple  
*Malus Kirghisorum* All et F.).

*Morus* spp (mulberry) the most common endemic species in Central Asia are *M. multicaulis*, *M. tartarica* and *M. nigra*.

Peach:  
*Persica vulgaris* – Common peach  
*Persica ferganensis* – Ferghana peach

Pistachio:

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\(^{23}\) *Malus sieversii* is one of the key ancestors of all cultivated apples grown and eaten around the world
Pistacia vera L.\textsuperscript{24}

Plane trees:  
*Platanus orientalis* L.

Poplars:  
*Populus euphratica*  
*Populus diversifolia* Schrenk  
*Populus pruinosa* Schrenk  
*Populus ariana*  
*Populus nigra* var. *Pyramidalis* Spach.  
*Populus alba* L.  
*Populus densa* Kom.

Cherry and Plum:  
*Prunus divaricata* – Cherry Plum  
*Prunus sogdiana* – Sogdiyana Plum  
*Prunus mahaleb*, Syn. *Cerasus mahaleb* Mill. – Mahaleb Cherry  
*Prunus armeniaca* syn. *Armeniaca vulgaris* Lam. – Armenian Plum

Pear:  
*Pyrus bucharica korshinskyi* Litv. – Bukharan pear  
*Pyrus regelii* Rehd. (A rare endemic wild pear)

*Quercus* spp (endemic oak species)

Willow:  
*Salix songarica* Anders  
*Salix australior* syn. *Salix excels*

*Sorbus tianshanica* Rupr.  
*Sorbus persica* Hedl.  
*Sorbus turkestanica* Hedl.

Elm:  
*Ulmus pumila*  
*Ulmus androssowii*  
*Ulmus densa*

*Zizyphus jujuba* – Chinese date

\textbf{5.5.2. Suitable shrub species:}

*Abelia corymbosa* – honeysuckle family

\textsuperscript{24} Grows naturally in Uzbekistan even under 200 ml rainfall/year. Good for soil erosion control and for transforming degraded areas into orchards / agroforest orchards.
Atraphaxis virgata – atraphaxis

Barberries:
Berberis integerrima
Berberis oblonga
Berberis nummularia

Calophaca tianshanica

Colutea rostrata

Convolvulus campanulatus
Convolvulus fruticosus

Cotoneasters:
Cotoneaster multiflora
Cotoneaster racemiflora

Ephedra:

Ephedra equisetina
Ephedra ciliata
Ephedra strobilacea

Evonymus semenovii
Evonymus koopmannii

Exochorda alberti syn. Exochorda racemosa – Pearlbush

Hippophae rhamnoides – common sea buckthorn

Lonicera altmannii – honeysuckle family
Lonicera nummulariifolia – honeysuckle family

Luciumda systemum

Paliurus spina-christin (Jerusalem thorn)

Prunus bifrons syn. Cerasus erythrocarpa syn. Prunus erythrocarpa
Prunus tianshanica syn. Cerasus tianshanica
Prunus verrucosa syn. Cerasus verrucosa

Punica granatum - pomegranade

25 Common names include bluestem joint fir, ma huang, et al.
Restella albertii

*Rhamnus cathartica* – common buckthorn  
*Rhamnus coriacea* – buckthorn  
*Rhamnus baldshuanica*

*Rhus coriaria* - sumach

*Ribes janczewskii*26– Yanchevskiy currant  
*Ribes meyeri* – Meyer’s currant

Rose shrubs:  
*Rosa beggeriana*  
*Rosa fedtschenkoana*  
*Rosa kokanica*  
*Rosa maracandica*  
*Rosa canina*  
*Rosa persica* syn. *Hultemia persica*

*Rubus caesius* – Dewberry

*Sageretia laetevirens*

*Spiraea hypericifolia* - Iberian spirea

*Tracantha bactriana*  
*Tracantha lasiostyla*

*Vitexagnus castus* – chaste tree berry

*Zygophyllum gontscharovii*  
*Zygophyllum bucharicum*

### 5.6. Approaches for maintenance and success monitoring

Forest monitoring is a permanent activity in order to assess growth rates, and the effectiveness, and local appropriateness of the site management choices (Botman, 2017) and of the participation choices with local communities to ensure success.

Planning and implementation of rehabilitation activities have significant importance for the improvement of degraded forestlands and rangelands. However, only planning and/or implementation of these activities would not provide effective and verified data and would not be sufficient to do impact assessment for the post-rehabilitation period.

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26 The *Ribes* spp. family includes also gooseberry and blackcurrant.
Therefore, development of a monitoring approach has a key role to monitor and ascertain the impact of rehabilitation activities on the ground.

A monitoring approach, which includes a set of criteria and indicators, will allow practitioners or project staff to identify progress, successes, and any constraints encountered. This in turn will enable them to take necessary corrective measures on the selected demo sites. Collected data/information would be useful for the impact assessment on CC-M, LD and SFM. Baseline data at the demo sites and in villages taken at the beginning of the monitoring (first cycle) such as vegetation type and cover, plant species, natural regeneration, biodiversity, socio-economic parameters, soil health, soil organic carbon, biomass, (soil) insect surveys, livestock numbers, impacts of tree planting and restoration to annual crops, and any planned other land uses (infrastructure, investments, potential exotic species, etc.) will provide reference that will be repeatedly measured over time in given intervals.

A monitoring plan will allow the project steering committee (PSC) and project management team (PMT) to identify progress, successes, and any constraints encountered. This will also help the PSC and PMT to prepare for GEF mid-term and final evaluations. GEF will be interested in the level of impact on CC-M, LD, and SFM, as well as crosscutting issues in GEF-6.

Large amounts of site-specific data (biophysical and socio-economic) is already available. Hence, the project should ensure this data is accurate and applied to the new activities in the villages. Some of the most important data to measure against will be the establishment rate of trees/hectare, shrubs/hectare and the regeneration rate of the agro-forest and watershed restoration landscape.

Besides quantitative data, qualitative data can be gathered during site establishment from stakeholders. Such information can allow local communities to self-identify capacity gaps to help develop capacity building and training accordingly. For cost-efficiency, these activities are best integrated into the pilot site establishment, nursery and other training activities. This means interactive feedback during the trainings. Besides qualitative data, the baseline and monitoring data will also measure biophysical changes in the project site. Please refer to Annex 6 below for the Monitoring Plan.

With the leasing period of state lands having been extended to 49 years, the areas with planted tree seedlings by private farmer lessees is expected to increase. The project can capitalize on the information available on the secrets to success from many of the privately managed sites – they have “staff” on site close to the (privately-publically) regenerated lands and therefore have easy to the sites every day. Hence, it is extremely important for upscaling to engage local communities as much as possible in the design, tending, and monitoring of sites. The pilot sites serve the purpose of demonstration, training, and as a two-way learning ground between the communities and the FOs, when they attend capacity-building activities together.

FOs will have overall responsibility for maintenance of the sites and they will also do periodic site monitoring as part of their normative work for both co-financing and GEF-funded sites, as well as for the privately managed leased lands as extension support.
However, as mentioned above, to ensure reaching the target number of hectares under SFM, it is crucial to engage local communities in site monitoring as a) they live close to the sites and therefore know the area, b) participating closely with communities builds trust with them and therefore reduces chances of resource conflicts. The communities and FOs will also benefit mutually from information exchange to compare global, national, and local best practices. To summarize, local men and women in communities, including staff or retired staff who live in the communities, can monitor any changes or threats to private/state investments every day (fire, diseases, dieback rates, stem and branch formation development, etc.). This cooperation is also beneficial towards incentivizing larger public-private cooperation, raise the interest of investors in the private sector, and help achieve wider restoration targets.

For maintenance work, the FO staff and communities should be trained together to cover the full cycle from nursery techniques and irrigation, to planting, pruning and success monitoring. This is necessary, as the project will introduce innovative nursery planting, mother plantation, and irrigation systems. For example for maintenance work on pistachio mother plantations, it is important to do pruning of the branches and leave only 2-3 stems on each branch – selecting the stems that are the straightest. Maintenance work also includes checking for, inter alia, signs of drought stress, signs of diseases, soil salinization, and identifying reasons for success rates or dieback. Managing this requires both training communities and the FOs on the technical details of being able to identify these details, as well as training of FOs on how to participate with the communities, and training the communities to participate with the FOs. There is a great opportunity in two-way information flow regarding i) local knowledge from communities to FO, and ii) scientific knowledge from FO to communities to ensure success.

Geospatial monitoring can indicate changes in real time. However, in the pilot site areas, especially for the sites with planted seedlings and grafting (pistachio, juniper, etc.), it is important to focus also on community-based monitoring to follow success. Even in mature stands, GIS or drone monitoring is best combined with frequent ground-truthing and engagement of local people in the activities, who have to rely or manage the forest landscapes themselves.

To summarize, community participation in forestry can be used to provide cost-efficient succession monitoring. This entails forest-dependent communities and forestry organizations working together in the design and management of forest areas, including joint land use planning, livelihoods design, mainstreaming existing resources in the new innovative FLR designs, etc. Please see Annex 6 for more details on success monitoring.

5.7. Project pilot site activities

All the project site establishment activities will also serve as an on-the-job training opportunity (as a form of the FAO farmer/forest (staff and/or community members) field school) regarding learning new climate-smart techniques, as well as new planting techniques. Each site should be provided with one Lada Niva car as a field car (at USD
11 000 each) to enable field visits for FO staffs. Tractors, motor cultivators, greenhouses, and some other procurement items are already being provided from the project to support implementing the activities described below. Please refer to Annex 3 for a list of procurement items.

**Sirdaryo:**

The goal of the activities combined in the Sirdaryo villages is the sustainable management of valley forests and shelterbelt forests. FOs will be enhanced by improving the livelihoods of at least 100 farmers. 30 % of these should be female farmers or household members. For example a father and a daughter, a mother and a son, or a whole family of farmers can attend trainings together.

Malik Village: The project has planted a mother plantation of poplars in March 2019 by co-financing of government of Uzbekistan (GoU). There are 25 varieties of poplars planted. The plantation was created by planting cuttings 20-25 cm long on a field measuring approximately 40x10 m. with the planting bed being in the middle of the ridge. The distance between the seedlings is 50 cm. The distance between rows is 1.5 meters.

**Gulistan:**

Sirdaryo activity option 2 (S1)²⁷: On the site there is a 16 hectare area of irrigated land, located on a narrow strip along the canal. For this site, it is recommended to i) expand the irrigated area through drip irrigation over a 0.5 ha area, ii) rehabilitate and reconstruct a shelterbelt to surround the entire 16 ha site (see site scheme below in Figure 1). The shelterbelt will surround a mother plantation, a nursery, almond and pistachio orchard (with annual crops planted in early years in an agroforestry arrangement), and areas to be leased by farmers. Man-made materials such as canvas were considered to support the shelterbelt function in early years but it was decided these are not needed at this site because i) poplars at this site will reach a sufficient height in 1 year, ii) it is cost-efficient to concentrate all purchases on biological material, and iii) biological planting material will support faster the GEF objectives of the project on carbon sequestration, sustainable forest management, and on reducing land degradation. Besides *Populus* spp., it was a comment from one stakeholder to include *Ulmus* spp., in shelterbelts. Hence, *Ulmus* spp. seedlings should be grown in the nursery; a suggestion also is to include *Ulmus* spp. on one side of the site (one side of this plot, or along the roadside close to this site where the old *Ulmus* shelterbelt is very degraded. It was recommended to plant a two-row *Populus/Ulmus* spp. shelterbelt around this site.

As mentioned above it is recommended to develop a mother plantation in Gulistan as a two ha model nursery and as a geographically close source of seedlings for restoration and reforestation work in this project area. The nursery should be developed from seeds and cuttings for windbreak purposes. Cuttings from Malik will

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²⁷ To be funded from GEF project funds.
be transferred also to this site\textsuperscript{28}.

The same model of having a nursery and a mother plantation as close as possible to the planting site is a best practice that improves the right species/site specifics match. Training provided on this pilot site will enable up scaling this model with co-financing into other areas.

Species such as pistachio need to be coppiced and grafted in order to ensure productivity. Here, it is important to engage farmers in the training. This forging of partnerships between the FOs and the farmers will facilitate information exchange and SFM expansion in Sirdaryo.

The nursery species currently are: \textit{E. angustifolia} (Russian olive), \textit{Salix} spp. (willows), \textit{Fraxinus} spp (ash), \textit{Ulmus} (elm), \textit{Populus} (poplar), \textit{Morus} (mulberry), \textit{Platanus} spp. (plane), \textit{Catalpa}/\textit{Chitalpa} spp.\textsuperscript{29}, \textit{Sophora} spp\textsuperscript{30}, \textit{Rosa canina} (shrub), pistachio, almond, and \textit{Platicladus orientalis} (previously classified as \textit{Thuja orientalis}, now listed as “near threatened” in the IUCN Red List, and is native to Uzbekistan)\textsuperscript{31}.

It is also recommended to build a greenhouse in Gulistan for these nursery purposes\textsuperscript{32}, to test the different responses to open air and greenhouse conditions. Greenhouse option: The greenhouse should be made zero-emission through provision of solar paneling.

The 16 ha pilot site should be completely surrounded by windbreaks as indicated in this Figure 1:

Besides the 2 ha nursery supplying poplars for the windbreak. Endemic poplar varieties will also be planted in the Gulistan site over 1 ha. Eventually, this site can be used to provide villagers and FO (leshoze) facilities with a source of fuel wood for winter, as well as construction material. The S2 option will also include 1 ha of pistachio, 1 ha of almond, and 1 ha of mixed almond/pistachio orchards. The almond and pistachio agroforestry pilot will serve ameliorative purposes prior to bearing nuts. In the first

\textsuperscript{28} See details and compare with nursery concept note.
\textsuperscript{29} \textit{Catalpa bignonioides} is native to USA and should not be used in this project. The prevalence of Chitalpa is related to Chitalpa being a cross of \textit{C. bignonioides} and \textit{Chilopsis linearis} (native to USA and Mexico) having been developed in Tashkent.
\textsuperscript{30} \textit{Sophora japonica} is native to Japan and therefore should not be used in these project pilot sites.
\textsuperscript{31} See details and compare with nursery concept note.
\textsuperscript{32} Budget covered in the nursery concept note.
years before overshadowing, annual crops such as cotton, wheat, and watermelon to be planted in an agroforestry approach.

The remainder of 10 hectares on this site:

PES Option S1a: The community members that receive planting material and participate in trainings perform succession monitoring, and assist in site establishment\(^{33}\) are to be provided with free planting material for 10 hectares.

PES Option S1b: Fuel wood worth 200 USD is provided free of charge from the project funds to 5 households who provide workforce for the site establishment\(^{34}\).

Field trainings should be done on these pilot sites in 2019-2020 for interested farmers together with FO staff.

Training provided to farmers with foresters will enable upscaling of shelterbelts improvement of agricultural, agroforestry, and tree orchard production through investments in land management with drip irrigation and precision NPK and other fertilizer application.

