STORIES OF SUCCESS

Strengthening and scaling up integrated natural resource management in the Middle East and North Africa

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Strengthening and scaling up Integrated Natural Resource Management across MENA

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Greening of the Badia: using the Vallerani water harvesting system to help grow forage crops and rehabilitate rangelands in arid areas. This system was transferred from Morocco to Jordan as part of the project.
Photo: Nawras Media

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Cover photos (from top): Mr Hugo Remaury, ICARDA; Nawras Media; Mr Hugo Remaury, ICARDA.

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Community rehabilitation of rangelands in the arid and semi-arid high plateau ecosystem of eastern Morocco.
Photo: Mr Hugo Remaury, ICARDA

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Land, water, and natural resources degradation, which are quite often coupled with rural poverty, jeopardize sustainable development in the Middle East and North Africa (MENA). In these drylands, uncoordinated interventions and investments are fueled by harsh agroecological conditions, institutional constraints, and limited access to natural resources. Most fundamentally, these sparsely populated areas have always lacked an adequate flow of technical and market information.

Several environmental initiatives exist at the national and regional levels to tackle these issues. However, these are often stand-alone projects not aligned with the broader planning and development sectors. Further, project leaders and participants often fail to capture and share knowledge – another barrier to the transition from localized to system-wide operations.

The Middle East and North Africa Regional Program for Promoting Integrated Sustainable Land Development (MENARID) program is an initiative of the Global Environmental Facility (GEF) that catalyzes coherent strategies for managing and restoring degraded ecosystems across the MENA region, while supporting rural development. It brings together a range of integrated environment and development projects in six countries – Algeria, Iran, Jordan, Morocco, Tunisia, and Yemen. These projects address critical challenges faced in the MENA region, namely land degradation, biodiversity losses, water depletion, and climate change.

Each MENARID national project offers a wealth of practical examples that have locally demonstrated the potential for increasing farm productivity, shielding from climate change uncertainties, and improving livelihoods and overall food security for rural communities. Many of these approaches have the potential for scaling up to benefit larger swathes of population in these countries and those living in similar agroecosystems across the world.

One International Center for Agricultural Research in the Dry Areas (ICARDA)-led MENARID initiative has attempted to mine the rich but hidden knowledge in these national rural development projects. Through capacity building, the initiative has enabled project leaders to analyze their natural resource management projects, and capture and synthesize information in a manner that is ready for wider dissemination and application. The process has been documented in ICARDA Working Paper 18.

This document disseminates 19 success stories from MENARID's network and partners. The stories highlight activities sustaining the use of natural resources, improving the livelihoods of rural communities, and that have high potential for scaling up in other locations and for tackling resource degradation. Inspired by work carried out jointly between the International Fund for Agricultural Development (IFAD), ICARDA, and GEF, this endeavor adds value to field work by capturing and disseminating knowledge that promotes, targets, and optimizes public investments in integrated natural resource management in dry areas.

STORIES OF SUCCESS

Helping farmers make better decisions to improve management of their natural resources

Participatory mapping using geographic information systems (GIS) can be used as a tool to help communities plan for better management of natural resources. In the village of Kamkueyeh, in Iran's Yazd Province, land tenure is very low (less than 0.5 hectares per farmer), and so careful planning in the use of land, water, and other resources is needed.

A GIS mapping exercise carried out by MENARID covered an area of 32 hectares in Kamkueyeh, which included 359 parcels of land belonging to about 70 farmers. The mapping enabled farmers to work out the location and size of their parcels of land, and to identify and prioritize the main problems the community was facing.

Mapping natural resource distribution in Iran.
Photo: MENARID Iran team

Integrating indigenous knowledge with new technologies

The mapping captured indigenous knowledge, by identifying bordering parcels of land that could be shared between neighboring farmers. The new mapping techniques also helped to identify the most effective locations to build water stream channels, thereby benefitting the maximum number of farmers with more efficient irrigation systems.

As a result of the mapping exercise, patterns of cultivation within the community have improved – water is now allocated in a more organized way, based on parcel size and crop requirements. The community is therefore able to plan for improved irrigation and household water consumption.

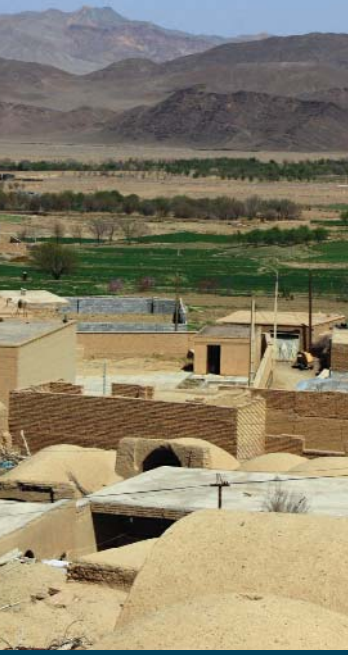
Helping to identify and solve disputes over land ownership

For many years, the village had experienced disputes with the government over ownership of certain parcels of land: the government claimed the areas were state-owned, whereas farmers claimed they had owned these lands for many years. The maps drawn up by the community helped to convince government and community officials that the boundaries as set were the correct ones. The participatory mapping tool also helped to raise support from non-government organizations and government authorities as it made sure that problems identified by the community were clearly presented and prioritized.

