

N° 21

June 2012

Watch Letter



Enhancing Research in the Mediterranean

Editorial Director

Francisco Mombiela
Secretary General
CIHEAM

Editor in Chief

Sébastien Abis
CIHEAM-SG

Scientific Committee

Masum Burak
(Turkey)

Luis Miguel Albisu
(Spain)

Dimitris Diakosavvas
(Greece)

Luis Lavadinho
Telo Da Gama
(Portugal)

Sami Reda Saber Sabry
(Egypt)

Ali Zouba
(Tunisia)

Research and Innovation: EU Long-Term Strategy for the Mediterranean Area

Domenico Rossetti di Valdabero, Aurélie Pancera
European Commission, DG Research and Innovation

Plant Genetic Resources: The "Green Gold" of the Mediterranean

José Esquinas Alcázar, University of Córdoba, Spain

Animal Genetic Resources: The "Golden Fleece" of the Mediterranean

Luís Telo da Gama, Technical University of Lisbon, Portugal
Dunixi Gabiña, CIHEAM, MAI Zaragoza

Research and Innovation in Irrigation for Mediterranean Agriculture

Cosimo Lacirignola, Claudio Bogliotti, Nicola Lamaddalena, CIHEAM, MAI Bari
Mahmoud Abu-Zeid, Arab World Water Forum
Michael Scoullos, Mediterranean Information Office for Environment Culture and Sustainable Development
Latifa Bousselmi, Technopôle de Borj Cedria Technopark, Tunisia

Research in Malta: Capture Fisheries and Aquaculture

Carmelo Agius, Simeon Deguara, University of Malta, Malta

Research on Food Consumption Patterns and their Health Implications in Greece

Antonia Trichopoulou, University of Athens, Greece

The contribution of Geosciences in environmental research

Mohamad Awad, Talal Darwish, Amin Shaban, Gaby Khalaf, Mouin Hamzé
CNRS Lebanon

Zoom on... ARIMNET

Zoom on... FORESTERRA

Activities in the MAIs

Bibliography & Agenda

Latest publications on www.ciheam.org

www.ciheam.org

ISSN 2114-3129

Graphic: G. Manganello, CIHEAM



CIHEAM
International Centre for Advanced
Mediterranean Agronomic Studies

Research and Innovation: EU Long-Term Strategy for the Mediterranean Area

Domenico Rossetti di Valdalbero, Aurélie Pancera

European Commission, DG Research and Innovation¹

Research and innovation in a context of crises: Towards a socio-ecological transition

Europe's current crisis is a debt, financial, economic and social crisis but also an environmental crisis and - even more dangerous - a distrust in the future. Europe needs to get a fiscal policy back on the right track, to increase productivity and to regain lost competitiveness. In the Southern Mediterranean area, the Arab Spring has completely changed the political, economic and social situation. The questions of education, research and innovation are in a blurred phase. Are the investments in these fields increasing or decreasing over the next years? From Joseph Schumpeter to Paul Romer passing by Robert Solow and Michael Porter, education, research, human capital and technological progress have been considered as key ingredients for economic growth².

Europe and the Mediterranean countries have one of the most impressive track-records in science and technology, in mathematics and humanities, in arts and engineering. But a knowledge stock without a strong impetus towards the future is not enough. Economic, social and political advancements need strong education, research and innovation. With emerging countries competition, there is a risk that southern Mediterranean countries turn the eyes towards other regions than Europe³. Research and innovation policy are at the heart of tomorrow employment and prosperity. More and more industrial policy and innovation policy are integrated. Competitive industry and services require both technological developments and social innovations.

The Europe 2020 Strategy sets a clear research and innovation target for the EU: 3% of GDP should be dedicated to R&D. One study shows that reaching this target could create up to 3.7 million jobs and increase annual GDP in Europe by nearly € 800 billion by 2025⁴. Leading knowledge and innovation economies (cf. Germany, Scandinavian countries) are weathering the economic crisis better than others. As demonstrated by evidences, there is a strong correlation between the economic rebound of Member States in 2010 and their average level of R&D investments over the period 2004-2009. The higher the average R&D intensity in the past, the faster the economic growth now⁵.

Science and research have a central role in identifying innovative solutions that are economically feasible, environmentally friendly, and socially acceptable. Innovation lies between sustainability and competitiveness. It can accelerate the transition towards a more resource-efficient, greener and inclusive development. Europe needs to invent a new model of economic and social development combining work, wealth and welfare. For this purpose, neighbouring and Mediterranean countries have a key role to play⁶. The EU has put sustainability at the centre of its policies and strategies. The European Council conclusions (1-2 March 2012) underlined the strong support for an ambitious outcome at the Rio+20 United Nations conference on sustainable development. The EU wants to work towards clear operational targets at national and international level, and to advance the global transition towards a green economy including environmental protection and poverty eradication.

In the rapidly changing global context where the relative share of EU GDP is expected to be reduced by almost a factor 2 by 2050 (achieving 15-17% of world GDP), the EU cannot act alone⁷. Increased international collaborative efforts will be needed, particularly to address global societal challenges, such

CIHEAM

Founded in 1962,
CIHEAM is an
intergovernmental
organisation comprising
thirteen member countries
from the Mediterranean
Basin.

CIHEAM is made up of a
General Secretariat (Paris)
and four Mediterranean
Agronomic Institutes (Bari,
Chania, Montpellier and
Zaragoza).

In pursuing its three main
complementary missions
(post-graduate specialised
education, networked
research and facilitation of
the regional debate),
CIHEAM has established
itself as an authority in its
fields of activity:
Mediterranean agriculture,
food and rural
development.

At present,
Mr Adel El-Beltagy is
CIHEAM's President and
Mr Francisco Mombiola is
its Secretary General.

¹ The views expressed in this article are the sole responsibility of the authors and do not necessarily reflect the view of the European Commission.

² D. Rossetti di Valdalbero, *The Power of Science*, Peter Lang, 2010.

³ S. Abis, *La Méditerranée sans l'Europe*, Confluences Méditerranée n°74, septembre 2010. <http://www.confluences-mediterranee.com/La-Mediterranee-sans-l-Europe>

⁴ P. Zagamé, *The costs of a non-innovative Europe*, 2010. http://ec.europa.eu/research/social-sciences/pdf/demeter-costs-non-innovative-europe-zagame_en.pdf

⁵ European Commission, *State of the Innovation Union 2011*, COM(2011)849

⁶ K. Aiginger, Coordinator of the EU project WWWforEurope, *The future of European industrial policy*, conference "Social dialogue and industrial policy", Paris, 24-25/1/2012.

⁷ European Commission, *Global Europe 2050*, DG RTD, 2012 - http://ec.europa.eu/research/social-sciences/pdf/global-europe-2050-summary-report_en.pdf

as climate change, food safety and security, sustainable transport and mobility, affordable renewable energy, and inclusive and secure societies. In the next years, the EU will pay particular attention at treating scientific cooperation with third countries as an issue of common interest. The EU has a privileged cultural, historical and geographical relation with the Mediterranean partner countries and is committed to further support research on global societal challenges. These EU efforts should be maximised through coordinated actions at international level. But in addition to increasing investment in R&D, Europe has to increase in parallel the quality and the impact of its research. This is one of the main objectives of the Innovation Union and of the Horizon 2020.

The European instruments: Innovation Union and Horizon 2020

The Innovation Union, launched in October 2010, contains a series of commitments to improve the basic conditions that allow researchers, entrepreneurs and companies to flourish. Obstacles - that prevent innovators from transforming basic research into new products and services that will be successful in world markets - have to be removed. A faster standard-setting in Europe, a cheaper and easier patenting, more public procurement of innovative products and services and better access to venture capital are needed⁸. As part of the growth and jobs strategy for Europe 2020, the 34 specific commitments included in the Innovation Union are giving results to create an internal market for innovation, to increase territorial and social cohesion, to pool resources for accelerating innovative breakthroughs, for instance in the field of active and healthy ageing. Progresses are being made and recognised by governments, large business, SMEs, researchers and universities.

The Horizon 2020 – the instrument for European research and innovation funding from 2014 - will make EU support for research and innovation simpler, more efficient, and more effective at delivering the bigger impacts needed to sustain growth and tackle societal challenges such as food security, health, climate change and energy. Horizon 2020 will increase scientific and economic impact and it will give the taxpayer better value for money. In terms of simplification, all the European-level funding for research and innovation will be delivered under one single set of participation rules for the whole programme. Horizon 2020's simplified structure is composed of three distinct, yet mutually reinforcing priorities and account for a total of € 80 billion⁹.

Innovation starts with excellent research and strong science base. One-third of the Horizon 2020 budget is expected for this pillar that will enable the most talented scientists to carry out cutting edge research of the highest quality. The Commission proposes doubling (to more than 13 billion Euro) the support to the European Research Council, securing the best fundamental research that leads to the greatest innovations. The Commission proposes to increase to almost € 6 billion funding to the Marie Skłodowska-Curie actions on researcher training, mobility and careers; while funding for research infrastructures will focus on networking and access, and on maximising the innovation potential of these infrastructures. The second pillar of Horizon 2020 aims to boost industrial leadership, with actions to make Europe a more attractive place for businesses to invest in R&D and innovation. It is proposed that the EU invests 25% of the Horizon 2020 budget under this pillar from which almost € 14 billion for targeted support on the key enabling and industrial technologies that underpin innovation across different industries and sectors. This includes ICT, nanotechnologies, advanced materials, biotechnology, advanced manufacturing processes and space. The Commission also proposes a major strengthening of its support to venture capital and loans for innovative companies with a budget of € 3.5 billion. Linked to this, the EU is introducing a new support tailored to the needs of innovative SMEs. Tackling Societal Challenges is the focus of the third pillar which will receive nearly 40% of Horizon 2020 budget or 32 billion Euro of funding. It is proposed to focus on the following six challenges:

- Health, demographic change and wellbeing;
- Food security, sustainable agriculture, marine research and the bio-economy;
- Secure, clean and efficient energy;
- Smart, green and integrated transport;
- Climate action, resource efficiency and raw materials;
- Inclusive, innovative and secure societies.

⁸ European Commission, *Europe 2020 Flagship Initiative – Innovation Union*, COM (2010) 1161.

⁹ European Commission, *Proposal for a Council Decision establishing the Specific Programme Implementing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020)*, COM(2011)811.

Solutions to these societal challenges will only come from groundbreaking research and innovation which brings together the best minds from across Europe – and here comes the initiatives concerning the European Research Area that aims at building a European "single market for knowledge"¹⁰. Finding solutions to these challenges will offer massive opportunities for European businesses to create growth and jobs. Horizon 2020 will continue to fund projects on the basis of excellence. For Eastern and Southern Europe, the combination of EU research funding with the EU structural funds will allow to better exploit the knowledge potential in these regions.

The EU-Mediterranean cooperation: Realism and ambition

As written by an expert, the EuroMed relations "should address specific dimensions rather than be holistic in nature"¹¹. Research and innovation could be a privileged specific field of cooperation. The Joint Communication adopted in May 2011 as a response to the historic changes which have been taking place in the Southern Mediterranean countries since December 2010. It pointed out the need for a new approach to strengthen the partnership between the EU and the neighbourhood countries by working, in the area of Research and Innovation, towards the development of a "Common Knowledge and Innovation Space" (CKIS) covering the whole spectrum from policy dialogue, capacity-building in human resources and infrastructures, cooperation in research and innovation, and mobility¹².

This approach builds on what have been promoted since 1995 within the Barcelona Process which established, as part of the cooperation schemes, the Euro-Mediterranean S&T Monitoring Committee (MoCo), political framework dedicated to monitor and strengthen the cooperation in RTD in the region. Under this process, the European Commission has been demonstrating continuously its commitment to support research in the Neighbouring Countries, through the opening of the framework programmes since 1998 and, more recently, through the ENPI instruments.

Between 2002 and 2010, more than € 300 million have been invested in Euro-Med cooperation in the field of research and innovation and more than 200 projects involved at least three southern Mediterranean countries. In addition, two Mediterranean countries – Turkey and Israel – are Associated States to the Framework Programme and the EU financial contribution for R&D to these two countries amounts to almost € 600 million in the same period¹³. In parallel, important funds have been continuously dedicated to higher education through the Tempus and Erasmus programmes. The Cairo Declaration signed by the Euro-Mediterranean Ministers for Education and Research in 2007 highlighted the importance of this sector and reaffirmed the will to promote a Euro-Mediterranean Research and Innovation Space. The bilateral cooperation in RDT sector was also stimulated with the signature of S&T cooperation agreements with Morocco, Tunisia, Egypt, Jordan and Algeria, which should play a key role in the renewed regional cooperation in RTD.

The new approach introduced by the Joint Communication above mentioned brings several new elements which will certainly have a long term benefits. It recognises the importance of investing in the scientific and technological communities of the Southern Mediterranean as eminent actors of change to cope with the societal challenges highlighted by the recent political context. Secondly, it opened the doors to a renewed approach of the Euro-Mediterranean partnership in research and innovation. A turning point appeared in June 2011 during the 15th MoCo meeting held in Szeged (Hungary) where for the first time, the senior officials claimed the importance of redefining the drivers of the cooperation and adopted the principles of co-ownership, co-funding and co-evaluation¹⁴. With the Euro-Mediterranean Conference for Research and Innovation held in Barcelona in April 2012, these refunded principles became the pillars for the definition of a medium to long term agenda in research and innovation which should be validated in the coming months with the preparation of a Euro-Mediterranean Joint Programming Initiative from 2014 to 2020¹⁵.

So far, the first initiative which has been experimented in this sense is the ArimNet project, an ERA-NET in agro-food sector aiming at coordinating national programmes and funds from 13 European and South Mediterranean Countries in order to launch joint calls. The CIHEAM, in coherency with its long-standing

¹⁰ See the results of the ERA conference 2012 - http://ec.europa.eu/research/era/consultation/era-wrap-up-event_en.htm

¹¹ R. Aliboni, *EU multilateral relations with southern partners: reflections on future prospects*, EU Institute for Security Studies, 2/4/2012 - <http://www.iss.europa.eu/publications/detail/article/eu-multilateral-relations-with-southern-partners-reflections-on-future-prospects/>

¹² European Commission and High Representative of the EU for Foreign Affairs and Security Policy, Joint Communication - *A new response to a changing Neighbourhood*, COM(2011)303.

¹³ European Commission, *EuroMed 2030 – Long term challenges for the Mediterranean area*, Brussels 2011; European Commission, *International Cooperation with Mediterranean Partner Countries*, Brussels 2012.

¹⁴ MoCo Secretariat, Minutes of the 15th Monitoring Committee meeting - <http://www.miraproject.eu/moco-area/contact-moco>

¹⁵ http://ec.europa.eu/research/conferences/2012/euro-mediterranean/index_en.cfm

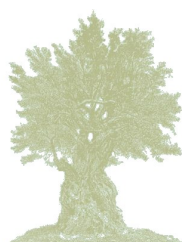
and sustainable links with the Mediterranean Partner Countries in this field, has naturally taken part of this key initiative. The CIHEAM is currently participating in several projects such as the INCO-NET MIRA (Mediterranean Innovation and Research Coordination Action), MELIA (Mediterranean Fostering the Euro-Mediterranean Integrated Water Resources Management Communities of Practice) and WASSERMED (water availability and security). It also assumed the coordination of several projects such as GEWAMED (water and gender), SWAP (water policies) and WASAMED (water efficiency in agriculture). Strong of these experience and trusty relationships with the Mediterranean Partner Countries, CIHEAM is certainly, at its 50 years old, one of the important institutions to animate and push the capacity-building, research and innovation in agriculture and water related-fields in the Euro-Mediterranean scene.

