

Mediterranean, Middle East and Balkan countries



Research in partnership to benefit agroecological transitions and Mediterranean territories

The Mediterranean is central to ecological, agricultural and human equilibria, and embodies the main global challenges of our time: growing water shortages, increasingly fragile rural territories and ever greater impacts of climate change. These issues, which are shared by the north and south shores of the Mediterranean, require collective, science-based responses. This fits neatly with the work done by CIRAD, which has a remit for agricultural research in partnership geared towards achieving the sustainable development goals, in tropical and Mediterranean regions. Since the start of the 2000s, CIRAD has been working closely with institutions in North Africa, maintaining a permanent presence within national and international higher education and research structures. The SIRMA network, devoted to water management and agriculture in the territories of North Africa, plays a strategic role in structuring that partnership. SIRMA and the various links built through inter-shore exchanges foster the co-construction and funding of joint projects. The approaches taken favour interdisciplinarity [associating the human and social sciences, agronomy, hydrology, ecology and zootechnics], targeted research that includes non-academic players in drafting research questions, and projects, by means of multi-stakeholder platforms and living labs. Training is a vital pillar of this cooperation. The many internships, Masters and PhDs co-supervised by our scientists fuel an ongoing trusting relationship between the generations and boost our collective capacity to innovate. Our membership of the scientific ecosystem in Montpellier facilitates exchanges of PhD students,

scientists and teachers between Montpellier, where most of our joint research units with other French or international research and teaching organisations (CIHEAM-IAMM) are based, and North Africa, fuelling a culture of learning and inclusion.

For the period 2025-2030, CIRAD has reaffirmed its engagement in the western Mediterranean, focusing on two priorities: sustainable water management, and pastoralism. Our ambition is to work with our partners to generate practical knowledge of direct use to grassroots players—farmers, policymakers, businesses and communities—to support agroecological and food transitions in the most vulnerable zones. Together, we aim to build more sustainable food systems in more equitable territories, capable of fulfilling local people's aspirations. CIRAD's work in the Mediterranean fits into an open scientific dialogue with other world regions: sub-Saharan Africa, Brazil, the Balkans and Asia. These exchanges serve to compare experiences of managing natural resources, transforming farming systems and promoting rural professions, while the range of viewpoints boosts the capacity of research to innovate and adapt. CIRAD's remit to work with its partners to build solutions for sustainable, inclusive and resilient farming systems comes into its own in the Mediterranean, with the support of the regional office in charge of the zone. ■

Élisabeth Claverie de Saint Martin,
CIRAD CEO



Water management is one of CIRAD's two priorities in the western Mediterranean. The Toudra Wadi valley in Morocco © G. Lacombe, CIRAD

Shared challenges and levers for action

Agriculture and food in the Mediterranean: between progress and vulnerability

The countries that surround the Mediterranean share an environment, a biodiversity and a history of cultural, human and economic exchanges. Over the past 50 years, their economic development pathway has been marked by an improved average standard of living. As a result of proactive policies, agriculture is now largely modern and specialised, although there are still substantial territorial inequalities. North African countries are an integral part of global markets, import staple foods and export high-added-value products such as fruit and vegetables. Dietary habits have shifted towards greater consumption of industrial products, which has triggered new health problems. Natural resources, notably water and soils, are increasingly under threat from climate change and over-use, while food systems are more fragile, as a result of environmental crises and the volatility of the global markets on which these countries are strongly dependent. In response, governments are working to strengthen their food sovereignty. The issue now is how to reconcile production, social justice and environmental sustainability.



Women workers on an irrigated plot in Regueb, Tunisia © S. Dury, CIRAD

Active international cooperation, despite a tense political landscape

The Mediterranean is marked by a number of conflicts and political tensions, which complicate relations between States. Despite these difficulties, several active frameworks for cooperation between the European Union and non-EU-member countries remain. For instance, the European Union plays a central role in cooperation through the Barcelona Process and the Union for the Mediterranean, aimed at guaranteeing stability, development and dialogue between the two shores. In fields such as research and education, programmes like Erasmus+, Horizon Europe and the Partnership for Research and Innovation in the Mediterra-

nean Area (PRIMA) encourage mobility, innovation and joint scientific projects. PRIMA in particular funds research on water management, agriculture, agrifood value chains and the water-food-environment nexus. Other initiatives, such as the Blue Plan or Interreg-type regional cooperation mechanisms, serve to promote cooperation in the environmental and regional fields.