Photo: MENARID Iran team

Participatory mapping using geographic information systems (GIS) has the potential to help farming communities better manage natural resources worldwide.

Photo: Mr Hugo Remaury, ICARDA



This project has the potential to be replicated in any community wishing to reduce energy costs and dependence on fossil fuel. It is especially suited to communities in remote locations. In Iran, at least 600 sites are potential candidates for the initiative.

Solar water heating benefits remote villages while reducing emissions

In the remote, cold villages of Iran's Yazd Province, residents have been forced to use gas from portable cylinders and firewood to heat water. The gas, and the transportation of the cylinders, is expensive – costing about US$ 100 per month – and the use of these fossil fuels causes environmental damage through emissions and destruction of forests for firewood.

A pilot MENARID project in the village of Asfij has employed solar panels to provide inexpensive and sustainable hot water to households while reducing the need for carbon-emitting gas systems.

Solar water heaters can target 600 sites in Iran. Photo: MENARID Iran team

Multiple benefits

The project demonstrates the potential for clean, cheap energy from solar panels to benefit poor remote communities while meeting sustainability needs and carbon reduction schedules.

By reducing the villagers' reliance on fossil fuels, the project has also raised awareness of environmental issues. An extra benefit has been the reduction of traffic transporting gas cylinders to the village as well as a welcome lifting of the burden on young and elderly residents who often have to carry the heavy containers.

Cost-effective

The project team commissioned a private company to install 24 solar panels in individual households and trained two community members to repair and maintain the panels. Supplying and installing a solar panel, which lasts for an average of 10 years, costs about US$ 800. A microcredit fund was therefore established to loan villagers the money to install solar panels from only a small deposit.

Farmers enrolled in the project could recover their costs in as quickly as 20 months, while for those not enrolled it could be as quick as 40 months. Also, carbon emissions can be reduced by 121 kg per year per household. The project has been very popular, and surrounding villages have asked for similar help. Local authorities are now considering installing 4,000 solar panels in the province following the success of the project.

Enterprise funds empower women and tackle rural poverty

Families in southern Jordan face multiple hardships: water scarcity, soil erosion, and poor roads and infrastructure. Poverty in the area is high and economic opportunities for women in particular are severely limited.

But despite the challenges, there is potential for economic change in southern Jordan. A MENARID project developing women-led enterprise is testimony to this. Working closely with local communities, the project has ensured that an investment of US$ 1.5 million has been successful in raising household incomes, improving livelihoods, and strengthening women's independence.

Women benefit in pocket and position

As a result of the MENARID project, around 400 women have set up their own businesses, with the potential of generating up to US$ 250 a month. These enterprises include food processing, dairy and pickle production, and the harvesting of mushrooms. MENARID staff also provided business training to 1,300 women.

Improvements in jameed production efficiency mean more income for households and women.
Photo: Nawras Media

Before the project, women in the area were economically marginalized, with no capacity to contribute to household incomes. But the project has changed things dramatically. By learning how to manage small-scale enterprises, women involved in the project have increased their economic independence, and with it their status. This means they are able to participate more effectively in decision making – in both the community and the household.

Success depends on local knowledge and sustainability

Some key factors made the venture successful. Firstly, the project team used a participatory approach to tap into traditional knowledge and involve local women from the outset. Secondly, the team carried out initial assessments on household need and market potential to ensure that investments were targeted correctly.

Other key factors relate to the long-term sustainability of enterprise development. When helping local women to develop business plans, careful consideration was given to the sustainable use of natural resources and local viability. And to ensure that financial support is ongoing, the team liaised with women's associations on initiatives such as credit unions.


Photo: Nawras Media

This project has the potential to work wherever funding is available for the financing of small-scale income-generating activities.


Photo: IFAD/Jon Spaull

Replicating this project could improve farming livelihoods throughout Jordan and beyond.

Fruits of success: improved irrigation and pruning raises incomes for olive farmers

In the Karak region of Jordan, olive orchards dominate the agricultural landscape. Traditionally, these orchards are irrigated via a network of unlined canals that take water from natural springs to farmers' fields. But, in this system, a huge amount of water is lost *en route*, restricting olive yields and limiting farmers' cropping options. And, many olive trees in the area are more than 50, or even 100, years old, and have limited productivity.

The MENARID project tackled these problems in two ways. Firstly, staff worked with local farmers to improve irrigation canals by either lining them with concrete or replacing them with plastic pipes. Secondly, the team rejuvenated older olive trees through pruning and improved management.


Improved irrigation efficiency techniques can be used by olive farmers across West Asia and North Africa. Photo: IFAD/Lana Slezic

Interventions bring spectacular results

To date, the MENARID project has rehabilitated some 65 km of irrigation canals with impressive results. Up to 75% more water is now delivered to farmers' fields, and yields of olives per tree have increased by 76–100% in orchards with 130 to 140 trees per hectare.

The MENARID team pruned olives trees on more than 500 hectares in the Karak region. This rehabilitation, together with the increase in irrigation water, has meant that nearly 2,000 farmers have increased their income by up to US$ 1,800 per hectare per year. And with more water coming to their farms, many farmers are growing additional crops, such as vegetables, or establishing new olive orchards.

