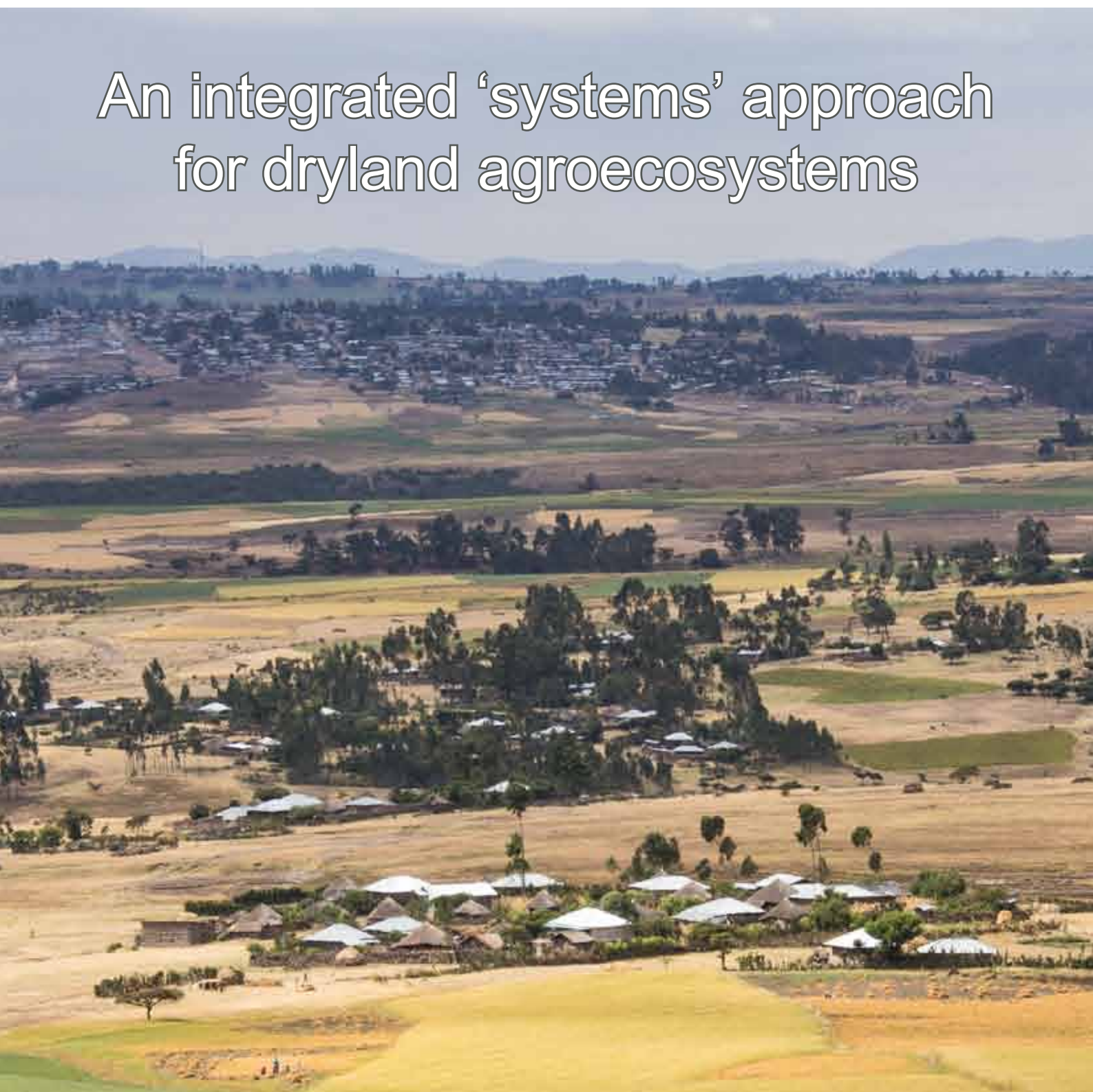


*Review of agriculture in the dry areas*  
**Caravan**

An integrated 'systems' approach  
for dryland agroecosystems





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# The sustainable way forward: An integrated 'systems' approach for addressing the challenges facing dryland agroecosystems

Dryland agroecosystems present unique complexities for more than 2.3 billion people in the developing world who depend mainly on agriculture for their livelihoods. They are faced with various constraints including natural resource limitations and degradation, water scarcity, encroaching desertification and serious climate change implications. Poor access to markets and inputs, weak governance and lack of information about alternative production technologies also limit the options available to farmers to increase both their agricultural productivity and income. Results of the past interventions to address these challenges clearly show that unless these complexities are viewed holistically as production systems and addressed in an integrated fashion, strategies and interventions to address these challenges will have limited impact.

The CGIAR Research Program on Dryland Systems is using a first-of-its-kind integrated 'systems' approach to bring sustainable agricultural development across dryland areas. The program, led by ICARDA, integrates social and economic considerations with institutional support to enhance the uptake of innovations and improved technologies in sustainable natural resource management along with crop and livestock improvement. This integrated agroecosystem approach is expected to better serve dryland communities, delivering sustainable solutions that can be adopted and adapted across similar agroecosystems for

wide-scale impacts to achieve global development challenges namely, food security, improving livelihoods, reducing poverty and protecting natural resources.

For the effective implementation of an integrated systems approach, the Drylands Program is applying expertise across various disciplines and sectors, including farming, rangelands, forestry, markets, environment, water and energy. The research partnerships include various actors in the whole research for development continuum through innovative platforms targeting specific agricultural production systems. Partners include scientists, extension workers, farming communities, policy-makers, regional and international organizations, development agencies, and the private sector. As the lead center, ICARDA brings over 35 years' expertise in implementing systems approach in drylands to the research partnerships.

This issue of *Caravan* presents some successes of the collaboration of scientists and other stakeholders from ICARDA and national partners, where participatory research with local communities and women's groups in particular, has reaped a range of benefits through an integrated systems approach. These examples demonstrate a path forward for sustainably enhancing agricultural productivity and improving the livelihoods of communities in dry areas.



*Mahmoud Solh  
Director General, ICARDA*

# CGIAR Research Program on Dryland Systems

Food security and better livelihoods for rural dryland communities

## About Dryland Systems

In collaboration with eight other centers, ICARDA leads the CGIAR Research Program on Dryland Systems, a global agricultural research partnership to realize the potential of dryland communities. This program brings together numerous international, regional and national partners to engage in integrated agricultural systems research and unique partnership platforms to ensure improved food security, equitable and sustainable natural resource management, and better livelihoods for the world's dryland communities. Our partnerships combine scientific research results with the skills and capacities of national agricultural research systems, advanced research institutes, non-governmental and civil society organizations, the private sector, and other actors to test and develop practical innovative solutions for rural dryland farming communities.

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## Why drylands matter?

Roughly 2.5 billion people – 30% of the world's population – live in the dry areas. Failure to achieve sustainability in the drylands will mean failure for the global community. The challenges to sustainability are manifest in the drylands: in poverty, inequity, and human well-being; the effects of globalization; unbalanced private-public shares in development; damage to the environment; conflict and competition for resources; and poor governance.

The drylands are likely to suffer disproportionately from the impacts of climate change – because of their vast area, land use in the drylands affects atmospheric circulation and carbon fluxes. In proportion to their size, population, and importance for global sustainability, drylands ecosystems (in poor countries) receive less scientific and developmental attention, less investment than other major ecosystems, and are poorly understood by policy makers.

Dryland Systems aims to overturn this lack of attention and investment by producing a robust body of scientific knowledge - integrating technological, policy and institutional innovations - to help various stakeholders address specific dryland challenges and deliver evidence-based development outcomes for rural dryland areas with the highest concentration of the world's poor.

## Our Vision

We envision prosperous rural dryland communities with higher incomes, better access to food, improved nutrition and health, and increased capacity to manage natural resources in equitable, sustainable, and innovative ways.