Moreover, there is an opportunity to involve local people in poplar and other tree farming on a contractual basis, for which both local residents and the leadership of the FOs are ready. To this effect, communities and FOs should attend land use planning, restoration, regeneration and planting activities and tending /maintenance activities together. FOs should be trained in aspects of PRA and PNTD or related FAO participation tools to engage the communities together with community members.

The procurement from the project to the site will include the greenhouse, as well as 1 moto-cultivator, 1 tractor, 1 trailer (for accommodation of project personnel visiting the sites to provide training etc.), as well as general personnel equipment such as uniforms, gloves, etc.

**Shirin nursery site**

The project can support the Shirin nursery project site with the following technical equipment: 1 moto-cultivator, 1 electrical tree branch cutting device, and other small inventory (uniforms, gloves, and small forestry tools) as well as 1 trailer as a staff resting place for lunch/tea breaks (they currently do not have such facilities)\(^{35}\).

As the Shirin nursery currently provides 80 % of the planting material in Sirdaryo region, it is recommended for the communication activities of the project to capture the knowledge from the current nursery manager (audio, videos etc.) and use this

\(^{33}\) Hence, the budget for the site establishment contractee could be smaller as they do not have to provide workforce.

\(^{34}\) Some of the PES options differ for each site. However, if any of these options are also interesting to apply in other sites, it is suggested to use them in these other contexts.

\(^{35}\) To be compared with the nursery concept note.
material for extension and field training purposes. This material can be provided to FOs and communities who can then compare their approaches with the Shirin nursery approaches.  

**Sirdarya: Bayaut plot 3**

The Bayaut nursery requires an upgrade in terms of technical equipment: these could include (if budget allows): 1 motor cultivator, 1 solar-powered water pump, 1 electrical tree branch cutting device, as well as a small inventory of uniforms, gloves, and small forestry tools.

S2: To reduce pressure on forests and prevent illegal logging by local population, a 10-hectare fuelwood plantation to be created in degraded or other lands suitable for planting with poplar (*Populus*), willow (*Salix australior, S. songarica*), Siberian elm (*Ulmus pumila*), and Tianshan ash (*Fraxinus sogdiana*) with irrigation furrows and application of manure and chemical fertilizer (NPK). It is suggested to try i) only manure, ii) only chemical (NPK) fertilizers, and iii) a mix of chemical and manure in equal amounts to discover best local practice for upscaling. Furthermore, it is recommended to try between spacings, with the minimum distance being 3m x 3m (ca. 1 100 units/hectare). By observing trees and shrubs growing under natural conditions, it is often found that plants grow widely apart in low rainfall areas. Therefore, wide spacing of plantings in arid zones generally should be practiced to avoid competition for soil moisture (FAO, 1989). Hence, it is recommended to try between i) 3m x 3m, 4m x 4m, and 5m x 5m to identify the optimal format for each site that can be used to show trainees the differences that spacings produce and the best format for upscaling.

S3: 10 hectares of a mixed almond and pistachio plantation in an agroforestry approach. Saplings to be planted with a closed root system - grown in a plastic container. 10m x 10m format with irrigation furrows and both organic (manure) and chemical fertilizers. It is suggested to try i) only manure, ii) only chemical (NPK) fertilizers, and iii) a mix of chemical and manure in equal amounts to discover best local practice for upscaling.

Option S3a: Strongly suggest using PRA methods to identify which natural herbs or medicinal plants are being collected, if any, by the local communities. MA&D to be used to identify farmers during trainings that have capacity for horticulture, business planning, and interest to lease lands. In cases of conflicts between (potential) lessees, conflict resolution mechanisms such as PNTD recommended to be applied. At the least, this should involve a mechanism for conflict resolution such as a village elders council facilitated by the project and leshoze members. It is recommended also to consider an STA in cases of conflict, linking with the VGGT activities in Component 2.

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36 To be compared with the nursery concept note.
37 To be compared with the nursery concept note.
38 Besides yields, the impact of chemical fertilizers, and especially pesticides if they are used, on endemic insect populations should be monitored closely. Insects aerate soils and are the underlying factor to process litter into organic matter, store soil carbon, and provide a healthy soil that supports trees success.
S4: The purpose of the activity of providing planting material (tree seeds, seedlings, and cuttings) to local stakeholders is a way of i) raising interest for local communities to restore productivity and engage in SFM (therefore sequestering carbon and reducing land degradation) ii) supporting community-based and gender sensitive livelihoods and small business development and iii) building capacities of communities and leshozes to work together towards SFM. This will also build capacities to apply VGGT principles with households. There are a few options how engaging communities and providing planting material is best done. Leshozes should choose the locally appropriate approaches from the list in section 5.5. The list has been predesigned considering the GEF goals of the project. The species chosen by the leshozes and the project – so far - are pistachio (*Pistacia vera*), three varieties of almond, Persian walnut (*Juglans regia*), poplar (*Populus spp.*), Siberian elm (*Ulmus pumila*), Russian olive (*Eleagnus angustifolia*), Tianshan ash (*Fraxinus sogdiana*), juniper (*Juniper Zarafshanica*), willow (*Salix Australior, S songarica*), mulberry (*Morus spp.*), hawthorne (*Crataegus pontica*), and the rosehip shrub (*Rosa canina*). *E. angustifolia* can support the carbon sequestration of other trees and the soil as it is an N-fixing tree (Khamzina et al, 2009). The choice of species for each plot should be a compromise based on village and household engagement and the promotion of a mix of species that support each other, and mitigate the risk of overreliance in 1-2 species. The PES options below are a good way of linking community livelihood and food security with wider level restoration (linking pistachio cultivation with juniper restoration/protection).

In total, 100 households (with at least 30 % female-led households or households with female members as participants/recipients of project activity benefits) have to be targeted directly. As a result of the activities these (minimum) 100 households livelihoods has to be improved and their land use approaches be more climate-friendly (planting/restoring of trees to sequester carbon, (medicinal) plants and shrubs mainstreamed with tree planting in an agroforestry approach etc.

The activity of procuring 2535 kg of seeds in total for the 4 leshozes can cover a restoration area of 8000 - 12000 hectares – the exact area depends on how many seedlings can be produced with the amount of seeds, the species used, the spacing (4m x 4m, 6m x 6m, or 10m x 10m), and whether the objective is to produce shelterbelts, orchards, or restore+enrichment plant natural (juniper/hawthorn, etc.) forests. The activity of procuring 185 000 saplings will cover an area of 300-350 hectares, and procuring 40 000 cuttings can cover a total of 12-20 hectares.

S4a (PES option): Villagers receive the planting material free: For planting material for a 10 ha area, the recipient household is required to protect 1 hectare of juniper forest (natural). PRA or similar village screening should be done to identify recipients have interest and capacity. MA&D could be used to develop a business plan for households

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40 Endemic species in Uzbekistan and Central Asia include *M. multicaulis, M. tartarica* and *M. nigra*.

41 The list of suitable native species in section 5.5 should be actively consulted to ensure diversity of species that support local and global objectives.
identified with PRA (or similar), especially for the larger businesses. PNTD or similar deep participation approaches should be used when planning land uses at the leshoze/district area to be proactive regarding sustainability and avoiding potential conflict.

S4b (PES option): Villagers receive planting material at a 50 % discount. For planting material for a 10 ha area, the recipient household is required to protect 1 hectare of juniper forest (natural). PRA or similar village screening should be done to identify recipients have interest and capacity. MA&D could be used to develop a business plan for households identified with PRA (or similar), especially for the larger businesses. PNTD or similar deep participation approaches should be used when planning land uses at the leshoze/district area to be proactive regarding sustainability and avoiding potential conflict.

S4c (PES option): Villagers receive planting material at a 50 % discount as well as 35 beehives for the village (i) for communal ownership, or ii) leased by leshozes to households, or iii) owned by individual households. PRA should be done to identify recipients have interest and capacity on how to manage the activity, and MA&D elements to develop sustainable business plans.

S4d: Live fencing planting material for 1 hectare (thorny shrubs/trees) to cover areas close to villages where livestock/tree conflict is an issue. The live fencing (such as with a dense shelterbelt with thorny inedible shrubs) results can be compared with non-fenced sites to identify best practices.

For all options, the recipient can choose the method of protection themselves, but usually includes patrolling, awareness raising in the area; for forest fires and diseases it is recommended to provide a telephone number hotline to the leshoze to report incidents immediately. As in all sites, land use planning should leave firebreaks as a first line of defense against fires. Access to water (wells, springs, surface water, etc..) should be provided with pumps and hoses for irrigation and to extinguish any local fires.

The total area under the project to be restored, regenerated and brought under SFM in Sirdaryo requires the restoration/planting of 2 225 ha of shelterbelts and 20 ha of shrubs (or agroforestry). Please refer to Annex 4: Implementation activity template, Annex 2: alignment with GEF objectives, and Annex 5: Timeline for more details.

Kitab:

The target in Kitab is to enhance the sustainable management of mountain forests in Kitab forestry organization by improving the livelihoods of at least 150 farmers/households. 30 % of the households (including trainees and land lessees)

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42 4000 cuttings of shrubs/ha accumulatively over 5 years or 1200 cuttings of thorny trees/ha at 30 cm spacing. The trees are to be pruned yearly to produce low branching. Some trees can also be left unpruned to provide shade and produce windbreak effects. This decision can be taken locally at leshozes based on local knowledge and preferences.
supported under the project should be either female-led households or households with female members active in project activities.

As in all FOs, the Kitab sites are demonstration sites that serve the purpose as learning sites, awareness raising sites, and sites to enable upscaling sustainable forest management approaches to communities. They can be seen as learning and trust building sites that improve social cohesion, build mutual capacities, exchange information between FOs and communities, extend knowledge on local and global best practices and communicate the benefits of leasing lands to communities.

To build capacities, all Kitab sites will perform practical silvicultural training together for FO staff and community members regarding the full cycle of identifying new land areas for leasing for farmers, mainstream existing resource uses of community members with forestry objectives, and mainstream FMNR objectives in the restoration process.

Participatory training elements combining FAO best practices such as PRA, PNTD and MA&D are good examples of building trust and forging public-private social cohesion. PRA-type information may exist in many villages but it is good to exercise PRA before land use planning an area. Inaccurate or outdated information may cause disagreements between land users and delays or problems in project implementation. MA&D elements can be used when matching available land or products with market demands – to ensure good prices for farmers and mitigate over- or underproduction or over-harnessing land and water resources. PNTD elements such as the STA can help be proactive in land use conflicts and act as a reference point to land use planning.

**Ming Chinor:** 2nd Obchod, 4th Quarter: The site has established a 5 ha collection of varieties and a mother plantation of pistachios planted on a terrace already, with GoU cofinancing. The varietal plantation collection includes 10 varieties of pistachios, and the mother plantation includes 5 varieties of pistachios. The project will organize field trainings to community members and FO staff to capture and extend mutual knowledge as well as scientific knowledge on best practices that can lead to optimal success rates. FMNR approaches are best mainstreamed here as well in such trainings but only if there is a logical reason to do so (if there are numbers of naturally occurring seedlings or sprouts from e.g. stumps).

**Ming Chinor:** 1st Obchod, 3rd Quarter (39.15,543, 66.54,816). Kitab Option 1 (K1): Here, GEF funds will be used for the transformation of an old (now wild) 20 ha pistachio plantation into a varietal pistachio industrial plantation, including the installment of an irrigation system with four water tanks and pipes from the tanks to the sites. The site should install drip irrigation over 1 hectare (to compare results with rain-fed/other irrigation methods.

Option K1a: This pilot site can apply enrichment planting at different spacings over 3 ha, mainstreaming FMNR when logical. Each 1 ha plot could apply a different spacing, and existing trees (from any species) can be left on-site based on mutual community/FO decisions. The spacings for pistachios should not be too close to block
sunlight reaching the lower branches (when trees are mature) nor too wide (trials can be between 250 and 500 trees/ha). The rest, 17 ha, can apply the standard spacing (existing trees as well as enrichment planted) but incorporating underutilized species into the design; species that either support pistachio planting, or do not compete for resources, when locally appropriate. Potential species include the N-fixing E. angustifolia and cherry trees, or any trees growing naturally at the site (restored through ANR/FMNR). High grasses should be suppressed down such as with a wooden board without breaking the stalk to reduce competition and prevent fires. Firebreaks can be established relying on natural landscape features, or by leaving a 5m break between groups of trees. In steep sloping parts, trenches and shrubs can be applied to prevent soil erosion.

Option K1b: Of the 17 ha, a 1 ha area can be planted established solely as a men’s group, 1 ha as a women’s group, and 1 ha decided solely by the FO members. The results can then be compared to get gender-specific data and to later forge the results into a “best practice site.” The FO and community members themselves, facilitated by the project team, after receiving information from the project, can take this decision.

Option K2: Adjacent to the degraded terrace plantation, there will be a 2-hectare plantation of almonds in an orchard/agroforestry approach. The agroforestry approach means that in the early years annual cover crops like cotton can be planted, or that perennial shrubs producing benefits to communities can be planted, or naturally regenerated.

Option K3: On the upper reaches of the site, there will be a 1 ha terrace establishment with Juniperus serafshanica. Here, in more rocky areas, other more hardy species (such as Crataegus spp.) can be included. Hardy shrubs can also be planted/regenerated depending on the natural density rate of shrubs, junipers and other trees.

Makrid:

The Makrid nursery requires support in the form of technical equipment: 1 motor cultivator, 1 solar powered water pump, 1 electrical tree branch cutting device, and a small inventory of uniforms, gloves, and small tools. The site requires also one greenhouse for producing saplings.

The site has already a plantation of mother plantation of poplars established with GoU co-financing: 0.3 ha (3m x 102 m), two rows 150cm apart from each other. The distance between the saplings is 60 cm. The site has 25 varieties of poplars. The plot has been prepared by planting cuttings ca. 20-25 cm in length, and the plot has been prepared with irrigation furrows. Option K4 (with GEF funds): upgrade site with drip irrigation.

The Kitab FO is renovating one of the FO buildings to be used as a regional training and extension center as co-financing. The project will procure a VCD projector and

43 To be compared with the nursery concept note.
other equipment needed for training. (See section below for list of procurement items and other suggested budget items).

**Matmon:**

An entire area of 2,000 ha of terracing on state land was planted in 1986. Some trees have been replanted over the last 20 years when individual trees were removed or died. However, the site requires extensive restoration. There is some natural regeneration at the site, but the site requires enrichment planting as well as FMNR/ANR restoration. Here, *Crataegus* spp., *J. zerafshanica*, etc. should be i) (enrichment) planted and to ii) accelerate NR applying ANR/FMNR through weeding around natural sprouts and cutting any grasses around the natural sprouts where they occur. The weeding and cutting can also be applied to create areas for firebreaks (to protect plots from forest fires). Such segmentation will mitigate spread of fires, and potential diseases. To this regard, the grass from firebreaks can also be harvested as cut-and-carry grass for livestock stall-feeding. The site is suitable as a mixed forest restoration site (including *Juniper* spp., *Crataegus* spp., as well as fruit and nut trees).