Consultation key to success

Community consultation was key to the success of the MENARID olive project. From the outset, the project team involved farmers in identifying and prioritizing problems. The team also worked closely with community-based organizations and water users' associations to ensure sustainable management of the new irrigation canals.

This participatory approach was crucial for orchard management too. Once a handful of farmers agreed for one or two of their trees to be pruned, and the results spoke for themselves, many other farmers came forward. This was despite initial skepticism in the farming community.

Building on ethnic bonds to boost pastoral incomes

The high plateau regions of eastern Morocco are home to the Beni Guil people, who are traditionally pastoral nomads. But these people are increasingly becoming settled livestock farmers, raising their sheep on communal rangeland that is now losing productivity due to overgrazing and poor management.

The Moroccan government has been promoting farmer cooperatives in the hope of improving the situation. However, membership of these groups has been traditionally held by wealthy graziers, with poorer and smaller scale herders excluded. IFAD's Livestock and Pasture Development Project sought to address this imbalance by developing more unified cooperatives based on ethnic bonds and sensitive to existing indigenous institutions.

Redefining cooperatives for answers

The project was funded by IFAD and operated over 19 years ending in 2010. It established 44 pastoral cooperatives with almost 9,000 members representing 100,000 beneficiaries that include farmers and their family members. Cooperatives have taken on responsibility for managing 3 million hectares of rangelands on the eastern plateau.

Better managed livestock means improved nutrition and incomes for communities in dryland countries
Photo: IFAD/Alberto Conti

Through this new style of cooperatives, participants used improved management practices to control rotational grazing, fenced off more than 460,000 hectares of land, and planted nearly 15,000 hectares with fodder shrubs. Fodder availability in the fenced areas increased fivefold, from 150 kg of feed per hectare to 800 kg per hectare.

About 60 watering points were also installed or repaired, halving the distance herds had to travel to water, with usage fees covering ongoing costs.

Impressive results

The initiative also improved access to veterinary services and parasite treatments, and worked with the government to make the cooperatives more self-reliant in the future. As the cooperatives have no lawful control over common rangelands, they must currently rely on consensus and persuasion to prevent abuse of the new resources.

This new approach to cooperatives has successfully improved rangeland management, resulting in better livestock production and environmental protection. The end effect has been improved sustainability of the grazing land plus increased and stabilized incomes for cooperative members.

Photo: IFAD/Alberto Conti

This project has the potential to be replicated throughout Morocco and similar pastoral areas with strong indigenous institutions. It could positively affect huge numbers of farmers through the creation of pastoralist cooperatives.

Photo: Nawras Media

Replicating this project could benefit livestock owners and their families throughout Morocco and in similar degraded rangeland areas.

Restoring degraded grazing land using inexpensive water harvesting

In eastern Morocco about 70% of land is set aside for communal use and mostly utilized for grazing. Erosion from wind and water runoff is widespread in these areas, and much of the vegetation has been lost, including fodder species important for livestock grazing.

But as the land produces less food for livestock and pastoralists struggle to maintain their livelihoods, a MENARID project has teamed with GEF to reverse this trend. The project team has worked with local communities since 2011 to identify ways to deal with land degradation and has developed an inexpensive intervention to restore both the rangelands and the incomes of the pastoralists that depend upon it.

Water catchments promote new vegetation

The team developed a technique using a Vallerani plow to create small catchments capable of harvesting rainwater that would normally be lost to runoff and evaporation. Collected rainwater can then be used to restore vegetation.

The Vallerani is a special plow that produces furrows characterized by crescent-shaped pits and can cover up to two hectares per hour. The furrows capture and concentrate rainwater, and create a microenvironment suited to re-establishing and supporting important species of range vegetation.

The restored foliage protects the soil from continued wind erosion and the furrows reduce rainwater runoff and water erosion. Local groups have also collected and planted seeds of desirable fodder plants to help the regeneration process, and the treated areas have become lush in comparison to neighboring untreated areas.

Low-cost solution

This intervention has rehabilitated over 1,200 hectares of degraded rangeland used by two cooperatives that represent 600 pastoralists. The project's total cost was US$ 85,000 and the new vegetation will be well established in two seasons. It will then be capable of supporting the pastoralist herds in areas that previously had no grazing value.

At the cost of US$ 75 per hectare for treating the land, this restoration technique is a fast, easy, and inexpensive solution for restoring degraded rangeland of many soil types. The initial equipment costs are about US$ 170,000 and operators require training, but as the equipment can be used to treat vast areas of land, the potential to restore pastoralists livelihoods is immense.

Restoring rangelands: reviving traditional grazing lands for pastoralist communities

The vast rangelands of the arid and semi-arid high plateau of eastern Morocco are being degraded, leading to erosion and loss of vegetation. Large areas of land are bare and have been abandoned, biodiversity and productivity are reduced, and local communities' well-being is threatened.

Pastoralist communities dependent on goats and sheep use 70% of the Moroccan rangelands for communal extensive grazing. Loss of the palatable plant species forming a major part of these animals' diets is therefore of particular concern.