Conclusions

Europe and the southern and eastern Mediterranean countries will benefit from their intellegentia if it becomes easier for individuals, research institutes, universities and companies to cooperate. This was the case over the history since St. Augustin to Amin Maalouf passing by Averroes.

Obstacles to the cross-border flow of people, ideas and funding need to be removed both between EU Member States (cf. ERA) and between the two sides of the Mediterranean sea (cf. External Relations policy). A win-win solution is possible. The ageing Europe needs – and will need more and more – highly qualified and basic labour force available in southern Mediterranean countries. Young southern Mediterranean people are looking for job opportunities and willing to move in Europe. Mutual benefits will emerge from an increased cooperation between north and south Mediterranean, between academia and industry, between national and European initiatives, between European programmes and activities such as Structural Funds, Horizon 2020, EU neighbouring policy and the European Investment Bank. This is one of the directive of the new European Neighbourhood Policy (ENP) adopted on 15 may 2012¹⁶.

Education research and innovation are key elements for a better understanding of each other. Best-practices are on both side of the Mediterranean: on the efficient use of water, on sustainable construction, on clean energy, on healthy food habits. In a time of increased global competition, it is urgent that Europe and southern Mediterranean countries pool their resources of talent and knowledge for a better and shared future.



Academic Year 2012-2013

CIHEAM offers its own educational programme, which complements those of member countries' national institutions. The new Programme for the Academic Year 2012-2013 has just been published. 21 Master of Sciences are currently offered in our Education system.

The four CIHEAM Mediterranean Agronomic Institutes (MAI) offer Advanced Education at the Master of Science (M.Sc.) level. The Postgraduate Specialisation Diploma is obtained upon successful completion of the first year. The Master of Science (M.Sc.) degree is awarded at the end of the second year, during which students complete a research project.

Courses are made up of a variable number of modules that can be taken separately. All of them are leading to the delivery of a certificate. A certain number of scholarships is awarded each year with priority given to nationals from CIHEAM member countries. Selection is based on academic record. The number of participants is limited.

During the biennium 2009-2011, 830 students have followed the Centre's 21 MSc programmes, 574 of whom have benefitted from a CIHEAM scholarship.

¹⁶ Joint communication, Delivering a new ENP, Join (2012), 14.

Plant Genetic Resources: the “Green Gold” of the Mediterranean

José Esquinas Alcázar
University of Córdoba (Spain)

9th CIHEAM Ministerial Meeting in Malta

At the invitation of HE George Pullicino, Minister for Resources and Rural Affairs of the Republic of Malta, and in the presence of several high-level representatives of international institutions, the Ministers of Agriculture of the thirteen member countries of CIHEAM will hold their ninth meeting in Valetta on the 27th of September 2012.

Discussions will focus on “Food Security and Pricing in the Mediterranean Countries”.

This meeting will be a great opportunity to exchange ideas and experiences about actions to be undertaken for improving food security and moving towards resilience and stability in a region where vulnerability to the impacts of international price volatility is especially high.

It should be noted that the first of these meetings of CIHEAM member countries’ Ministers of Agriculture, informal fora for discussion on matters relating to agriculture, food and the environment, was held in Rome in 1999. Since then, successive meetings have been held in Rabat (2000), Athens (2001), Beirut (2002), Paris (2004), Cairo (2006), Zaragoza (2008) and Istanbul (2010).

Agricultural biodiversity and more specifically genetic resources for food and agriculture provides the building blocks for farmers, breeders and biotechnologists to develop new plant varieties and animal breeds necessary to cope with unpredictable human needs and changing environmental conditions, including those due to climate change. Selection is only possible in the presence of diversity. Genetic resources are therefore considered the warehouse for humanity to obtain food, clothes and medicines. They are essential for sustainable agriculture and food security.

The Mediterranean basin: a threatened biodiversity

The Mediterranean basin, a cresol of cultures and civilizations, has been during millennia a major bridge for world important crops and their genetic resources travelling between Orient and Occident, as well as between Africa and Europe (e.g., wheat, barley, sorghums, millet, rice and other cereals, lentils, pea, chick-pea and other legumes, citrus, sugar cane, much of the fruit trees of the temperate regions, spices, etc). With the arrival of Latin American crops (e. g. maize, phaseolus beans, potatoes, tomatoes, pumpkins, peppers, tobacco, etc.) to Spain in the 16th Century the Mediterranean became also the major bridge between the Old and the New Worlds for these new crops and their genetic diversity. The Mediterranean is in addition World Centre of Diversity of crops such as oat, beetroot, artichoke, cabbage, faba bean, lettuce, olive, grape and date palm, as identified by N.I.Vavilov in the 1920s (Zahary 1970). All this has contributed to a huge wealth of agricultural biodiversity in the Mediterranean countries. However, throughout the 20th century, much of this wealth has been lost as a result of a process of genetic and cultural erosion that continues to advance.

Actually this is a problem all over the world. In spite of its vital importance for human survival, agricultural biodiversity is being lost at an alarmingly increasing rate. Hundreds of thousands of farmers’ heterogeneous plant varieties and landraces that existed, for generations, in farmers’ fields until the beginning of the twentieth century, have been substituted by a small number of modern and highly uniform commercial varieties. In Greece over 95% of traditional wheat varieties that were grown in farmers’ fields by the middle of the twentieth century can no more be found and only a few of them are maintained in gene banks (IBPGR, 1981). In Spain, in the 1970’s, we collected and documented over 350 local varieties of melons, today no more than 5% of them can still be found in the field. The first State of the World on Plant Genetic Resources for Food and Agriculture (PGRFA) shows that the picture is much the same throughout the world (FAO 1998). The loss of agricultural biological diversity has drastically reduced the capability of present and future generations to face unpredictable environmental changes and human needs.

In addition, many crops of the past which are neglected today as well as many wild species are expected to play a critical role in food, medicine and energy production in the near future. The FAO report, published in 1998, also estimates that some 7 000 species have been used by mankind to satisfy human basic needs, while today no more than 30 cultivated species provide 90% of human caloric food supplied by plants (FAO 1998). Furthermore 12 alone provide more than 70% and a mere 4 species (potatoes, rice, maize and wheat) provide more than half.

Let us illustrate with some examples the importance that plant genetic resources from the Mediterranean have had in agricultural development all over the world: One local variety of wheat found in Turkey, collected by J. R. Harlan in 1948, was ignored for many years because of its many negative agricultural characteristics; but in the 1980s, it was discovered that this variety carries genes resistant to fungi such as *Puccinia Striiformis*, 35 strains of *Tilletia caries* and *T. foetida*, and 10 of *T. controversa*, and is also tolerant to certain species of *Urocystis*, *Fusarium* and *Typhula*; since then it has been used as a source of resistance to a whole array of diseases. (Kronstad 1986). Italian ryegrass (*Lolium multiflorum*) landraces were the source of resistance to crown rust. A local landrace of brome grass (*Bromus biebersteinii*), collected in Turkey in 1949, is responsible for the optimum vigour and many agricultural characteristics of the famous Regar variety produced in the United States. (FAO, 1998). In Mediterranean rain fed areas, genes from the wheat wild relative *Triticum polonicum* were used to confer the ability to respond to low fertilizer inputs that characterize the durum wheat cultivar Sebou (Nachit and Ketata 1986).

The Mediterranean countries have also greatly benefited from genetic resources in other regions of the world: resistance to *Phytoftora infestans* in potato came from Peru; the so-called green revolution, in the case of wheat was based on the dwarf Norin 10 variety from Japan, resistance to *Phloxera* in grapes came from wild american *Vitis*, etc. The region has also benefited from the use of wild relatives of cultivated plants in breeding programs: an outstanding example is the Latin American genus *Lycopersicon*, within which many wild species can be crossed with cultivated tomato (*L. esculentum*) and have been successfully used as donors of fungus-resistant genes (*L. hirsutum*, *L. peruvianum*), nematode-resistant genes (*L. peruvianum*), insect-resistant genes (*L. hirsutum*), genes for quality improvement (*L. chirmielewskii*), and genes for adaptation to adverse environments (*L. cheesmanii*). Similar examples could be cited for many other crops. (Esquinas-Alcázar 1981).

In general we can say that no country is self-sufficient in terms of genetic resources. Geographical and intergenerational dependency on genetic resources for food and agriculture is very high and continuous access to them is a prerequisite for effective agricultural research and breeding. In spite of its wealth on PGRFA, Mediterranean agriculture is very much depending of plant genetic resources from abroad. Actually the Mediterranean countries, both North and South, depend on an estimated average of 70% on crops genetic resource coming from other regions of the world. Table 1 shows the estimated range of dependency for each Mediterranean country from plant genetic resources from abroad (Flores Palacios 1998). It follows that international cooperation to ensure access to PGRFA from other countries is not a choice but a must for the region. Access to plant genetic resources and their conservation and sustainable use have socio-economic, political, legal and ethical implications, which are often associated with problems that threaten the economies of the countries concerned. Rapid globalization and economic integration are increasing the interdependence among countries. For this reason the United Nations, as a universal inter-governmental forum, has had a fundamental role to facilitate the necessary inter-governmental negotiations.

The negotiation in FAO, and wide ratification of the legally binding International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)¹ at the beginning of this century have been a significant achievement and a hope for the conservation, sustainable use, and continuous availability of these resources (Esquinas-Alcázar 2005). Almost all Mediterranean countries have already ratified by their National Parliaments the ITPGRFA: Albania, Algeria, Cyprus, Croatia, Egypt, France, Greece, Italy, Lebanon, Libya, Morocco, Portugal, Spain, Syria, Tunisia and Turkey. Malta has already signed the Treaty but it has not yet ratified it. However much effort is still needed to fully implement its provisions. The Treaty is not the only international agreement dealing with Genetic Resources for Food and Agriculture (GRFA), others such as the Convention on Biological Diversity (CBD) (CBD 2003)², UPOV and TRIPS/WTO are also directly or indirectly related to access to GRFA and their related knowledge, technologies and information. Complementarities and synergies must be ensured in the interpretation and implementation of their provisions at national, regional and international levels.

Biodiversity is at the base of solutions to agricultural challenges

The likely changes in agriculture production methods, environment and demand require increase use of genetic resources. The utilization of a wide range of PGRFA is crucial for food security and to face climate change.

Food security is not simply a matter of delivering more calories to more people. Nutritional security, where dietary diversity plays an important role, is a vital component of food security. The Mediterranean Diet is a good example which has been recognized by UNESCO as Immaterial Heritage of Mankind (CIHEAM, 2012). It should be noted that most hungry people are living in rural areas. Solutions are needed to improve stability of production at local level, to provide increased options for small-scale farmers and rural communities and to improve quality as well as quantity of food available. To ensure that enough food is produced and is available for those who need it, public-sector research is needed in areas in which the private sector does not invest. In a number of Mediterranean countries many commercial crop varieties are not adapted to the needs of poorer farmers, who have limited or no access to irrigation, fertilizers and pesticides. A new environmentally friendly, socially acceptable and ethically sound agricultural model is required to meet their needs. This can be facilitated by a systematic and participatory process of cooperation between breeders and farmers. Participatory approach assure that the plant breeding

¹ <http://www.planttreaty.org>

² <http://www.biodiv.org/handbook/>

programmes respond to farmers' needs, integrates farmers' knowledge in technologies development and smoothes the adoption of the innovations by producers.

All the predicted scenarios of the Intergovernmental Panel on Climate Change (IPCC) will have major consequences for the geographic distribution of crops and their genetic resources, including crop wild relatives. Some recent studies, have used current and projected climate data to predict the impact of climate change on areas suitable for a number of staple and cash crops (Jarvis et al. 2008 ; Fischer et al. 2002). To cope with Climate Change it will be required research not only on diversity itself and development of varieties adapted to new conditions, but also on how genetic resources can be used to broaden the genetic bases of our crops and to support mitigation strategies. These hopes are all the more important as powerful new technologies have increased the value and potential of PGRFA, especially for wild species, as potential donors of useful agricultural traits. Molecular genetics, genomics, proteomics, cryopreservation and ecogeographical remote-sensing techniques (using satellites and aircraft) have greatly expanded the technological bases for the location, conservation, management and use of genetic resources. This includes, for example, techniques for estimating the spatial and temporal distribution of genetic diversity, relationships between and within populations³, gaining insights into crop domestication and evolution (Lenstra et al. 2005; Diamond. 2002), monitoring gene flows between domesticated and wild populations (Moraesa 2007) and increasing the efficiency and effectiveness of gene bank operations (e.g. deciding what material to include within a collection, identifying duplicates, increasing the efficiency of regeneration and establishing core collections. (de Vicente 2004; Tivang et al. 1994).

Challenges ahead and recommendations for the Mediterranean region

Challenges ahead have technical, scientific, socio-economical, legal and institutional dimensions. The following recommendations for the Mediterranean region, have taken into account the priorities identified in the preparatory process of Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture (FAO, 2010), as well as on personal experience and other recent publications:

- To carry out systematic surveys to identify Mediterranean existing PGRFA both in the field and in plant germplasm banks and to publish inventories.
- To maintain data bases of national plant germplasm banks, Universities, Research Centres and other governmental and non governmental institutions and organizations dealing with the conservation, breeding and use of PGRFA in the Mediterranean basin.
- To give greater attention to the in situ management of wild relatives; neglected crops and promising species, as well as diversity in threatened ecosystem.
- To develop a more rational regional system of ex situ collections. The development of a Mediterranean Germplasm Bank or a network of germplasm banks could serve as a common depository for plant genetic resources from and for the Mediterranean area.
- To develop and implement national and regional Mediterranean strategies to strengthen national capacities to manage and use genetic resources, including a greater use and integration of scientific methods and traditional knowledge.
- Breeding to broaden the genetic basis of regional important crops in order to cope with climate change.
- To carry out ethno-botanical and socio-economic studies, including the study of local knowledge, to better understand the role of farming communities in the management of PGRFA.
- To ensure rapid implementation of all the provisions contained in the ITPGRA, both at national and regional level.
- Capacity building in collection, conservation and use of PGRFA

CIHEAM should play an important role in implementing many of these recommendations, including and in particular the publication of inventories, data bases, development of a Mediterranean Germplasm Bank and development of a regional Mediterranean Strategy for PGRFA. Providing postgraduate supplementary education is CIHEAM first mission, therefore its Mediterranean Agronomic Institutes (MAIs) should continue playing an active role on capacity building on PGRFA as they have been doing for more than 25 years.