## The Value of Systems Research:

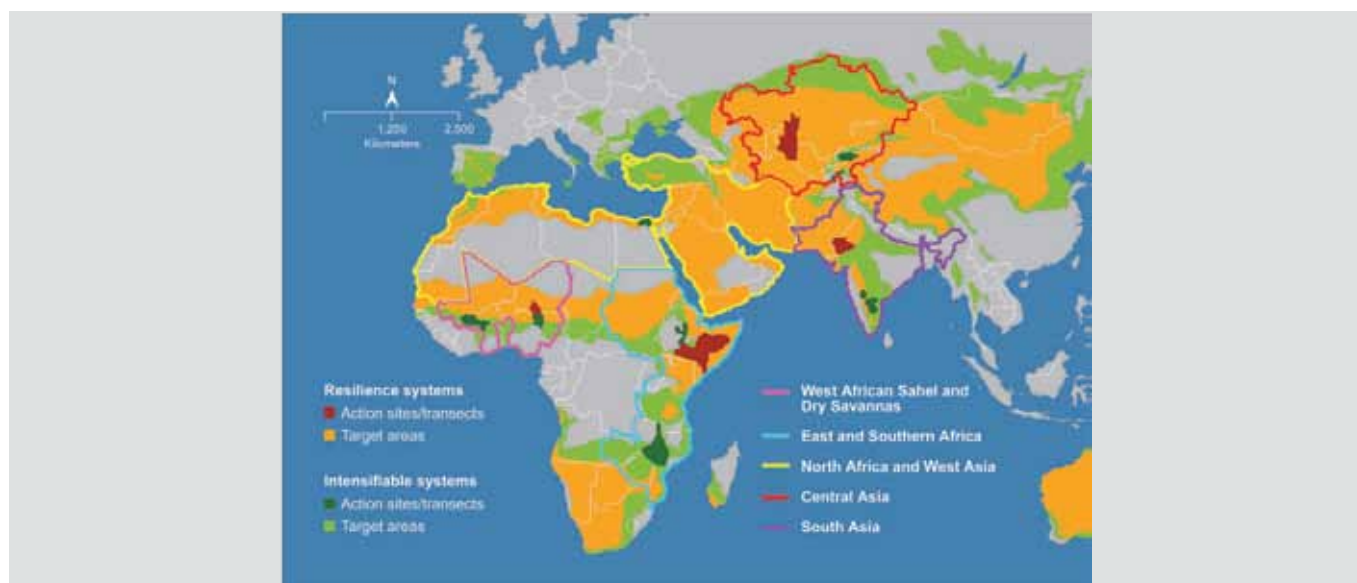
- Offers a comprehensive understanding of intractable drylands development challenges
- Develops and formulates appropriate technologies, practices, institutions and policies for solving those challenges
- Facilitates scaling out and up for greater development impact
- Allows for multi-stakeholder engagement for greater ownership of impact
- Builds local and national capacities to innovate for more sustainable development impact
- Applies continuous monitoring, evaluation and learning
- Provides credible evidence for increased investments in drylands
- Ensures that the needs and priorities of women and youth are integrated in all research activities.
- Helps smallholder farmers acquire skills in natural resource management that enable them to adapt to climate change and have better food security, nutrition and livelihoods

## What is the Systems Approach

Dryland ecosystems are incredibly varied and diverse in term of both biophysical characteristics and socio-economic issues. For many years, researchers have tended to focus on particular aspects of dryland agriculture, such as crops or irrigation. Dryland Systems takes a **holistic integrated systems approach** to understand the interactions and trade-offs between the whole spectrum of biophysical and socio-economic elements that constrain or improve dryland agricultural productivity in order to identify the most appropriate research-in-development interventions. Our research focuses on the **Agricultural Livelihood Systems** defined as the sets of farm, farming and human activity systems that determine the livelihood opportunities for agricultural households, enterprises or communities in dry areas. The **systems approach** involves the

combination of production systems inventions with policy, institutional and market interventions as a means of ensuring higher profitability of the farming community enterprise, while maintaining the natural resource endowment for future generations. The overall aim is to reduce poverty; increase food and nutritional security, reverse land degradation and improve resilient dryland livelihoods.


We work in five flagship projects covering agricultural livelihoods systems in over 3 billion hectares across drylands. In each of our five flagship projects, much of our work takes place in what we call 'action sites'. Our action sites represent the main agricultural livelihoods systems in each flagship project. This means that practices that prove successful in an action site can be applied rapidly or 'scaled out' right across similar dryland systems.




Action sites of Dryland Systems

### Resilience systems


In resource-lacking agricultural livelihoods systems, we work to build resilience and provide farmers with innovative practices and technologies to deal with risks and minimize losses.


 Pastoral livelihoods systems are constrained by overgrazing, land degradation, climate variability, and seasonal gaps in feed supply.

 Agropastoral livelihoods systems are constrained by overgrazing, rangeland and forage feed imbalances, land degradation, soil erosion, conflicts between pastoralists and crop growers, and climate variability.

### Intensifiable systems

In intensifiable agricultural livelihoods systems, we work to provide farmers with innovative practices and technologies to intensify sustainable production.

 Rainfed livelihoods systems are constrained by land degradation, nutrient deficiencies, climate variability, and water scarcity. Rainfed livelihood systems can also be high risk and subject to severe drought, in which case they may be somewhere between high risk and intensifiable.

 Tree-based livelihoods systems are constrained by rapid degradation by humans, livestock overgrazing, land degradation, and climate change.

 Irrigated livelihoods systems are constrained by groundwater depletion, salinization, and heat stress.

### The Difference We Expect to Make

By 2025, we expect to see that our work has improved food security, increased incomes and opportunities, and ensured better and sustainable management of natural resources for:

- 137 million people living rurally in the West African Sahel and Dryland Savannas (WAS&DS)
- 191 million people living rurally in North Africa and West Asia (NAWA)
- 237 million people living rurally in East and Southern Africa (ESAA)
- 39 million people living rurally in Central Asia (CA) and
- 978 million people living rurally in South Asia (SA).

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# Growing more olives with less water

Bensadek Mokhtar with his drip irrigation system

Olive farmers in Morocco and Syria have been introduced to effective, low-cost, and sustainable techniques that improve yields while using irrigation water more efficiently in water-scarce environments.

Like many other farmers in Morocco, it was not easy for Bensadek Mokhtar to adopt new irrigation techniques that researchers said would increase the productivity of olive trees using less water.

Water is a scarce resource in Morocco and flood irrigation is wasteful because of evaporation

and leaks from irrigation canals. Bensadek relied on a dam, and had restricted access to water. Despite the perceived risks, he agreed to try drip irrigation.

Drip irrigation applies water around the base of trees and dramatically reduces the amount of water used. With this technology, Bensadek now has sufficient water to irrigate

his land and has seen significant growth in olive yields – up to five tons per hectare (t/ha). Managing water through drip irrigation ensures the olive trees are not stressed. He even has enough water leftover to grow potatoes for extra income and alfalfa to feed his cattle.

## Challenges and constraints in the olive sector

In Morocco, around 950,000 hectares (ha) are cropped with olive trees and over two million people rely on olive production. Likewise, in Syria, over 10 percent of the country's planted area is covered by olive trees and more than 100,000 families depend on olive production as their main source of income. In both these countries olive production contributes substantially to the economy by generating employment and revenue.

Unfortunately, great instability exists in this sector. In Syria, rainfed olive yields are unpredictable and can vary up to ten times annually due to unfavorable weather conditions. In Morocco, yields are also low – fluctuating between 1.5 and 3 t/ha in irrigated areas – due to a range of constraints including traditional irrigation techniques, poor fertilizer management, and inadequate disease and pest control.

## Sustainable irrigation systems

ICARDA and its national partners initiated a project to stabilize crop yields through the implementation of advanced and sustainable irrigation systems. The project was aimed to raise farmer incomes, strengthen rural livelihoods, and improve water productivity.

The initiative demonstrated and disseminated effective, low-cost, and sustainable techniques that use irrigation water more efficiently in water-scarce environments. The project also advised smallholder farmers in a range of other potential yield-raising interventions: fertilization and pruning, pest and disease control, and tillage management. It addressed the entire olive cropping system, not just water management.



*Olive farmers in Morocco and Syria have been introduced to effective, low-cost, and sustainable techniques that improve yields while using irrigation water more efficiently in water-scarce environments.*

As demonstrated by Bensadek's success, results have been extremely encouraging and clearly demonstrate the effectiveness of new technologies being introduced.

"When we used water from the dam, we had no control over when we could water our trees, and they were often stressed. Now we can apply water when the trees need it most, and have enough left over to grow potatoes for sale and alfalfa to feed our cattle."