The following options (K5 to K10) can be applied in Matmon as well as/or in other areas in Kitab.

**Option K5:** The pilot site should consist of 1 ha for enrichment planting, and 1 ha to apply FMNR. This process will be a good opportunity to organize technical support and maintenance training together. The training should include elements of training in participation. This can include elements of PRA and PNTD as well as MA&D. One useful specific activity can be role-play, where community members act as officials, and officials act as community members, which is an element in some PNTD projects. This can be a good way of establishing close working relations.

**K5a PES Option:** Community members who participate in the planting and FMNR with FO staff could be supplied with planting material for fruit and nut tree orchards (for a total area of 10 ha of privately leased land areas).

**K6:** 3 hectare restoration with a terrace agroforestry landscape approach with juniper (*J. zerafshanica*) (100 units); pistachio (*P. vera*) (100 units), almond (100 units), hawthorn (*Crataegus*) (300 units), and Rosehip (*Rosa canina*) (300 units). Juniper planted in the upper areas, pistachio in the middle, and almond in the lower reaches, with hawthorn and rose hip planted in rows between the almond and pistachio. The terraces to have a trench at the edge. Site should trial with i) mixture of organic and chemical fertilizer to be applied, as well as a small area where either organic or chemical is trialed, if locally appropriate. The pistachio/almond + hawthorn/rose hip to be done in a 10m x 10m approach with 2.5m between rows. This K6 option can be incorporated in the Matmon 2,000 hectare old, degraded, site. In case ANR/FMNR shows high rates of natural regeneration, a larger area than 3 ha can be restored. The site should install drip irrigation over 1 hectare (to compare results with rain-fed/other irrigation methods).

**K7.** To reduce pressure on forests and prevent illegal felling of trees by local population, a 10-hectare fuelwood plantation to be created in degraded or other lands...
suitable for planting with poplar (*Populus*), willow (*Salix australior, S. songarica*), Siberian elm (*Ulmus pumila*), and Tianshan ash (*Fraxinus sogdiana*) with irrigation furrows and application of manure and chemical fertilizer (NPK). As in K6 above, it is suggested to trial i) only manure, ii) only chemical (NPK) fertilizers, and iii) a mix of chemical and manure to discover best local practice for upscaling. Furthermore, it is recommended to trial with spacings adjustments, with the minimum spacing being 3m x 3m (ca. 1100 units/hectare). By observing trees and shrubs growing under natural conditions, it is often found that plants grow widely apart in low rainfall areas. Therefore, wide spacing of plantings in arid zones generally should be practiced to avoid competition for soil moisture (FAO, 1989). Local conditions may vary, so it is suggested to apply participatory techniques with local communities to identify optimum arrangements and to see if they are collecting or using the proposed area for anything else.

For spacing, it is recommended to trial between i) 3m x 3m, 4m x 4m, and 5m x 5m to identify the optimal format for each site. This information will be useful to compare production rates and to identify best practices. The site can be within the 2000 ha degraded terrace area in Matmon, or at another location.

**K8:** 10 hectare mixed almond and pistachio plantation in an agroforestry approach. Saplings grown in a plastic container to be planted (with a closed root system). 10m x 10m format with irrigation furrows and both organic (manure) and chemical fertilizers. It is suggested to trial i) only manure, ii) only chemical (NPK) fertilizers, and iii) a mix of chemical and manure to discover best local practice for upscaling. The 10m x 10m will allow i) annual crops cultivation in first years, ii) intercropping N-fixing trees such as *E. angustifolia* and endemic medicinal shrubs to ameliorate soil, store carbon, and support local sustainable livelihoods. It is suggested also to integrate N-fixing trees in the design for example such as follows:

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N y x y x y x y N y y
y x y x y N y x y x
x y N y x y x y y y
N x y x y x y x N x
x y x y x y N x y y y
y x y x y x y x y x
x y N y x y x y N y
N x y x y N y x y x
x y x y x y x y x y
y x N x y x y x N x
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**Figure 2:** x: Pistachio, y: Almond, N: N-fixing tree.

Option K8a: Strongly suggest using PRA methods to identify which natural herbs or medicinal plants are being collected, if any, by the local communities, or to gather historical data from the region and identify new endemic species for restoration. MA&D can be used to identify farmers during trainings that have capacity for horticulture, business planning, and interest to lease lands. In cases of conflicts between (potential) lessees, conflict resolution mechanisms such as PNTD recommended to be applied. At
the least, this should involve a mechanism for conflict resolution such as a village elder’s council facilitated by the project and leshoze members. It is recommended also to consider an STA in cases of conflict, linking with the VGGT activities in Component 2.

K9: 1 ha restoration of an area with degraded micro-catchments. This pilot site will include native shrubs of forage kochia (*Kochia virescens*, *K. canescens*), *Kraschneninnikovia ceratoides* (L. Gueldenst), as well as *Astragalus sphaerocystis*. Erosion to be stopped with i) trenches and ii) stone barriers. The plots will identify between 5 to 10 micro-catchments in a 1 hectare area and plant (and restore when existing stocks are there) the three grasses to stop erosion and ameliorate soils. Strong recommendation: Any endemic trees, shrubs, and grasses should be allowed to co-exist with the planted grasses (any invasive exotic species to be replaced with endemic ones). The trenches will absorb water and soil to ameliorate the soil’s ability to support vegetation growth and restoration. Trenches close to gullies and in other erosion hotspots, danger of landslides on plantations and roads, should be reinforced with stone fence formations.

K9a) If there is danger of browsing, the area should be reinforced with live fencing with *Hippophae rhamnoides*, *Rosa canina*, *Elaeagnus angustifolia* (in irrigated conditions), and in rainfed conditions, with *Amygdalus bucharica*, *Paliurus spinachristi*, *Rosa canina*, and *Elaeagnus angustifolia*.

K10: Providing planting material (tree/shrubs seeds, seedlings, and cuttings) to local stakeholders is a way of i) promoting community engagement to upscale the rate of sequestering carbon, reduce erosion, and apply SFM; ii) support community-based (and gender aggregated when feasible) livelihoods, and iii) building capacities of foresters and communities. *Leshozes* should choose the locally appropriate approaches from the list below. The list has been predesigned considering the GEF goals of the project. The species chosen by the *leshozes* and the project are pistachio (*Pistacia vera*), three varieties44 of almond, Persian walnut (*Juglans regia*), poplar (*Populus spp.*), Siberian elm (*Ulmus pumila*), Russian olive (*Elaeagnus angustifolia*), Tianshan ash (*Fraxinus sogdiana*), juniper (*Juniper zaratshanica*), willow (*Salix australior*, *S. songarica*), mulberry (*Morus spp.*45), Altai hawthorne (*Crataegus pontica*), and the rosehip shrub (*Rosa canina*).

K10a: Villagers receive planting material free: For example, for planting material to cover 10 ha, the recipient entity (household) is required to protect for example 1 hectare of juniper forest (natural). This activity is best organized as a village community activity closely supervised with a leshoze staff. The participatory methods can be performed to identify recipients have interest and a business plan on how to manage the activity.

K10b: Villagers receive planting material at a 50 % discount. For each kilo of seeds, a


45 Endemic species in Uzbekistan and Central Asia include *M. multicaulis*, *M. tartarica* and *M. nigra*. 
unit of seedlings (decided by leshozes in consultation with consultants) and each unit of cuttings (decided by leshozes in consultation with consultants), the recipient entity (household) is required to protect 1 hectares of juniper forest The participatory methods can be performed to identify recipients have interest and a business plan on how to manage the activity.

K10c: Villagers receive planting material at a 50% discount as well as 35 beehives for the village (for communal ownership or ownership remains under leshozes and villagers/leshozes can choose which households receive the beehives. PRA should be done to identify recipients have interest and a business plan on how to manage the activity.

For all the K10a/b/c options, it is suggested the recipient choose the method of protection from a long list recommended in this concept + approved by the project and leshozes:

- Patrolling the juniper forest areas to prevent and report illegal felling, collection of firewood, wildlife or human encroachment, and disease and fire monitoring.
- Awareness raising about the protection activities to other community members.46
- Construction of terraces and stone barriers (or volunteering with contractors), monitoring of work done by contractors, building firebreaks (trenches etc.).47

The project objectives as listed in Annex 4 state that the degradation level be reduced from 40% to 35% over 5000 ha. Here FMNR for mainstreaming medicinal plants and any occurring other vegetation that supports restoration and livelihoods (such as existing tree saplings sprouting naturally, conserving stumps, etc.) with local community engagement is also one key aspect for carbon sequestration, ecosystem diversity and resilience, and sustainability.

In addition, for the objective of converting/restoring 1000 ha of degraded grassland into pistachio forest, and 200 ha for firewood plantation requires capitalizing on the new land lease having been extended to 49 years and training communities with leshozes on SFM approaches and ensuring leshozes can extend the knowledge to communities.48

It is suggested to provide one trailer at this site to allow project personnel to stay there during field visits. The trailer should be equipped with photovoltaic panels to make the trailer self-sufficient in energy. The investment of USD 6500 can be regained

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46 For reporting on fires, diseases, and encroachment it is recommended that leshozes provide a telephone number hotline to report incidents immediately. These numbers should be posted in visible locations in villages, stored on household mobile phones, and communities should have awareness on the purpose and service calling the number provides.

47 Access to water (wells, springs, surface water, etc., should be provided with pumps and hoses to put out fires.

48 The total forest area to be enhanced or sustained under SFM should cover 16200 ha (including co-financing). Please refer to Annex 4: Implementation Activity Template, Annex 2: alignment with GEF objectives, and Annex 5: Timeline for more details.
in 2-3 years as opposed to generator/grid electricity use. Additionally, there will be no emissions from the use of generators. If the project budget does not allow this, it is recommended to use co-financing.

**Dehkanabad:**

The target in Dehkanabad is to enhance the sustainable management of mountain forests in Dehkanabad forestry organization by improving the livelihoods of at least 150 farmers/households. 30% of the households (including trainees and land lessees) supported under the project should be either female-led households or households with female members active in project activities.

In the Dehkanabad pilot site, the upper watershed catchment area has patches of natural juniper trees – a landscape area that is degraded and hence shows signs of land erosion. The priority suggestion is to stop land erosion and restore forest cover in this area is to i) plant small terraces of 1m x 1m with junipers and hawthorn, preceded by ii) soil preparation and iii) provide irrigation to orchards planted in this project. The species should be endemic to Uzbekistan that match the soil and water availability and usefulness to community livelihood and poverty reduction needs (to consider sustainability). Junipers can be planted, but also other, more drought-tolerant species to increase survival rates, such as *Crataegus* spp. and other endemic species (from the list of endemic species in Annex). The site establishment and management will perform the function of training-on-the job for the FO staff and community members.

Training will also be provided to communities and FOs (and optionally also for interested other private investors) to mainstream their livelihoods with carbon sequestration and other forest landscape restoration objectives and forest management planning, to support up-scaling of land leasing and restoration activities. The pilot demonstrations can act as capacity building and further “trust building” sites between communities and officials when PRA, PNTD and MA&D elements are included.

The demonstration site is intended to function as a learning ground for FOs and communities. In total, the demonstration site should lead to 510 ha of pistachio, 1000 ha of regenerated juniper forest, and 20 ha of firewood forest. In total with ongoing co-financing, the entire area under SFM at project end should be 36 350 ha. It is fundamental that the project focuses also on engaging local communities to reach these project targets. Please refer to Annex 4: Implementation Activity Template, Annex 2: alignment with GEF objectives, and Annex 5: Timeline for more details.

It is suggested to provide one trailer at this site to allow project personnel and FO staff to stay there during field visits. One of the sites should also include 1 solar-powered water pump system (nursery or orchard site).

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49 See nursery concept for information on water pump recommendations.
D1: 2 hectare restoration with a terrace agroforestry landscape approach with juniper (*J. zerafshanica*) (100 units); pistachio (*P. vera*) (100 units), almond (*P. amygdalus*) (100 units), hawthorn (*Crataegus*) (300 units), and Rosehip (*Rosa canina*) (300 units). Juniper planted in the upper areas in small 1m x 1m terraces, pistachios in the middle slopes, and almond in the lower reaches, with hawthorn and rose hip planted in rows between the almond and pistachio. The terraces are to have a trench at the edge. Mixture of organic and chemical fertilizer to be applied. The pistachio/almond + hawthorn/rose hip will be done in 10m x 10m approach with 2.5m between rows. *Crataegus* (100 units) should be procured for rocky locations that do not provide sufficient conditions for juniper, as well as indigenous *Acer* (maple) (100 units). The site should install drip irrigation over 1 hectare to compare results with rain-fed/other irrigation methods.

D2: 10 hectares of a mixed almond and pistachio plantation agroforestry approach. Saplings to be planted with a closed root system - grown in a plastic container. 10m x 10m format with irrigation furrows and both organic (manure) and chemical fertilizers. It is suggested to trial i) only manure, ii) only chemical (NPK) fertilizers, and iii) a mix of chemical and manure in equal amounts to discover best local practice for upscaling.

Four irrigation tanks to be installed to allow improved irrigation of the village nursery, as the nursery area is being expanded. There should be four irrigation tanks of 5000 tons water volume each, as well as a pipe leading from the natural well 5 kilometers upstream to the tanks. As co-financing, the FO will build pipes leading from the tanks next to the nursery to the reforestation sites downstream in the micro-catchment area. This will supply the downstream pistachio restoration sites.

The site should install drip irrigation over 1 hectare (to compare results with other irrigation methods).

Option D2a: Strongly suggested to use PRA methods to identify which natural herbs or medicinal plants being collected, if any, by the local communities. MA&D to be used to identify farmers during trainings that have capacity for horticulture, business planning, and interest to lease lands. In cases of conflicts between (potential) lessees, conflict resolution mechanisms such as PNTD recommended to be applied. At the least, this should involve a mechanism for conflict resolution such as a village elder’s council facilitated by the project and leshoze members. It is recommended also to consider an STA in cases of conflict, linking with the VGGT activities in Component 2.

Option D3: 1 ha restoration of an area with degraded micro-catchments. This pilot site will include native shrubs of forage kochia (*Kochia virescens, K. canescens*), *Kraschneninnikovia ceratoides* (L. Gueldenst), as well as *Astragalus sphaerocystis*. As everywhere, the species should be endemic to Uzbekistan and match the soil and water availability and usefulness to community livelihood and poverty reduction needs (to consider sustainability). Junipers can be planted, but also other, more drought-tolerant species to increase survival rates, such as *Crataegus* spp. and other endemic species (from the list of endemic species in section 5.5).
Erosion will be stopped with i) trenches and ii) stone barriers. The pilots will identify between 5 and 10 micro-catchments in a 1 hectare area and plant (and restore when existing stocks are there) the three grasses to stop erosion and ameliorate soils. Strong recommendation: Any endemic trees, shrubs, and grasses should be allowed to co-exist with the planted grasses. The trenches will absorb water and soil to ameliorate the soil’s ability to support vegetation growth and restoration. Trenches close to gullies and in other erosion hotspots, such as slopes with danger of heavy rill or other erosion, will be reinforced with stone fence formations.