³ <http://www.fao.org/biotech/C13doc.htm>

Estimated range of plant genetic resources dependency (%) for each Mediterranean country

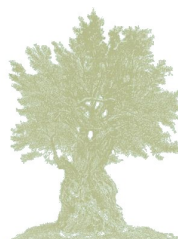
Mediterranean Countries	Minimum (%)	Maximum (%)
Albania	92.07.00	99.32.00
Algeria	74.24.00	80.48.00
Cyprus	79.33.00	90.19.00
Croatia	87.02.00	99.39.00
Egypt	91.20.00	99.10.00
France	75.55.00	91.07.00
Greece	54.24.00	69.34.00
Israel	28.29.00	42.33.00
Italy	71.22.00	81.21.00
Lebanon	34.25.00	58.57.00
Libya	67.21.00	81.24.00
Malta	84.35.00	98.15.00
Montenegro	No data available	No data available
Morocco	58.13.00	75.11.00
Palestine	No data available	No data available
Portugal	79.26.00	91.28.00
Slovenia	90.39.00	99.21.00
Spain	71.41.00	85.24.00
Syria	14.17.00	23.47.00
Tunisia	69.30.00	83.04.00
Turkey	32.21.00	43.16.00
AVERAGE	66.10.00	78.32.00

Based on the study by X. Flores Palacios (<ftp://ftp.fao.org/docrep/fao/meeting/015/j0747e.pdf>). The table shows the mean of countries' degree of dependency on crop genetic resources which have their primary centre of diversity elsewhere. The indicator used is the food energy supply in the national diet provided by individual crops. On the basis of the primary area of diversity of each crop, it has been calculated the estimated dependency that has maximum and minimum indices, showing there is a high rate of dependency by practically all cases.

Bibliography

- CIHEAM (eds), *The Mediterranean Diet for Sustainable Regional Development*, Edition 2012 of Mediterra, CIHEAM-IEMed-Mediterranean Diet Foundation Joint Report, Les Presses de Sciences-Po, Paris, March 2012.
- Convention on Biological Diversity, (2003). *Convention on Biological Diversity*, Handbook 3rd edn. [online], <http://www.biodiv.org/handbook/>
- De Vicente, M.C. 2004. *The Evolving Role of Genebanks in the Fast-developing Field of Molecular Genetics*. Issues in Genetic Resources No. XI, IPGRI, Rome, Italy.
- Diamond, J. 2002. *Evolution, consequences and future of plant and animal domestication*. Nature, 418, 700-707.
- Esquinas-Alcázar, J.T. 2005. *Protecting crop genetic diversity for food security: political, ethical and technical challenges*. Nature Reviews, Genetics. Vol. 6, December, 2005 (946-953).
- Esquinas-Alcázar, J.T. 1981. *Genetic Resources of tomatoes and wild relatives*, IBPGR, Rome.
- FAO, 2010. *The Second Report of the World's plant genetic resources for food and agriculture*. FAO. Rome.
- FAO 1998. *The state of the World's plant genetic resources for food and agriculture*. [online], <http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPS/Pgrfa/pdf/swrfull.pdf>
- Fischer, G. et al. 2002. *Impacts of climate on agro-ecology*. Chapter 3 in "Climate Change and Agricultural Vulnerability". Report by the International Institute for Applied Systems Analysis. Contribution to the World Summit on Sustainable Development, Johannesburg, 2002.
- Flores Palacios, X. (1998). *Contribution to the estimation of countries' interdependence in the area of plant genetic resources*. CGRFA Background Study Paper No. 7 Rev.1. [online], <ftp://ftp.fao.org/docrep/fao/meeting/015/j0747e.pdf>
- IBPGR, 1981. *Crops Genetic Resources*. Rome.

- Jarvis, A. et al. 2008. *The effect of climate change on crop wild relatives. Agriculture, Ecosystems and Environment*, 126 (1) 13-23.
- Kronstad, W.E. 1986. *Germplasm: the key to past and future wheat improvement*, in Smith E. "Genetic improvement of yield in wheat", p. 41-54, Special publication 13, Crop Science Society of America, Madison, Wisconsin.
- Lenstra et al. 2005. *Evolutionary and demographic history of sheep and goats suggested by nuclear, mtDNA and y-chromosome markers. Presented at meeting on The Role of Biotechnology*, Villa Gualino, Turin, Italy – 5-7 March 2005.
- Moraesa, A.P. 2007. *Chromosomal markers distinguish hybrids and non-hybrid accessions of mandarin. Cytogenet Genome Res* 119:275-281; Spooner, D.M. et al. *Molecular Markers for Genebank Management* International Plant Genetic Resources Institute, Rome. 126 pp.
- Nachit MM. and Ketata H. (1986). *Breeding strategy for improving durum wheat in Mediterranean rein fed areas. In Proceedings of the Fifth International Wheat Conference*, Rabat, Morocco.
- Tivang et al. 1994. *Estimation of sampling variance of molecular marker data using the bootstrap procedure. Theor Appl Genet* 89:259-264.
- Zahary D., 1970. *Centers of diversity and centers of origin*. In Frankel O. H., Bennet E., "Genetic resources in Plants: their exploration and conservation". Blackwell Scientific Publications, Oxford. 33-42.



Animal Genetic Resources: The « Golden Fleece » of the Mediterranean

Luís Telo da Gama

Faculty of Veterinary Medicine, Technical University of Lisbon (Portugal)

Dunixi Gabiña

CIHEAM-MAI Zaragoza

Overview

The Mediterranean region, in particular the Near and Middle-East, was the birthplace of agriculture and the center where domestication took place for several animal species (sheep, goats, cattle, donkey) nearly 100 centuries ago. From the domestication centers, livestock species spread through different routes, accompanying the advances of agriculture all over the world. Over the years, native animal breeds in the Mediterranean have played a major role in utilizing resources available in marginal areas or in extensive production systems, thus contributing for environmental and socio-economic stability. In addition, autochthonous breeds of livestock are extremely well adapted to local conditions, often very harsh, and have been an integral part of local culture, tradition and gastronomy.

Most likely, the major feature of agriculture and animal production in the Mediterranean area is diversity of climates, orography, agriculture, peoples, traditions, etc. As a result of the very distinct conditions, local animal breeds were developed and have gone through a long process of adaptation to specific environments, resulting in a very large number of breeds extremely well adapted to local conditions and production systems. So the huge diversity of animal breeds existing in the Mediterranean places this area as one of the richest in the world in what concerns animal biodiversity. According to FAO (2012), in Mediterranean countries there are about 400 sheep breeds, 300 cattle breeds, 180 pig breeds, 160 horse breeds and 150 goat breeds. These figures mean that nearly 20% of the breeds of different livestock species recognized throughout the world are raised in the Mediterranean region.

These breeds represent, therefore, an immense direct contribution to the overall diversity of Animal Genetic Resources, and give the Mediterranean region particular responsibilities in their management. But the impact of Mediterranean breeds of livestock in the diversity of Animal Genetic Resources in the world goes beyond their number alone, given the major indirect impact that they had in the development of livestock breeds in other parts of the world.

Nevertheless, the intensification of agriculture, which took place mostly during the second half of the 20th century, resulted in the extinction or endangerment of several livestock breeds in the Mediterranean area as it happened all around the world. In recent years, emphasis on the need to implement sustainable development programs and protect biodiversity, of which native breeds are an important component, has caused a re-evaluation of the strategies followed in the past. The worldwide disappearance of native breeds, which has occurred at an alarming pace in the recent past, prompted the development of national and international programs aimed at the characterization, conservation and sustainable utilization of Animal Genetic Resources (AnGR) in several countries, including those in the Mediterranean region.

This very high diversity of Animal Genetic Resources is a result of adaptation to a widely diverse range of environmental conditions in the Mediterranean, and brings added responsibilities to the region in what concerns the need to maintain these resources for the future. These breeds represent, therefore, an immense direct contribution to the overall diversity of AnGR, given the share that they represent in the world.

Contribution of the Mediterranean region to the diversity of Animal Genetic Resources in the world

Among other examples, perhaps the cases of Merino sheep and Creole breeds of livestock represent some of the major contributions of the Mediterranean region to livestock production and biodiversity in the whole world. Merino sheep are believed to have originated from animals introduced into the Iberian Peninsula from northern Africa during the period of Moorish conquest, and then selected for wool fineness for several years. Throughout the years, and until the 20th century, wool was a highly valued product, and fine wool produced by Merino sheep was exceedingly appreciated for clothing. Up until the 18th century, Merinos existed only in the Iberian Peninsula, and export of live Merino sheep to other countries was strictly forbidden. In the circumstances of that time, the Merino was a highly prized genetic resource, valued by the quality of its major product, and integrated in a production system with a tremendous social and economic impact. These systems were highly sustainable and, apparently, quite profitable, but of course this monopoly could not be kept forever, and permission to export outside the Peninsula was finally granted in the 18th century. In the century that followed, Merinos rapidly spread throughout the world, to become the major sheep breed in the planet.

Another very important contribution of the Mediterranean to the diversity of Animal Genetic Resources in the world was the formation of Creole breeds of all livestock species in the American continent. The Pre-Columbian American civilizations had domesticated the dogs, the turkey, the guinea pig and the Andean camelid. Livestock species were brought from the Iberian Peninsula since the late 15th century, starting with the second trip of Columbus, who brought horses, cattle, sheep, goats and pigs to the Americas for the first time. Many other conquerors and settlers followed, and animals brought from the Iberian Peninsula spread throughout the Americas, adapting to a wide range of environmental conditions and giving origin to the populations currently known as Creole breeds. For over three centuries, Creole animals were used as a source of food, fiber, draught power and transportation, playing a key role in the settlement of human populations and the development of agriculture throughout the Western Hemisphere. In spite of the introduction in America of livestock from other origins starting in the 18th century, recent research with neutral genetic markers indicates that, several centuries after the introduction of Iberian livestock into America, Creole breeds still show strong and predominant signatures of this Iberian influence (Martinez et al., 2012).

Animal gene flow along the Mediterranean

For centuries, the Mediterranean Sea played a major role as a route for exchanges among the peoples of the region. The impact of the early development of agriculture in the Fertile Crescent expanded to the west, probably following both northern and southern paths along the Mediterranean. Nevertheless, research with different types of genetic markers indicates that the flow of livestock genes through the Mediterranean region probably differed, depending on the species considered.

For example, genetic diversity studies on goats indicate that there is a clear East-West cline along the Mediterranean, with little evidence of exchanges between North and South (Cañon et al., 2006). This would suggest that goats have followed a westward path of expansion mostly by land, accompanying the development of agriculture along the same course. Cattle, on the other hand, show a somewhat different pattern of dispersion, where in addition to the flow of genes towards the west, there is evidence of a South –

MAI Chania Award Ceremony

By unanimous decision of the Governing Board, the CIHEAM has delivered on May 10th 2012 the Gold Medal of CIHEAM to the Director of CIHEAM/MAICh, Mr. Alkinoos Nikolaidis. In his 25 years of tenure, through his multifaceted approach, his innovative initiatives, perseverance and above all his belief in the critical importance of the idea to which CIHEAM was established for, he contributed substantially to the development of the vision and realization of its objectives.

North exchange. In this case, research with genetic markers (Beja-Pereira et al., 2006) indicates that animals from northern Africa were probably introduced in the Iberian, Italian and Balkan Peninsulas, but did not move further north, possibly because of the orographic obstacles which would restrict that movement.

Animal Genetic Resources and Sustainable Agriculture in the Mediterranean

As we told formerly, domestic animal breeds result from a long process of domestication, evolving in specific environments to which they gradually adapted, fitting to different constraints (environment, market, social, etc.), and developing specific attributes. Among these, hardiness (a broad expression which includes high longevity, ability to withstand periods of scarcity, disease resistance, etc.) is a trait of major importance, especially in the Mediterranean region, where native breeds tend to be used mostly in marginal areas, in which the ability to survive and produce is frequently the major breeding objective. On the other hand, the sustainable use of forest and grazing lands by native livestock has been promoted as a viable way to satisfy human needs, while maintaining or enhancing the quality of the environment and conserving natural resources.

Native breeds in the Mediterranean are also an important part of local culture and tradition, and the large assortment of high quality local specialties reflects this specificity. One very important point is that many of these quality-products are associated with specific breeds and production systems, and if these breeds are abandoned or extinct, so will the products with which they are associated.

Another important role of Animal Genetic Resources is to support the livelihood of local communities, often dependent upon animal production in marginal areas for their maintenance. In the harsh conditions of these areas, only local breeds are able to survive and produce, the alternative being abandonment and desertification. Hence, the contribution of native Animal Genetic Resources in rural development and human fixation must be acknowledged, with important consequences in ecological and social equilibrium. Livestock species which are kept in low-input systems tend to be used in extensive systems and marginal areas, with diversified environmental constraints. This often represents a serious limiting factor to their production efficiency. Native breeds selected over time under those specific constraints are usually better adapted, and the only ones able to take advantage of the scarce and irregular resources available in those conditions. As a result, an equilibrium has been reached between the environment and native genetic resources, which fits well within the framework of sustainable development.

Valorization of products from local breeds

The properties and features associated with the quality of animal products include both real and perceived attributes of the product, with the first ones encompassing objective characteristics (physical, chemical, organoleptic, etc.) while the second group relates to how the consumer perceives the product and the mode of production associated with it (animal welfare, environmental impact, cultural value, etc.). Local breeds of livestock produced under extensive systems are often the basis of many high quality local specialties and gastronomy, which excel in both of these perspectives of quality. For example, research has shown that products from local breeds often have better organoleptic properties and a more favorable lipid profile than products from imported breeds, and this has been used in the framework of product certification in some Mediterranean countries, valorizing the products from those breeds.

Genetic improvement and sustainable utilization

Selection of local breeds is probably the best way to make them more competitive and improve the livelihood of the producers who depend on them. However, selection programs of local breeds under extensive systems have, in most cases, had limited success until now. This is perhaps because they have been largely inspired by the breeding programs carried out under intensive production systems. This is certainly an area where more research is needed, established under a different philosophy of animal breeding where short-term productivity is not the only goal. New selection programs, with breeding goals emphasizing adaptation and product quality, are crucial for Mediterranean native breeds, and their adoption should give these breeds a better opportunity in the future.

Challenges and priorities

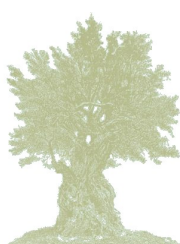
Native livestock breeds in the Mediterranean result from a long process of adaptation to local environmental conditions and constraints. In the last 50 years, new tools were incorporated in their conservation and selection programs, including for example reproductive techniques such as artificial insemination (which, by the way, was a discovery made in the Mediterranean region by Arabian horse breeders in the 14th century). The possibility of implementing marker assisted selection programs is now

becoming a reality, given the availability of high-density panels of genetic markers, which are opening up new possibilities of selection based on genotypic information.

These marker panels are currently being used in dairy and beef cattle selection programs, mostly to enhance selection response in breeding programs carried out in intensive systems. However, these high-density marker panels could also be tested in carefully designed studies. It would then be possible to identify genes more closely related to traits of economic importance, especially those more difficult to measure, expressed late in life or sex-specific, such as hardiness, disease resistance, longevity, ability to use roughage and reproductive efficiency (Gama and Bressan, 2011). Indeed, these new technologies could, if carefully adopted, boost adaptation, production traits and profitability in native breeds of livestock. They would definitely contribute to their ability to survive in the future and adjust to unforeseeable challenges, including climatic changes.