In 2012, a MENARID project cultivated 1,200 hectares of degraded and abandoned rangeland using the Vallerani plow. This plow produces a furrow of crescent-shaped pits that harvests and holds rainfall, making the captured water available to plants.

Restoring rangelands

Preliminary results of the work have been promising: plants are growing and there has been natural recolonization from wind-blown seeds. The furrows, combined with the growth of shrubby plants, have also reduced erosion. Two pastoralist cooperatives with 600 members have been actively engaged in replanting the pilot area by collecting seeds of desirable indigenous rangeland species and planting them in the Vallerani pits. The pilot area is now lush and green while adjacent untreated rangeland remains largely bare.

Looking forward

The Vallerani system incurred moderate operating costs (US$ 75 per hectare) which cooperatives will recoup by charging members to use the regenerated rangeland. However, the high up-front investment cost (US$ 170,000), the need for skilled staff, limited availability of spare parts, and scarcity of appropriate seeds present significant challenges.

The Government of Morocco identified regeneration of the eastern rangelands as strategically important and, with GEF, bought the machinery on behalf of local communities. MENARID trained Vallerani operators and mechanics, and is building local capacity to make spare parts.

The pastoralist communities are committed to regenerating their grazing lands. MENARID is working with these communities by supporting local cooperatives in developing seed nurseries, and is responding to their request for assistance in monitoring and managing the restored rangelands.

Photo: Mr Hugo Remaury, ICARDA

This project can be replicated on any rangeland with slopes up to 12°, sustaining pastoralist communities and protecting the environment across the MENA region.

Photo: IFAD/Joseph Marando

Replicating this project could benefit farming families throughout Morocco and similar areas.

Zero-tillage techniques boost incomes for cereal farmers

In the Rabat Salé Zemmour Zair region of northwestern Morocco, local farmers use cultivation-intensive practices to prepare their land for planting, and new methods are needed to help these growers combat the effects of climate change. The farmers prepare their land using plows to dig deep furrows or harrow tools to break up and smooth the surface. Old crops are usually burned off and the soil is left vulnerable to water and wind erosion, and depleted of organic content.

A project has been working with farmers in the region to promote conservation agriculture methods to lessen preparation time, reduce costs, and improve the fertility and structure of the soil.

Direct planting

The method leaves the ground undisturbed after harvesting and seeds are directly planted into untilled soil. The soil is better protected from erosion, its structure is enhanced, and it retains moisture better. Remaining crop residue increases the organic content in the soil, and boosts its fertility.

Photo: Mr Hugo Remaury, ICARDA

The project team worked with 70 smallholder farmers over two seasons from 2011 to adopt a zero-tillage approach across 500 hectares of cereal fields. They used an imported seed drill for the planting which can cost up to US$ 25,000, but locally produced units can make this more affordable.

Crop yields for the zero-tilled fields were similar to those achieved under conventional practices, but the reduced costs and labor requirements were a profitable advantage to the farmers, and the region benefitted from strengthened food security.

Inspiring neighboring farmers

Neighboring farmers not participating in the project were impressed by the success of the trial, and were inspired to independently sow a further 700 hectares of land using their own seed drills. Later they developed modifications using locally available equipment for sowing other crops such as chickpea.

The project team is encouraged by the spontaneous take-up of the technique and the local adaptations of machines. The technique is poised to create a dramatic change across the region – positively affecting the livelihoods of many farmers and securing the productivity in the face of changing conditions.

A geographical approach to combating land degradation

Despite the many measures to combat it, land degradation in Tunisia is an increasing problem, claiming more land every year. Making a full and accurate assessment of the current degradation of land in the governorates of Tunisia is difficult.

The Land Degradation and Assessment in Dry Areas project was developed by the Food and Agriculture Organization of the United Nations to implement a methodological approach to assessing the degradation and sustainable management of land at local, national, and global levels. The project began in 2006, with the goal of identifying and describing geographical areas suffering from land degradation.

At a national level, a 1:50,000 scale map of land-use systems was produced, identifying and describing the various existing systems. A map of the degraded lands was also developed, which demonstrated their size, and the type and degree of degradation. The maps also revealed the type of conservation practices used, their scale, and their effectiveness.

Strategic support to planners: the LADA natural resource assessment approach gives a clear overview of land degradation levels, at field, district and regional scale.
Photo: IFAD/Susan Beccio

More in-depth study reveals successes and failures

At the local level, three governorates (Siliana, Kasserine, and Medenine) were selected for a more in-depth study of land degradation and sustainable land management. This made it possible to carry out a comparative study of the level of soil degradation in the predominant land-use systems in these three areas, and so reveal the successes and failures in controlling land degradation.

The local assessment used a data-collection and analysis process that included both socioeconomic and biophysical factors, and political and institutional involvement. Interactions were analyzed using the Driving forces, Pressures, States, Impacts, Responses (DPSIR) model.

Building local community capacity to resist climate change

In the three selected regions, local participants were trained in carrying out local assessments and in developing a system to monitor and assess land degradation, and identify good practices. This increases local participation in the decision-making process and helps people to make appropriate decisions concerning land use, the sustainable management of resources, and in controlling land degradation.

Photo: IFAD/Susan Beccio

This project has the potential to promote good practice in combating land degradation throughout Tunisia, and in any other affected regions of the world.