*Bensadek El Mokhtar  
Farmer, Morocco*

## Results in Morocco

In Morocco, the main focus of the project was on drip irrigation, but deficit irrigation was also introduced. Deficit irrigation, the targeted application of water during drought sensitive growth stages, reduced water stress and produced significant water savings. If applied at the country level there could be savings of millions of cubic meters of water.

A combination of deficit irrigation and deep tillage achieved yields of up to 7.8 t/ha, an improvement on the 4.5 t/ha produced under flood irrigation, confirming the need to switch from traditional production methods to alternative irrigation regimes. Furthermore, sensory evaluations of olive oil revealed a far superior product under deficit irrigation conditions.

Growing more olives with less water in Morocco is of utmost importance because the country is set to double the area under olive orchards by 2020, an ambitious plan that reflects the rising global demand for olive products. However, this expansion will also greatly stress the country's water supplies.

**Project Title:**

Program for the Development and Dissemination of Sustainable Irrigation Management in Olive Growing

**Donors:**

- Common Fund for Commodities
- OPEC Fund for International Development

**Supervisory Body:**

- International Olive Council

**National Partners:**

- Institut Nationale de la Recherche Agronomique, Morocco
- General Commission for Scientific Agricultural Research, Syria

**International Partners:**

- Instituto de Agricultura Sostenible, Spain
- Instituto per I Sistemi Agricoli e Forestali del Mediterraneo, Italy

**Period:**

2010-2014

**Results in Syria**

In Syria, where olive growing was expanding rapidly before the recent conflict, there is little or no rain when trees need it the most – in the late summer and early autumn when the fruits grow rapidly and oil accumulates.

Drip irrigation was installed at research sites, alongside a package of improved management practices, including fertigation, applying fertilizer with irrigation water, and cultivation practices to reduce evaporation and improve weed control. The yields increased dramatically by 90-125 percent on plots using deficit irrigation, with additional improvement in oil quality.

Deficit supplemental irrigation produced water savings of 1400 m<sup>3</sup>/hectare compared to full supplemental irrigation, a promising result that could translate into huge water savings at the national level. Compared with rainfed production, fruit yields under deficit supplemental irrigation increased between 3900 and 5150 kg/ha.

**Growing more olives with less water**

In comparison to traditional flood irrigation, the alternative regimes tested during this project successfully raised yields, improved the quality of olive oil, increased incomes, and conserved scarce water resources. This performance is convincing researchers that sustainable irrigation systems can play a dual role – supporting the expansion of both countries' olive sector while reducing chronic water stress.

"It is important to note that the success of this project depended on the participation of local farmers to demonstrate the potential of sustainable irrigation techniques," said Dr. Vinay Nangia, project

coordinator. "Working with the community, and embracing an integrated "systems" approach, demonstrated that drip and deficit irrigation may offer the best combination of fruit yield, oil content, and oil quality."

A short video about this project can be found at:

<https://www.youtube.com/watch?v=pLNzESdg8MY>



CGIAR Research Program: Dryland Systems

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A woman farmer in Tunisia, wearing a wide-brimmed straw hat and a colorful patterned dress, is crouching in a field, tending to young green plants. The background shows a large, curved structure, possibly a greenhouse or tunnel, covered in plastic. The title 'Addressing the gender gap in agricultural production systems' is overlaid in white text on the right side of the image.

# Addressing the gender gap in agricultural production systems

A woman farmer in Tunisia

Through the adoption of a participatory approach, ICARDA scientists are gaining a better understanding of gender gaps and wage equity in agricultural production systems. ICARDA's gender strategy enhances women's involvement in the farming systems.

In a region struggling with food insecurity, ICARDA scientists were baffled to find tomatoes rotting in the fields in rural Egypt. On initial investigation it appeared to be a case of lower prices being offered by marketing agents. However, a participatory research conducted by ICARDA scientists showed that the tomato variety was not

well-suited to local food preparation and preservation and the women did not like its taste. It was clear that the women's preferences had significant impact on the perceived value of the tomatoes, but were not taken into account when selecting the seed variety.

This revealed the importance of engaging women in decision-making in the local agricultural systems. However, despite their significant role in agricultural systems, women often remain marginalized. Addressing the 'gender gap' is essential for their empowerment and raising overall productivity.



*Women are an integral part of the agricultural production systems*

### Role of women in agriculture

According to the United Nations, women make up approximately 43 percent of the world's agricultural labor force. This 'feminization' of agriculture is prevalent across many of the areas targeted by ICARDA. Women undertake 60 percent of agricultural work in Syria and Jordan, and in Egypt they are entering traditionally masculine spaces related to irrigation, land management, and agricultural cooperatives.

### Participatory Research

Participatory appraisal shows that agricultural research is more effective if scientists recognize the role of different household members in agricultural activities related to production, processing, and marketing. However, due to the complex social, cultural, economic and political factors, integrating a gender perspective into the analysis of farming systems is still a challenge.

According to the FAO, if women had the same access to productive resources as men, they could increase crop yields by

**20–30 percent**

Raising total agricultural output in developing countries by

**2.5–4 percent**

Production gains of this magnitude could reduce the number of hungry people in the world by

**12–17 percent**

### Invisibility of women in agriculture

When ICARDA started a participatory plant breeding program in Syria, initially, women were not engaged in the process. With time, when ICARDA researchers became aware of women's interest in the program they coordinated directly with the community, respecting the cultural sensitivities, and created women-only venues for discussion.

With women on-board in the program, barley varieties were selected that better responded to farmers' overall household needs. Along with marketability, additional factors like reduced cooking time, taste preferences, and the quality of straw for producing handicrafts were considered. Including women's opinions benefited the research in terms of understanding the trade-offs between income and household well-being.

## Empowering women

ICARDA recently conducted a diagnostic study on the value chain of argan oil production in the Souss Massa Draa region in Southwestern Morocco. One of the objectives was to investigate whether women's participation in the value chain resulted in empowerment. Interestingly, empowerment has a varied understanding. Often it is defined in terms of women's relationships to specific crops, livestock, or the tasks performed rather than their level of knowledge or skills.

Women farmers are an important part of the booming argan oil industry but economic returns for them are few. The study determined that women are locked in a poverty trap despite their participation in the value chain.

However, the access to income has given them respect within their household and community, and they control its allocation to an extent. They do not receive adequate wages, but benefit from social responsibility programs, literacy courses, and sometimes make small investments. Their empowerment also comes through their skill development.

It is important to understand the tradeoffs between empowerment within the household. For example, an empowered mother who spends long hours at a collective cracking nuts may lead to a disempowered adolescent daughter, who sacrifices her education to take on greater household responsibilities. ICARDA scientists are continuously working towards gaining a better understanding of gender gaps and addressing them adequately.

## Wage equity in the agricultural sector in Morocco and Egypt

Improving wages and working conditions for women is also an important part of ICARDA's research. A research was conducted in Egypt and Morocco to investigate and assess how working conditions, opportunities, constraints and sociocultural norms interact to shape the experiences of female and male agricultural laborers working under different terms and conditions (full time, part time, formal, informal, seasonal and permanent) in the agricultural sector.

It was found that higher-paid equipment-intensive tasks tend to be assigned to men whereas women are much more likely to find themselves performing lower-paid time-intensive tasks. Even in the informal sector, men are routinely paid more than women for the same work.

Enforcing equal-pay legislation for women as well as training employers to respond adequately to gender equity is an essential first step towards enabling women to benefit equitably with men from their labor contributions to the agricultural sector.

**The ICARDA-led Dryland Systems program** follows a gender strategy to enhance women's involvement in the farming systems.

- In Mali, gender-related interventions are being incorporated into projects, and measures taken to assess women's roles and enhance the benefits they receive from agriculture.
- In South Asia, a "farmer facilitator" approach specifically targets women farmers, providing training on appropriate land, water, and soil management.
- In Southern Africa's Chinyanja Triangle, gender studies are examining the farming technologies being used by men and women and technology preferences of female versus male farmers.
- In North Africa and West Asia, research is identifying the gender wage gap in the agricultural sector in Egypt and Morocco and linking up with organizations (local and transnational) that can deliver outcomes.