Bibliography

- Beja-Pereira A, Caramelli D, Lalueza-Fox C, Vernesi C, Ferrand N, Casoli A, Goyache F, Royo LJ, Conti S, Lari M, Martini A, Ouragh L, Magid A, Atash A, Zsolnai A, Boscato P, Triantaphylidis C, Ploumi K, Sineo L, Mallegni F, Taberlet P, Erhardt G, Sampietro L, Bertranpetit J, Barbujani G, Luikart G, Bertorelle G. 2006. *The origin of European cattle: evidence from modern and ancient DNA*. Proc. Nat. Acad. Sci. USA. 103: 8113.
- Cañón, J., D. García, M. A. García-Atance, G. Obexer-Ruff, J. A. Lenstra, P. Ajmone-Marsan, S. Dunner, *The ECONOGENE Consortium*. 2006. *Geographical partitioning of goat diversity in Europe and the Middle East*. Animal Genetics, 37: 327.
- FAO. 2012. *Domestic Animal Diversity Information System*. <http://dad.fao.org/> (consulted April 20th, 2012).
- Gama, L.T. and M.C. Bressan. 2011. *Biotechnology applications for the sustainable management of goat genetic resources*. Small Ruminant Research. 98: 133
- Martínez, A.M., L.T. Gama, J. Cañón, C. Ginja, J.V. Delgado, V. Landi, I. Martín-Burriel, M.C.T. Penedo, J.L. Vega-Pla, A. Acosta, L.A. Álvarez, E. Camacho, O. Cortés, S. Dunner, J.R. Marques, O.R. Martínez, R.D. Martínez, L. Melucci, G. Martínez-Velázquez, J.E. Muñoz, A. Postiglioni, J. Quiroz, C. Rodellar, P. Sponenberg, O. Uffo, A. Villalobos, D. Zambrano, P. Zaragoza. 2012. *Genetic footprints of Iberian cattle in America 500 years after Columbus arrival*. PLOS One (Accepted for publication).



Research and Innovation in Irrigation for Mediterranean Agriculture¹

Claudio Bogliotti, Cosimo Lacirignola, Nicola Lamaddalena
CIHEAM-MAI Bari

Mahmoud Abu-Zeid
Arab Water Council

Michael Scoullios
Mediterranean Information Office for Environment Culture and Sustainable Development (MIO-ECSDE)
and of Global Water Partnership-Mediterranean (GWP-Med)

Latifa Bousselmi
Centre de Recherches et des Technologies des Eaux, Technopôle de Borj Cedria, Soliman (Tunisia)

CIHEAM's International Seminar in Malta

An international seminar, organized by CIHEAM in collaboration with Maltese authorities will be held in Malta, on September 25th and 26th, on the eve of the 9th meeting of the CIHEAM member countries' ministers of agriculture. This seminar will be focused on "Sustainability of Agri-food Systems in the Mediterranean", which will include two complementary sessions. The first will be dedicated to "Food chains, Food systems and Sustainable Diets". The second will be devoted to "Quality and Organic Labels: sustainability implications and prospects in the Mediterranean countries"

State of play

Water availability is a prerequisite for the sustainable development of the Mediterranean region, and the three main topics identified for the "water" session are subject to research and debates while strictly interconnected. Major problems with fresh water resources management in the region arise from the pressure to meet the food demand, domestic needs in urban and rural areas, industrial and energy needs of a fast-growing population as well as from climate change. The region as a whole is undergoing rapid social, economic, environmental and political changes which may have implications for sustainable development. This is particularly true for the water sector where pressures and impacts on water are likely to be exacerbated leading to increased risk of water scarcity under climate change. Water scarcity often results in a non-equitable access to resources, sanitation problems (a substantial number of inhabitants does not have adequate access to clean water and sanitation, particularly in the rural areas) and consequent conflicts among the users.

Given the above concerns, there is no doubt that for the Mediterranean region the integrated approach to manage limited water resources in a sustainable way has to be an essential requirement for development and a main policy concern. Though certain progress has been made on policy development towards integrated approaches, implementation is facing substantial challenges. Creative new policies, realistic action plans, visionary legislation as well as functional enforcement and implementation mechanisms (with the necessary resources attached) need to be carefully developed to achieve application of integrated water resources management that will address both the needs of populations and ecosystems, particularly under conditions of climate variability and change. Regarding climate, the reality of climate changes renders it obsolete, very risky or extremely difficult – if at all possible – to use the past as an indicator for the future, thus we need to develop policies and a system of governance easy to adapt to changes and unpredictable perturbations while improving a societal shared knowledge base on climate variability and change and related water risks. The low reliability of supply services and infrastructures are also important constraints to sustainable water management in many Mediterranean countries.

The major challenge facing water managers, water planners and decision makers is that while water yields of southern Mediterranean countries are constantly or dramatically reducing, demand for water increases steadily for the different uses. This causes emerging water conflicts are between cities, countries and different types of users, such as agriculture, urban areas, industry, tourism as well as ecosystem. There is an increasing need of multi and inter-disciplinary and comprehensive approach to enhance "integrated" and sustainable water management, which simultaneously takes into account all the constraints described above and insert them rationally in a sufficiently long-term socio-economic and environmental-climate scenario.

Management of limited water resources has taken many different forms and directions throughout the Mediterranean region. Researchers, managers and decision makers have long sought ways of capturing, storing, re-cycling and redirecting water resources in efforts to reduce their vulnerability to irregular river flows and unpredictable rain patterns and droughts (supply policies). The early agriculture-based society lead to a certain concentration of efforts in "agricultural" water management, while the growing

¹ The paper was prepared by the authors in view of the Euro-Mediterranean Conference on Research and Innovation organised in Barcelona on 2-3 April 2012 by the European Commission¹. In particular, the paper aimed at triggering and stimulating the discussion among international experts in the "Water" Panel of the Conference. Although the paper will be published in the Conference proceedings (http://ec.europa.eu/research/conferences/2012/euro-mediterranean/index_en.cfm) it has been agreed with the EC to publish it also on the CIHEAM Watch Letter to increase dissemination and outreach of Conference activities across the Euro-Mediterranean scientific community.

urbanisation is requiring new advances in the science of civil engineering and hydrology as water supplies had often to be brought from long distances or extracted from the sea by expensive desalination techniques or obtained through recycling waste waters. Nevertheless the dynamic process of managing water resources and demand is gradually changing. There are many components to this change: a shift away from sole reliance on finding new sources of supply to address perceived new demand; a growing awareness on the importance of preventing and mitigating water conflicts; a growing emphasis on incorporating ecological values into water policy; a re-emphasis on meeting basic human needs for water services; and a conscious breaking of the ties between economic growth and water use. A reliance on technical solutions continues to dominate traditional water planning approaches, but this approach is facing increasing opposition: water technology alone is not sufficient to address water sustainability and there is a need for sustainable technologies to be adapted to specific socio-economic context. In the same time new methods are being developed to strategically assist meeting the demand of growing population in the Mediterranean, based more on water use efficiency, participative approach and good governance, without disregarding the construction of large-scale water transfer and supply infrastructures.

Over the last 10 years the research agenda was gradually shifting to explore efficient ways of water saving (particularly in agriculture), implementing options for managing demand and reallocate water among users. However, new approaches will also likely fail if they are not supported by real participatory approach, communication among interested stakeholders, water players and citizens, institutional strengthening, relevant education, common knowledge, mutual awareness of interested parties. The literature is rich with regard to small- to medium scale technological trials / projects (end-user scale) and assessment of water management options. However the most recent literature and field experience revealed the need for more integrated and common efforts focusing on the following elements:

- Establishing and carrying out water management policies coherent with the emerging need of ensuring sustainable development and adaptation to changes;
- Developing coherent national-regional policies including sustainable strategies for water resources management and water ethics;
- Improving the efficiency and capacity of public administration at the local and central level;
- Appraising water actions from the point of view of culture, economics, environment (including health);
- Overseeing the promotion and enforcement of national legislation and guidelines for best practices;
- Setting new and more coherent water pricing and water governance;
- Creating a common knowledgebase to settle water conflicts;
- Developing policies and strategies to manage impact and to adapt to cultural, political, climate and financial changes.

The literature lacks an adequate overview of water management experiences throughout the Mediterranean, particularly those with potential for replication, as well as a tentative assessment / modelling of results which could be achieved by comparing, integrating and up-scaling local experiences, accounting also the active public participation and community involvement. Significant challenges still remain in the areas of technological, managerial and policy innovation and adaptation, human resources development, gender roles in water management (particularly in rural areas), sharing common knowledge, gathering a new frame and consensus on the use of sustainability indicators (economic, social, environmental, institutional). Constraints to the uptake of effective research / project results are of two kinds:

- Local level projects are scattered and fragmented, often different standards are used and results are difficult to be compared and integrated;
- Water management practices are not standardized across the different Southern Mediterranean countries, as they vary from country to country and from basin to basin;
- The legislative and institutional system does not support the implementation of innovative research results or approaches;
- The European Commission as well as other donors (ex.: EU Member States) extensively funded collaborative research and support actions along the past 10 years on water management issues and there is a significant number of technical and socio-economic data and information on water resources in the Mediterranean. Relevant Euro-Mediterranean regional S&T dialogue on water was carried out in several EU funded actions (ex.: WASAMED, MELIA). Dialogue and research produced results and guidelines, mainly shared within the agora of researchers, but it still needs proper national and trans-national dissemination and share with decision makers, users and society.

The main elements for a medium to long term agenda of Euro-Mediterranean Cooperation in Research and Innovation are the following.

Water scarcity and management under climate change

- Developing approaches to risk assessment, impact evaluation and adaptation, providing options for wide-range problems ;
- Adaptation policies development to drive adaptation actions ;
- Strengthening the climate change knowledge base ;
- Engaging stakeholders by developing suitable methodologies for assessment of impacts, vulnerabilities and planning as a pre-requisites for cost-effective water management adaptation ;
- Increasing societal awareness and capacity building to support the implementation of adaptation measures to address a particular water risk under climate change ;
- Developing sustainable innovative technologies and concepts in water saving, water use efficiency, water productivity, use of non-conventional waters, water harvesting and conservation as options to mitigate risk and impact by climate change ;
- Water management under long-term drought conditions: early warning, prevention and preparedness ;
- Management of extreme flood events: early warning, prevention and preparedness/contingency plans ;
- Developing robust and flexible water data base systems with efficient monitoring systems at the regional level for climate projections.

Ensuring sustainable access to limited water resources

- Optimal allocation of scarce water resources, both between and across different users ;
- Institutional strengthening and participatory water management ;
- Improving water sanitation to reduce water related diseases ;
- Water pricing, cost recovery mechanisms and efficient water charge policies ;
- Basin-wide cooperation between riparian states.

Water use in agriculture: interlinks between lands and water use – cultural heritage and behaviour

- Ecosystem based management of agricultural waters ;
- Improving participatory approach in agricultural water management ;
- Enhancing innovation and sustainable use of agricultural water management through an appropriate inclusion of cultural heritage (ex.: sustainable re-use of “foggara” for irrigation) ;
- Management of agricultural waters under scarcity conditions: sustainable land-use changes, alternative agricultural practices, water use efficiency and system performance, water productivity (water-plant-soil), use of unconventional waters (including wastewater reuse and related nutrients valorisation) ;
- Technologies in water saving, water use efficiency, water productivity, use of non-conventional waters (including gray waters and treated wastewater reuse and related health issues), water harvesting and conservation, distribution system.

Main intervention strategy

- Competitive research to enhance innovation in relevant water sectors (water use efficiency-productivity, system performance, non-conventional water, water risks, access to water) ;
- Regional approach to water management, including build of knowledge share and efficient transfer of mechanism for the use of research results at regional level, common monitoring/observatory mechanisms, technology share, water strategies/policies alignment ;
- Capacity building including a wide array of actions such as organizational reforms, institutional strengthening, science-policy interfacing, training and networking, participative approach implementation. Capacity building has to be rationalized to reach researchers as well as public, private, NGOs and water users ;
- Strengthening national water governance to enhance innovation in the management of limited water resources ;
- Research at both small scale community/catchment and water basin level (including transnational basins) ;

- Integrating research in local and regional clusters of relevant actors, stakeholders and final users. The participation of stakeholders in all aspects of water management is crucial to the successful uptake of research results and implementation of water policies ;
- Create operational synergies with political and multi-stakeholder processes on water in the region, like the Mediterranean Component of the EU Water Initiative, assisting to reach out to policy makers, a range of regional and national players as well as other related initiatives, processes and programmes that provide support to policy making ;
- Research development for water multi-uses towards zero water discharge ;
- Linking Southern Mediterranean Countries' water strategy with the EU Water Framework Directive to improve quality of mutual EU-MPC cooperation and competitiveness in the water sector ;
- Research should also be on applied socio-economics aimed at assessing how to induce technological, managerial and organizational-social changes ;
- Water cultural heritage as a basis for innovation and adaptation to water risks ;
- Fostering regional networking as an effective way of enhancing synergies and allow concentration of efforts, know-how exchange, co-ownership and dialogue ;
- Fostering high quality but diversified partnership to promote (i) interface interaction between specialties and sectors leading to new approaches, tools and innovation; (ii) the integrated and sustainability aspects; (iii) collaboration between experienced and new teams for coaching and capacity building in cooperation.

Specific actions and instruments

- Special pre-competitive research efforts to develop technology that can be used for a wide range of costs, management systems, scales and technological advances in the region ;
- Pilot demonstrations and real case studies to substantiate pre-competitive research in the water sector in the region, with particular regard to develop income generating water saving and multi-use solutions and alternative at user level ;
- Developing tools enabling replication and the scale up (regionalization) of successful pilot / demonstration actions ;
- Linking research, technology enterprising and water users to enhance competitive research in water use efficiency, drought and flood management, non-conventional water use, water conservation, mitigation of salt intrusion in coastal groundwater and impact of desalination brine discharges to coastal environments;
- Increasing the sustainability of water technology and their adaptation to different socio-economic contexts and treated water uses;
- Activities in support of institutional strengthening and participatory water management;
- Supporting the creation of cooperation and financial partnerships among researchers, SMEs, investors, institutions active on water saving, water use efficiency, drought and flood management, unconventional water use;
- Strengthening trilateral financial synergies / co-funding (EU-MS-MPCs) in identified challenges ;
- More research cooperation based on equal participation / co-ownership of EU and MPC researchers. In particular, a permanent ERANET type of action, based on variable geometry, could be established to ensure continuity of actions and commitments by MPC, MS and EU to achieve common water challenges;
- Facilitate the engagement of Mediterranean Partner Countries in the EU Water Technology Platform (ex: Water Supply and Sanitation Technology Platform).

Conclusions

The Water Panel of the Euro-Mediterranean Conference on Research and Innovation of 2-3 April 2012 concluded that important issues to be focused are:

- Developing capacities in risk assessment, planning and adaptation through adequate good governance, stakeholders / societal engagement” ;
- Good governance to ensure equity in water allocation, sustainable water management and institutional reinforcement;
- Holistic but competitive research and innovation in water quantity management and use efficiency, and management of non conventional waters.