Photo: IFAD/
Susan Beccio

Direct planting schemes raise productivity for dryland farmers

Direct planting uses crop residue left on unplowed fields to improve soil fertility and structure. Water conservation is improved and soil erosion is reduced, leading to better productivity. The approach is widely used in middle- and high-income countries, and is a key aspect of conservation agriculture. However, although it can also benefit smallholder farmers in dryland and marginal farming areas of low-income countries, adoption of the practice here has been slow.

Replicating this project could raise productivity and incomes in any dryland farming region where farmers are able to access financial assistance.

Photo: Hugo Remaury,
ICARDA

A pilot trial, initiated in 2010 in the Tunisian town of Tinja, demonstrated the expected gains if the practice is extended to the dryland regions in Tunisia and across similar areas in the MENA region.

Many benefits

The results of the trial were impressive and showed increases in all key areas. Soil loss rates improved from 3.2 g per liter to 0 in wheat fields, and from 4 g per liter to 0 for faba bean crops. Direct planting also reduced surface runoff on uphill fields, from 80 to 70 mm on fields planted with faba beans and from 60 to less than 20 mm with wheat. In addition, the need for fertilizer and labor was reduced, adding to profitability and environmental gains.

Skepticism and resistance

Despite the proven benefits, many dryland farmers in Tunisia remain unconvinced by the technique, mainly due to the cost of the necessary planting machines. A machine can cost up to US$ 25,000 and farmers require financial assistance in order to buy them. Locally produced units can reduce the price, but government subsidies are still needed to help make planting machines more affordable. Cooperative farmer groups can also help to share these costs.

Direct planting has the potential to strengthen food security across Central and West Asia, the Middle East and in North and sub-Saharan Africa. But it will require training, demonstrations, and information exchange efforts to convince farmers of the benefits.

Empowering communities to become guardians of their natural environments

Although many of Tunisia's national parks enjoy a degree of protection, a lot of them still suffer from the effects of mismanagement and unsustainable practices. Poaching, deforestation, and livestock herding in these important areas cause irreparable damage to the ecosystems. And the effects of climate change are amplified in these parks due to their location in a region experiencing increasing water scarcity and rising temperatures.

A MENARID conservation project focused on three national parks, L'Ichkeul, Bouhedma, and Jbil, has addressed these issues by strengthening the parks' links to local communities and empowering people to become custodians of the precious natural environments in their area.

Economic development

The project focused on incorporating conservation and ecosystem services into regional economic development plans. And participating communities have increasingly, through understanding the potential economic gains to be derived from good ecosystem management, recognized the value of sustainability and the potential economic impact of a healthy natural resource base.

The three national parks were chosen for their diversity of ecosystems and, from an investment of less than US$ 14,000, the project has reached 4,000 people living within or close to the parks.

Forming associations

The project adopted a participatory approach and encouraged members of local communities to form associations capable of liaising with government. Five community groups were formed and charged with the responsibility for raising awareness about conservation issues and protecting ecosystem services.

Awareness of the initiative is increasing: a 2005 survey found that 90% of children in the project areas were 'weakly aware' of environmental issues, but a survey conducted two years later found that 91% of children had become 'aware' or even 'highly aware'.

Natural resource management plans produced with local community groups have identified opportunities for sustainable micro-projects and enterprises that pose minimal impact on the environment, such as honey production and ecotourism. It is planned for these groups to actively participate in the future management of the parks.

Photo: Mr Mustapha Laaroui

This project has the potential to be replicated throughout Tunisia and wherever there is capacity for ecosystems to contribute to economic development. It could potentially affect 40,000 people.

Photo: IFAD/Susan Beccio

This project targeted 100,000 people but, if replicated, could reach many more women and graduates in similar rural communities in Tunisia and beyond.

Helping marginalized women and youth through training in business and agriculture

Marginalized communities in Tunisia, particularly women and young people, face difficulty finding work and generating income. This leads to low living standards and debilitating rates of migration to cities among young graduates.

A MENARID project, financed by the World Bank and initiated by the Ministry of Agriculture, is equipping these people with the skills and knowledge to set up and maintain small-scale enterprises, with a focus on sustainable agriculture.

Increasing food production and generating incomes

The first phase of the project is already complete. It focused on agricultural interventions aimed at increasing food production and reducing environmental degradation. Activities included initiatives targeting water and soil conservation, irrigation, tree planting, and improved livestock production.

In the second and final phase, these interventions are being supplemented by training women and graduates in income-generating activities, including livestock breeding, handicrafts, and honey production.

Service industries and businesses have also been created in this phase. These include carpentry businesses that can help with the construction of agricultural items such as beehives, and mechanical construction or repair enterprises which can help fix vital machinery such as agricultural pumps.

Many new enterprises created

This initiative has created thousands of income-generating activities, as well as 80 small businesses and agriculture based small enterprises. Assistance is ongoing for one year, allowing individuals to consult project leaders and seek advice on a range of issues throughout implementation.

As well as directly helping women and graduates to generate incomes, the project is reducing environmental degradation, increasing food production among local communities, and improving relations between the local population and authorities. The project has held lengthy consultations with target communities to understand their specific needs. It has also encouraged communities to form their own elected 'development committees', which act as a liaison between government officials and the local population. These committees work alongside government to create local development plans, and explore opportunities to access funding for future projects.