D4: The purpose of the activity of providing planting material (tree seeds, seedlings, and cuttings) to local stakeholders is a way of i) promoting community engagement, ii) supporting community-based and gender sensitive livelihoods and small business development in the vicinity of households in villages, and iii) promoting SFM and restoration of degraded forest landscape areas, combined with horticultural production. There are a few options how this is best done. Leshozes should choose the locally appropriate approaches from the list below. The list has been predesigned considering the GEF goals of the project. The species chosen by the leshozes and the project are pistachio (*Pistacia vera*), three varieties 51 of almond, Persian walnut (*Juglans regia*), poplar (*Populus spp.*), Siberian elm (*Ulmus pumila*), Russian olive (*Eleagnus angustifolia*), Tianshan ash (*Fraxinus sogdiana*), juniper (*Juniper zarafshanica*), willow (*Salix australior, S. songarica*), mulberry (*Morus spp.*), Altai hawthorne (*Crataegus pontica*), and the rosehip shrub (*Rosa canina*).

D4a: Those community members that participate in land preparation, terracing, planting works, and trainings with FOs to get planting material paid by the project to receive nut/fruit tree planting material for their leased lands equivalent to a certain area, for example 10 ha 53. The participation/community engagement activities (suggested a mix of PRA, PNTD and MA&D) can include estimations of the volume of firewood needs in the community; this will help in planning the locations and species used in firewood plantations, for example, the firewood plantations should be close to the villages. This will enable easier monitoring and access to harvest - firewood access is often a key contention point in poor communities that do not have resources to purchase firewood.

D4b: Another PES option is to require nut farmers also to participate in juniper restoration work. For example, if Farmer/Household X buys seedlings to restore 10 ha of pistachio in leased lands, they receive for free 1 ha worth of seedlings for natural juniper.

Options:
- If Farmer X purchases the seedlings for nut and fruit tree orchards for 10 ha, they could get the 1 ha of juniper/hawthorn seedlings from the project.
52 Endemic species in Uzbekistan and Central Asia include *M. multicaulis, M. tartarica* and *M. nigra*.
53 See the options D1-D4 below.
they have to monitor the success 1 ha area of juniper/hawthorn restoration areas (indicators can be developed by FOs, a successful achievement of targets can result in free planting material for example for an additional 5 ha area.)

D4c: Villagers receive planting material at a 50% discount. For planting material to cover 10 ha, the recipient entity (household) is required to protect 1 hectare of juniper forest. PRA should be done to identify recipients have interest and a business plan on how to manage the activity.

D4d: Villagers receive planting material at a 50 % discount as well as 40 beehives for the village (for communal ownership or ownership remains under leshozes and villagers/leshozes can choose which households receive the beehives. PRA should be done to identify recipients have interest and a business plan on how to manage the activity.

The methods of protection linked with PES should involve patrolling for success monitoring, and awareness raising with community members on the benefits of juniper restoration. In addition, for forest fires and diseases it is recommended to provide a telephone number hotline to the leshoze to report incidents immediately. As in all sites, land use planning should leave firebreaks as a first line of defense against fires. Recommendation is also to provide additional access to water (such as wells) to help in fire control.

**Pop:**

The target in Pop is to enhance the sustainable management of mountain forests in Pop forestry organization by improving the livelihoods of at least 100 farmers/households. 30% of the households (including trainees and land lessees) supported under the project should be either female-led households or households with female members active in project activities.

Capacity building to the FO (leshoze) staff and community members on how to prepare planting material, soil preparation, and site selection based on seedling characteristics and soil qualities, decisions on irrigation/NPK needs, manuring, composting etc. to be done as on-the-job training. This should be done in all the sites listed below (sites P1 to P5) as well as at planned and already established GoU co-financing sites, such as at the poplar mother plantation site in Margizor. This site will be used to provide material for windbreaks in the Pop region. Also, at the co-financing site in Kosmos (pistachio mother plantation), which will provide material for cuttings for grafting and planting of pistachios.

Trainings to NWFP users, such as private farmers and other entities engaged in NWFP handicrafts and furniture manufacture, on how to mainstream their NWFP livelihoods with forest restoration, management and land use planning and on participation and negotiation skills with project stakeholders to support further leasing of state lands and upscale forest restoration and sustainable forest management activities while supporting their own livelihoods. The pilot demonstrations also act as capacity building sites between the project, staff and communities.
The PRA, PNTD, and MA&D are excellent ways of i) building trust, ii) exchanging local and scientific information, and iii) finding optimal species mixes (combining objectives of carbon sequestration, NWFP livelihoods needs, national forest policy needs, and erosion control needs that lead to the highest possible success projection.

The target in Pop is to reduce the forest degradation rate from 40% to 35% over 5000 ha, convert/restore 400 ha of grasslands into pistachio, and establish 10 ha of firewood plantation. In total with co-financing, the area under SFM should cover 29010 ha at project end. Please refer to Annex 4: Implementation Activity Template, Annex 2: alignment with GEF objectives, and Annex 5: Timeline for more details.

P1: 2 hectare restoration with a terrace agroforestry landscape approach with juniper (*J. zerafshanica*) (100 units); pistachio (*P. vera*) (100 units), almond (100 units), hawthorn (*Crataegus*) (300 units), and Rosehip (*Rosa canina*) (300 units). Juniper planted in the upper areas, pistachio in the middle, and almond in the lower reaches, with hawthorn and rose hip planted in rows between the almond and pistachio. The terraces are to have a trench at the edge. Mixture of organic and chemical fertilizer to be applied. The pistachio/almond + hawthorn/rose hip will be done in 10m x 10m approach with 2.5m between rows. A similar irrigation system to be established here as in Dehkanabad (4 water tanks and a 3-5 km pipe leading to the water source to provide water for the tanks). This site establishment will also function as an on-the-job training for FO staff as well as community members interested in leasing lands. The site should install drip irrigation over 1 hectare (to compare results with other irrigation methods).

P2: To reduce pressure on forests and prevent illegal logging by local population, a 10-hectare fuelwood plantation to be created in degraded or other lands suitable for planting with poplar (*Populus*), willow (*Salix australior, S. songarica*), Siberian elm (*Ulmus pumila*), and Tianshan ash (*Fraxinus sogdiana*) with irrigation furrows and application of manure and chemical fertilizer (NPK). It is suggested to trial i) only manure, ii) only chemical (NPK) fertilizers, and iii) a mix of chemical and manure in equal amounts to discover best local practice for upscaling. Furthermore, it is recommended to trial between spacings, with the minimum spacing being 3m x 3m (ca. 1100 units/hectare). By observing trees and shrubs growing under natural conditions, it is often found that plants grow widely apart in low rainfall areas. Therefore, wide spacing of plantings in arid zones generally should be practiced to avoid competition for soil moisture (FAO, 1989). Hence, it is recommended to trial between i) 3m x 3m, 4m x 4m, and 5m x 5m to identify the optimal format for each site that can be used to show trainees the differences that spacings produce and the best format for upscaling.

P3: 10 hectares of a mixed almond and pistachio plantation agroforestry approach. Saplings to be planted with a closed root system - grown in a plastic container. 10m x 10m format with irrigation furrows and both organic (manure) and chemical fertilizers. It is suggested to trial i) only manure, ii) only chemical (NPK) fertilizers, and iii) a mix of chemical and manure in equal amounts to discover best local practice for upscaling. The site should also include 1 solar-powered water pumping system.
Option P3a: Strongly suggest to use PRA methods to identify which natural herbs or medicinal plants are being collected, if any, by the local communities. MA&D to be used to identify farmers during trainings that have capacity for horticulture, business planning, and interest to lease lands. In cases of conflicts between (potential) lessees, conflict resolution mechanisms such as PNTD recommended to be applied. At the least, this should involve a mechanism for conflict resolution such as a village elder’s council facilitated by the project and leshoze members. It is recommended also to consider an STA in cases of conflict, linking with the VGGT activities in Component 2.

P4: 1 ha restoration of an area with degraded micro-catchments. This pilot site will include native shrubs of forage kochia (*Kochia virescens, K. canescens*), *Krascheninnikovia ceratoides* (L. Gueldenst), as well as *Astragalus sphaerocystis*. Erosion will be stopped with i) trenches and ii) stone barriers. The pilots will identify between 5 and 10 micro-catchments in a 1 hectare area and plant (and restore when existing stocks are there) the three grasses to stop erosion and ameliorate soils. Strong recommendation: Any endemic trees, shrubs, and grasses should be allowed to co-exist with the planted grasses. The trenches will absorb water and soil to ameliorate the soil’s ability to support vegetation growth and restoration. Trenches close to gullies and in other erosion hotspots, such as slopes with danger of heavy rill or other erosion, will be reinforced with stone fence formations.

P5: The purpose of the activity of providing planting material (tree seeds, seedlings, and cuttings) to local stakeholders is a way of i) promoting community engagement, ii) supporting community-based and gender sensitive livelihoods and small business development and iii) promoting SFM and restoration of degraded forest landscape areas, combined with horticultural production. There are a few options how this is best done. *Leshozes* should choose the locally appropriate approaches from the list below. The list has been predesigned considering the GEF goals of the project. The species chosen by the *leshozes* and the project are pistachio (*Pistacia vera*), three varieties of almond, Persian walnut (*Juglans regia*), poplar (*Populus spp.*), Siberian elm (*Ulmus pumila*), Russian olive (*Eleagnus angustifolia*), Tianshan ash (*Fraxinus sogdiana*), juniper (*Juniper zarafshanica*), willow (*Salix australior, S. songarica*), mulberry (*Morus spp.*), Altai hawthorne (*Crataegus pontica*), and the rosehip shrub (*Rosa canina*).

P5a: The community members who participate in trainings and who can act as volunteers to assist FO staff in succession monitoring will be provided with a more beneficial share of the proceeds of harvests. For example, if the arrangements has been 50-50 %, a 40-60 % or 30-70 % arrangement will be applied.

P5b: Villagers receive planting material free: For planting material (for pistachio) to cover 10 ha, the recipient entity (household) is required to protect a hectare of juniper

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55 Endemic species in Uzbekistan and Central Asia include *M. multicaulis, M. tartarica* and *M. nigra*. 
(or other natural) forest. Village screening such as PRA should be done to identify recipients that have time and resources to perform this function.

P5c: Villagers receive planting material at a 50% discount. For planting material worth to cover 10 ha, the recipient entity (household\textsuperscript{56}) is required to protect 1 hectare of juniper (or other natural) forest. Village screening such as PRA should be done to identify recipients that have time and resources to perform this function.

P5d: Villagers receive planting material at a 50% discount as well as 40 beehives for the village in exchange for either volunteering to do soil preparation, plant juniper, and do success monitoring for natural forests.

For all the options listed above in P5a-P5d, the monitoring services to be provided should include area patrolling for wildlife or human encroachment (including illegal activities), awareness raising in the area; for forest fires and diseases it is recommended to provide a telephone number hotline to the leschozes to report incidents immediately. As in all sites, land use planning should leave firebreaks as a first line of defense against fires. Access to water (wells, springs, surface water, etc.), should be provided with pumps and hoses to put out fires.

6. Procurement

Each are has one project car (4 Lada Nivas – 1 Niva cost is USD 11 000/unit).
Each area has one green house (200 m\textsuperscript{2}) provided.
A total of five trailers; two for Sirdaryo, and one each for Kitab, Dehkanabad and Pop\textsuperscript{57}.

Recommendation: Equip areas in need of irrigation and quick access to water to i) irrigate orchards, ii) mitigate forest fires or iii) use in nurseries: 4 solar powered water pumps. The current feedback is that these are not a priority for households (the priority is the planting material). However, nurseries need water pumps in any case. In addition, the technology is especially suited to off-grid rural communities for irrigation of orchards, particularly where the groundwater level may be too low to be reached by traditional hand pumps, and off-grid solar pumps mitigate the danger of forest fires. A UNICEF study found that an average price of a solar-powered water pump system costs on average USD 20 000 (UNICEF, 2016).

\textsuperscript{56} In all cases, 30% of households should be female-led households, and PES/training recipients should include 30% women.

\textsuperscript{57} Although this is a cost, it will reduce the budget used for accommodation, because project personnel can use the trailer during field visits. In addition, it will reduce travel times and transport costs from accommodation to field sites.
Figure 3: Typical layout of solar water pumping system in remote areas (UNICEF, 2016).

Table: Comparison of water-pumping technologies (UNICEF, 2016):

<table>
<thead>
<tr>
<th></th>
<th>Hand pumps</th>
<th>Motorized pumps (diesel or other fuel)</th>
<th>Solar powered water pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial cost (USD) per beneficiary</td>
<td>10-20</td>
<td>20-50 (varies according to context and size of system)</td>
<td>10-90 (varies according to context and size of system)</td>
</tr>
<tr>
<td>Pumping depth</td>
<td>Up to 80m</td>
<td>Up to 600m(^{58})</td>
<td>Up to 250m(^{59})</td>
</tr>
<tr>
<td>Installation</td>
<td>Simple</td>
<td>Moderately complex</td>
<td>Moderately complex</td>
</tr>
<tr>
<td>Popularity with beneficiaries</td>
<td>Less popular – major effort required to collect water and breaks down regularly. Cheap to maintain.</td>
<td>Less popular – minimal effort required to collect water and breaks down regularly. Expensive to maintain.</td>
<td>More popular – minimal effort required to collect water and rarely breaks down. Cheap to maintain.</td>
</tr>
<tr>
<td>Operation costs</td>
<td>None</td>
<td>Significant day-to-day operating costs are required (cost of fuel and paying an operator).</td>
<td>None – unless system is manually operated, in which case a part-time operator is necessary.</td>
</tr>
<tr>
<td>Durability</td>
<td>Poor – breaks down frequently and requires regular maintenance. Average lifespan of 1-5 years.</td>
<td>Poor – breaks down frequently and regular maintenance is required. Average lifespan of 5-10 years.</td>
<td>High – rarely breaks down and little maintenance is required. Average lifespan of 10+ years.</td>
</tr>
<tr>
<td>Pollution</td>
<td>No greenhouse gas emissions</td>
<td>Significant greenhouse gas emissions</td>
<td>No greenhouse gas emissions</td>
</tr>
<tr>
<td>Other considerations</td>
<td>Only suitable for shallow water depths and requires time and physical labor (usually from women and children).</td>
<td>Noisy, heavily reliant on reliable fuel supply.</td>
<td>Requires consistent sun exposure throughout the year, reduced output when cloudy.</td>
</tr>
</tbody>
</table>

4 photovoltaic panels at 7 000 watts/day for off-grid electricity (and to avoid using generators) for trailers to supply the trailers with electricity enough to run appliances.