National agricultural and food policies supported by research and innovation

In the countries of North Africa, where CIRAD has major collaborations, food systems face a number of shared challenges: water shortages, soil degradation and salinity, pollution, input and imported food price pressures, the disappearance of the Mediterranean diet, the explosion in diseases caused by an unbalanced diet, socioeconomic inequalities between territories, and so on.

Agricultural research institutes, universities and agricultural advice services have joined forces to inform agricultural policy and find solutions to these interlinked, complex issues. Various technological solutions to enable the use of groundwater reserves or desalinate seawater and intensify crop and livestock farming are being rolled out. However, they bring their own challenges, relating to their accessibility to all and environmental sustainability.

It is important to note that very strong water constraints are increasingly a shared issue for the north and south shores of the Mediterranean, and warrant inter-shore scientific and operational exchanges.



Date harvest in the Figuig oasis, Morocco © S. Dury, CIRAD

Scientific priorities and methodology

Two priority research topics

CIRAD and its partners have pinpointed two priority research topics: sustainable water management, and rangeland sustainability.

Research on water, which is mostly interdisciplinary, includes:

- modelling of socio-hydrological systems within territories,
- the links between different types of water resources (surface water, groundwater, water from seawater desalination plants, reusable treated water) and their uses,
- how water is managed and how various players, including women and young people, participate in management decisions,
- changes in policies, practices and behaviour that affect the resource,
- the link between agroecological practices and water use within irrigation schemes.

Rangelands are the main type of land use in the countries of North Africa, particularly in the most arid parts and mountainous regions. However, they are subject to a range of constraints: climate change, land grabbing, constraints on mobility, ageing stakeholders, and largely undeveloped animal product marketing circuits. Research on the sustainability of the region's rangelands focuses on:

- what determines the social and economic resilience of livestock farming households and pastoral territories,
- flock or herd productivity and the different value chains for products from small ruminants and camels (including emerging value chains),
- vegetation growth dynamics,
- the identification of operational levers, to improve resource management (water, fodder, land) in territories, by means of multidisciplinary work (pastoral ecology, zootechnics, geography, socioeconomics, etc).



Shepherds and their flocks of sheep in the Middle Atlas Mountains in Morocco © P. Dugué, CIRAD

Transverse lines of research

Agroecological innovations to adapt agriculture to climate change

The agroecological research being done by CIRAD and its partners in the Mediterranean essentially focuses on production and operating systems. It includes:

- the identification and multi-criteria, technical, agronomic and ecological assessment of existing or emerging agroecological practices in various cropping systems (irrigated and rainfed),
- the co-design of innovative production systems to tackle the challenges of both agroecology and climate change,
- diagnosis of the factors that govern farm vulnerability and resilience to climate change,
- knowledge and modelling of Mediterranean soil functioning, in relation to plants and water.

Sustainable food and nutrition systems

The Mediterranean diet, which is known for its organoleptic and nutritional merits, is under threat. While there are many causes (sedentarisation, urbanisation, high-fat and -sugar products that are now more accessible due to subsidies, etc), the consequences in terms of public health are proving costly.

In this context, new demands are emerging in terms of food safety and access to a healthy diet. Our research in this field encompasses:

- analyses of the food environment of different population groups, notably those in urban areas,
- support for simultaneous work to address agricultural, environmental, food and social justice issues within a "sustainable food system" vision, to boost the development of sustainable food value chains,
- the design of and support for governance of food systems that will be more sustainable on various scales.



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Restoring agrobiodiversity, to adapt to climate change

Current research is aimed at understanding the climate, socio-economic and biological mechanisms that account for the collapse in natural and crop biodiversity and the social and ecological adaptation phenomena under way within landscapes. It includes:

- analyses of past change factors, to be able to suggest possible levers for action in order to adapt current and future cropping systems by means of existing or new plant species and varieties (or animal races),
- knowledge of associated know-how and practices, which is crucial to an understanding of the social and ecological dynamics of social ecosystems,
- a study of the region's strategic and heritage food crops (olives, legumes, cereals, citrus, etc), under the umbrella of broader partnerships between southern Europe and North Africa.