CGIAR Research Program: Dryland Systems

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# Sustainable food security and poverty reduction in Afghanistan

Farmers engaged in participatory demonstrations

Cereal crops and food legumes are grown on ninety percent of Afghanistan's cultivated land. However, the country faces a serious food deficit. To address the issue of food security, a project was implemented through farmer-participatory demonstrations that improved food availability through a systems approach including capacity development, research, and technology transfer.

As Afghanistan emerges from decades of instability that had a huge impact on agricultural productivity, rebuilding food security is vitally important. The country suffers from an average yearly cereal deficit of around 250,000-500,000 tonnes. There has been a 30 percent increase in

the price of chickpeas from 2007-2011.

ICARDA and Afghanistan's Ministry of Agriculture, Irrigation, and Livestock (MAIL) received financial support from the Netherlands government to commence a three-year project (2009-2012) to

increase food supplies and improve the livelihoods of farmers. The overall objective of the project was to support the efforts of MAIL to achieve sustainable food security and reduce poverty by facilitating the introduction of new and improved varieties and enhanced technologies to farmers.

For this, researchers adopted a three-layered fast-track approach of: (1) evaluating and introducing improved varieties; (2) raising awareness and encouraging the adoption of improved varieties through farmer-participatory demonstrations; and (3) reintroducing improved varieties using a 'flush-through' approach to maintain the purity of varieties and to ensure uninterrupted availability of pure (certified) seeds.

Uruzgon province in south central Afghanistan was the main target area for the project. The research was also duplicated in other provinces (Balkh, Baghlan, Herat and Nangarhar) using a mirror approach to ensure the continuity and collection of useful data even if the project was affected at some sites due to security risks.

### Adaptive Research

The fast-track, adaptive research approach used by this project allowed semi-finished, advanced material from the breeding programs of ICARDA and other CGIAR and international centers to be evaluated and introduced. Improved varieties were released within three to four years, as compared to the traditional process of 9-11 years.

A total of 1696 genotypes (lines and varieties) were tested during 2009–2012 and 335 were potentially worthy of detailed evaluation. During the project period, five wheat lines (2 irrigated wheat lines and 3 rain-fed varieties), two barley lines, and two chickpea lines were identified for release as new, improved varieties. Variety release proposal documents for these lines were submitted to the National Variety Release Committee. A total of 74 wheat lines, 226 chickpea genotypes, and 35 barley lines were also selected for further evaluation.

### LONG-TERM BENEFITS

- Improved production from irrigated wheat varieties will result in an estimated annual benefit of US\$7.11 million.
- Increased production from rainfed wheat will generate US\$8.05 million per annum.
- Through 5 percent nationwide adoption by the end of 2017–2018, the expected present value of benefits will reach US\$47 million.
- Improved varieties of wheat, rice and mung bean in the five target provinces will yield a benefit of US\$0.9 million.
- Total benefit-cost ratio and Internal Rate of Return (IRR) of the project will be 9.2 and 62 percent respectively.

### Transfer of technology through participatory demonstrations

In order to enhance the adoption of new, improved varieties, the project implemented a farmer-participatory approach to demonstrate the usefulness and economic benefits of improved varieties of wheat, rice, chickpea and mung bean.

A total of 288 farmer-participatory demonstrations of improved varieties of the four target crops were held in Uruzgon province, and 124 demonstrations (45 chickpea and 79 mung bean) in Baghlan and Mazar provinces.

An average of 25.5 percent yield increase was obtained over local varieties. Improved varieties of wheat, rice and mung bean exhibited an average of 0.98 t/ha (29 percent), 1.04 t/ha (16 percent) and 0.3 t/ha (32 percent) higher

yields over traditionally grown varieties, respectively. Chickpea was a new introduction in Uruzgon by the project, so no yield change could be estimated.

### Promoting Village-Based Seed Enterprises (VBSEs)

Village-Based Seed Enterprises (VBSEs) were launched in two districts of Uruzgon, which previously had no formal access to certified and good quality seed produced in other parts of the country. This greatly increased access to quality seed of wheat, rice, chickpea, and mung bean. During 2010–2012, the two VBSEs produced 136 tonnes of certified seed, comprising 41.66 tonnes of wheat, 65.92 tonnes of rice, 7.5 tonnes of chickpea and 21.06 tonnes of mung bean. The quantity of seed produced in 2012 was four times higher than 2011.



*Seed distribution through village-based seed enterprise*

### Encouraging Herbal Remedies Producers' Associations

Two Herbal Remedies Producers' Associations were established, which produced 11,062 units of herbal products during 2010–2012. Dry mint, mint distillate, mint oil, cumin oil and cumin distillate were produced and marketed in Uruzgon and beyond. This resulted in a net benefit of US\$4840.

### Assisting in capacity development activities

In order to strengthen the capacity of MAIL and university staff, 71 researchers and policy-makers were trained abroad through 28 training events covering various aspects of cereal and legume cultivation. The trainees participated in various symposia, meetings, and workshops.

A total of 2446 farmers, students, and members of seed associations and herbal remedies associations were trained through in-country training events and field days for both men and women. Three radio programs and one radio commercial were produced in local languages (Pashto and Dari) and broadcast through private and Government-owned radio stations in Uruzgon and other provinces. These are expected to disseminate the project activities to an estimated seven million people, nationwide.

Additionally, three best-practice guides prepared in local languages were published and 15,000 copies were distributed to MAIL staff in provinces, extension workers, universities, through national and international NGOs, and to the farmers in five provinces.

Along with the local capacity development, the project interventions are expected to alleviate food insecurity and generate an estimated benefit of US\$14.78 million in the target provinces by the end of 2017-2018.

CGIAR Research Program: Dryland Systems

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# Improving agricultural research through Geoinformatics



Enhanced geospatial technologies are helping improve agroecosystems

Enhanced geospatial technologies (remote sensing, global positioning system and geographical information system) upgrade ICARDA's integrated agroecosystems research and support the 'systems' approach for agricultural research for development. The high resolution data thus received gives a better understanding of the complexities related to dryland farming systems. Consequently, researchers can better diagnose vulnerabilities and suggest interventions to improve agricultural productivity.

In a bid to improve agricultural productivity, ICARDA recognizes that geoinformatics is critical in obtaining adequate data for tackling food security and improving livelihoods, particularly in

dry areas of the developing world that struggle with limited natural resources. Geoinformatics has the ability to influence agricultural research, programs, and policies.

Defined as an integrated technology for the collection, transformation and generation of information from integrated spatial and non-spatial databases, geoinformatics includes the

techniques of remote sensing, geographical information sciences (GIS), and global positioning systems (GPS).

The use of geoinformatics in agricultural research has recently increased due to advances in satellite sensor technology, and advances in the processing and handling of large amounts of data. Particularly, over the last five years, there has been a notable increase in the use of spatial data and the development of machine learning algorithms for thematic research. This trend has ushered in a new era of “open access.”

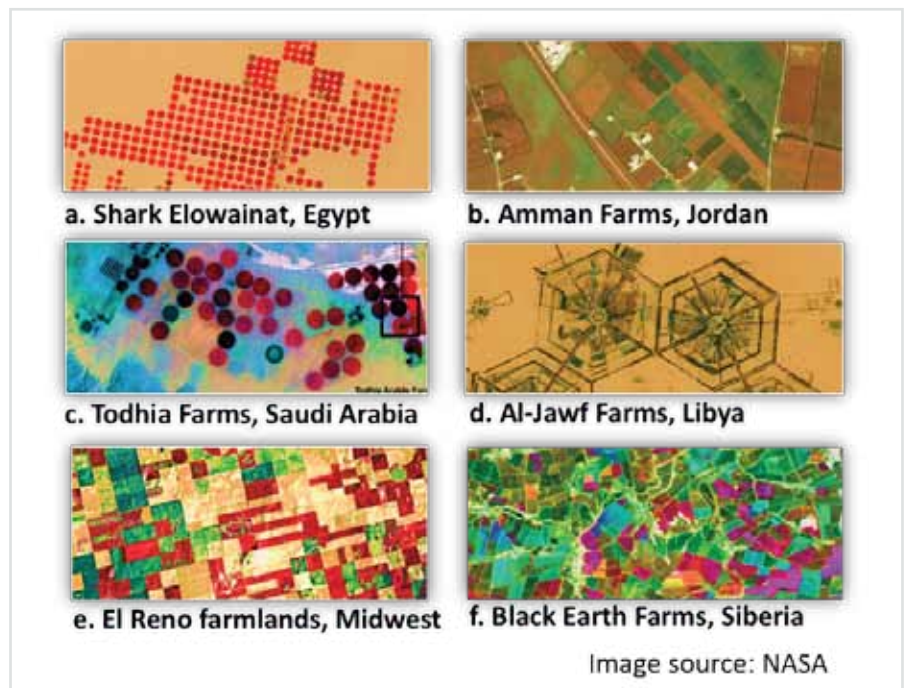
### Complexities of agroecosystems

While efforts are underway throughout the world to increase agro-geoinformatics data, in many instances the information is collected at very coarse resolution, ranging from several hundred meters to tens of kilometers. At these scales, the data may fail to reflect ground realities that are often very different from information or data collected at larger scales. As a result, the information is incapable of capturing the complex nature of agroecosystems.