\(^{58}\) Riser pipes are the limiting factor for the installation depth – more so than the power of the pump.

\(^{59}\) Example: Grundfos SQ Flex 1.2-3.
(Option 1: For each site 1 quadricycle for monitoring, each at USD 11 000).

6.1. Budget expenditures: procurement

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost per Unit (USD)</th>
<th>Number</th>
<th>Total (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field cars</td>
<td>11 000</td>
<td>4</td>
<td>44 000</td>
</tr>
<tr>
<td>Quadricycle60</td>
<td>11 000</td>
<td>4</td>
<td>44 000</td>
</tr>
<tr>
<td>Trailers</td>
<td>8 000</td>
<td>5</td>
<td>40 000</td>
</tr>
<tr>
<td>Greenhouses</td>
<td>7 000</td>
<td>4</td>
<td>28 000</td>
</tr>
<tr>
<td>Planting material per hectare</td>
<td>35061</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sirdarya: 24 ha, Kitab 49 ha, Dehkanabad 13 ha, Pop 23 ha. Total 109 ha.</td>
<td></td>
<td></td>
<td>38 150</td>
</tr>
<tr>
<td>Planting material (seeds, saplings, cuttings)</td>
<td>270 000 (total for seeds, saplings and cuttings for four leshozes)</td>
<td>2 535 kg of seeds, 180,000 saplings, and 40,000 cuttings.</td>
<td>270 000</td>
</tr>
<tr>
<td>Irrigation system (water tank and pipes)</td>
<td>20 000</td>
<td>3 (Sirdaryo, Kitab, Dehkanabad)</td>
<td>60 000</td>
</tr>
<tr>
<td>Beehive 1st year: beehive + starter kit63 (as PES)</td>
<td>90</td>
<td>150</td>
<td>13 500</td>
</tr>
<tr>
<td>Small field implements (tools, uniforms, gloves, etc.)</td>
<td>1 lump sum</td>
<td>13 13064</td>
<td>13 130</td>
</tr>
<tr>
<td>Mini-Tractor</td>
<td>25 000</td>
<td>3</td>
<td>75 000</td>
</tr>
<tr>
<td>Drip irrigation per hectare</td>
<td>600/ha</td>
<td>5.8 ha</td>
<td>3 480</td>
</tr>
<tr>
<td>4 photovoltaic panels for trailers at</td>
<td>6 500</td>
<td>4</td>
<td>26 000</td>
</tr>
</tbody>
</table>

60 Quadricycles can be useful for accessing remote sites. However, the pilot sites are situated close to road access and the project is procuring four field cars. The field cars are useful in accessing the pilot sites as well as for transport planting material. There is also a monitoring drone as co-financing. Preferably, a quadricycle is not necessary.

61 Figure based on Dehkanabad FO interview for pistachio saplings, for some species the figure will be considerably higher. The budget allows for this, and can rely partly also on seedlings produced in nurseries from seeds provided with the GEF budget. However, in areas with other species, such as with juniper, and in degraded pistachio orchards, the project can rely partly on ANR/FMNR which results in a reduced need of saplings, which compensates for the higher cost of some saplings (such as juniper).

62 S1 site is a total of 16 hectares. However 2 hectares of this is for a nursery; see nursery concept for details.

63 It was suggested by FAO-UZB to provide also in-kind beehives to farmers. Farmers themselves would buy bees. The beehive 1st year kit should include: i) the beehive structure, ii) 1 all-purpose hive tool, iii) reversible entrance reducer, iv) 1 bee smoker, v) 10 grooved top-bar frames, vi) 1 hat/veil pullover combo, vii) 10 sheets plastic based foundations, 1 set of sting resistant gloves, viii) 1 entrance feeder, ix) manual (if available in Uzbek/Russian)

64 This is ½ of the entire 26 260, assuming that a half of the small field implements are required for component 2 on forest restoration/regeneration.
7000 watts/day.

| 4 solar-powered water pump systems\textsuperscript{65}. | 20 000 | 4 | 80 000 |

\textbf{6.2. Budget expenditures: capacity building}

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Unit Cost</th>
<th>Units</th>
<th>Total</th>
<th>Notes</th>
<th>Oracle Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical support and capacity building for improved shelterbelt management</td>
<td>60 000</td>
<td>1</td>
<td>60 000</td>
<td>According to the project document, the term “technical support” is mentioned in relation to “technical support to upscaling of SFM”. The main agents of upscaling shelterbelts relate to incentivizing and training farmers to restore/regenerate shelterbelts in their farmlands ii) incentivizing private entities to lease state lands, these should include outreach and training activities to private companies and cooperatives. This is best done through a combination of technical trainings (5020) and training on participatory tools such as PRA, PNTD, and MA&amp;D.</td>
<td>5 650 Contracts (LoAs)</td>
</tr>
<tr>
<td>Training on shelterbelt management</td>
<td>25 000</td>
<td>4</td>
<td>100 000</td>
<td>The trainees to include: i) FO staff (including nursery managers), ii) private farmers, iii) cooperatives /agribusinesses. The trainings to include site restoration techniques in-situ and classroom type trainings comparing results and success stories from other shelterbelts around the world.</td>
<td>5 020 Training and workshops</td>
</tr>
<tr>
<td>Materials for shelterbelts (saplings, etc.)</td>
<td>55 000</td>
<td>3</td>
<td>165 000</td>
<td>Suggestion to provide a %age of saplings free-of-charge to “champion farmers” who are proactive to participate with FOs in trainings and who volunteer to do success monitoring, fire and disease monitoring, raise awareness, etc. in</td>
<td>6 000 Expendable procurement</td>
</tr>
</tbody>
</table>

\textsuperscript{65} This is not an additional cost per se, as e.g. nurseries will require pumps in every eventuality.
<table>
<thead>
<tr>
<th>PES Option</th>
<th>Planting Material</th>
<th>Area</th>
<th>Unit Cost</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2a,(^{66})</td>
<td>304/ha (example for pistachio saplings (^{67}))</td>
<td>10</td>
<td>3 040</td>
<td>The area could cover private farmers’ lands as well as lands FO leases to farmers.</td>
<td>6 000 Expendable procurement</td>
</tr>
<tr>
<td>S2b</td>
<td>200</td>
<td>5</td>
<td>1 000</td>
<td>Firewood purchase</td>
<td>6 000 Expendable procurement</td>
</tr>
<tr>
<td>S5a</td>
<td>304</td>
<td>10</td>
<td>3 040</td>
<td>Pistachio</td>
<td>6 000 Expendable procurement</td>
</tr>
<tr>
<td>S5c</td>
<td>152</td>
<td>10</td>
<td>1 520</td>
<td>pistachio, 50% discount</td>
<td>6 000 Expendable procurement</td>
</tr>
<tr>
<td>S5d</td>
<td>2</td>
<td>1200</td>
<td>2 400</td>
<td>(Figure is for tree seedlings; for shrubs would be higher)</td>
<td>6 000 Expendable procurement</td>
</tr>
<tr>
<td>K5a</td>
<td>304</td>
<td>10</td>
<td>3 040</td>
<td>pistachio</td>
<td></td>
</tr>
<tr>
<td>K10a</td>
<td>304</td>
<td>10</td>
<td>3 040</td>
<td>pistachio</td>
<td></td>
</tr>
<tr>
<td>K10b</td>
<td>152</td>
<td>10</td>
<td>1 520</td>
<td>pistachio, 50% discount</td>
<td></td>
</tr>
<tr>
<td>K10c</td>
<td>152</td>
<td>10</td>
<td>1 520</td>
<td>pistachio, 50% discount + beehives</td>
<td></td>
</tr>
<tr>
<td>D4a</td>
<td>304</td>
<td>10</td>
<td>3 040</td>
<td>pistachio</td>
<td></td>
</tr>
<tr>
<td>D4b</td>
<td>304/120</td>
<td>10+1</td>
<td>4 240</td>
<td>pistachio + juniper</td>
<td></td>
</tr>
<tr>
<td>D4c</td>
<td>152</td>
<td>10</td>
<td>1 520</td>
<td>50% discount</td>
<td></td>
</tr>
<tr>
<td>D4d</td>
<td>152</td>
<td>10</td>
<td>1 520</td>
<td>50% discount, + beehives</td>
<td></td>
</tr>
<tr>
<td>P5b</td>
<td>304</td>
<td>10</td>
<td>3 040</td>
<td>pistachio</td>
<td></td>
</tr>
<tr>
<td>P5c</td>
<td>152</td>
<td>10</td>
<td>1 520</td>
<td>pistachio, 50% discount</td>
<td></td>
</tr>
<tr>
<td>P5d</td>
<td>152</td>
<td>10</td>
<td>1 520</td>
<td>pistachio, 50% discount + beehives</td>
<td></td>
</tr>
<tr>
<td>Technical support for management of fruit and nut trees</td>
<td>50 000</td>
<td>3</td>
<td>150 000</td>
<td>According to the project document, the term “technical support” is mentioned in relation to “technical support to upscaling of SFM”. The main agents of upscaling relate to incentivizing and training communities to expand privately managed leased state lands, and ii) incentivizing other private entities to lease state lands. This is best done through a combination of technical support.</td>
<td>5 650 Contracts (LoAs)</td>
</tr>
</tbody>
</table>

\(^{66}\) This is not an additional cost per se, as the material would come from the 270,000USD planting material. This same statement is true for all the PES options.

\(^{67}\) The figure is different when farmers plant other species (range of sapling price is 1 to 5 USD).
<table>
<thead>
<tr>
<th>Training on management of fruit and nut trees</th>
<th>45 000</th>
<th>2</th>
<th>90 000</th>
<th>This to include i) training FO and communities on site establishment and maintenance, nursery and mother plantation management, silvicultural procedures, irrigation, etc. (full cycle from seed to monitoring) ii) training for FO and communities/farmers to participate and find optimal ways of co-working in monitoring, site maintenance, and mainstreaming non-forest livelihoods in forestry activities to avoid resource conflicts and ensure success iii) training for communities to negotiate land leases, share best practice local information with peers and stakeholders, identify market niches, etc.</th>
<th>5 020 Training and workshops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials for nut and fruit tree plantation</td>
<td>50 000</td>
<td>3</td>
<td>150 000</td>
<td>A part of this budget could be used as in-kind PES support to volunteer farmers who volunteer in monitoring and maintenance. The estimated cost for provision of seedlings is USD 304/one hectare(^{68}). Depending on the species, this may not be sufficient for a very dense spacing. FOs may opt to co-finance this if this model works well. For one site, the cost for 5 ha would be USD 1520, and for 10 ha the cost would be USD 3020. For four sites the cost would be USD 12080 (4 sites x 10 ha). (The area can even be higher if budget allows).</td>
<td>6 000 Expendable procurement</td>
</tr>
<tr>
<td>Material for mountain forest (e.g. seeds, etc.)</td>
<td>55 000</td>
<td>3</td>
<td>165 000</td>
<td>As there is no training on juniper terracing in the training budget, it is suggested to organize the nut and fruit tree + juniper restoration/regeneration training in an integrated fashion. The sites are also</td>
<td>6 000 Expendable procurement</td>
</tr>
</tbody>
</table>

\(^{68}\) Figure is based on interview with Dehkanabad FO.
physically close to each other, and the juniper restoration/regeneration supports the success probability of the fruit and nut trees through improved forest hydrology functions and reduced erosion into fruit and nut tree sites.

| Exchange visits by land users to demonstration sites | 10 000 | 7 | 70 000 | A part of this budget could be used to visit demonstration sites in other countries’ GEF projects with similar activities. Many of the land users who will visit the demonstration sites live close by to the sites and the FOs could also cover a part of this, if there is interest from further afield to visit the Uzbek demonstration sites. | 5 900 Travel |

| Study Tour To Turkey (GEF projects), or China (dry land areas/GEF projects), or Germany (seed laboratory)⁶⁹ | | | | A clear oracle code could not be found. It is suggested to either use a part of the budget reserved for “exchange visits by land users to demonstration sites” mentioned above, when visits are from Uzbekistan to other GEF project demonstration sites in other countries. A good option is to visit the GEF project sites with similar activities in Turkey. Another option, if visiting e.g. the seed laboratory, is to source a budget from other than (GEF) project funds. Opportunities may also include other GEF projects that have a suitable budget for exchange visits and study tours. | 5 900 Travel |

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⁶⁹ This is an expensive item. If done, the number of participants should be low: suggestion to do it for 3 people for 1 week. Preferably, to focus use of funds for local travel and for field training.
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Annexes

Annex 1: Case Studies described in GG

Integrated WRM in Nepal

In the Bagmati River Basin in Nepal, landscapes have been restored through integrated watershed management to address landslips, gully formation and stream bank erosion. A combination of mechanical barriers and vegetative measures was used to control erosion and improve soil fertility. The approach emphasized multi-stakeholder partnerships and cooperation among local institutions (e.g. village development committees, local CSOs, community forest user groups and individual households), line agencies, district authorities and researchers. The approach built the capacity of community groups through community-level training and the establishment of communication facilities (e.g. telephone and radio) and by building community networks and empowering women and disadvantaged groups.

Multidisciplinary research on sociology, economics/marketing, ecology and technology development involving scientists and the Bagmati project staff was an important part of the approach and a key element of success. Land users and soil and water conservation specialists worked together, providing opportunities for users to share, learn and test watershed management technologies.

Improving soil fertility in Senegal

Soil fertility can be managed through a variety of means, such as the integration of leguminous trees and plant species in farming systems; composting; and the minimization of burning. A fairly simple and efficient practice is *Yaaram Saas* employed by the Serer community in the Groundnut Basin of Senegal: this community actively protects the *Acacia albida* seedlings disseminated by cattle dung. A density of 50 *A. albida* per hectare provides a fertilizing equivalent of 50 tons per hectare of manure. Millet and groundnut yields on such soils are over 50% higher than on other croplands.\(^{70}\)

Applying waste to ameliorate soil

The application of organic amendments such as sewage sludge has been used widely in agriculture and commercial forestry as a way of improving soil fertility and water availability, promoting biological activity and facilitating seedling establishment. Another treatment that promotes growth is the incorporation of fresh organic waste (rather than composted waste) into plantation furrows (mixed with seeds) rather than spreading it as a layer on the surface. This is a common practice in agroforestry in sub-Saharan Africa.

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\(^{70}\) GG, p.46.
Holistic Planned Grazing (HPG) in East Africa.

In cases where farmers are willing and have sufficient time and capacity to practice it, HPG can be practiced. HPG basically involves using livestock to mimic the now fewer herds of wildlife that used to roam around dry agro-forest areas. In HPG, livestock are used to regenerate degraded open forest landscapes or fallow areas that have the potential to become forests by developing a grid of paddocks and moving livestock from one paddock to another before overgrazing occurs. At the same time, the dung and urea of the livestock provide additional natural fertilizer to the area, and the movement of the livestock un-crusts soil and creates small pockets of water/dung/urea to support tree and shrub natural regeneration.