Furthermore, the Panel concluded that the main challenges to be addressed are the following:

- Ensuring water management for all ecosystem functions and food security. Political willingness is needed to ensure a multi-sector and multi-scale approach;
- Strengthening societal and water users empowerment, improving dialogue as well as mutual trust among institutions, researchers and society;
- Building a regional co-ownership on water resources management, from challenges identification to financial and implementation synergies.

That is why some priorities for action were suggested:

- Adopting the Mediterranean Water Strategy and Action Plan which will provide the financial and instrument framework for the future ;
- Partnerships to create conditions for competitive research in water use efficiency, use of non-conventional waters, risk management ;
- Regional join funding for trans-basin cooperation and regional water innovation programme.

Bibliography

- C. Bogliotti and N. Lamaddalena – 2007 – Vision Document. *WASAMED Water Saving in Mediterranean Agriculture* – EU FP5.
- Asano, T., 1998. *Wastewater reclamation and use*. Water Quality Management Library. Vol. X, Taylor and Francis CRC Press.
- Choukr-Allah, R., Malcom L.V., and Hamdy A. (Eds.), 1995. *Halophyte and Biosaline Agriculture*. Marcel Dekker Inc., New York, Basel, Hong Kong.
- FAO, 1989. *The state of food and agriculture 1989: world and regional reviews; sustainable development - and natural resources management*, FAO, UN Rome.
- Gleik H. P., 1993. *Water crises: a guide to the world's fresh water resources*. Ed. Gleik H. P. Oxford University Press, Oxford, New York.
- Hamdy, A. and Lacirignola, C., 1999. *Mediterranean Water Resources: Major Challenges Towards The 21st Century*. Presented at the International Follow-up Seminar: Mediterranean Water Resources: Major Challenges towards the 21st Century, Cairo (Egypt), 1-5 March, 1999, CIHEAM-IAM, Bari, Italy.
- Hoffman G.J., Howell T.A. and Solomon K.H., 1990. *Management of Farm Irrigation Systems*. Eds. G.J.Hoffman, Howell T.A. and Solomon K.H. ASAE publisher.
- IHE-UNDP, 1991. *A strategy for water sector capacity building*. Proceedings of the UNDP symposium, Delft, The Netherlands, 3-4 June 1991. IHE Report series n. 24.
- Jensen M.E., 1980. *Design and operation of farm irrigation systems*. Ed. M. E. Jensen – ASAE publisher.
- Lamaddalena N. and Sagardoy J.A., 2000. *Performance analysis of on-demand pressurized irrigation systems*. FAO Irrigation and Drainage Paper 59. FAO, Rome.
- Pereira, L.S., Cordery, I., Iacovides, I., 2002. *Coping with Water Scarcity*. UNESCO IHP VI, Technical Documents in Hydrology No. 58, UNESCO, Paris (accessible through <http://unesdoc.unesco.org/images/0012/001278/127846e.pdf>)
- World Commission on Environment and Development, 1987. *Our Common Future*. Oxford University Press, London.

Research in Malta: Capture Fisheries and Aquaculture

Carmelo Agius and Simeon Deguara

Biology Department, University of Malta

Malta is situated in the Central Mediterranean and has a total land area of 320 km² and a coastline of 140 km. It has small but very diverse capture fisheries and aquaculture industries. Competition from other users is heavy within the coastal areas. Indeed diverse industries, especially tourism and maritime traffic, restrict the activities and potential expansion of the fishing and aquaculture industries. Together the proportion of the Maltese working population depending on the capture fisheries and aquaculture industries is around 1% and these industries provide direct employment for about 1,400 people. Recently the capture fisheries sector has been characterised by an aging work force indicating a requirement to attract young people into the industry. Landings from capture fisheries is typically in the range of 900 to 1200 metric tonnes a year whilst total aquaculture production has varied recently between 4000 to 8000 metric tonnes depending on the Atlantic bluefin tuna (*Thunnus thynnus*, BFT) quota stocked in the cages. Together both industries contribute less than 1% to Malta's GDP.

Maltese capture fisheries is multi-species and multi-gear and is typically artisanal in nature, with the majority of Maltese fishing vessels being below 10m in length. In 2009 over 60% of the landings by the fleet were provided by only three species BFT, swordfish (*Xiphias gladius*) and the dolphin fish (*Coryphaena hippurus*). Malta maintains a 25 nautical miles Fisheries Management Zone (FMZ) with the main objective of protecting the local fishing industry and the sustainability of the marine habitat. This zone, which was declared by Malta in 1971 (as an Exclusive Fishing Zone, EFZ), is managed to limit fishing effort by restricting and controlling the size and engine power of fishing vessels in the zone.

The aquaculture industry in Malta started on a commercial basis in 1991 and produces mainly gilthead sea bream (*Sparus aurata*), and the European sea bass (*Dicentrarchus labrax*). Since 1999 a number of farms holding purse-seine caught BFT for the Japanese sashimi and sushi markets were set up; these farms depend on quotas available for the catch of wild BFT to stock their cages. This species portfolio is being expanded with research into 'new' species such as the amberjack (*Seriola dumerili*), the meagre (*Argyrosomus regius*) and the white bream (*Diplodus sargus*).

Because of the limited coastal area and strong competition from other industries, Malta has had to develop its aquaculture industry in offshore sites and was a pioneer in this field of application. Whilst offering a number of advantages in terms of water quality characteristics, these sites are often exposed to strong and variable currents and gale winds which can sometimes last a number of days. Both industries have been assisted and provided with scientific guidance and feedback for many years. This research has been supported by the Fisheries and Aquaculture Departments of the Maltese Government, the University of Malta and other private organisations in Malta, very often in collaboration with other international bodies and organisations.

Capture Fisheries

The scientists of the Government of Malta through the Agriculture and Fisheries Regulation Department (MRRA) are involved in many projects and collaborations aimed at expanding the knowledge base on the biology and management of the various fisheries stocks in the Mediterranean and specifically pertaining to Malta. Such a programme of research is that looking at demersal resources. This research forms part of the MEDITS (MEDiterranean International Trawl Survey) programme. These annual surveys have been underway since 2000 with the scope of gathering information on benthic and demersal species in terms of population distributions as well as demographic structures, with the best coverage possible around the Mediterranean. Through the samples taken for the MEDITS project, the MRRA is currently focusing on the distribution and population dynamics of deep-water cephalopods in the Maltese Fisheries Management Zone.

Malta, Sicily, Tunisia and Mallorca have been collaborating for a number of years on research related to the biology and fisheries of the dolphin fish, which is a very important species for the Maltese fishing fleet. One specific aspect of this research carried out by the MRRA was to provide an updated and improved age-length function for the central Mediterranean based on both adult and juvenile fish and using dorsal spine annuli and daily growth increments. MRRA is also participating in the CREAM (Coordinating Research in support to application of Ecosystem Approach to fisheries and management advice in the Mediterranean and Black Seas) project which started in 2011. The MESMA (Monitoring and Evaluation of Spatially

New Director in MAI Chania

The position of Director of MAICh has been taken over from the 1st of June 2012 by Dr. George Baourakis, who has been the Studies and Research Coordinator of the Business and Management Program of MAICh for more than twenty five years.

Managed Areas) project was launched in November 2009 and has a duration of 48 months with the objective of focusing on marine spatial planning and aims to produce integrated management tools (concepts, models and guidelines) for monitoring, evaluation and implementation of SMAs.

The MRRA is involved in the collection of data and samples of BFT and the swordfish, two species of high importance to the Maltese fishing industry. This data is made available to the Standing Committee or Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tunas (ICCAT) and forms part of the data utilised during the stock assessments carried out as part of the management of these two stocks in the Mediterranean. The Department of Biology (DoB) of the University of Malta with the MRRA and other organisations have been participating in a number of projects which are of great relevance to the Maltese fishing industry and incorporating a more holistic approach to the fisheries sector. In the BENSPEFISH project (BENThic Secondary Production and Essential Fish Habitats in the Malta FMZ) research has been and is being carried out to identify and improve the knowledge on the characteristics of the habitats in the FMZ (in particular those related to foraging, reproduction and early life stages) of those species of relevance to the Maltese fishing industry and how fishing activity impacts these habitats.

Of equal relevance is the collaboration of the DoB and MRRA, together with other EU-wide participants, on the application of Marine Protected Areas (MPA) in a wide range of geographical areas including the Mediterranean and, specifically Malta (EMPAFISH, European Marine Protected Areas as tools for FISHeries management and conservation). The objective of this research is to analyse how MPAs can be managed to ensure a continued sustainable and economically viable fisheries activity whilst protecting sensitive and endangered species their habitats and the general ecosystems where they are found. The project also aims to provide tools and indicators to measure and monitor the impact of the MPA on the targeted species and their habitats and on the fisheries industry associated with a particular fishing activity which may be impacted by the MPA.

The MRRA has also been collaborating with the Federation of Maltese Aquaculture Producers (FMAP) on various aspects concerning the biology and culture of BFT. The latest such project, related to the management requirements of the BFT, involves the utilisation of state of the art stereo camera technology from Australia to measure the length of BFT caught by purse seiners and transferred to BFT rearing cages for fattening purposes. Since 2009, the FMAP has been collaborating with scientists from the University of Malta to study additional aspects of the biology of BFT related to its growth when fattened and harvested in cages in Malta. In 2011, the FMAP also formed part of a 13-partner consortium collecting BFT biological and genetic samples from all parts of the Mediterranean and Eastern Atlantic as part of the ICCAT Atlantic wide research program for Bluefin Tuna (GBYP); this research is set to continue for the rest of 2012.

Aquaculture

Malta has been active in marine aquaculture research since the early seventies with the main focus being on hatchery technology, offshore cage technology and diversifying the species of fish cultured in its farms. This diversification research has been spearheaded by the Malta Aquaculture Research Centre (MAR) which focuses principally on species diversification by carrying out research on marine species with potential for aquaculture. Whilst in the past various species were studied including mussels, oysters, coryphenes, etc recently, the main focus has been on the amberjack *Seriola dumerili* and the BFT. Domestication of wild caught amberjack broodstock started in 1992. The first eggs from caged amberjack broodstock were obtained in 2005. This led to the establishment of the Amberjack Project, which started in 2006 as a joint venture between MAR and a Maltese fish farm (MFF Ltd), and which led to the first production of juveniles in 2006. Further advances have been made and spawning and egg collection have become an annual procedure with a maximum production of 14,000 fingerlings transferred to sea cages in 2010. Larval survival still needs to be improved and this, along with the development of standard rearing techniques to market size fish, are the continued focus of this collaboration.

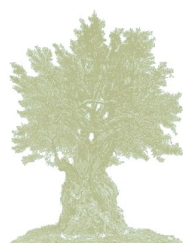
Malta has been a partner in all the EU-funded "DOTT" Projects (Domestication of *Thunnus thynnus*), starting with the DOTT conference in the early 2000's, followed by the 5th Framework EU Project "REPRODOTT" (REPRoduction of the bluefin tuna in Captivity -feasibility study for the DOMestication of *Thunnus thynnus*) and the 7th Framework EU Project "SELFDOTT" (SELF-sustained aquaculture and DOMestication of Bluefin Tuna *Thunnus thynnus*). Another 7th Framework EU project "TRANSDOTT" (TRANSlation of DOMestication of *Thunnus thynnus* into an innovative commercial application) will start in 2012 to carry out another two years of EU funded research. The TRANSDOTT Project will deal with implementing knowledge obtained through all the DOTT Projects and transforming it into an innovative

commercial application. Malta (MAR and MFF Ltd) plays a major role in this project and is responsible for holding BFT broodstock, egg collection, egg transportation trials, larval rearing, fingerling transfer to cages and ongrowing. Additional species being studied by MAR include the white bream, meagre and grouper (*Epinephelus marginatus*).

Other research being carried out in Malta is looking at the commercial development of specialised cost-effective recirculating aquaculture systems (RAS) for broodstock, hatchery and on-growing operations. The same company carrying out this development (AquaBioTech Group) is participating in the EU FP6 SUSTAINAQUA project which involves research, training and dissemination in the field of sustainable freshwater aquaculture and studied potential economically valuable by-products, and in the EU FP7 CLEANHATCH project to develop and test a new cleaning technology for marine and freshwater larval hatchery tanks. The DoB has carried out numerous trials in aquaculture species testing potential applications of biologically active products extracted by a Malta-based company (ICP Ltd) from the prickly pear (*Opuntia ficus indica*), and the peacock's tail (*Padina pavonica*), which is a brown algae which grows abundantly in the Mediterranean. Trials involving these two products, the former having anti-stress properties and the second being involved in calcium metabolism, have shown significant improvements in the health, production and harvest characteristics in those species tested which have included the gilthead sea bream, BFT, whiteleg shrimp (*Penaeus vannamei*) and Atlantic salmon (*Salmo salar*).

Conclusions

No industry can survive in the current economic and legislative climate without some form of scientific input. This applies for both the capture fisheries industry where there is increasing pressure to manage sustainably with an ever-increasing legislative burden and for the aquaculture industry which is increasingly being required to satisfy demand for nutritious but sustainable food for an ever-increasing human population. Both industries have their specific challenges and therefore data requirements. Maltese scientists, although having limited resources, have been able to contribute locally and internationally to both industries by participating in the many programmes available in the Mediterranean, in the EU and often even globally.



Research on Food Consumption Patterns and their Health Implications in Greece

Antonia Trichopoulou, MD, PhD

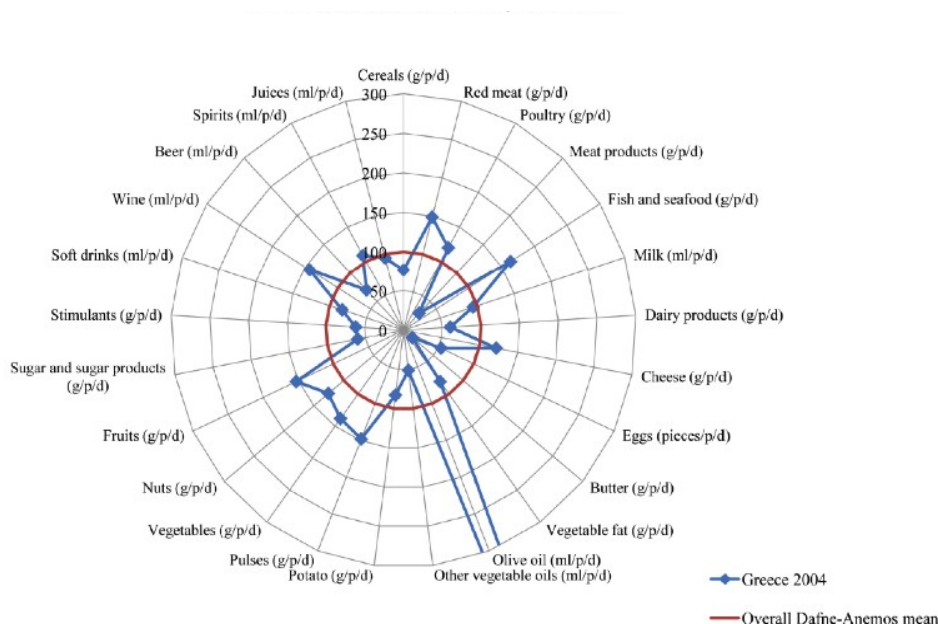
WHO Collaborating Center for Food and Nutrition Policies, Department of Hygiene, Epidemiology and Medical Statistics, University of Athens Medical School. Hellenic Health Foundation, Athens (Greece)

Publications derived from food consumption surveys focus mainly on presenting dietary intakes in terms of individual foods and/or nutrients consumed. Because of the potential implications of nutrients to the causal pathways of diseases, nutrients dominate most of the literature on nutrition research, and early dietary guidance was largely based on recommendations for the intake of particular nutrients. As diet comprises a number of nutrient and non-nutrient constituents that are often interacting, nutrition research has later shifted towards studying inclusive food-based approaches that focus on dietary patterns.