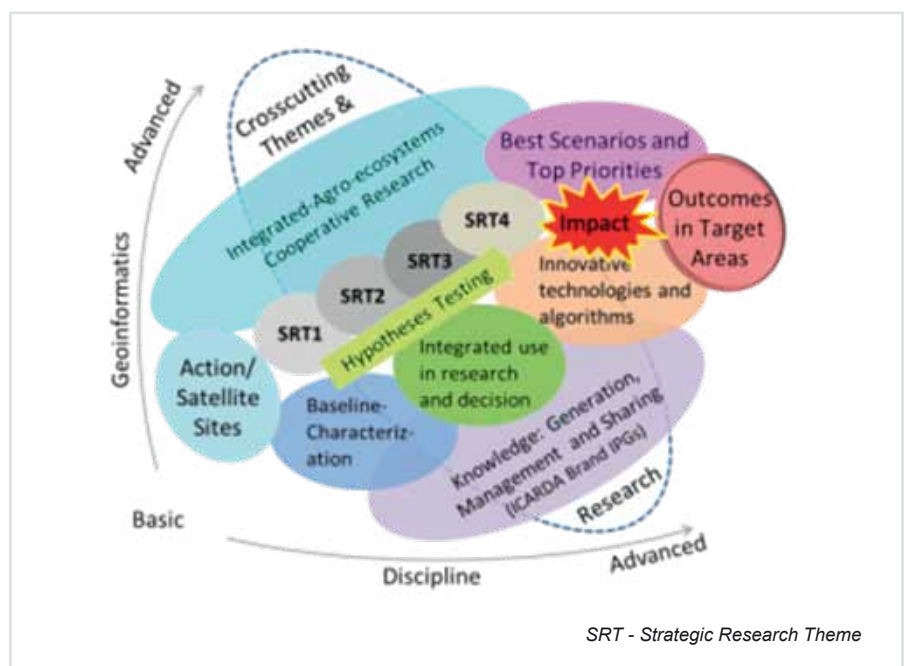
This problem is especially prevalent in the developing world, where landholdings are small, and production systems are highly diverse and complex. Such complexity includes various factors such as soils, water availability, elevation, localized weather events, poverty distribution, infrastructure, migration, market access, conflict, and more.

### Increased resolution

Recent developments in advanced sensor technology, platforms, satellite constellation, multiple-clone satellites, onboard capacity, and grounding stations have resulted in a new era of remote sensing applications.



*Diversity of agro-ecosystems in dry areas observed from the space*



*Role of Geoinformatics in the ICARDA-led CGIAR Research Program on Dryland Systems*

These advancements have enhanced the ability to obtain satellite imagery on a near real-time basis at sub-meter (even at <30cm) for any given location. The quality and details of the

imagery have increased dramatically. As a result, the inherent information contained in each image is more detailed and fulfills the needs of agricultural researchers.

Simultaneously, software companies and open-access platforms are developing necessary calibration and processing tools to make information easily available to a range of end-users.

### Improved processing

Enhanced processing – including increased computation power and speed for faster image processing, better GIS infrastructure, new algorithms for modeling, and other tools – has allowed the geoinformatics community to study and characterize agricultural production systems at various scales. These improved tools have contributed to the ability of researchers to enhance pixel-based image analysis of high resolution data acquired over complex and greatly variable agroecosystems.

It is important to note that there are still limitations associated with time-variant identical spectral characteristics among different land use and land cover types. However, the combined use of higher spatial, spectral, and temporal resolution images has enabled researchers to produce better thematic maps with higher classification accuracy.

### Decreased costs of operations

In the past, costs associated with satellite image acquisitions, and cyber infrastructure for processing and handling the satellite data, made geoinformatics very expensive.

These costs have recently been declining due to increased open access to data, open source program and algorithms, decreased cost of mass storage, and increased computational efficiency. This drastic reduction in operational costs has led researchers to use geoinformatics tools and technology across wide areas of

application in agricultural research, starting from molecular level research to landscape level assessment.

### Integrated approach to drylands research

As a result of improved geoinformatics techniques and increased access to data, the ICARDA-led Dryland Systems Program heavily relies on these innovative tools in conjunction with traditional knowledge to mitigate risks and increase overall agricultural productivity.

“Geoinformatics enables researchers to effectively incorporate the constellation of biophysical, climatic, socio-economic, and institutional factors controlling the adoption of new innovations and technologies. As a result, these spatial data and knowledge base are critical to supporting ‘systems’ approach to agricultural research for development.”

*Dr. Chandra Biradar*  
*Head, ICARDA*  
*Geoinformatics unit*

One of the primary objectives of the CRP on Dryland Systems is to develop detailed baseline databases for different “action sites.” This is intended to enhance researchers’ understanding of the various production systems in terms of land use, land cover, land degradation, water use, and more. These databases will allow researchers and stakeholders to

track the progress and assess the impact of various program interventions. For example, the capability to identify different land management units or production systems through their associated spectral properties is a major step forward in ICARDA’s ability to classify and monitor dryland systems.

Given the complexity of dryland farming systems, it is necessary to characterize these systems at very high spatial resolutions to understand the risk and vulnerability factors. Mapping presents emerging and future land use trends, status and processes (e.g., land degradation, climate change). It allows researchers to better diagnose vulnerabilities and intervene to improve livelihoods.

Such maps allow researchers to take into account different factors such as land cover dynamics, cropping patterns and intensities, water use and availability, changing demographics, infrastructure, poverty, markets, climate change, and more. Information generated can be used to assess vulnerable areas for possible pathways to increased resilience and mitigation of risks, whether biophysical (land degradation and drought), or socioeconomic (price shocks or policy changes in land tenure).

CGIAR Research Program: Dryland Systems

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# Increasing resilience of livestock migration in dry areas

Pastoralist communities participating in a multidisciplinary study

A comprehensive study to understand the migration practices of livestock herders in Rajasthan, India, in the context of a changing climate, economy, and sociological systems, identifies the challenges faced by pastoralists and suggests strategies to cope with fodder and water scarcity.

Expanding urban areas and diminishing pasturelands pose a serious threat to pastoralists in Rajasthan, a state in northwest India. Freedom to move their animals in search of forage and water resources is critical to their livelihoods. Government

regulations have been trying to make pastoralist populations sedentary. Alternative livelihoods suggested for this impoverished community are not feasible. Sporadic droughts further threaten their livelihoods. Consequently, a culture of non-compliance with the

new sedentary policy has evolved. This is further encouraged by an increasing demand for sheep products — particularly mutton in urban centers. As a result, the migration of sheep flocks in this region continues unabated.

## Analyzing livestock migration for policy recommendations

As pastoralism continues in Rajasthan, there is a growing need for regeneration of existing pasturelands to cope with changing climate and land use. Approaches need to be adapted for local communities so they are successful and generate livestock benefits. Pastoralists often increase their herd size to cope with high mortality. Adequate nutrition and access to health services is important to enhance the productivity of small ruminants and reduce the pressure on pasturelands.

For effective management techniques of small ruminants in the world's dry areas, researchers need to analyze livestock migration. The development of veterinary mobile services and restoration of degraded rangelands are widely needed. Research on livestock mobility can provide valuable knowledge to the herders and recommendations to policymakers.