Seed modification in nurseries to improve drought-tolerance

A research project on ecological restoration in the Albatera watershed in Spain focused on the production of native plant species using innovative nursery techniques. Technological improvements enabled the production of high-quality seedlings with morpho-functional characteristics adapted to water-limited environments, thereby improving the quality of restoration.

World Bank GEF project in eastern Anatolia, Turkey

The World bank supported GEF –project in eastern Anatolia in the 1990s found that rural poverty is a major cause of environmental degradation in watersheds, exerting pressure on land and forest resources through the overharvesting of goods and environmental services such as timber, fuel and fodder and the overuse of grazing and cultivation areas. Due to poverty, people may also exert a certain disregard to their environment as the focus is on the core essential of making a decent living. Farmers and communities within and around the project area were provided with training related to, for example, new agriculture-based income-generation/diversification activities, environmentally friendly agricultural practices, sustainable manure management, organic farming, and the marketing of organic products.

Field trips were organized to participating micro-catchments to observe first-hand the economic and ecological benefits of project activities. Public awareness programs on the causes and effects of land degradation and measures for natural resource rehabilitation were undertaken in all 28-project micro-catchments.

Income from agriculture led to a reduction in need of overharvesting forest resources. Hence, the project led to, inter alia:
- An increase in vegetative cover (by 74 %), soil fertility, and agricultural productivity (e.g. by 182 % for sainfoin, 89 % for chickpea and 18 % for alfalfa);
- Poverty alleviation and increased household incomes (by 53 %), in addition to

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71 GG, p.56.
employment opportunities\textsuperscript{73}.

In summary, the key best practices related to poverty reduction with value adding of agricultural crops combined with awareness raising measures. This allowed farmers to reduce their overharvesting of products from forest environments.

In Mauretania, a project supported by FAO to rehabilitate and extend tree plantation areas. The first step was to stabilize dunes mechanically by erecting fences of unwoven branches of \textit{Leptadenia pyrotechnica} and \textit{Prosopis juliflora}, which were placed directly in previously dug trenches. Once the dunes were stable, they were fixed permanently by planting perennial grassy and woody vegetation after the first rains. Tree nurseries were set up and managed by communities, with a priority to indigenous woody and grassy species. Restored areas were protected by permanent guards, who were posted to prevent livestock from wandering from dedicated livestock corridors and to reduce non-allowed activities by adjacent communities (such as the collection of fuel wood and the extraction of fodder).

The key approach for achieving long-term, sustainable results was a collaborative, participatory approach. The approach linked administrative and municipal authorities, technical services and communities directly affected by degradation in the target zones. Local communities and national authorities played important roles in planning and delivering activities and in selecting appropriate local plant species for rehabilitation/restoration. Regular meetings were organized with administrative and municipal authorities and the leaders of cooperatives and NGOs. Guards were hired in villages near the planted areas to protect restored areas.

\textbf{Key lessons learned were:}

A participatory approach, with the continual involvement of local actors, is indispensable for sustaining results in the long term.\textsuperscript{73}\textsuperscript{73} This continuous process of participation is adopted in this process. The participation and training will be done simultaneously. Both foresters and “civilians”, especially those who lease lands from the FOs, will work together to learn and share knowledge on both silvicultural practices as well as on methods of engaging with one another.

An effective framework for capacity development allows the scaling up and sustaining of results. The strategy for training forest technicians is a key to the extension and implementation of successful techniques on the ground, as is raising the awareness of local actors and CSOs. This project goes further by engaging local communities with a combination of participatory approaches and raising awareness in the wider public to scale-up activities.

The Ecograze project in Australia relied on a simple form of HPG based on rotation and resting. Although the project focused on grassland restoration and preventing overgrazing, it can form the basis for a form of HPG whose focus is to use livestock grazing to prepare the ground for tree and woody shrub seed germination.

\textsuperscript{73}GG, p.102.
Annex 2: Alignment with GEF Objectives

The restoration/rehabilitation activities for degraded forests are closely aligned with the GEF-6 strategy and results framework. The GEF climate change objective 2: CC 2: Demonstrate systemic impacts of mitigation options; Program 4: Promote conservation and enhancement of carbon stocks in forest, and other land use, and support climate smart agriculture focuses on the following approaches and activities, linking closely with the biodiversity and sustainable land management GEF objectives:

- Protect and enhance carbon concentration and CO₂ sequestration in forests and other ecosystems. -> The activities of this concept support this by restoration, enrichment planting and allowing regenerating trees and woody shrubs. To ensure maximum benefit, there are two priorities in this: 1) participation facilitation by the project for public sector and the local people to work together in the land use planning process to ensure SFM (including that existing vegetation that is ecologically or socio-economically significant for communities and the district is mainstreamed in the design without compromising carbon sequestration objectives and national forest policy objectives)

- Activities within and outside of forest and other land use areas to address the identified and prioritized drivers of carbon depletion at the appropriate scale -> the activities focus on degraded forest restoration, agroforestry, as well as shelterbelts in agricultural areas.

- Diversifying livelihoods and building capacity for improved forest restoration, rehabilitation and management. -> Nut and fruit trees diversify livelihoods for farmers. Building capacities of farmer women and men to negotiate village land use planning, especially on mainstreaming aromatic and medicinal plants into forestry activities, and ensuring no conflict between livestock grazing and agro-forestry. Building capacity for foresters for site establishment through on-the-job training on all silvicultural aspects (nursery, mother plantations, soil preparation on site, planting, cutting/grafting (pistachio), pruning, and monitoring.

- Promotion of soil management practices and maintenance of soil quality, and increasing carbon storage in agricultural lands (which may contain forest patches and trees), linking with GEF Land Degradation objectives, such as rehabilitation of degraded areas with agroforestry. -> Shelterbelts ameliorate agricultural and agro-forest soils by reducing wind speeds and hence reducing evapotranspiration.

- Incentivizing land users to undertake emission-reducing measures including training systems to support farmers who engage in new practices -> See point above on diversifying livelihoods.

The GEF objective LD-2 focuses on:

The integration and management of forests in agricultural landscapes by promoting access to innovative financing mechanisms, technology, and best practices combined with on-the-ground application. The LD-2 Program 3 Landscape Management and Restoration focuses on forests and “trees outside forests” in relation to production
landscapes, reinforcing synergy with the SFM/REDD+ incentive mechanism. Specifically:

- Sustainable management of forests and agroforestry for increased ecosystem services (e.g. food resources, reduced land and soil degradation, diversification) in agriculture; -> the fruit and nut trees will bring revenue to farmers upon maturity. Improved capacities of farmers to negotiate with foresters combined with training provided to foresters on new livelihood (such as nut and fruit tree) management and

- Landscape regeneration through use of locally adaptive species, including agroforestry and FMNR; The species in this concept are locally adaptive endemic species; for example the nurseries are designed to be close to the pilot sites; also, relying on baseline research, in more rocky soils more hardy species are used to improve success rates. Furthermore, communities are trained together with FOs on locally adapted silvicultural approaches; both FOs and communities are also trained together in participatory approaches to enable the exchange of local, scientific, and global knowledge.

- SLM approaches to avoid deforestation and forest degradation in production landscapes; including practices for sustainable supply of wood and biomass energy; The concept applies planting and regenerating fuel wood species; shelterbelts to ameliorate agricultural lands (reduce wind speeds and evapotranspiration).

- Good practices in community and smallholder land management, including local knowledge. The concept works will build participation capacities of communities as well as the FOs through training, and will provide incentives to farmers to lease lands for self-management of such lands supported by the FOs.

The GEF SFM 3 objective: Restored Forest Ecosystems: Reverse the loss of ecosystem services within degraded forest landscapes focuses on:

- Restoration of forest landscapes to restore a wide range of ecosystem services, while at the same time ensuring the support of local livelihood opportunities, enhanced climate change resilience, and sustainable development efforts. The activities restore degraded forest landscapes with nut/fruit and renewable energy/construction use trees. The nut and fruit trees diversify and enhance people’s livelihoods, reduce poverty and therefore reliance on public natural resources; areas with important shrubs/plants as local livelihoods are identified and either protected and other areas are identified for nut trees, or the two objectives can be combined with agroforestry.

- Natural regeneration, assisted natural regeneration, and planting of indigenous tree species. The project uses both enrichment planting and ANR, and identifies areas that have potential for NR, when feasible.

The key outcome under this SFM-3 objective is to:

Integrated landscape restoration plans to maintain forest ecosystem services are implemented at appropriate scales by government, private sector and local community actors.

Programs addressing this strategic objective may for example focus on:
- Improved landscape level planning processes to rehabilitate ecosystem services and create livelihood opportunities. -> The training provided to communities and FOs will include improved landscape level planning processes, such as the PNTD approach. Elements in PNTD will enable finding optimal measures so that ecosystem services and livelihood needs are mutually supportive and do not occur at the cost of the other.
- Innovative finance mechanisms for forest restoration such as Payment for Environmental Services (PES). -> Project funds are used to reward participants of trainings by providing them with planting material to "kick-start" forest restoration efforts.
- Capturing potential synergy between reforestation efforts, local community livelihood opportunities, and the restoration of forest ecosystem services. By supporting the development of integrated natural resource management including agroforestry techniques, especially for small-scale land users, a mix of conservation, commercial, and community-focused restoration can be achieved through this programmatic priority. -> The PRA, PNTD, and MA&D approaches that include mainstreaming NR and FMNR with tree-planting are excellent ways of identifying optimal solutions that ensure conservation needs, the need of restoration on commercially important tree crops, and to ensure the focus includes the needs of communities.

Annex 3: Alignment with National Forest Policy

The Uzbekistan national forest policy stipulates the following activities for the restoration, rehabilitation, and planting of forests.

In mountainous areas:
- Restoration and improvement of the conditions of existing sparse forests in mountainous areas through planting, seeding, conducting of measures to promote NR and forest reclamation works; -> This project plants endemic trees and applies NR and FMNR in degraded mountain forest landscapes and participates closely with local communities who can promote their experiences to other interested communities in leasing land.
- Monitoring of soil erosion processes and creation of the system of protective forest plantations through terracing of steep slopes in watershed areas with risks of mudflows; -> the concept applies cost-effective terracing in micro-catchment areas prone to erosion and landslides.
- Restoration and improvement of the condition of natural forests in the mountain zone. The emphasis in the sub-mountain zone is on the establishment of industrial plantations of nut-bearing trees and other species, and regulation of cattle pasturing with involvement of the local population. -> The project restores degraded nut and fruit orchards in mountain zones and improves the condition of these forest landscapes by implementing scientific and locally approvable measures, which include inter alia, pruning, coppicing, grafting, pollination and any other necessary silvicultural approaches.

In the valley zone:
- Expanding the areas of planted fast-growing and nut-bearing species in order to
create plantations for harvesting timber and nut products. The concept applies planting of fast-growing species such as poplar in valleys as well as drought-tolerant nut and fruit agroforestry and orchards. Irrigation is provided in selected areas to support faster growth rates.

**Crosscutting measures:**
- Community outreach and public awareness measures with state, non-governmental, and community stakeholders. This can include also payment for environmental services (PES) to provide incentives to people. The activities include building capacities of men and women farmers to negotiate with foresters and to co-design and manage land use activities. This will also reduce monitoring costs for foresters. PES happens in the form of farmers receiving planting material from the project in return for monitoring not just their own leased areas but also areas managed directly by the FOs against encroachment, fires, erosion by water and wind, mudflows, diseases and pests, etc.
- Engaging local communities to participate in the restoration, rehabilitation and planting work. The concept includes training to communities with FOs to plan land use, restoration and rehabilitation approaches (ratio of NR, FMNR and enrichment planting, species selection) and site maintenance together.
- Mitigating the risk of pests and diseases. The concept applies the use of different varieties of nut trees to reduce reliance on few varieties that may be susceptible to diseases. In addition, to reduce the spread of pests and diseases, the concept applies breaks between plots to form the function of disease prevention. Furthermore, the on-the-job silvicultural management training to foresters (and with participation of community members) will facilitate pest and disease control, including grafting, cutting and pruning techniques, pollination, male/female ratio regulation of pistachios, and other management systems that reduce stress and susceptibility for diseases and pests.
Annex 4: Implementation activity template of strategic rehabilitation plan

<table>
<thead>
<tr>
<th>Project Structure</th>
<th>Activity</th>
<th>With Project Scenario</th>
<th>BAU Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome 2:</strong> SFM operationalized at 4 demonstration sites generating sustainable benefits such as carbon sequestration and improved livelihoods of at least 500 local households</td>
<td><strong>Output 2.1:</strong> Sustainable management of mountain forests and improving the livelihoods of at least 100 farmers/households in Dehkanabad forestry organization</td>
<td>Pistachio Tree plantation</td>
<td>510 ha of grassland converted into pistachio tree plantations capturing could sequester 2,966 tCO2eq per year. 59,334 tCO2eq sequestered for the entire duration of the project.</td>
</tr>
<tr>
<td><strong>Forest restoration – Juniper</strong></td>
<td>The afforestation of 1,000 ha of Juniper forest could capture 42,558 tCO2eq per year. 851,154 tCO2eq sequestered for the entire duration of the project.</td>
<td>No afforestation.</td>
<td></td>
</tr>
<tr>
<td><strong>Firewood Plantation</strong></td>
<td>20 ha of firewood plantations could capture 480.9 tCO2eq per year. 9,618 tCO2eq sequestered for the entire duration.</td>
<td>Assumption that 8.7 hectares of firewood will be planted.</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Sustainable management activities in Dehkanabad FO concerning 36,530 ha could sequester - 91,961.2 tons of CO2eq per year. For the entire duration of the project: - 1,839,224 tons of CO2eq is captured.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Output 2.2:</strong> Sustainable management of</td>
<td><strong>Forest management</strong></td>
<td>5,000 ha of forest land for which the</td>
<td>5,000 ha of Juniper forest, which</td>
</tr>
</tbody>
</table>
mountain forests and improving the livelihoods of at least 200 farmers/households in Kitab forestry organization.

degradation level will be reduced from 40 \% (moderate) to 35 \% (low) capturing 5 569 tons of CO$_2$-eq per year.
111 381 tCO$_2$eq sequestered for the entire duration of the project.

| Pistachio Tree plantation | 1 000 ha of grassland converted into pistachio tree plantations could sequester 5 817 tCO$_2$eq per year.
116 341 tCO$_2$eq sequestered for the entire duration of the project. | Assumption that 130 hectares of pistachio tree plantations will be planted. |

| Firewood Plantation | 200 ha of firewood plantations could capture 4 809 tCO$_2$eq per year.
96 180 tCO$_2$eq sequestered for the entire duration. | Assumption that 87 hectares of firewood will be planted. |

| Total | Sustainable management activities in Kitab FO concerning 16 200 hectares could sequester 31 434.8 tons of CO$_2$-eq per year. For the entire duration of the project 628 695 tons of CO$_2$eq is captured. | |