In the absence of regular and comparable individual-based surveys in Greece, Household Budget Surveys constitute a valuable source of information about long-term nutrition trends, their socio-demographic determinants and their likely health implications. For this purpose the DAFNE-ANEMOS data were used which are freely available through a web-based application tool, the Dafne-Anemos Soft¹.

The DAFNE-ANEMOS initiative derives from a joint effort of several European countries to compare the food habits of their populations and monitor trends in food availability over time through a dynamic, regularly-updated food databank, making use of data collected through the nationally representative household budget surveys (HBS). The overall aim is the development of a nutrition monitoring tool that could assist the formulation, implementation and evaluation of nutritional policies across Europe. Data collected through HBS undertaken in Greece and other countries were analysed. A pattern of a plant-based diet is recorded in Greece with substantially higher daily mean availability of olive oil, fruits and pulses in comparison to the average of several European countries in late 2000s (Figure 1; Greece above average is shown as outside the area circumscribed by the red line, which is representing the average as 100). However, Modern Greeks show a tendency towards increased meat consumption and a substantial fraction of the population fails to meet the Greek nutrition guidelines.

Figure 1: Deviation (%) of the daily individual food availability from the overall mean in DAFNE-ANEMOS countries, in late 2000s



Source: The DAFNE-ANEMOS SOFT (<http://www.hhf-greece.gr/dafnesoftweb/>)

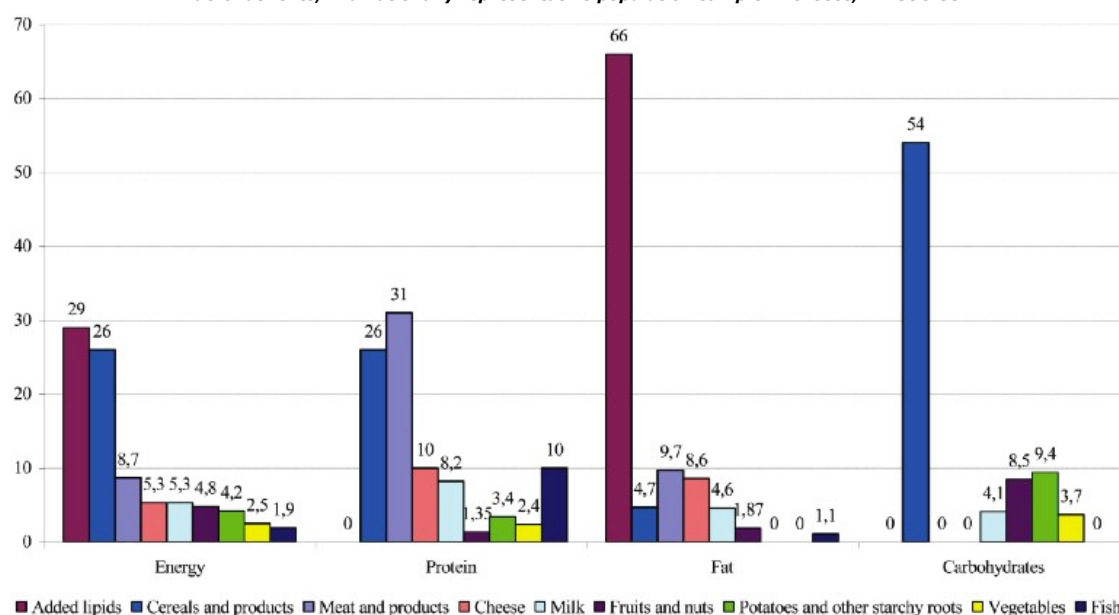
The availability of soft drinks is steadily and significantly increasing. Soft drinks were found to be correlated with lower availability of plant foods and milk and higher availability of meat, sweets and cakes. Lower socio-economic status was associated with more frequent and higher availability of soft drinks in the household.

Data collected through the HBSs were also used for estimating the daily availability of energy, macro- and selected micro-nutrients (Naska et al. 2007). Mono-unsaturated fatty acids (mostly from olive oil) were important contributors in the Greek diet (21% of the daily energy availability). It should however be pointed that the share of saturated fatty acids in the Greek diet has increased substantially since the 1960s, when the first data on the diet of Mediterraneans were collected, and is now close to the upper recommended level of 10% of total energy intake.

Figure 2 presents the relative contributions of main food groups to the daily energy and nutrient availability for Greece. In these plots, food groups appear in the order in which they contribute to daily energy availability; a zero value is indicated when a food group does not contribute to the daily availability of the specific nutrient (Naska et al. 2007).

¹ <http://www.hhf-greece.gr/dafnesoftweb/>

Figure 2: Percentage contribution of main food groups in the mean daily availability of energy and macronutrients, in a nationally representative population sample in Greece, in 1998-99



Source: Naska A. et al PHN 2007

Among the food groups presented, the first three energy suppliers were in Greece added lipids (mainly olive oil), cereals (and cereal products), and meat (and meat products). With respect to added lipids, their contribution to the daily fat availability followed a decreasing trend in recent years whereas the contribution of vegetable oils other than olive oil has increased (from 2.1% in 1981/82 to 8.8% in 1998/99).

Using Principal Components Analysis (PCA), two major dietary patterns emerged. The PC1, indicating 'wide-range' food buyers, was more common among households whose head was retired and elderly, possibly indicating infrequent out-of-home consumption. In addition, elderly individuals, particularly women living alone, have often been reported to over-purchase and the extra purchasing was occurring throughout the range of foodstuffs. Higher scores in PC2, which indicated 'beverage and convenience' food buyers, were more common among households located in urban or semi-urban areas. Considerable work, some of it reported in major scientific journals, has been undertaken in Greece on the health (and economic) effects of a dietary pattern still common in Mediterranean countries, the traditional Mediterranean pattern.

Traditional Mediterranean is the diet that prevailed in the olive tree growing areas in the countries of the Mediterranean basin, before globalization expanded into the food culture. Traditional Mediterranean diet drew the attention of scientists during the early post World War II years, mostly because the health of the Mediterraneans was better than expected from the regional economic development, the available health care resources and certain common life style habits (notably the high prevalence of smoking). The insightful research by Keys and his colleagues (Keys, 1980) (done largely in Greek areas) brought the concept of the Mediterranean diet into the scientific mainstream.

Three developments after the late 1980's have contributed to the resurgence of Mediterranean diet as a nutritional pattern of major importance for health and wellbeing. A workshop in Delphi with the scientific contribution of WHO Europe (Helsing & Trichopoulou, 1989), a conference in Boston co-sponsored by the Harvard School of Public Health (Willett et al. 1995) and the publication in 1995 of a scale (Trichopoulou et al. 1995) allowing the semi-quantitative assessment of adherence to the traditional Mediterranean diet. I will indicate below some of the major findings of research in this field that was undertaken in Greece or with important input of Greek resources.

The 1995 paper (Trichopoulou et al. 1995) already referred to adherence to traditional Mediterranean diet (TMD) and was based on high consumption of vegetables, fruits, pulses and unprocessed cereals (above the corresponding median value), low consumption of meat and whole fat dairy products (below the corresponding median values), high ratio of monounsaturated (mostly from olive oil) to saturated lipids (above the corresponding median value) and consumption of wine during meals in moderation (rather than excessively, or not at all). Higher adherence to TMD was associated with longer survival in a small cohort of elderly. The healthy TMD was considered to be an expression of culture and history, economic constraints in a geographical background characterized by the abundance of olive trees. The advantages of TMD were found to also apply in a small cohort of Anglo-Celts and Greek Australians in

Mediterra 2012

The 2012 edition of *Mediterra* has been published in March 2012. The new CIHEAM report takes the mobilising potential of the Mediterranean Diet as a basis and proposes a multidimensional itinerary involving sociodemographics, health, ecology, enterprise, geoeconomics and citizens' initiative.

Mediterra 2012, in which 49 international experts have participated, has been prepared in partnership with the European Institute of the Mediterranean (IEMed) and the Mediterranean Diet Foundation (FDM).

It is published in English and French by the Presses de Sciences-Po. The Spanish version has just been published in May 2012.

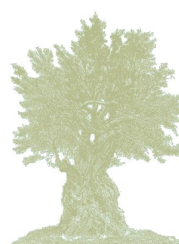
The report can be downloaded in free access from www.ciheam.org

Australia. A series of studies were subsequently done in the Greek component of the European EPIC cohort. EPIC (European Prospective Investigation into Cancer and Nutrition) is a large cohort of about 500.000 individuals from 10 countries who are continually followed-up (the Greek component contributes with about 28000 participants). Firstly, the TMD was traced in the Greek population through principal components and cluster analysis and then the health advantages of adherence to TMD were firmly confirmed with respect to total mortality (Trichopoulou et al. 2003). The TMD was shown to improve prognosis among patients with established coronary heart disease and it was first reported in the Greek EPIC cohort and then confirmed in the total EPIC cohort to be associated with reduced overall cancer incidence (Benetou et al. 2008). It was also shown that the dominant components of the Mediterranean Diet score as a predictor of lower mortality are moderate consumption of ethanol, low consumption of meat and meat products, and high consumption of vegetables, fruits and nuts, olive oil, and pulses. In my Award address at the Federation of European Nutrition Societies conference in 2011, I have pointed out that, in addition to its beneficial health effects, TMD also has considerable beneficial, economic and social consequences and can contribute crucially to a sustainable environment (Trichopoulou 2012). The 2012 Edition of *Mediterra*, the last regional report of CIHEAM dealing with Mediterranean Diet, has delivered the same global message.

In a short report it is not possible to adequately summarize all the work undertaken in our country on food consumption patterns and their health implications. Unavoidably, I am also biased towards our own work on nutritional epidemiology. Nevertheless, important scientific work is currently done in Greece, even though resources are limited and are likely to be more limited in the near future. With respect to diet, however, the economic crisis may actually motivate the population towards the traditional Mediterranean Diet which, in addition to been healthy and supportive of a sustainable environment, is also less demanding from the economic point of view. Indeed, the TMD is based on plant foods, which are, or can be, locally produced, whereas discourages meat intake, which is mostly imported at a cost of almost 1 billion Euros per year.

Bibliography

- Benetou V, Trichopoulou A, Orfanos P, Naska A, Lagiou P, Boffetta P, Trichopoulos D; *Greek EPIC cohort. Conformity to traditional Mediterranean Diet and cancer incidence: the Greek EPIC cohort*. Br J Cancer. 2008 ;99:191-5.
- Helsing E, Trichopoulou A, eds (1989). *The Mediterranean Diet and food culture: a symposium*. Eur J Clin Nutr. 1989; 43(suppl 2):1-92.
- Keys A. *Seven countries. A multivariate analysis of death and coronary heart disease*. Cambridge MA: Harvard University Press; 1980.
- Naska A, Oikonomou E, Trichopoulou A, Wagner K, Gedrich K. *Estimations of daily energy and nutrient availability based on nationally representative household budget survey data*. The Data Food Networking (DAFNE) project. Public Health Nutr. 2007; 10:1422-1429.
- Trichopoulou A, Kouris-Blazos A, Wahlqvist ML, Gnardellis C, Lagiou P, Polychronopoulos E, Vassilakou T, Lipworth L, Trichopoulos D. *Diet and overall survival in elderly people*. BMJ. 1995; 311:1457- 1460.
- Trichopoulou A, Costacou T, Bamia C, Trichopoulos D. *Adherence to a Mediterranean Diet and survival in a Greek population*. N Engl J Med. 2003; 348: 2599- 2608.
- Trichopoulou A. Speech, *Diversity v. globalization: traditional foods at the epicenter*. Public Health Nutr.2012; doi:10.1017/S1368980012000304 .
- Willett WC, Sacks F, Trichopoulou A, Drescher G, Ferro-Luzzi A, Helsing E, Trichopoulos D. *Mediterranean Diet pyramid: a cultural model for healthy eating*. Am J Clin Nutr. 1995;61:1402S-1406S. Review.



The contribution of Geosciences in environmental research

The case of Lebanese CNRS

Mohamad Awad, Talal Darwish, Amin Shaban, Gaby Khalaf, Mouin Hamzé

National Council for Scientific Research, CNRS Lebanon

Introduction

Increased population adds pressure on limited Mediterranean natural resources. Excessive use of resources is expressed through the expansion of urban settlements accompanied with diminishing vegetation cover and forests. In addition, urban settlements require underground infrastructure such as sewer systems and artificial wells which affect groundwater causing seawater intrusion and deterioration in the natural and built environment. In order to recognize how the Geosciences contribute to the understanding of the environmental status in Lebanon it is necessary to survey the programs and activities of the National Council for Scientific Research (CNRS) which encompass research grants, multilateral and bilateral funding and the creation of CNRS specialized research centers in different scientific and Geosciences disciplines which are not covered by any other Lebanese institutions. The geoscientists analyze and report measurements and observations of air, water, soil, and other sources and make recommendations on how best to clean and preserve the environment. This report surveys CNRS's role to the success of environmental research on water, soil, forest and coastal marine ecosystem, reviews the contribution of geospatial technology to Geosciences and presents main outputs oriented to the protection and sustainable management of the environment.

Institutional setting

The Lebanese CNRS, which is celebrating its 50th anniversary in 2012, is a public institution that advises the Government on all science and technology issues. CNRS has mandated its four national research centers, the Remote Sensing, Marine Science, Geophysical Research, and the National Atomic Energy Commission to assess and monitor the state of the environment and support the decision making in the Lebanese government on the sustainable use and management of limited natural resources. CNRS Centers have experienced staff of geoscientists and environmental researchers, many of whom were raised within the centers through the PhD Scholarship program in co- advisory between Lebanese and foreign researchers, mainly French. In 2011, CNRS provided fifty PhD scholarships to young Lebanese future scientists.

The tasks performed by the two first Centers can be summarized as follow:

- to undertake pure, applied and action-oriented research, development and applications of Remote Sensing (RS), geographic information system (GIS) and related technologies in conducting Geosciences research to assess the current state of the environment;
- to acquire, store, publicize and provide regular information about the Lebanese coastal and marine environment, forest fire, land degradation, sea level rise, landslide and drought risk assessment and hazard mapping;
- to undertake promotional activities to and promote public awareness through dedicated conferences, seminars, workshops, papers and portals;
- to develop joint/collaborative programs with local institutes mainly Ministry of Environment (MoE), Ministry of Agriculture (MoA) and Ministry of Energy and Water (MEW), NGOs, and international donor organization whose objectives are in line with the national interest;
- to provide consultation services in order to advance the research objectives by acquiring the latest technologies in geochemistry, GIS and RS. In addition, the National Center for Geophysics-CNRS conducts research studies to delineate areas prone to earthquake using geospatial technologies, supports the decision makers and informs the public about the current seismic activities.