Reintroducing the indigenous Bargou peach with improved returns

Smallholder farmers in the Siliana District of northwestern Tunisia need to make best use of their small blocks of land. By 1998, all but two had turned away from growing indigenous Bargou peaches because of low yields, diseases, pests, and agronomic problems.

But a MENARID project has since helped restore this traditional fruit and return it as a sustainable asset in the region. Technical experts from the Ecole Supérieure d'agriculture du Kef identified practices that could revive productivity of Bargou peach trees through improved use of irrigation, fertilizers, and fungicides and herbicides.

The team also developed a program for creating new trees – grafting cuttings onto rootstocks in a nursery and training local farmers – to ensure that work continued after the project ended in 2006.

This approach to boosting peach yields can be transferred to other crops: cherries, figs, walnuts and olives. Photo: Mr Hugo Remaury, ICARDA

Threefold increase

The result has been a threefold increase in yield and price. Harvest yields rose from between 15 and 20 kg per tree to between 45 and 65 kg per tree. And prices increased from no more than 0.8 dinars per kg to between 1.5 and 2.5 dinars per kg.

Twenty hectares of Bargou peaches were planted or restored by the end of the US$ 85,000 project, with 75 farmers now growing this important indigenous fruit and benefitting from improved livelihoods and future prospects.

Broad suitability

The MENARID approach can be scaled up to assist all smallholder production systems, and can be adapted to other indigenous varieties such as Kesra figs and cherries, Maktar cherries and walnuts, and Westlati olives. Preliminary results in Morocco's eastern regions also show potential to restore biodiversity and productivity in large areas of communal rangeland there.

Rigorous diagnostics, flexible and participatory approaches, and clear targeting have been the key to success in reviving farmer confidence and market interest in this crop. Thanks to the project, a valuable indigenous crop has been rescued and lost knowledge has been restored to rural people in a poor and underdeveloped part of Tunisia.

Photo: Mr Hugo Remaury, ICARDA

Replicating this project could improve livelihoods for fruit farmers throughout Tunisia and beyond.


Photo: IFAD/Susan Beccio

Replicating this project could benefit farmers and rural communities throughout Tunisia and in similar areas where aquifers are depleted and the risk of contaminated flood water is minimal.

Replenishing depleted subterranean water tables using flood water runoff

The arid regions of Tunisia face increasing water scarcity due to depletion of aquifers – underground water tables that can supply useable water via wells. The Koutine Watershed, in southeastern Tunisia, is an extremely important aquifer as many rural industries depend upon it. However its water supply is being rapidly depleted by overuse and evaporation rates that reach up to 1,300 mm per year.

A pilot project is applying a novel intervention to replenish this valuable resource, using flood water that would normally be lost to runoff.

Recharge wells

Storing water above the ground in this region is unrealistic given the high evaporation rate, so using recharge wells to replenish aquifers ensures much better use is made of flood water runoff. But care must be taken to ensure the water is not contaminated or too saline. To create the recharge wells, the flood water is gathered in a small dam. There it is diverted into wells drilled especially to inject the water directly into the aquifer below.

The wells are fitted with filters to remove gravel and debris from the water before it percolates down into the aquifer. The filters can be removed and exchanged, allowing for regular maintenance to ensure water quality.

Benefitting thousands of people

This pilot project is benefitting 20,000 people at a cost of US$ 63,000. After drilling 10 wells, the Koutine Watershed can now be replenished at a rate of one liter per second when flood water is available. The cost of establishing similar interventions is approximately US$ 6,300 per well. Initial government investment is needed because this is beyond the means of most local farmers. The technique is best suited to aquifers that are close to ground level, as the cost rises when drilling deeper wells.

This project has demonstrated significant capacity to increase water availability in a region experiencing damaging water shortages. There is further potential to boost local employment opportunities through construction and maintenance.


Photo: IFAD/Susan Beccio

Using geothermal water to support irrigation in dry regions

Southeastern Tunisia is a region suffering from water scarcity. Contributing to this, decades of over-exploitation across Algeria, Libya, and Tunisia has significantly reduced water levels in the North-western Sahara Aquifer System – an underground basin of non-renewable water.

If agricultural production and rural farming communities are to survive in southeastern Tunisia, a sustainable source of irrigation water must be found. An innovative pilot project by MENARID near El Hamma de Gabes in Tunisia, investigating the use of geothermal water for irrigation, is offering hope of a solution.

Cost issues

Geothermal water sources, though plentiful, have rarely been considered by agricultural researchers as the extraction costs are high and beyond the reach of smallholder farming communities in developing countries. But recent trials using geothermal water have shown a tripling of yields and demonstrated there is significant potential to affordably maintain crop production – providing there is financial support for the initial costs and that highly intensive production systems are used.

Geothermal water can heat greenhouses to optimal growing conditions then, after cooling and desalinization, can be used for irrigation. Following this approach, farms participating in the MENARID project have utilized geothermal water to produce between 20 and 30 kg of crops per m^3.