Output 2.3: Sustainable management of valley forests and

<p>| Shrubs Plantation | 20 ha of shrubs planted on grassland could capture 360.85 tCO$_2$eq. | No shrubs plantations. |</p>
<table>
<thead>
<tr>
<th>Project Area</th>
<th>Activity Description</th>
<th>Land Area</th>
<th>CO₂eq Sequestration</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sirdaryo Forestry</td>
<td>Creation of Shelterbelts</td>
<td>2225 ha</td>
<td>37,891 tons CO₂eq per year</td>
<td>125 ha of shelterbelts would be created without the project.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>757,826 tCO₂eq captured for the entire duration of the project.</td>
<td></td>
</tr>
<tr>
<td>Sirdaryo FO</td>
<td>Total Sustainable management activities</td>
<td>2,995 ha</td>
<td>39,395.1 tonnes CO₂eq per year</td>
<td>787,902 tons of CO₂eq is captured.</td>
</tr>
<tr>
<td>Sirdaryo FO</td>
<td>Forest management</td>
<td>5,000 ha</td>
<td>5,569 tons CO₂eq per year</td>
<td>5,000 ha which would stay moderately degraded</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>111,381 tCO₂eq sequestered for the entire duration of the project.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plantation of pistachio/almond tree crops</td>
<td>400 ha</td>
<td>2,326.8 tCO₂eq per year.</td>
<td>Assumption that 52 hectares of pistachio tree plantations will be planted</td>
</tr>
</tbody>
</table>

**Output 2.4:** Sustainable forestry management and improving the livelihoods of at least 100 farmers/households in the Ferghana Valley, Pop Forestry Organization.
Annex 5: Timeline

2019:

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training on forest restoration/regeneration concept/strategic rehabilitation plan to FOs, selected community members, SCF, etc. in Tashkent. Training on participation approaches; selection of elements from FAO toolboxes and best practices.</td>
<td></td>
<td>Planting/restoration/regeneration for establishment of pilot sites Training/technical support for FOs and communities on site establishment: nurseries, mother plantations, fruit/nut tree demonstration sites, agroforestry, shelterbelts, juniper terracing (focus on nurseries, planting/grafting, FMNR)</td>
<td></td>
</tr>
<tr>
<td>Technical support on nut and fruit tree</td>
<td>Technical support on nut and fruit tree</td>
<td></td>
<td>Procurement of irrigation systems, cars, trailers, small inventory, other.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Training in Pop with FOs and communities on community engagement on NWFP</td>
</tr>
</tbody>
</table>

46,536 tCO$_2$eq sequestered for the entire duration of the project.

Firewood Plantation

10 ha of grassland converted into firewood plantations could sequester 242.6 tons of CO$_2$eq per year.

4,852 tCO$_2$eq sequestered for the entire duration of the project.

Assumption that 4.3 hectares of firewood will be planted.

Total

Sustainable management 9,618 activities in POP FO on 29,010 ha could sequester 43,230.3 tons of CO$_2$eq per year.

For the entire duration of the project, 864,606 tons of CO$_2$eq is captured.
<p>| sites establishment, mother plantations. | sites, mother plantations. | livelihoods; workshop to identify upscaling into other areas that have livelihoods on NWFPs. |</p>
<table>
<thead>
<tr>
<th>Co-financing activities start</th>
<th>Procurement of green houses, tractors, green houses, etc.</th>
<th>Study Tour (Turkey)</th>
<th>Screening of villages to identify PES recipients/preliminary PES options selection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-financing activities start</td>
<td>Procurement of planting material.</td>
<td>Procurement for Kitab Regional Training Center (VCD etc.).</td>
<td></td>
</tr>
</tbody>
</table>

2020:

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone barriers and trenches constructed</td>
<td>Beehives procurement and training</td>
<td>Training/technical support on maintenance and site establishment, participation continued. There can be less focus on the participation aspect when co-working and monitoring so suggest.</td>
<td>Mid-Term Review (in 2021 with no-cost extension)</td>
</tr>
<tr>
<td>Soil preparation and planting.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terraces construction</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Procurement of planting material
- Planting/restoration/regeneration for establishment of pilot sites.
- Training on FMNR/ANR, PRA etc. + gender mainstreaming and other participatory tools
- Training/technical support on maintenance and site establishment, PRA for PES
- Training/technical support for FOS and communities on site establishment: fruit/nut tree demonstration sites, agroforestry, shelterbelts, juniper terracing in-situ at sites (focus on nurseries, planting/grafting, ANR/FMNR)
- Plating/restoration/regeneration for establishment of pilot sites.
- Finalize selection of PES options
- Procurement of planting material
- Continue and upscale planting of leased lands by farmers and leshoe co-financing sites.
- Training on PRA etc. + gender mainstreaming and other participatory tools
- Potential trouble-shooting missions as technical support based on success monitoring.
- Procurement of seedlings for autumn restoration and planting.
- Continue and upscale planting of leased lands by farmers and leshoe co-financing sites.
- Training/technical support on maintenance and site establishment + PES and PRA/MA&D/PNT D.
- Continue and upscale planting of leased lands by farmers and leshoe co-financing sites.
<table>
<thead>
<tr>
<th>Advocacy and communication for farmers and FOs on land leases, selection of further farmers to be provided with in-kind seedlings for leased lands.</th>
<th>Training/technical support on maintenance and site establishment, participation continued.</th>
<th>Evaluation of success based on monitoring; revision of strategies on approaches when needed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success monitoring.</td>
<td>Success monitoring.</td>
<td>Success monitoring.</td>
</tr>
</tbody>
</table>

### 2021:

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training/technical support on maintenance and site establishment, success monitoring (including participatory and gender mainstreaming).</td>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
</tr>
<tr>
<td>Continue and upscale planting of leased lands by farmers and leshoze cofinancing sites.</td>
<td>Continue and upscale planting of leased lands by farmers and leshoze cofinancing sites.</td>
<td>Continue and upscale planting of leased lands by farmers and leshoze cofinancing sites.</td>
<td>Continue and upscale planting of leased lands by farmers and leshoze cofinancing sites.</td>
</tr>
</tbody>
</table>

### 2022:

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
</tr>
<tr>
<td><strong>Village interviews to assess success of participation, gender-based livelihoods and gender mainstreaming in training, selection of (PES and other) approaches to upscale; outreach to private sector etc.</strong></td>
<td><strong>Success monitoring (GIS and ground-truthing).</strong></td>
<td><strong>Success monitoring (GIS and ground-truthing).</strong></td>
<td><strong>Success monitoring (GIS and ground-truthing).</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Success monitoring (GIS and ground-truthing).</strong></td>
<td><strong>Village interviews to assess success of participation, selection of approaches to upscale.</strong></td>
<td><strong>Success monitoring Monitoring/implementation of approaches to upscale (PES, awareness, etc.).</strong></td>
<td><strong>Success monitoring Monitoring/implementation of approaches to upscale (PES, awareness, etc.).</strong></td>
</tr>
<tr>
<td><strong>Procurement of seedlings for spring planting/restoration.</strong></td>
<td><strong>Procurement of seedlings for autumn planting/restoration.</strong></td>
<td><strong>Procurement of seedlings for autumn planting/restoration.</strong></td>
<td><strong>Procurement of seedlings for autumn planting/restoration.</strong></td>
</tr>
<tr>
<td></td>
<td>Continue and upscale planting of leased lands by farmers and leshoze co-financing sites.</td>
<td></td>
<td>Continue and upscale planting of leased lands by farmers and leshoze co-financing sites.</td>
</tr>
</tbody>
</table>

**2023:**

<table>
<thead>
<tr>
<th><strong>Q1</strong></th>
<th><strong>Q2</strong></th>
<th><strong>Q3</strong></th>
<th><strong>Q4</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
<td>Training/technical support on maintenance and site establishment, success monitoring.</td>
<td>Final Evaluation(^74)</td>
</tr>
<tr>
<td>Success monitoring (GIS and ground-truthing).</td>
<td>Success monitoring (GIS and ground-truthing).</td>
<td>Success monitoring (GIS and ground-truthing).</td>
<td>Success monitoring (GIS and ground-truthing)&gt;</td>
</tr>
<tr>
<td>Procurement of seedlings for spring planting/restoration.</td>
<td>Continue and upscale planting of leased lands by farmers and leshoze co-financing sites.</td>
<td>Continue and upscale planting of leased lands by farmers and leshoze co-financing sites.</td>
<td>Continue and upscale planting of leased lands by farmers and leshoze co-financing sites&gt;</td>
</tr>
</tbody>
</table>

\(^{74}\) Pending on (expected) no-cost extension. Otherwise in Q1/2023.
Annex 6: Monitoring Plan

Sirdaryo:

<table>
<thead>
<tr>
<th>MONITORING SUBJECT</th>
<th>Indicator</th>
<th>Baseline value (to be identified at first monitoring cycle)</th>
<th>Target\textsuperscript{75}</th>
<th>Means of Measurements</th>
<th>Monitoring Date/Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground situation and Ground vegetation (Planted and naturally regenerated trees combined)</td>
<td>Bare land amount (ha)</td>
<td>Ha</td>
<td>75</td>
<td>Monitoring with drone, Google Earth Images, Field measurements with GPS, In-situ control with clip Plots,</td>
<td>Every sixth months starting from May 2020</td>
</tr>
<tr>
<td></td>
<td>% age of plants coverage</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support climate change adaptation</td>
<td>Number of tree species capable to thrive in hot conditions</td>
<td>#</td>
<td></td>
<td>List of species</td>
<td>Every year in June</td>
</tr>
<tr>
<td>Number of seeds and saplings planted specified in their technical specifications,</td>
<td>Number of plants including Populus spp, Ulmus pumila, Pistacia vera, Amygdalus spp., Fraxinus sogdiana, Salix australior, Salix songarica, Elaeagnus angustifolia, etc.</td>
<td>#</td>
<td></td>
<td>Count total number of plants</td>
<td>May 2020 and every 6 months</td>
</tr>
<tr>
<td>Fuelwood plantations</td>
<td>10 ha</td>
<td>Count total number of plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survival rate of planted saplings</td>
<td>Change in number of plants</td>
<td>%</td>
<td></td>
<td>Field measurement for survival rate and change in number of plants</td>
<td>May 2020 Nov 2021 May 2022</td>
</tr>
<tr>
<td></td>
<td>#</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{75} Further target values will be added in the course of the project, mainly after data for the first monitoring cycle are available.
<table>
<thead>
<tr>
<th>Study variable</th>
<th>Evaluationparameter</th>
<th>Unit</th>
<th>Field measurement</th>
<th>Monitoring frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germination rate</td>
<td>% of germination rate</td>
<td>%</td>
<td>First year: (15-20%) germination rate</td>
<td>May 2020, May 2021</td>
</tr>
<tr>
<td></td>
<td>% of germination rate</td>
<td>%</td>
<td>Second year: (50-60%) germination rate</td>
<td></td>
</tr>
<tr>
<td>Shelterbelts for agricultural and orchard protection. firewood source</td>
<td>Length of shelterbelts</td>
<td>km</td>
<td>Field measurement</td>
<td>May 2020 and every 6 months</td>
</tr>
<tr>
<td>Number of livestock</td>
<td># of livestock in fenced areas</td>
<td>#</td>
<td>Count livestock feces inside fenced area</td>
<td>May 2020 and every 6 months</td>
</tr>
<tr>
<td>Water quantity in water harvesting area</td>
<td></td>
<td></td>
<td>In-situ control</td>
<td>Every year in May</td>
</tr>
<tr>
<td>Drip irrigation area</td>
<td>Area size</td>
<td>Ha</td>
<td>Monitoring with drone, Field measurements with GPS</td>
<td>May 2018, 2019</td>
</tr>
<tr>
<td>Assisted natural regeneration</td>
<td>Regeneration rate of natural seedlings</td>
<td>%</td>
<td>In-situ control</td>
<td></td>
</tr>
<tr>
<td>Number of local households employed in rehabilitation/planting activities</td>
<td># of people</td>
<td>#</td>
<td>Participant list Calculate total households and % of households benefit from demo sites</td>
<td>April and May 2020, April and May 2021</td>
</tr>
<tr>
<td></td>
<td>% of households benefit from demo sites</td>
<td>%</td>
<td>Money provided to local people</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of income increase</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of participants are women</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support honey production</td>
<td>Number of beehives</td>
<td>#</td>
<td>Count number of beehives</td>
<td>Every year in September</td>
</tr>
<tr>
<td>Baseline annual income</td>
<td>Monetary amount</td>
<td>USD</td>
<td>Income</td>
<td>Every year in September</td>
</tr>
<tr>
<td>Share of income based on honey produced in the demo sites</td>
<td>% of income increase</td>
<td>%</td>
<td>Monetary value of new income</td>
<td>Every year in September</td>
</tr>
<tr>
<td>Soil Quality</td>
<td>Macronutrient amount: Calcium (Ca), Calcium Oxide (CaO), Phosphorous (P), Potassium (K), Magnesium (Mg), Nitrogen (N), Sulphur (S);</td>
<td>3 soil samples will be collected in demo sites. Conduct laboratory analyses of soil samples</td>
<td>Every year in June</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
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<td>---</td>
<td></td>
</tr>
<tr>
<td>Soil Organic Carbon</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>3 soil samples will be collected in demo sites. Conduct laboratory analyses of soil samples</td>
<td>Every 5 years in June</td>
</tr>
<tr>
<td>Monitoring of Aboveground and Belowground Biomass Carbon Pool</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>Calculate biomass of live trees, shrubs and other herbaceous plants. Belowground biomass is calculated with root to shoot ratio (R) provided by IPCC 2006 Guidelines for National GHG Inventories.</td>
<td>Every 5 years in June</td>
</tr>
<tr>
<td>Monitoring of Litter Carbon Pool</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>Collect litter, dead leaves and dead twigs on the soil surface that has a diameter between 2mm and 10cm with 1m² clip plots. Take a sub-sample to the laboratory and dry the sub-sample. Use carbon fraction coefficient (0.37) for carbon content. Details in Carbon Flow Monitoring Protocol prepared by Çağlar Başsüllü.</td>
<td>Every 5 years in June</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>MONITORING SUBJECT</th>
<th>Indicator</th>
<th>Baseline value (to be identified at first monitoring cycle)</th>
<th>Target76</th>
<th>Means of Measurements</th>
<th>Monitoring Date/Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground situation and Ground vegetation (Planted and naturally regenerated trees combined)</td>
<td>Bare land amount (ha)</td>
<td>Ha</td>
<td></td>
<td>Monitoring with drone, Google Earth Images, Field measurements with GPS, In-situ control with clip Plots,</td>
<td>Every sixth months starting from May 2020</td>
</tr>
<tr>
<td>Support climate change adaptation</td>
<td>Number of tree species capable to thrive in hot conditions</td>
<td>#</td>
<td></td>
<td>List of species</td>
<td>Every year in June</td>
</tr>
<tr>
<td>Number of seeds and saplings planted specified in their technical specifications,</td>
<td>Number of plants including P. vera, E. angustifolia, Crataegus spp., Juniperus spp., Rosa canina, Ulmus pumila, F. sogdiana, etc.</td>
<td>Count total number of plants</td>
<td></td>
<td>May 2020 and every 6 months</td>
<td></td>
</tr>
<tr>
<td>Survival rate of planted saplings</td>
<td>Change in number of plants</td>
<td>%</td>
<td>First month: Survival rate more than % 90&lt;br&gt;Sixth month: Survival rate more than % 80&lt;br&gt;First year: Survival</td>
<td>Field measurement for survival rate and change in number of plants</td>
<td>May 2020&lt;br&gt;Nov 2021&lt;br&gt;May 2022</td>
</tr>
</tbody>
</table>