Challenges

Lebanon faces many natural and environmental risks and disasters like flash flood, earthquake, pollution, chaotic urban expansion and forest fires. The elaboration and implementation of measures to prevent, mitigate and reverse land degradation trends and risks need strategic planning and public

Press Review and Day-to-Day Events

Every month, CIHEAM publishes a press review about agriculture, food, environment and economy in the Euro-Mediterranean region. It is available at www.ciheam.org

A new free entry system has been set up in April 2012, in order to be able to follow the news about the Mediterranean on a daily basis:
<http://www.scoop.it/t/ciheam-press-review>

awareness exacerbated by poor economic policies and institutional weakness. Unfortunately, the dominant strategic development plans followed since 1950's were based on supporting service oriented low cost economy and paid little attention to environmental concerns. Nevertheless, CNRS research in the environmental problems has been concentrated on water and soil conservation, the state of vegetation cover, degradation and desertification risks and pollution of the three main assets: soil, water and air. Other environmental problems faced by CNRS can be summarized as follows:

- Mapping land cover and land use change including human settlements expansion on arable lands to assess the vegetation cover, forest fires and desertification risks;
- Water and soil pollution caused by the discharge of thermo-electric power and industrial plants;
- Mismanagement of municipal liquid and solid wastes dumped into open space, streams and deep bore-holes with the risk of contamination of underground waters, springs and coastal marine ecosystem;
- Effect of prevailing agricultural practices with uncontrolled pesticides and fertilizer application on the groundwater quality;
- Coastal marine water quality and sea pollution as affected by untreated wastes and wastes from marinas and boats.

Many Lebanese Geoscientists in CNRS do work and have training that is similar to other physical or life scientists, but is applied to Geosciences and environmental areas. Many specialize in some specific area, such as environmental ecology and conservation, chemistry, biology, or marine science. Utilizing their knowledge of various scientific disciplines, Lebanese geoscientists collect, study, and report data on natural resources. The scientists in the National Center for Remote Sensing-CNRS integrate mathematical modeling, systems analysis, thermodynamics, Geographic Information Systems, Remote System and computer techniques to study, map and assess environmental risks related to soil (erosion, mass movement, pollution), water and snow (quantity and quality), vegetation (change, NDVI, forest fire). Many of the Lebanese geoscientists are involved in searching for natural resources, while others work closely with environmental scientists in preserving and cleaning up the environment. Oceanographers in the National Center for Marine Research-CNRS use their knowledge in biology and geochemistry to study the environment of Lebanese coastal zones. They study the movement and circulation of the sea waters and their impact on climate and weather; assess the physical and chemical properties of the sea coast and how these properties affect coastal areas and coastal zone management.

CNRS research programs

One of the main CNRS programs is the grant research funding program devoted to support research projects in the Lebanese Universities in line with the science and technology innovation policy (STIP) adopted by the Lebanese Government in 2006 and CNRS priorities. Only in 2011, CNRS provided a sum of 1,200,000 US \$ to 87 new research projects mainly in fundamental and information technology sciences (30 projects), medicinal and biological sciences (24 projects), environmental and agricultural sciences (21 projects) and social and humanitarian sciences (12 projects).

The primary focus of the CNRS associated research units program joining researchers from CNRS and local universities address drinking water and air quality, as affected by human activities, and their impact on public health. The bilateral Lebanese-French (CEDRE), Lebanese-Syrian and newly established Lebanese-Italian joint research program support tens of environmentally and socially sound research projects and contribute to researchers mobility and interaction which serve capacity building and integration between North-South and South-South cooperation.

CNRS Geosciences research activities

One of the important research lines in CNRS which contributed to the diagnoses of the Lebanese environment is relating human pressure and mismanagement to the scarcity and deterioration of water resources (Shaban, 2010a). Recent applications of advanced Geosciences techniques combined with geospatial technologies contributed in understanding many concepts on snow and water regime in Lebanon (Shaban 2010b, Shaban 2009, and Shaban & al. 2009). Therefore, a number of clues on water flow and storage were recognized. This includes surface and groundwater, such as identifying groundwater discharges into the marine environment, watershed mapping, monitoring snow dynamics and mapping recharge potential zones, in addition to other several systematic applications. Nevertheless, there is still a need to develop new methodologies for more detailed and specified processes of water resources assessment, notably those concerned with quality control and mapping groundwater reservoirs.

In the area of soil science supported by the geospatial technology, a new detailed soil map of Lebanon at 1:50.000 scale with associated digital terrain database was created. Soil data and information from this map has been largely used for the assessment of land suitability for agriculture for the Consul of Development and Reconstruction (CDR) national land use planning project (Schéma Directeur d'Amenagement des Territoires, SDATL), modeling of soil vulnerability to desertification for the MoA national action program (NAP) to combat desertification. Using real time satellite monitoring system, the soil data is periodically used for the detection and mapping of historic and current urban sprawl on arable lands for the JRC/UNHABITAT. Given the rainfall pattern in the Mediterranean type of climate, predictive and descriptive soil erosion was given priority in the research projects funded and co-funded by CNRS and run in the National Center for Remote Sensing. Studies of erosion risk assessment using remote sensing and GIS in the central Lebanese karstic mountains showed that around 36% of the area is under high risk of water-erosion. Passive satellite imageries have been used to identify and differentiate between various mass movements' types (landslides, rock/debris falls, and earth flows), using various platforms (SPOT, IRS, IKONOS). Active sensors (radar) helped in monitoring large mass movements over time using radar interferometry and permanent scatter techniques (Abdallah, 2010).

Remote Sensing techniques were also used in the assessment of the impact of degraded quarries on land resources in Lebanon. Multi temporal analyses of LANDSAT images and IKONOS revealed that between 1996 and 2005 the number of quarries increased from 711 to 1278 and the quarried land area increased from 2875 to 5283 ha [Darwish & al., 2010]. Recent remote sensing data (2005) showed that 21.5% of quarries expanded on forest land and arable land. Based on impact assessment, geomorphology, climate and land capability the suitable areas for future quarrying activities were defined and mapped. Based on the prevailing short seasonal precipitation and long dry season in East Mediterranean, a model for the suitability of quarries to re-vegetation and/or water harvesting was developed. Moreover, geospatial and nuclear techniques were combined to assess soil pollution with heavy metals (Nsouli & al., 2004) and contamination of the soil-groundwater system with nitrates (Darwish & al., 2011). Results showed relative accumulation of Ni and Cr in some arable soils implying control over land use notably the restriction for the cultivation of leaf succulent vegetables and the need to shift to more suitable crops. It was shown that under current agricultural practices in the region consisting of vegetable monoculture and excess fertilization and irrigation, nitrates accumulate in the soil and under the effect of rainfall leach down to the shallow water table. Thematic maps on heavy metal spatial distribution in the soils and nitrates accumulation in groundwater were produced using GIS and presented to the decision makers and end users to disseminate good land management practices.

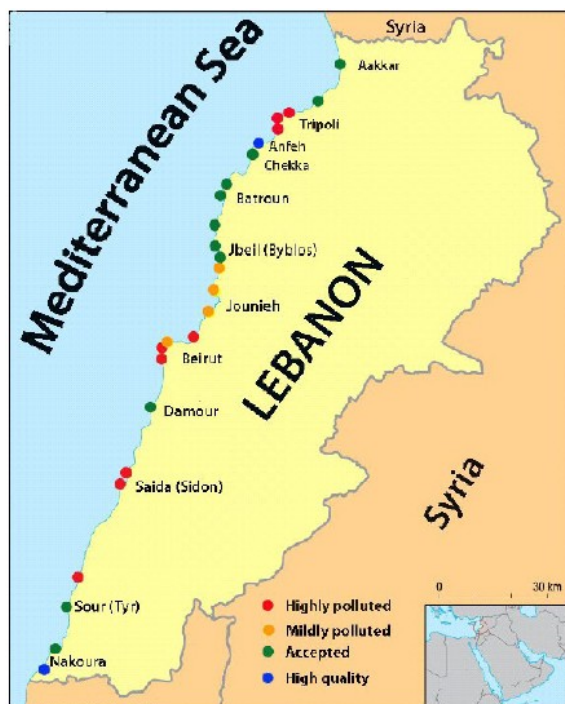


Figure 1: Network for the assessment and observation of coastal water quality

The Monitoring of the Lebanese coastal water is conducted by the Marine Science Center for many years. The Center follows an environmental monitoring program for coastal water quality in order to evaluate the pollution level in marine water (Figure 1) and to study the alteration of the Lebanese littoral. For this purpose, measurements of physico-chemical, chemical, bacteriological and biological indicators are carried out every month in 25 sites reflecting the geomorphological and environmental modifications of the littoral. Many correlative studies have clearly indicated the direct impact of continental effluents on the variability of different parameters in the marine environment.

The marine waters in the Eastern basin of the Mediterranean Sea are oligotrophic in nature; thereby the Lebanese rivers contribute to the enrichment of the marine water with nutrients which increase phytoplankton development. The results gave an average value of 1.72 mg/l NO_3^- and 0.029 mg/l PO_4^{3-} for the waters at the inflow seawater - river freshwater, and 0.055 mg/l NO_3^- and 0.005 mg/l PO_4^{3-} in marine waters. Nutrients input of the rivers into

marine coastal area have a positive effect on the primary production during late winter and spring. However the orthophosphate found in the waters of Batroun area and that reaches Shekka (30 km to the North), comes from the liquid effluents of Selaata chemical plant.

Fecal bacteria loads values exceed in some areas (Tripoli, Beirut, Saida) thousands of times the accepted values; however the extent of the contamination is limited in space because of the self-purification process that reduces bacterial loads and prevents the spread of the pollution.

As regard trace metals, the concentrations of some of these elements in some sites are slightly higher than normal; this is the case of lead and mercury in marine sediments in the vicinity of the Dora dumpsite, chromium in the sediments at the mouth of the River Quasmieh and cadmium in marine deposits near the chemical factory of Selaata. Most of the marine analysis is depicted as maps using GIS for creating public awareness. The creation of the coastal quality indicator map is for the purpose of indentifying swimming suitable areas.

CNRS International research cooperation

In addition to the national projects, CNRS has implemented many other regional and international projects of interests to many countries which share common natural resources such as the Mediterranean basin. NOSTRUM DSS (2004-2007) is one of these projects funded by EU FP6 program and coordinated by Fondazione Eni Enrico Mattei (FEEM), Italy. The project contributed to the achievement of improved governance and planning in the field of sustainable water management, by establishing a network between the science, policy, and civil society spheres, by fostering active involvement of the relevant stakeholders, and through the development and dissemination of Best Practices Guidelines for the design and implementation of DSS tools for IWRM in the Mediterranean Area. Lebanon's role in this project is accomplished by CNRS which included the assessment and review of remote sensing and GIS data availability and data constraints in the Mediterranean Area, in order to address policy makers' and local stakeholders' needs. CNRS was able to create an online web based Meta database and published paper (Awad & al., 2009) which explains all the activities and the products completed in the project.

The MEDCOASTLAND-INCO-MED project (2002-2006) supported the building of environmental database on published works on the state of degradation of land resources in Lebanon and other Mediterranean countries under the leadership of CIHEAM-IAM, Bari. This database is available on the web¹ with metadata on more than 450 Lebanese and 6000 published Mediterranean papers related to the management of land conservation and lessons learned to combat land degradation for the sustainable use of Mediterranean natural resources. Cooperation with CIHEAM-IAM, Bari advanced within the supported by the Italian Cooperation Tercom project (2007-2009), which represented a step ahead towards the creation of a portal with large scale geoinformation and GIS interface on two Lebanese pilot areas, Byblos-Baalbak and Tyr-Nakoura². With the initiation of INCAM, ERAWIDE project (2011-2012), with CNRS acting for the first time as European project leader, building a complete national geodatabase at 1:200.000 scale was possible. Access to all these portals is possible with a registration and password. New perspectives for capacity building and visibility were opened with CNRS partnership in current EU funded projects: Mediterranean Innovation and Research Cooperation Action (MIRA), Establishing the EU Mediterranean ICT Research Network, JOIN-MED and approved new GEF/WB project to improve water resources and agricultural management, based on quantitative and spatial-based decision making tools.

Another important research initiative is the CANA project funded by the Italian Cooperation. The scientific vessel CANA represents a qualitative step ahead in capacity building and advanced infrastructure for the assessment and monitoring of marine environment. The Vessel is studying the bathymetry of Lebanese shallow coastal waters and its router was able to find the black box of the crashed Ethiopian airplane in 2009 several miles from the Lebanese coast. Several other projects supported by the IAEA allowed the establishment of national laboratories at the National Atomic Energy Commission-CNRS for the assessment and monitoring of radiation risk and analysis of micro concentrations of pesticides and heavy metals which can serve food safety.

¹<http://medcoastland.iamb.it/>

²<http://tis.cnrs.edu.lb>

Future outlook

In Lebanon, many inter institutional actors still remain interested in Geosciences combined with geospatial technology arising from differences in objectives. This is also partially due to the low number of experts, misunderstanding of the importance of Geosciences based on geospatial technology, and lack of funding. The analysis has shown that there is a need for a unit with strong experience in Geosciences based on geospatial technologies in order to improve the capabilities of other organizations to implement environmental research whose objectives are to support efforts to create better environment and sustainable exploitation of natural resources. Various private and public sector organizations can play a key role by promoting a greater investment in Geosciences and supporting technologies such as GIS and RS. CNRS is able to play a central role to support capacity building in advanced geoscience and environmental research on the service of the Lebanese society.

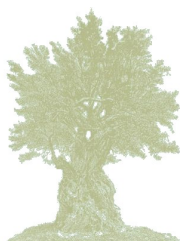
Conclusion

The involvement of geoscientists accompanied with geospatial technologies such as GIS and RS in supporting environmental research lead to an increase in the efficiency of the decision makers and in turn to reduce environmental deterioration. To overcome all the obstacles and to improve Lebanon's environment more support to Geosciences according to the following recommendations is required such as:

- Increasing awareness of policy makers, planners and decision-makers about the essential contribution of geoscience to research in environment;
- Strengthening the interest and participation of geoscience community in environmental research is accomplished by providing relevant information on policy, economic and social issues;
- Supporting greater application of geoscience in sustainable use of land, soil, water and other resources for the benefit of society;
- Promoting multidisciplinary initiatives based on geoscience, basic science and geospatial technologies for better understanding of environmental processes and for the development of new approaches, tools and techniques to forecast and solve environmental problems;
- Increasing funding opportunities through enhancing multilateral local and regional research funding programs and cooperation, notably that in 2011 the Secretary general CNRS was appointed as the national contact point (NCP) of the EU FP7.