High intensity farming and cooperatives

Geothermal water sources require significant funding through bank loans, subsidies, or donors. But the funding requirement can be offset through using hyper-intensive production systems exporting high-value crops such as tomatoes or eggplants.

Organizing farmers into cooperative groups can help share initial investment costs and better support intensive production as well as improve the management of export channels. Export development plans featuring intensive production systems are better at attracting long-term investment, and combined with the benefits from this sustainable irrigation source, offer attractive returns on investment.

The MENARID scheme is already attracting the attention of several large European donors. And returns, expected to occur within five years, are capable of reaching up to US$ 1.4 million for an initial investment on just 12 hectares – helping local communities to manage these challenging environments and sustaining rural economies into the future.

Photo: Mr Djamel Latrech

Replicating this project could benefit smallholder farmers throughout Tunisia and in other areas where geothermal waters can be exploited.


Photo: Mr Djamel Latrech

This scheme can be applied to all dryland agroecosystems with available but degraded groundwater sources.

Water desalination increases food security and income in very dry areas

In the southeast Tunisian steppe, water shortages are becoming more acute due to increasing salinity of the groundwater. The livelihoods of farming communities are threatened, causing them to cease pastoral activities and turn to rain-fed olive cultivation. However, several thousand olive trees die with every drought.

In a bid to ensure the stability of water quality and its supply, a MENARID project tested a small-scale desalination program over a period of two years.


Small-scale and affordable desalinization systems support household food security in all dry areas.
Photo: Mr Djamel Latrech

Initial findings show profits for farmers

The scheme has shown that using local groundwater desalination to create a new water source for legume crops generates sufficient income to cover the cost of the investment and leave a substantial profit for the farmer.

A desalination unit costs US$ 12,000, with maintenance and electricity costs of US$ 2,200 per year. The return on this investment is US$ 3,500 per hectare of new income generated per desalination unit for legume and olive production. In many cases, the irrigated olive plantations increase yields from 20 to 60 kg per tree per year.

Project expansion

The study team plans to expand the pilot project to demonstrate the potential of the approach. To further develop the initiative there is a need for national or regional subsidies, or credit schemes to ensure large-scale supply of desalination technology, and local suppliers to ensure service and repair. It is possible that in the coming three to four years, the desalination units could be powered by solar energy rather than electricity.

If the desalination practice becomes widespread, a water-use and sharing policy will be needed to ensure sustainable use of the aquifer including the management of drainage water. A water resource assessment of each site will also be required to indicate the number of farmers that the new resource can serve.

Building climate change resilience into rangelands

The central Asian rangelands cover more than 260 million hectares and are extremely vulnerable to the effects of climate change. Average air temperatures in the state-owned rangelands of Uzbekistan have risen by 2°C over the past 80 years and rainfall is predicted to decline by 25% by the middle of this century. Common areas set aside for use by villagers are poorly controlled, and overgrazing, combined with the effects of climate change, have caused intensive desertification.

A pilot project, costing US$ 137,000 over two years, has been helping to increase the climate change resilience of 500 people from two villages in the Qiziltepa District of the Navoiy Province.

Finite resources

The desertification of rangelands means that villagers must grow their own cattle feed, using water from melting glaciers which is not expected to last beyond 2050. To tackle this, the project team has been working with villagers to develop sustainable livestock production methods and management plans based on seasonal grazing techniques. They have also been helping villagers form pastoral user groups to restore vegetation across 1,200 hectares of rangelands, reducing the need to feed animals on crops that require irrigation.

Seed isles

In 2012, the team began creating seed isles – patches of 0.05 to 0.15 hectares sown with perennial, drought tolerant, native plants suitable for foraging – in an area covering a third of the villagers' grazing land. Livestock is kept away from this zone for three years until it becomes well established; then another third is treated in the same way.

The technique ensures that within nine years the whole grazing area will be covered with deep-rooted vegetation capable of providing sustainable grazing. However, extending this approach to other areas depends upon the groups securing long-term rights to the land to be restored, which is not currently possible in Uzbekistan.

Trials suggest that forage yields of over one tonne per hectare are achievable. This, together with a switch from cattle to sheep herds, will help make pastoralists' livelihoods in these rangelands secure, sustainable, and more resistant to climate change.

Community-based climate change resilience strategies have improved the situation for 500 people, and can be transferred to many more communities.
Photo: Mrs Stefanie Christamann, ICARDA

Photo: Mrs Stefanie Christamann, ICARDA

Replicating this project could protect the livelihoods of pastoralists throughout Uzbekistan and on other rangelands at risk of desertification.

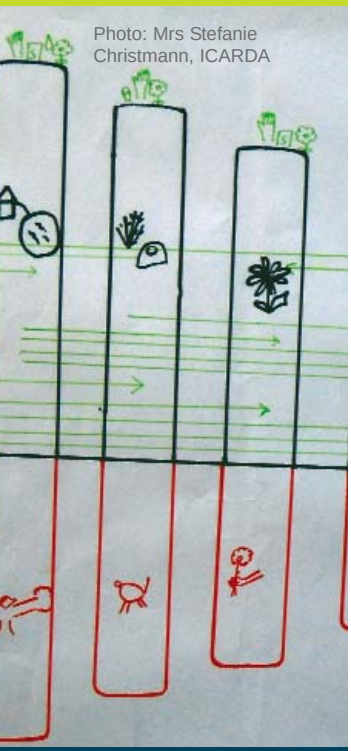


Photo: Mrs Stefanie Christmann, ICARDA

Replicating this project could benefit communities in any foothill landscape or mixed crop–rangeland area in the MENA region, and especially those in areas suffering from land degradation or overuse.