76 Further target values will be added in the course of the project, mainly after data for the first monitoring cycle are available.
<table>
<thead>
<tr>
<th>Description</th>
<th>Count Method/Measurement</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terraces</td>
<td>Number of terraces</td>
<td></td>
</tr>
<tr>
<td>Live fencing</td>
<td>Length of live fences</td>
<td></td>
</tr>
<tr>
<td>Stone barriers</td>
<td>Stone barriers length, meters</td>
<td>Direct measurement for length of barriers</td>
</tr>
<tr>
<td>Number of livestock</td>
<td>Number of livestock in fenced area, #</td>
<td>Count livestock feaces inside fenced area</td>
</tr>
<tr>
<td>Damage to barriers and trenches</td>
<td>Holes, landslides, etc., #</td>
<td>In-situ control</td>
</tr>
<tr>
<td>Water quantity in water tanks</td>
<td></td>
<td>In-situ control</td>
</tr>
<tr>
<td>Assisted natural regeneration/farmer managed natural regeneration.</td>
<td>Area size, Regeneration rate of natural seedlings, Ha, %</td>
<td>Monitoring with drone,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Field measurements with GPS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-situ control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Count number of plants</td>
</tr>
<tr>
<td>Participation/Number of local people employed in rehabilitation activities.</td>
<td># of people, % of households benefit from demo sites, % of income increase, % of households with women participants/female-led households</td>
<td>Participant list</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Calculate total households and % of households benefit from demo sites</td>
</tr>
<tr>
<td>Number of farmers to receive planting material</td>
<td># of people, % of households benefit from demo sites, % of income increase, % of households with women participants/female-led households</td>
<td>Amount of planting material provided to local people (gender-disaggregated)</td>
</tr>
</tbody>
</table>

**Notes:**
- **Terraces:** Number of terraces
- **Live fencing:** Length of live fences
- **Stone barriers:** Stone barriers length in meters, Direct measurement for length of barriers, January 2020 and every 6 months
- **Number of livestock:** Number of livestock in fenced area, #, 0, Count livestock feaces inside fenced area, May 2020 and every 6 months
- **Damage to barriers and trenches:** Holes, landslides, etc., #, 0, In-situ control, May 2020 and every 6 months
- **Water quantity in water tanks:** In-situ control, Every year in May
- **Assisted natural regeneration/farmer managed natural regeneration:** Area size, Regeneration rate of natural seedlings, Ha, %, Monitoring with drone, Field measurements with GPS, In-situ control, Count number of plants, May 2020, 2021
- **Participation/Number of local people employed in rehabilitation activities:** # of people, % of households benefit from demo sites, % of income increase, % of households with women participants/female-led households, Participant list, Calculate total households and % of households benefit from demo sites, April and May 2020 and 2021
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<thead>
<tr>
<th>Area under agroforestry including mainstreaming medicinal plants and annual crops in agroforestry approaches, +amount of N-fixing trees per ha.</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Area under drip irrigation</td>
<td>Area size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support honey production</td>
<td>Number of beehives</td>
<td>#</td>
<td>35</td>
</tr>
<tr>
<td>Baseline annual income</td>
<td>Monetary amount</td>
<td>USD</td>
<td>Income</td>
</tr>
<tr>
<td>Share of income based on honey, ferula, and medicinal plants produced in the demo sites</td>
<td>%age of income increase</td>
<td>%</td>
<td>Monetary value of new income</td>
</tr>
<tr>
<td>Soil Quality</td>
<td>Macronutrient amount: Calcium (Ca), Calcium Oxide (CaO), Phosphorous (P), Potassium (K), Magnesium (Mg), Nitrogen (N), Sulphur (S);</td>
<td>%</td>
<td>3 soil samples will be collected in demo sites. Conduct laboratory analyses of soil samples.</td>
</tr>
<tr>
<td>Soil Organic Carbon</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>3 soil samples will be collected in demo sites. Conduct laboratory analyses of soil samples</td>
</tr>
<tr>
<td>Monitoring of Aboveground and Belowground Biomass Carbon Pool</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>Calculate biomass of live trees, shrubs and other herbaceous plants. Belowground biomass is calculated with root to shoot ratio (R) provided by IPCC 2006 Guidelines for</td>
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<td></td>
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<tr>
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</tr>
<tr>
<td>Monitoring of Deadwood Carbon Pool</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>National GHG Inventories. Details in Carbon Flow Monitoring Protocol prepared by Çağlar Başşıllü</td>
</tr>
<tr>
<td>-----------------------------------</td>
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<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Monitoring of Litter Carbon Pool</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>Collect litter, dead leaves and dead twigs on the soil surface that has a diameter between 2mm and 10cm with 1m² clip plots. Take a sub-sample to the laboratory and dry the sub-sample Use carbon fraction coefficient (0.37) for carbon content Details in Carbon Flow Monitoring Protocol prepared by Çağlar Başşıllü</td>
</tr>
</tbody>
</table>

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<th>MONITORING SUBJECT</th>
<th>Indicator</th>
<th>Baseline value (to be identified at first monitoring cycle)</th>
<th>Target77</th>
<th>Means of Measurements</th>
<th>Monitoring Date/Frequency</th>
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</thead>
</table>

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<thead>
<tr>
<th>Ground situation and Ground vegetation (Planted and naturally regenerated trees combined)</th>
<th>Bare land amount (ha)</th>
<th>Ha</th>
<th>%</th>
<th>Monitoring with drone, Google Earth Images, Field measurements with GPS, In-situ control with clip Plots,</th>
<th>Every sixth months starting from May 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support climate change adaptation</td>
<td>Number of tree species capable to thrive in hot conditions</td>
<td>#</td>
<td></td>
<td>List of species</td>
<td>Every year in June</td>
</tr>
<tr>
<td>Number of seeds and saplings planted specified in their technical specifications,</td>
<td>Number of plants including <em>Pyrus elaegrifolia</em>, <em>Elaegnus angustifolia</em>, <em>Fraxinus excelsior</em>, <em>Crataegus monogyna</em>, <em>Prunus amygdalus</em>, <em>Hipophae rhamnoides</em>, <em>Rosa canina</em></td>
<td>%</td>
<td></td>
<td>Count total number of plants</td>
<td>May 2020 and every 6 months</td>
</tr>
<tr>
<td>Survival rate of planted saplings</td>
<td>(Pyrus elaegrifolia, Elaeagnus angustifolia, Fraxinus excelsior, Crataegus monogyna, Prunus amygdalus, Hipophae rhamnoides, Rosa canina)</td>
<td>%</td>
<td>First month: Survival rate more than % 90 Sixth month: Survival rate more than % 80 First year: Survival rate more than % 80</td>
<td>Field measurement for survival rate and change in number of plants</td>
<td>May 2020 Nov 2021 May 2022</td>
</tr>
<tr>
<td>Germination rate</td>
<td>%age of germination rate of <em>J. serafshanica</em> in seedling areas</td>
<td>%</td>
<td>First year: 15-20% germination rate Second year: (50-60% germination rate</td>
<td>Field measurement</td>
<td>May 2020 May 2021</td>
</tr>
<tr>
<td></td>
<td>%age of germination rate for of <em>Crataegus</em> seeds in seedling areas</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>%age of <em>J. serafshanica</em> coverage</td>
<td>Area coverage</td>
<td>%</td>
<td>Field measurement</td>
<td>May 2020 May 2021</td>
</tr>
<tr>
<td></td>
<td>%age of <em>Crataegus</em> coverage</td>
<td>Area coverage</td>
<td>%</td>
<td>Field measurement</td>
<td>May 2020 May 2021</td>
</tr>
<tr>
<td>Terraces</td>
<td>Number of terraces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live fencing</td>
<td>Length of live fences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stone barriers</strong></td>
<td><strong>Stone barriers length</strong></td>
<td><strong>meters</strong></td>
<td><strong>Direct measurement for length of barriers</strong></td>
<td><strong>January 2020 and every 6 months</strong></td>
<td></td>
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<td>---------------------------------------------</td>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Number of livestock</strong></td>
<td><strong>Number of livestock in fenced area</strong></td>
<td>#</td>
<td>0</td>
<td>Count livestock feaces inside fenced area</td>
<td>May 2020 and every 6 months</td>
</tr>
<tr>
<td><strong>Water quantity</strong></td>
<td><strong>Water quantity in irrigation tanks</strong></td>
<td></td>
<td></td>
<td>In-situ control</td>
<td>Every year in May</td>
</tr>
<tr>
<td><strong>Assisted natural regeneration</strong></td>
<td><strong>Area size</strong></td>
<td>Ha</td>
<td></td>
<td>Monitoring with drone, Field measurements with GPS In-situ control Count number of plants</td>
<td>May 2020, 2021</td>
</tr>
<tr>
<td><strong>Number of local people employed in rehabilitation activities</strong></td>
<td># of people</td>
<td></td>
<td>%</td>
<td>Participant list Calculate total households and % of households benefit from demo sites Money provided to local people</td>
<td>April and May 2020 April and May 2021</td>
</tr>
<tr>
<td><strong>Number of farmers to receive planting material</strong></td>
<td># of people</td>
<td></td>
<td>%</td>
<td>Amount of planting material provided to local people (gender-disaggregated)</td>
<td></td>
</tr>
<tr>
<td><strong>Soil Quality</strong></td>
<td>Macronutrient amount: Calcium (Ca), Calcium Oxide (CaO), Phosphorous (P), Potassium (K), Magnesium (Mg), Nitrogen (N), Sulphur (S);</td>
<td>%</td>
<td></td>
<td>3 soil samples will be collected in demo sites. Conduct laboratory analyses of soil samples</td>
<td>Every 5 years in June</td>
</tr>
<tr>
<td><strong>Soil Organic Carbon</strong></td>
<td>Carbon content</td>
<td>%, t/ha</td>
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<td>3 soil samples will be collected in demo sites. Conduct laboratory analyses of soil samples</td>
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</tr>
<tr>
<td><strong>Monitoring of Aboveground and</strong></td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td></td>
<td>Calculate biomass of live</td>
<td>Every 5 years in June</td>
</tr>
<tr>
<td>Activity</td>
<td>Parameter</td>
<td>Unit</td>
<td>Details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belowground Biomass Carbon Pool</td>
<td></td>
<td></td>
<td><strong>Trees, shrubs and other herbaceous plants.</strong> Belowground biomass is calculated with root to shoot ratio (R) provided by IPCC 2006 Guidelines for National GHG Inventories. Details in Carbon Flow Monitoring Protocol prepared by Çağlar Başsüllü.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring of Deadwood Carbon Pool</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>Measure non-living woody biomass ≥10cm diameter. Details in Carbon Flow Monitoring Protocol prepared by Çağlar Başsüllü. Every 5 years in June.</td>
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</tr>
<tr>
<td>Monitoring of Litter Carbon Pool</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>Collect litter, dead leaves and dead twigs on the soil surface that has a diameter between 2mm and 10cm with 1m² clip plots. Take a sub-sample to the laboratory and dry the sub-sample. Use carbon fraction coefficient (0.37) for carbon content. Details in Carbon Flow Monitoring Protocol prepared by Çağlar Başsüllü. Every 5 years in June.</td>
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<tr>
<td>Share of income based on honey, ferula, and medicinal plants</td>
<td>%age of income increase</td>
<td>%</td>
<td>Monetary value of new income. Every year in September.</td>
<td></td>
<td></td>
</tr>
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</table>
produced in the demo sites

<table>
<thead>
<tr>
<th><strong>Agroforestry</strong></th>
<th>Area under agroforestry including mainstreaming of Ferula and other medicinal plants in agroforestry approaches</th>
</tr>
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<tbody>
<tr>
<td><strong>Damage to barriers and trenches</strong></td>
<td>Holes, landslides, etc.</td>
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</tr>
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<td>Number of plants including J. serefshanica, P. vera, Crataegus, R. canina, Salix spp, Populus spp, Ulmus pumila, Fraxinus sogdiana Pyrus elaegrifolia, Eiaegnus angustifolia, Hippophae rhamnoides, Prunus amygdalus, Atriplex, Kochia, etc.</td>
<td></td>
<td>Count total number of plants</td>
<td>May 2020 and every 6 months</td>
<td></td>
</tr>
<tr>
<td>Survival rate of planted saplings</td>
<td>Change in number of plants</td>
<td>%</td>
<td>First month: Survival</td>
<td>Field measurement for survival rate and</td>
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<td>Number of farmers to receive planting material</td>
<td># of people</td>
<td>%</td>
<td>% of households with women participants/female-led households</td>
<td>Amount of planting material provided to local people (gender disaggregated)</td>
<td>Summer 2020</td>
</tr>
<tr>
<td>Damage to stone barriers and trenches</td>
<td>Holes, landslides, etc.</td>
<td>#</td>
<td>0</td>
<td>In-situ control</td>
<td>March 2020 And every 6 months</td>
</tr>
<tr>
<td>Soil Quality</td>
<td>Macronutrient amount: Calcium (Ca), Calcium Oxide (CaO), Phosphorous (P), Potassium (K), Magnesium (Mg), Nitrogen (N), Sulphur (S);</td>
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<td>Carbon content</td>
<td>%, t/ha</td>
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<td>Monitoring of Deadwood Carbon Pool</td>
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<td>%, t/ha</td>
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<tr>
<td>Monitoring of Litter Carbon Pool</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>Collect litter, dead leaves and dead twigs on the soil surface that has a diameter between 2mm and 10cm with 1m² clip plots. Take a sub-sample to the laboratory and dry the sub-sample. Use carbon fraction coefficient (0.37) for carbon content. (Details in Carbon Flow Monitoring Protocol prepared by Çağlar Başsüllü?)</td>
<td>Every 5 years in June</td>
<td></td>
</tr>
<tr>
<td>Soil Organic Carbon</td>
<td>Carbon content</td>
<td>%, t/ha</td>
<td>3 soil samples will be collected in demo sites. Conduct laboratory analyses of soil samples.</td>
<td>Every 5 years in June</td>
<td></td>
</tr>
</tbody>
</table>