Thanks to its global network of biological resource centres (BRCs) and partnerships, CIRAD is involved in identifying, preserving and testing new species in new contexts. Plants from sub-Saharan Africa (fonio, millet etc), or other continents (quinoa) may be of interest in the new Mediterranean context. In Corsica, the Citrus BRC (CIRAD, INRAE), one of the world's largest genetic resource centres, is a valuable resource for varietal innovation.



The olive tree is a symbol of Mediterranean landscapes
© A. Guichardaz, CIRAD

Training, a major priority

Training has a huge place in this regional strategy. Various types of action have been implemented in the past and will continue to be so in future. They include:

- co-supervision of PhDs and Masters. For instance, dP SIRMA has supervised more than 50 PhD students in the past 20 years (see box page 7),
- reception of scientific partners, interns and PhD students at CIRAD's installations in Montpellier,
- interventions in training modules at local engineering colleges and universities. This serves to pass on and share our knowledge and identify students interested in research and likely to embark upon a PhD,

- field schools. These innovative international teaching tools are a specificity of the training offering co-constructed with our partners in the Mediterranean. They involve groups of students from engineering schools, and also professionals and civil servants (from the water and agricultural sectors), accompanied by several supervisors and teachers, who over several days or weeks conduct multi-scale, multidimensional diagnoses of agricultural development in small rural regions. Field schools are also an opportunity for South-South exchanges, thanks to student hosting.

For transformative research

CIRAD is strongly promoting the impact culture being rolled out across the organisation. It involves specific participatory operations and concrete mechanisms to facilitate the emergence of transformative innovations. Those operations and mechanisms take more or less structured and sustainable forms, known as experimentation or innovation hubs, living labs, field schools, multi-stakeholder processes, etc. They are places where farmers, public and private food system players and scientists in different fields work together to design and test innovations. CIRAD and its partners make use of their numerous achievements in the fields of both research¹ and development support. Flagship projects such as PACTE and PACT-AE, MASSIRE and MORFEUS are emblematic examples.



Collecting proposals for actions during a participatory planning workshop in the governorate of Siliana in Tunisia, as part of the PACTE project © Soumaya Younsi

1. For further information on this topic, see Hassenforder Emeline, Ferrand Nils. 2024. Transformative participation for socio-ecological sustainability: Around the CoO-PLAGE pathways. Versailles: Editions Quae, 273 p.
<https://doi.org/10.35690/978-2-7592-3920-7>

Partnership priorities

CIRAD has many partnerships in the Mediterranean, through joint projects, teaching, co-supervision, student and scientific staff exchanges, co-publications, advocacy operations, etc.

Research and teaching partners

The assignment of CIRAD staff to higher education and research structures in North Africa is both a partnership spearhead and a major historical characteristic of its operations. This presence on the ground is boosted by numerous missions by scientists based in Montpellier.

This way of working in partnership is bolstered by framework agreements with various national training and research organisations. The main partners include:

- in Algeria: the École nationale supérieure agronomique (ENSA) and the Centre de recherche en économie appliquée pour le développement (CREAD);
- in Morocco: the Institut agronomique et vétérinaire Hassan-II (IAV), the École nationale d'agriculture de Meknès (ENA Meknès) and the Institut national de recherche agronomique (INRA Maroc);
- in Tunisia: the Institution de la recherche et de l'enseignement supérieur agricoles (IRESA), the Institut national agronomique de Tunisie (INAT), the Institut national de la recherche en génie rural, eaux et forêts (INRGREF), the École supérieure des ingénieurs de Medjez el Bab (ASIM) and the École supérieure des industries agroalimentaires de Tunisie (ESIAT).