## Gathering data through community participation

Embracing ICARDA's innovative 'systems' approach, a study was conducted by a multi-disciplinary team from ICARDA, Oregon State University (USA), and the Central Arid Zone Research Institute (CAZRI) in India. The project, funded by the CGIAR research program on Climate Change, Agriculture and Food Security (CCAFS), aimed to inform the formulation of policies and government initiatives that could improve the livelihoods of pastoralist communities.

A Participatory Rural Appraisal method was used for this study. Participant groups included extension workers, representatives of livestock associations, traders,



*A multi-disciplinary team conducting the study to understand migration practices*

and cooperatives, representatives of government departments, non-governmental organizations, pastoralists, and researchers.

Detailed information was collected from 30 households in each village. Livestock migration was tracked through the use of GPS animal collars. This technology provided knowledge about the spatial-temporal context of herd's mobility and other dynamics. Such information was essential in engaging with policy makers and dispelling some of the misunderstandings regarding migratory pastoralists.

## Enhanced understanding through data analysis

Researchers found that the rearing of small ruminants depends on labor inputs from all family

members. With a market-oriented production system, small ruminants are utilized for meat, wool, dung, and milk.

Three types of livestock migration patterns were identified. Temporary migration occurs within the same district when local pastures are exhausted. Semi-migration is out of the district or state during the dry season, but herders return to their native area during monsoon. Permanent migration occurs when animals are moved to other districts or states with family members rotating the herding responsibility. Overall, migration routes are well established.

A total of ten GPS collar units were deployed (2-3 GPS collars per herd). Researchers created maps detailing the daily distances

traveled by the herd being tracked and the time (duration) each herd spent at various land use types. A buffer of 10 kilometers was established around the path for animals and a 5 kilometer buffer was placed around known well points. The creation of these buffer zones helped identify priority areas for needs of veterinary services and water access. The data and maps showed that increasing water access in these expanses would reduce grazing pressures in degraded areas.



*Using Participatory Rural Appraisal approach to gather local knowledge*

Data obtained through the GPS collars also indicated that animals travel roughly 6-17 kilometers per day and the type of land that is utilized. Migration routes and length of time spent in one area are determined by the ease of access to water, pasturelands, and markets. Cropland and fallow land compromised 78.5 percent of the land utilized by cattle. Grasslands, deciduous trees, and scrub forest land only accounted for 8.4 percent of the area utilized by cattle for forage.



*A sheep collared with a GPS tracking unit*

### New insights

This study revealed new information and suggested approaches to improve pastoral livelihoods:

- Livestock migration reduces grazing pressure in herders' home villages and allows them to follow forage according to climate variability. This mobility increases the communities' resilience to climate change.
- Dissemination of near real-time information about the condition and abundance of forage resources and availability of crop aftermath/fallow fields is expected to facilitate the migration process and increase efficiency.
- Provision of government services in the present migration routes, such as post processing facilities, and watering camps in new areas could potentially reduce grazing pressure by dispersing herders to new areas and increase incomes.
- Increased awareness of government veterinary services at key points along the migration route can be generated through a promotional campaign.

### The intersection of science and policy

Helping countries leverage science and technology for development is an important component of ICARDA's work. Along with providing critical information to scientists to develop strategies for fodder and water scarcity, this comprehensive study also equipped policymakers with increased knowledge on how to best assist a vulnerable population. Providing knowledge to support sustainable agricultural and

livestock management policies is critical to reducing poverty and increasing food security.

A short video about the project can be found at [https://www.youtube.com/watch?v=unUe5BWM\\_AE&list=UUwzPIJDIXyBNQuEL-YdzRpQ#t=14](https://www.youtube.com/watch?v=unUe5BWM_AE&list=UUwzPIJDIXyBNQuEL-YdzRpQ#t=14)

### Key Recommendations:

- **Rangeland Improvement**
  - better productivity of common grazing lands for nutritional requirements of migrating animals
  - livestock watering points on different migratory routes
- **Defend Livestock Corridors**
  - improve animal health care and veterinary services
  - provide market infrastructure to facilitate the sale of animals/animal products at remunerative prices
  - develop identification and traceability systems for better management

CGIAR Research Program: Climate Change, Agriculture and Food Security

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## Promoting community participation in research to increase the adoption of new technologies

Enhanced geospatial technologies are helping improve agroecosystems

Involving communities and building local partnerships are at the core of ICARDA's research strategy for developing technology packages for specific agroecosystems. This ensures appropriate adaptation of existing technologies and widespread adoption of innovative technologies. At two water benchmark sites of the Egyptian Nile Delta, along with the participation of smallholder farmers, ICARDA's scientists and partners facilitated raised bed irrigation technique with remarkable success in improving water productivity and lowering overall input costs.

Agricultural innovations have the potential to improve livelihoods and drastically increase crop yields. However, there is never a "one size fits all" solution. Particular combinations of climate, terrain, water availability and soil

conditions create unique environments with distinctive challenges. For a technology to succeed in a community, it needs to be adapted to its specific agro-ecosystem and socio-economic conditions.

Water Benchmarks Program was established by ICARDA in 2003, with funding from Arab Fund for Economic and Social Development (AFESD) and International Fund for Agricultural Development (IFAD), to work directly with communities to



*Developing technologies to increase agricultural production and manage natural resources.*

develop and promote affordable technologies tailored to site specific constraints. Specific benchmark research sites are selected for certain agro-ecosystems.

Farmers work directly with researchers to develop, implement, and fine-tune technologies to increase agricultural production while properly managing natural resources. Through community engagement, ICARDA also investigates socio-economic constraints in adopting new technologies and looks at solutions. Community involvement and commitment of national governments, academic institutions, and non-governmental organizations are the key determinants of this program's success.

### Partnerships for success

The benchmarks approach has also been adopted by other initiatives, such as ICARDA's

initiatives, such as ICARDA's Middle East Water and Livelihoods Initiative (WLI) that was established in collaboration with National Agricultural Research and Extension Systems (NARES) in eight countries, and the United States Agency for International Development (USAID) and targets some of the most water insecure communities in the Middle East and North Africa regions. Through WLI, collaborative field research is undertaken to improve land and water management in drylands and their suitability for scaling up in similar agroecosystems.

This initiative provides a platform to the Water Benchmarks Program to successfully scale out tested technologies to rural communities.

The WLI and Water Benchmarks Project together create strong local partnerships with an understanding of local gender dynamics, community-level hierarchies, market opportunities for farmers,

and their infrastructure and equipment needs.

Through these partnerships, tested technologies are disseminated to increase crop production at the local, regional, and national level.

### Benchmark research sites

ICARDA has embraced a 'systems approach' to address the challenges of rural communities. Regions are identified to fit the criteria of a specific zone – or 'system'. Suitable technology packages are then recommended accordingly.

Much of ICARDA's water and land management basic research is focused within the benchmark research sites in the following agroecosystems and then scaled out to relevant areas:

- Irrigated agroecosystems,
- Rainfed agroecosystems,
- Rangeland agroecosystems.

## Successful implementation of raised bed system through community participation

Few examples of a technology package implemented in the 'irrigated agroecosystem' in ICARDA's benchmark sites are located in the "Old Lands," or areas within the traditional flood plain of the Nile with fertile soils in the Egyptian Delta. Farms in the Old Lands, which yield two or three crops per year, typically use surface flood irrigation when water is available.

Due to unreliable water deliveries, whenever water is available farmers in the Old Lands tend to over-irrigate their crops. This increases input costs, leaches out fertilizers and raises water table, and causes water shortage for farmers at the lower end of the canal, who have to routinely depend on drainage water, drought tolerant cropping and deficit irrigation.

ICARDA scientists and project partners worked with communities at benchmark research sites in the Old Lands to develop a package that is more water-use efficient, economically viable and easily implemented.

A known water-efficient farming practice is the raised bed. The water benchmarks project adapted this practice through adaptive research to the conditions of the Nile delta. The package included furrows size and spacing, bed specifications, improved agronomic components such as varieties, fertility and weed control. Deficit irrigation was also included. The package reduced water application, decreased water loss from percolation, ensured good aeration of the roots, efficient use of fertilizer, and easier weed control.