How one village links practice with sciences to develop its climate change adaptation strategy

The village of Kadok in Uzbekistan had experienced progressive deterioration of its foothills and grape cultivation system due to changes in climate patterns, and land overuse from logging and livestock grazing. Income options were severely affected and it was assumed that the village would be abandoned in favor of urban migration.

In response to this critical situation, the Kadok community developed a 'climate-smart' strategy and action plan. A self-assessment of the current situation, facilitated by a MENARID specialist in natural resource management, generated ideas for interventions to rehabilitate degraded land and diversify its production system.

Community action plan

The community prioritized several action areas including:

- Reforesting foothills through planting indigenous trees and shrubs, and forage shrubs with strong roots which prevent mudflows and sustain livestock production.
- Developing new income options not reliant on increased water use, such as one-day recreational tourism and the production of handicrafts.
- Creating additional income streams from the sale of produce such as rosehip, medicinal plants, and almonds.

These initiatives have allowed 6,000 people to benefit from the project in an area covering 6,000 hectares. With an investment of only US$ 140,000, this low-cost approach enables remote villages to instigate their own adaptations to climate change and maintain their cultural identity.

Village ownership

Village management of shared resources is crucial to the project's success. A core team gathers opinion, builds consensus, sets guidelines, and organizes collective harvest days and shared work to rehabilitate the foothill-forest. Drawings – such as a priority-setting diagram – are important to the collaborative process.

Long-term land management ensures rehabilitation efforts are not lost over the coming years. All decisions are therefore focused around the question: "Will reforestation efforts lead to increased benefits within 5, 10, and 15 years?"

Long-term sustainability is underpinned by two agreement types: between all households of the village; and with leaders of neighboring villages on resource use and allocation, especially livestock grazing locations and rights.

Community empowerment builds productivity and income

In Yemen's Saber District, on the outskirts of the southwestern highland city of Taiz, land rehabilitation programs are both important and urgent. To ensure the success of these programs, a method of encouraging community engagement has been implemented.

A MENARID water harvesting rehabilitation project has used an innovative approach to community engagement in order to make great gains in rehabilitating the Saber District. An important added benefit has been the strengthening of rural networks in the area.

Participation

The project team ensured long-term success by using a participatory approach that encourages people to discuss their needs and contribute to the design of the rehabilitation strategy. The outcome has been impressive productivity gains and improved incomes in the region. The project rehabilitated an area of 50 hectares at a cost of US$ 20,000. And a total of 1,100 people benefitted from the project with their potential income increasing by up to 30% as a result of the scheme.

Community organizations

Beneficiary communities were encouraged to participate fully in the implementation of the project, assembling formal democratic groups to promote collaborative ways of working, and to maximize impact and long-term sustainability. All project activities were implemented and monitored through these community organizations, which are registered with the Ministry of Social Affairs. Women and other marginalized people gained great empowerment from the groups, as their impact and influence was strengthened, and higher levels of education and collected knowledge were encouraged.

The community organizations were a requirement of the project. It was also important to draft community agreements to effectively outline the responsibilities of the group, activity timelines, and expected costs of the project.

Long-term success depends upon accurate assessment of existing conditions within the target community at the onset of the project. A 'rapid rural assessments' framework was developed specifically to improve this assessment phase. This participatory approach promotes accountability and community responsibility, and by encouraging collaboration and knowledge-sharing, it better ensures long-term sustainability for the community.

Photo: Mrs Balquis Anwer Abdulsattar

Replicating this project could empower communities and raise incomes anywhere where dryland rehabilitation is taking place.

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The Kadok community designed its own climate change strategy – addressing land degradation and new income opportunities.
Photo: Mrs Stefanie Christmann, ICARDA

About ICARDA and CGIAR

Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is one of 15 centers supported by CGIAR. ICARDA's mission is to improve the livelihoods of the resource poor in dry areas. It does this through research and partnerships dedicated to achieving sustainable increases in agricultural productivity and income, while ensuring efficient and more equitable use and conservation of natural resources.

ICARDA
Science for Better Livelihoods in Dry Areas

ICARDA has a global mandate for improving barley, lentil, and faba bean. In non-tropical dry areas, its mandate is to improve the efficiency of on-farm water use, the health of rangelands, and production from small ruminants. In Central Asia, West Asia, South Asia, and North Africa, ICARDA helps improve bread and durum wheats, kabuli chickpea, pasture and forage legumes, and associated farming systems. It also works on improved land management, diversification of production systems, and value-added crop and livestock products. Social, economic, and policy research is an integral component of ICARDA's research, in order to better target poverty, enhance uptake, and maximize the impact of research outputs.

www.icarda.org

CGIAR is a global agriculture research partnership dedicated to reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring more sustainable management of natural resources. It is carried out by the 15 centers who are members of the CGIAR Consortium in close collaboration with hundreds of partner organizations and the private sector.

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