Many universities are also partners, in the fields of environmental science and human and social science in particular. They include Caddy Ayad, Abdelmalek Essaâdi, Mohamed V and UM6P in Morocco, Carthage in Tunisia, and Tipaza in Algeria. CIRAD has been collaborating for several decades with the International Center for Agricultural Research in the Dry Areas (ICARDA), which regularly hosts CIRAD scientists in its research centers.

From its main base in Montpellier, CIRAD also encourages scientific cooperation between institutions in North Africa and higher education and research institutions along the Mediterranean coast of France (EPE-University of Montpellier, Institut Agro, Institut agronomique méditerranéen de Montpellier [IAM-M], INRAE, IRD, University of Aix-Marseille, University of Perpignan, etc) or territorial development players (town halls, metropolitan councils, decentralised State services).

Lastly, on an international level, CIRAD is engaged in several international networks, of which the SIRMA platform in partnership for research and training (dP) is the cornerstone.

Elsewhere, the TSARA initiative (Transforming Food Systems and Agriculture through Research in Partnership with Africa) is playing an ever-greater part in structuring CIRAD's strategy in the Mediterranean. It was launched in 2021, associates 36 agricultural higher education and research establishments in Africa and Europe (as of January 2026), and is intended to structure research communities in the fields of water management, livestock farming, agroecology and nutrition, among others.

For further information:
<https://initiative-tsara.org/>



Discussion with a group of women during a spatial planning workshop in the governorate of Siliana, Tunisia, as part of the PACTE project © Abdel Belhadi

SIRMA: Irrigated systems at the water-energy nexus in North Africa

dP SIRMA, created in 2002, associates eleven partners, including six research and higher education establishments in three North African countries, IRD, INRAE, and IAM-M. The platform is analysing irrigated systems in a context of environmental and societal change of crucial importance for the region's economic future. Over the years, SIRMA has successfully completed numerous regional R&D projects, guided by three main ambitions: (i) multi-disciplinary exchanges relating to integrated water management; (ii) bringing the world of research and that of its users closer together; and (iii) stepping up regional exchanges within North Africa and with France, and then as part of South-South cooperation with Brazil. The initial aim of the dP was to establish a centre of excellence in the field of training and research on irrigated farming systems, and it has gradually broadened out to cover oasis agriculture, agroecology and water, "non-conventional" water, the energy-water management nexus, and the water management-farming practices-food systems nexus.

For further information:
<https://www.rcp-sirma.org/>



Financial partners

Development funding bodies such as the Agence française de développement or the International Fund for Agricultural Development are and will continue to be crucial partners for CIRAD, notably thanks to their public agricultural development policy support. They fund research in support of operational programmes being rolled out by the authorities in line with government priorities.

The European Union is another major partner for agricultural research in both the Mediterranean and the Balkan countries.

It makes use of several levers to this end:

- The EU Directorate General for Research and Innovation (DG RTD) and national research agencies, via the Partnership for Research and Innovation in the Mediterranean Area (PRIMA), fund research projects in the fields of water management, agriculture, agri-food value chains and the water-energy-food-environment nexus.
- DG RTD funds projects without specific geographical targets through its Horizon Europe programme. CIRAD and its partners in the Mediterranean play an active part by suggesting possible topics via national contact points and responding to calls for projects. ■



Oasis and town of Tinghir
in south-eastern
Morocco,
the Massire project
© G. Lacombe, CIRAD



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CIRAD is the French agricultural research and international cooperation organisation working for the sustainable development of tropical and Mediterranean regions

It works with its partners to build knowledge and solutions for resilient farming systems in a more sustainable, inclusive world. It mobilises science, innovation and training in order to achieve the Sustainable Development Goals. Its expertise supports the entire range of stakeholders, from producers to public policymakers, to foster biodiversity protection, agroecological transitions, food system sustainability, health [of plants, animals and ecosystems], sustainable development of rural territories, and their resilience to climate change. CIRAD works in some fifty countries on every continent, thanks to the expertise of its 1750 staff members, including 1200 scientists, backed by a global network of some 200 partners. It also supports French scientific diplomacy operations.

CIRAD is a public establishment (EPIC) under the joint authority of the Ministry of Higher Education, Research and Space, and the Ministry of Europe and Foreign Affairs.

Working together for tomorrow's agriculture



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