*Mechanized system for raised bed cultivation that increases yield and saves irrigation water*

### The raised bed machine helped the growers reduce:

- Water application by 20%
- Seed rate by 50%
- Farming cost by 25%
- Planting time by 88% and Increase crops yields by 15-25%

However, smallholder farmers had to implement the raised bed either manually or semi-mechanically through traditional plows, which was costly and inefficient. Considering the specific needs of smallholder farmers in Egypt's Nile Delta region, ICARDA's scientist and partners retrofitted a machine that raises a planting bed, creating the furrows between beds, and simultaneously seeds the bed with grain or silage seed. The machinery was tested and fine-tuned to various farm and crop conditions in the delta. This new mechanized system saves water and fertilizer and helps avoid crop lodging and alleviates pressure on rising water tables.

Farmers in the Al-Sharkia province applied this package for raised bed cultivation of wheat and reported 24 percent saving in irrigation water, 34 percent increase in yield, and 78 percent improvement in water use efficiency.

These remarkable results have encouraged its widespread adoption. In 2009, the raised bed package was pilot tested on 950 hectares, that increased by over 20 times to 21,200 hectares by 2013, under the food security project funded by AFESD, Kuwait Fund for Arab Economic Development, Islamic Development Bank and OPEC Fund for International Development. Given its simplicity and impressive results, the practice is rapidly gaining momentum in Egypt and also being transferred to countries such as Sudan, Ethiopia, Eritrea, Nigeria, Iraq and Morocco.

CGIAR Research Program: Dryland Systems

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# Improving food security and climate change adaptability of livestock producers using rainfed barley-based systems in Jordan



Jordanian farmers gathered at the time of crop planting to observe the Zero Tillage seeder in operation

Food insecurity among farming communities dependent on barley-livestock systems in Jordan, is growing. ICARDA engaged these farmers in a project financed by the International Fund for Agriculture Development (IFAD) aimed at improving food security and climate change adaptability. The benefits of Zero Tillage were demonstrated through community participation. Information about climate change, and techniques for improving livestock production, milk processing and marketing of dairy products was disseminated. Assessments and evaluations of livelihood impacts, conducted by the farmers themselves, motivated many for uptake.

Desperate to enhance the cultivation of rainfed cereals, farmers in select areas of Jordan perform repeated deep plowing of their soils. Instead of enhancing cultivation, frequent deep plowing however destroys the soil structure, decreases water storage capacity, reduces organic matter, and fosters soil erosion.

In an effort to mitigate risk, livestock owners increase their herd size regardless of constraints on feed. As a result, the lack of adequate resources results in low productivity in terms of milk, meat, and reproduction.

These outdated practices keep rural communities in the arid marginal zones of Jordan, that are dependent on barley-livestock systems, deeply shackled in poverty. With little diversification in their livelihoods, climate variability further adds to the food insecurity of these poor rural households.

### Improving food security and climate change adaptability

ICARDA engaged these farming communities dependent on barley-livestock systems in targeted areas of Jordan, in a project to increase food productivity and climate change resilience. Farmers were actively engaged in all the stages of project planning, implementation and evaluation. The project was also started in Iraq, but could not be completed due to security concerns.

### Conservation agriculture

Farmers were introduced to conservation agriculture, which is a proven technique to improve soil fertility through the elimination of plowing, also known as zero tillage (ZT). ZT results in water efficiency, high yields and elimination of plowing costs. The project's success motivated farmers

throughout the region to adopt ZT techniques.

### Community participation in selecting improved technologies

Twenty-nine farms hosted demonstrations of ZT and conventional tillage (CT) in the Karak Governorate for this project. Researchers divided each field into two parts – one was prepared using ZT and the other using CT. Nine fields were planted with common vetch (*vicia sativa*), eight with bitter vetch (*vicia ervilia*), eleven with barely (*hordum vulgare* L.), and one with a barley-common vetch mix.

The results showed that biological and grain yields of barley and vetch varieties grown under the ZT system were higher than those produced under CT. For example, data received from an average of 28 demonstration fields that planted barley over three growing seasons (2011/12/13/14), showed that the biological yield of barley increased by 11 percent and average grain yields increased by 23 percent under ZT compared to CT. For common vetch, the average grain yield under ZT was 2.5 percent higher. Further, average biological yields of bitter vetch varieties increased by 20 percent and grain yields by 11 percent under ZT systems.

Despite this success, the uptake of this technology is slow due to the limited availability and affordability of ZT seeders. However, collaborations with local cooperatives are helping convert conventional seeders to ZT. Recently, collaboration was established with a local seeder manufacturer, the Rama Company, to develop zero-till seeders and a prototype is currently operational.

“Community participation was vital to the project's success. Also, the farmers' perceptions regarding what worked and what did not were important for scientists, development workers, and policy makers to understand the factors impacting livelihoods.”

*Dr. Nasri Haddad*  
Project Coordinator

### Assessing the impacts to inform communities

Providing empirical evidence of the benefits of new technologies might encourage farmers to adopt new innovations. Therefore, researchers conducted baseline and follow-up surveys to compare the costs and benefits of old technologies versus the newly introduced ones. Income impacts of the use of ZT on barley and vetch were specifically assessed. Half of the sample farmers were project participants in various activities, while the other half did not have any relationship with the project and were randomly selected.

The analysis confirmed the financial feasibility of ZT technology. Results showed that the adoption of ZT leads to a gain in net margins of about US\$357/ha for the typical adopters. Moreover, if the typical non-adopter farmers were to adopt the ZT technology, they would earn about US\$240/ha more than their current net margins. Along with the positive biophysical effects of the adoption of ZT, its environmental benefits are also well documented.



*Community engagement for the selection of appropriate technologies*

The farmers were asked to evaluate the effects of ZT technology on their livelihoods. Fifty percent of the farmers found ZT technology to be beneficial with positive impacts on their livelihoods. Only 13 percent believed that ZT technology was harmful and 37 percent were neutral.

Eighty-seven percent of the farmers believed that the cost of tillage had decreased, with 57 percent viewing the decrease as significant. Only three percent of farmers believed that the cost of tillage had increased.

Twenty-seven percent of farmers indicated that their income had improved as a result of adopting ZT

technology. Seventy-five percent of farmers within this group believed that the increase was moderate.

### **Increasing awareness and educating extension agents**

In order to increase the awareness of climate change and the need for adaptation options, a climate change and drought atlas was also prepared for Jordan. The maps display projections of drier conditions, reduced growing periods, shifts in climatic zones, higher temperatures, and increased water stress.


The project also heavily invested in training. The development of extension programs helped

introduce ZT techniques, enhance livestock production, and improve milk processing and the marketing of dairy products. This also provided an additional method to help farmers understand the negative impacts of climate change and learn adaptation options.

CGIAR Research Programs: Dryland Systems; Climate Change, Agriculture and Food Security

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## Promoting improved food security and nutrition in Iraq by increasing access to information

IRAQ

Enabling decision-making process to better identify vulnerable areas

A pioneering online tool, Iraq Spatial, enables decision-makers in Iraq to accurately identify areas more vulnerable to climate variations and climate change by mapping relevant indicators for precipitation, temperature, and biomass variability. The comprehensive set of data thus received, will have the potential to support the required agricultural policies and regulations, and bring greater benefits to the communities.

ICARDA's "systems approach" recognizes that successful dryland agricultural systems have evolved through an integrated approach that includes the right mix of innovative partnerships, diverse technologies, and appropriate

policies. This holistic approach to agricultural research has proven to be successful at bringing rural communities living in the world's dry areas practical solutions for improved livelihoods and food security.

Such success depends on current agricultural science and technology being readily available to policy makers. Without access to accurate and comprehensive data, decision makers and researchers struggle to develop appropriate



*Developing technologies to increase agricultural production and manage natural resources.*

policy agendas. As a result, their policies may do more harm than good, or at best, be ineffective and miss their intended targets.

Iraq is one of many countries across the Arab World that is looking to make its decision making processes more effective. After decades of conflict, sanctions, and increasing environmental degradation brought on by climate change, Iraq needs an appropriate policy agenda capable of revitalizing its struggling agricultural sector and meeting the food needs of its growing population.

In a country where government ministries and other decision making bodies face significant capacity constraints, policy reform is unlikely to be an easy task. Yet this process can be facilitated if policymakers are given reliable data on which to complement evidence-based decision making.

### **Harmonized Support for Agricultural Development in Iraq (HSAD)**

ICARDA's HSAD initiative aims to improve the incomes of Iraqi farmers and agribusinesses by strengthening agricultural value chains. It targets key crop commodities crucial to Iraqi food security and prioritizes women and poor small-scale farmers. The Program also eases value chain constraints and raises the competitive potential of Iraq's agricultural sector. Activities include improving the delivery of extension services, developing the capacities of beneficiaries, and supporting reforms of agricultural policies, regulations, and institutions.

HSAD is funded by USAID and places Iraq's Ministry of Agriculture and Water at the heart of reform efforts, alongside a range of international partners providing support and expertise.

This is the thinking behind a new online tool that aggregates a full range of development-related data – a “one-stop” source of reliable

and comprehensive geo-spatial information that targets Iraq's policymakers and research community.

Iraq Spatial, launched in Baghdad on 23 March 2014, provides over 200 indicators, including macroeconomic, sectoral, climate, biophysical, and socio-economic data at the national, subnational, and pixel level. The tool enables users to target policies where they are most needed, for instance pin-pointing which areas are more vulnerable to climate variations and climate change by mapping relevant indicators for precipitation, temperature, and biomass variability.

The tool is a collaborative effort between ICARDA and the International Food Policy Research Institute (IFPRI), as part of the USAID-funded Harmonized Support for Agriculture Development (HSAD). It is also the first country portal affiliated with the more expansive Arab Spatial, a region-wide repository of geo-spatial information initiated by IFPRI and supported by the International Fund for Agricultural Development (IFAD) and the CGIAR Research Program on Policies, Institutions, and Markets (PIM). Iraq Spatial builds on this model to provide more specific national and sub-national level data to assist in the precise targeting of food security and development interventions.

As a free and open access knowledge platform, it allows end-users to query a full range of databases, build interactive multi-layer maps, and use customized analytical tools to compare, explore, and download these results. It will also be updated and expanded on a regular basis and welcomes the submission of new information from partners and other stakeholders – thereby helping to continually improve the tool and further assist in the delivery of appropriate development interventions across Iraq.

### First Country Spatial

“Iraq Spatial is the first country spatial which provides a comprehensive and accessible set of visual analytics that help to target policies and research more effectively. It gives Iraq’s decision makers and research community the information they need to develop appropriate policy reforms and strategies that are capable of raising agricultural productivity and strengthening food security. With an option for end users to add relevant data, the tool will become even more comprehensive over time, helping to further assist the targeting of interventions.”

Iraq Spatial is built upon a conceptual framework developed by IFPRI, termed the “Food Security System,” which identifies pathways to improved food and nutrition security. This framework links the complex interaction of factors at the macro and micro levels to demonstrate how external shocks such as food price hikes or interventions in the form of policies and programs affect the availability of food and the nutritional status.

The tool also supports the work now being rolled out by the ICARDA-managed HSAD initiative to support policymakers in Iraq. Since the initiative’s inception last year, the program has supported Iraqi decision makers to identify policy and regulatory constraints, and initiated a policy and reform agenda capable of raising the country’s agricultural productivity. ICARDA and HSAD have been closely involved in the development of a national seed law, for instance, that promises to deliver quality seed to Iraqi farmers and raise their productivity.

The effectiveness of legislation such as this ultimately depends upon the quality and accessibility of the information that policymakers have to reach their decisions. Iraq Spatial raises the bar in this regard, providing a reliable and comprehensive set of data with the potential to fundamentally change the way that policies are developed.

The Iraq Spatial can be accessed free of charge at <http://www.arabspatial.org/iraq>.

CGIAR Research Program: Dryland Systems

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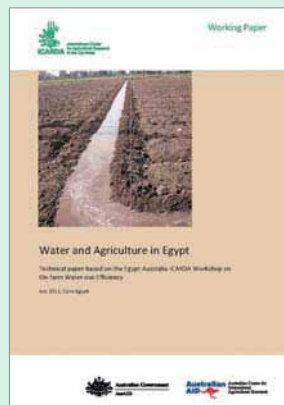




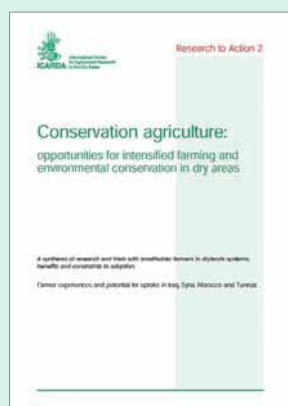
**A strategic plan to revive wheat in Central and West Asia and North Africa by out-pacing *Puccinia striiformis* Westend (yellow rust).** S. Nagarajan and S. Rajaram. ICARDA Working Paper. Background and analysis for a proposed research and capacity building initiative to support countries in Central and West Asia and North Africa regions to better manage and reduce the threat of wheat stripe rust (yellow rust).



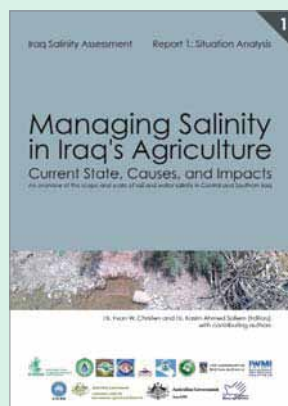
**Improving Water and Land Productivities in Irrigated Systems. 10.** M. Karrou, T. Oweis, B. Benli and A. Swelam (Eds). One of three final reports from the Water Benchmarks of CWANA Project: **Improving water and land productivities in rainfed systems. 8.** M. Karrou, T. Oweis and A. Bahri; **Rehabilitation and integrated management of dry rangelands environments with water harvesting. 9.** M. Karrou, T. Oweis, F. Ziadat and F. Awawdeh.



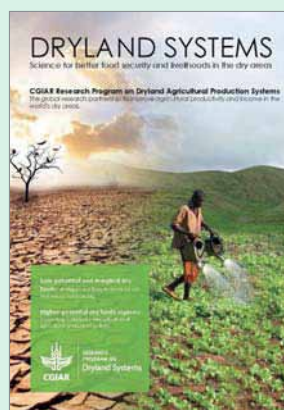
**Water and Agriculture in Egypt. Technical paper based on the Egypt-Australia-ICARDA Workshop on On-farm Water-use Efficiency.** ICARDA Working Paper.



**Conservation agriculture: opportunities for intensified farming and environmental conservation in dry areas.** A synthesis of research and trials with smallholder farmers in dryland systems; benefits and constraints to adoption. Farmer experiences and potential for uptake in Iraq, Syria, Morocco and Tunisia.

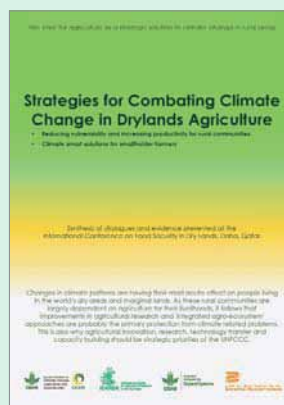


**Iraq Salinity Assessment. Report 1: Situation Analysis. Managing Salinity in Iraq's Agriculture. Current State, Causes, and Impacts.** Dr. Evan W. Christen and Dr. Kasim Ahmed Saliem (Eds). An overview of the scope and scale of soil and water salinity in Central and Southern Iraq. One of a series of publications covering the Iraq Salinity Assessment.



**CGIAR Research Program on Dryland Agricultural Production Systems.**

The global research partnership to improve agricultural productivity and income in the world's dry areas.



**Strategies for Combating Climate Change in Drylands Agriculture.**

Synthesis of dialogues and evidence presented at the International Conference on Food Security in Dry Lands, Doha, Qatar. The case for agriculture as a strategic solution to climate change in rural areas.



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 contribute to the improvement of livelihoods of the resource poor in dry areas by enhancing food security and alleviating poverty through research and partnerships to achieve sustainable increases in agricultural productivity and income, while ensuring the efficient and more equitable use and conservation of natural resources.

ICARDA has a global mandate for the improvement of barley, lentil and faba bean, and serves the non-tropical dry areas for the improvement of on-farm water use efficiency, rangeland and small-ruminant production. In the Central and West Asia and North Africa region, ICARDA contributes to the improvement of 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 to better target poverty and to enhance the uptake and maximize impact of research outputs.



CGIAR is a global research partnership that unites organizations engaged in research for sustainable development. CGIAR research is 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, including national and regional research institutes, civil society organizations, academia, and the private sector. [www.cgiar.org](http://www.cgiar.org)

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