Bibliography

- Abdallah, C., 2010. *Spatial distribution of blockfalls using volumetric GIS-decision-tree models*. Int. J. of Appl. Earth Observ. and Geoinform. 12: 393-403.
- Awad, M., Khawlie, M., Darwish, T. (2009). *Web based meta-database and its role in improving water resources management in the Mediterranean basin*, Springer Water Resources Management, DOI 10.1007/s11269-009-9402-9 Springer.
- Darwish, T., Khater, C., Jomaa, I., Stehouwer, R., Shaban, A., and Hamzé, M. 2010. *Environmental impact of quarries on natural resources in Lebanon*. Land Degradation and Development. DOI: 10.1002/ldr.1011.
- Darwish, T., Atallah, T., Francis, R., Saab, C., Jomaa, I., Shaaban, A., Sakka, H., and P. Zdruli. 2011. *Observations on soil and groundwater contamination with nitrate, a case study from Lebanon-East Mediterranean*. Agricultural Water Management, DOI 10.1016/j.agwat.2011.07.016.



Zoom On... ARIM-NET

The ARIM-NET project (« Coordination of agricultural research in the Mediterranean area ») financed by the European Union at the initiative of CIHEAM, is intended to promote synergy and foster cooperation between the countries bordering the Mediterranean. Launched in 2007, it has rallied twelve Mediterranean countries behind the common objective of more closely coordinating research activity conducted at national level towards addressing the challenges faced by Mediterranean agriculture.

The project is part of the 7th Framework Programme for Research and Development (FP7) and fits into the broader perspective of shaping a Euro-Mediterranean research area. It is intended to strengthen coordination within agricultural research in the Mediterranean which, despite the specific key features of climate, ecosystems and biodiversity common to the region, is currently conducted on a fragmented basis in the European Union and Mediterranean partner countries. Given the threats facing these shared elements, scientific research should be dovetailed and take on a more prominent role in mitigating the threats facing mankind. Whilst these issues are of a global nature, the response provided by agricultural research is all too often national and local.

The ARIM-NET project is the fruit of past experience and the Euro-Mediterranean dialogue. It has set out a roadmap comprising various strategic stages towards enhanced scientific cooperation. The first crucial stage involved the identification of appropriate research programmes for transnational cooperation, the aim also being to identify best practices and create integrated research where programmes would no longer overlap. The second stage consisted of drawing up transnational programmes, common methodologies and a strategic agenda shared by the member institutions. This agenda will thus serve as a tool for regional cooperation and be instrumental in consolidating research in the Mediterranean.

In 2011 ARIM-NET launched a joint call for international research projects based on contributions from the various participating countries. This call to tender will open the way for the financing of international projects between researchers from different countries and disciplines covering a wide range of themes from production systems to agri-food networks. It aims to promote research consortiums able to provide an integrated response to global issues as well as the challenges facing Mediterranean farming. Several projects supported by a wide range of backers were selected in early 2012. Their aim is to produce transnational research on Mediterranean biodiversity, livestock farming, food safety rules etc.

The ARIM-NET project sets out an ambitious joint vision of agricultural research in the Mediterranean but also of agriculture in the face of challenges relating to resource management, animal health and food security. In the light of its outcomes, the ARIM-NET project is also intended to be transposed to further fields of research as well as being exported to other regions of Europe or around the world.

The ARIM-NET consortium

ARIMNet comprises twelve countries (6 EU member states, 1 associated state and 5 other Mediterranean countries), thirteen major institutions and two associated international institutions: CIHEAM and ICARDA.

- Institut National de la Recherche Agronomique (INRA, France)
- Centre de coopération internationale en recherche agronomique pour le développement (CIRAD, France)
- Ministero delle Politiche Agricole Alimentari e Forestali (MIPAAF, Italy)
- Institut National de la Recherche Agronomique d'Algérie (INRAA, Algeria)
- Instituto Nacional de Investigacion y Tecnologia Agraria y Alimentaria (INIA, Spain)
- General Directorate for Agricultural Research, Ministry of Agriculture and Rural Affairs (TAGEM, Turkey)
- Agricultural Research Centre (ARC, Egypt)
- Fundação para a Ciência e a Tecnologia (FCT, Portugal)
- Institut Agronomique et Vétérinaire Hassan II (IAV, Morocco)
- National Agricultural Research Foundation (NAGREF, Greece)
- Institution of Agricultural Research and Higher Education (IRESA, Tunisia)
- Agricultural Research Institute (ARI, Cyprus)
- Ministry of Agriculture and Rural Development (AGRI, Israel)

Zoom On...FORESTERRA

The FORESTERRA project (Enhancing Forest Research in The Mediterranean trough improved coordination and integration), an ERA-NET funded by the European Commission under FP7, and which aim is to strengthen the scientific coordination and integration of programs that study Mediterranean forest, has began its path with its kick-off meeting in February 2012 in Madrid, where members of sixteen institutions from twelve countries involved have met.

This ERA-Net that will be developed during the next four years has a budget of almost two million Euros supported by the European Commission. It has the objective of improving the coordination and cooperation among different entities who work in the Euro-Mediterranean Forestry Research field.

The aim of FORESTERRA is to foster the coordination between the ERANet participants' programs based on four steps. The first one will be mapping and information exchanging to improve mutual knowledge of existing programs and capacities as well as for sharing best practices. The second step aims at defining common strategic activities to reduce the fragmentation of the research community, avoiding overlaps and promoting synergies among existing capacities and identifying scientific areas that require transnational funding; then joint activities will be implemented to consolidate partnerships and develop common schemes for program evaluation, as well as for mutual opening of facilities, laboratories and experimental sites; Eventually, calls for joint research projects will be launched to maximize the research impact of the network.

In addition to these four steps, a targeted action will focus on "upscaling" them at a global Mediterranean level by exchanging information on existing programs with other Mediterranean Climate Areas in order to identify common strategic activities and scientific priorities of mutual interest. The United States of America, Australia, Chile and South Africa are in the same situation. In this context, members of the project have already contacted, among other institutions, the University of Berkley (California, USA), the University of New South Wales (Australia), the Industrial Engineer School of the University of Chile (Chile). All of them have expressed their interest in joining this international initiative.

The coordination of the project is led by the Secretary of State for Research of the Spanish Ministry of Economy and Competitiveness. The European Forest Institute Mediterranean Regional Office (EFIMED) in Barcelona will be in charge of the secretariat.

The CIHEAM-MAI Zaragoza will coordinate a work-package on dissemination of the project's impacts across the forestry sector, including research organizations, policy-makers and relevant stakeholders, as well as to other relevant connected sectors: agriculture, energy, water, etc.

MAI Bari

Women in Agriculture

MAI Bari was invited to participate, as representative of the Mediterranean Region, to the workshop/conference entitled "Women, Sustainable Development and Food Sovereignty/Security in a Changing World" organized by the Cornell Law School (Cornell University) in Ithaca, New York on March 30-31, 2012.

The conference brought together an international group of women who have been involved in projects to encourage sustainable development in their regions. Speakers from Nepal, India, Bangladesh, Latin America, and the Mediterranean region joined speakers from the sustainability movement locally and a number of Native American speakers to discuss projects that have been locally successful in their respective contexts — ones that have involved women as leaders or key movers in grassroots projects. The debate during the conference among women and groups that have been involved in environmental advocacy and development in local communities in different regions of the world emphasizes on fostering dialogue among them, based on their real experiences of success or failure, to facilitate cooperation among them and cross-fertilization of ideas.

MAI Bari presented its experience as coordinator of the European project GEWAMED (Mainstreaming Gender Dimension into Water Resources Development and Management in the Mediterranean Region) and as one of the promoters of the creation of NOWARA Observatory (National Observatory for Women in Agriculture and Rural Areas) in Lebanon.

Organic Agriculture

The 6th Annual Meeting of the Mediterranean Organic Agriculture Network (MOAN) was organized in the Former Yugoslav Republic of Macedonia (FYROM) on 15-17 May 2012. As usual, it was a three-day meeting including one-day international workshop, one-day session devoted to the presentation of the organic sector of the host country and to a technical visit and an internal Network meeting for updates and discussion of the subsequent activities. Building on the outcomes of the 5th MOAN meeting held in Tunisia in 2009, with the help of international experts and the contribution of Network members, the first day of the international workshop was focused on institutional trust building mechanisms in trade relations, addressing, more specifically, some topical issues like:

- EU Member States' concern for control quality in Third Countries and competition of organic imports from Third Countries flooding the domestic and EU markets;
- Mediterranean Third countries' interest in barriers reduction for organic trade (i.e. easier access to EU markets) and capacity building in the interaction with EU and MS institutions;
- Some Mediterranean Third countries' interest in setting up an organic market supervision and surveillance system to allow for diversification of the product range in the national organic market;
- All Network countries' interest in creating and consolidating good (extra- and intra-regional) trade relations based on reliable and transparent control systems, reliable data on organic trade and effective communication mechanisms.

The outcomes of this 6th Annual Meeting are the following:

- Improved understanding among Network members of challenges and opportunities associated to rules and schemes affecting organic trade.
- Identification of best practices in organic market supervision and surveillance and data collection for future reference in: i) developing national organic systems; ii) drafting institutional agreements; iii) designing cooperation initiatives.
- Fostering partnerships between North and South as well as among Southern Mediterranean countries for a better trade of organic products.

More information on <http://moan.iamb.it>

MAI Chania

New Children's book

A children's book has been published by MAI Chania in the framework of Junicoast, a Life+ Nature and Biodiversity 2007-2013 programme. The book is entitled: "The journey of a grain of sand to the sand dunes with the cedar trees". It is an educational book who targets to inform children on the environmental pressures caused by natural or anthropogenic causes and raise awareness regarding the value of coastal dunes with *Juniperus* spp habitat as well as the threats which they are facing. Coastal dunes with *Juniperus* spp. are classified as priority habitat (code 2250*) by the "Habitats Directive". The texts have been written by Electra Remoundou. The book has been published with the co-operation of the Kapodistrian University of Athens and the Region of Crete.

A small extract from the book follows: *"Once upon a time on a beach far far away there was a tiny grain of sand that had always lived at the bottom of the sea when suddenly a huge wave carried it away onto the coast. It was a cold, rainy and windy day and the wind was blowing and whirling everything in its path. The tiny grain of sand held on tightly to the shore. But then a strong gust of wind dragged the tiny grain along with many others far away from the shore. The tiny grain had never been away from the depths of the sea and this other world was creating lots of questions in his mind along with much terror! Where was he? Where was he going? He didn't know! The sea depth where he had always lived didn't have any wind (to carry him away on the air). It only had an endless watery peacefulness. Without being able to stop anywhere, however, he began to fly with the wind trying desperately to hold on to land bouncing again and again till he finally landed on a small plant growing on the beach"*

MAICh "Conference Centre Albert Simantov"

The Governing Board of CIHEAM during its 126th meeting held in Paris in December 2011 has decided to name the Conference Centre of MAI Chania "Conference Centre Albert Simantov" in honor of the late Representative of the Greek government and President of the CIHEAM Governing Board, Mr Albert Simantov.

The Conference Center of MAI Chania is situated in a picturesque, typical Mediterranean pine-tree forest setting in the Institute premises in Chania in Crete. It is conceived with respect to the environment, dedicated to accommodate Academic and Research Conferences, Seminars, Workshops and Summer Schools with a full range of integrated organizational support services. It has a maximum conference capacity of 600 people, 350 in a plenary session in the Poseidon Room. It can host up to 11 parallel sessions and includes poster and exhibition area. The accommodation facilities include the academic village (15 stone houses established in the botanical garden of MAI Chania) and the student dormitories (66 double, 54 single and 8 lofts). Wired or wireless internet connection is provided in all facilities. Simultaneous translation and high end audiovisual technology is available. Special facilities are available for the disabled. The Mediterranean restaurant is also located in the premises.

MAI Chania Conference Centre offers multipurpose versatility, latest technology and high quality standards of service. It is certified by DAS GmbH with DIN EN ISO 9001:2000 for the organization and accommodation of conferences and related activities.

Activities of our Institutes

MAI Montpellier

A new Masters on Value Chain (s) and Agri-Logistics

MAI-Montpellier is introducing a new vocational Masters course entitled « Value chains and Agri-Logistics » in place of the former « Food supply chains and operator strategies » programme. The analysis of food supply chains continues to form the basis for this new course. Much of the Institute's reputation can be attributed to the skills and know-how developed in relation to these concepts as well as their practical application in cooperation and research projects. In introducing new methods of analysis relating to the study of value chains, the aim of the teaching staff has been to bring this competence up to date. Moreover, familiarity with the supply chain and product transport—from field to fork—is now crucial to understanding how supply channels operate correctly. This post-graduate vocational teaching programme is specifically intended to train and specialise young graduates in value chain coordination and management.

At the end of a three month core base module where students are introduced to the macro-analysis of the environment within which players in value chains operate, the course offers a specialisation in logistical supply chain management (industrially processed products and international trade). Students are taught to analyse value chains within the framework of the agri-food system to which they belong and to observe and understand the environment of value chain operators with the ensuing assets and constraints. The course also familiarises them with the national and international rules constituting the socio-institutional framework for value chains. It specialises students in supply chain coordination and management. By the end of the course students will have acquired the skills needed to produce a strategic diagnosis of an agri-food value chain, thus enabling them to propose projects for the entire range of operators. Work is team-based and students learn the interface between technical and socio-economic aspects.

Contact: tozanli@iamm.fr

Scientific cooperation with the Sahara and Sahel Observatory (OSS)

The Tunis-based OSS (Tunisia) is a regional technical and scientific centre specialising in the monitoring and management of natural resources in arid and semi-arid areas. This inter-governmental organisation was set up in 1992. The OSS is noted for having fostered regional understanding of the issues relating to natural resource management: combined management of cross-border aquifers and networks of desertification observatories. Environmental monitoring is an essential step in this understanding as well as being an important vector in the implementation of appropriate solutions.

As the fruit of well-established institutional cooperation, MAI-Montpellier and the OSS are co-editing an issue of the Options Méditerranéennes magazine entitled « Environmental monitoring and development. Achievements and prospects. Mediterranean, Sahara, Sahel » (OM B/n°68). The publication consists of three parts. The first section deals with the underlying scientific and institutional fundamentals of the implementation of environmental observatories and the links evolving between these research initiatives and the development issue. The second section uses various case studies to highlight a series of issues relating to scientific observation serving development. Finally, the last section of the publication addresses the technical and political issues concerning the implementation of environmental monitoring mechanisms using three accounts from international, national and regional level.

This twelve contributions sets out three essential lines for promoting future consideration: partnerships, modes of governance and the role of the decentralised level. The MAI Montpellier has been exploring these issues for many years, for example through its research and cooperation projects on rural and territorial development policy and international environmental governance.

Contact: requier@iamm.fr

MAI Zaragoza

Innovative Training

MAI Zaragoza together with the University of Lleida, the Wageningen University and Research Center, the Technische Universität München, the Institut Agronomique et Vétérinaire Hassan II and Oregon State University, has submitted an application for an Erasmus Mundus Master in Plant Breeding.

The proposed Master is a 2-year programme (120 ECTS) structured in four semesters that closely follows the structure of the CIHEAM-MAI Zaragoza Master of Science in Plant Breeding. This is a research and professional oriented programme which receives direct support from the leading international plant breeding companies. It has been built on the premise that modern plant breeders need, on top of classical methods, the most advanced molecular and statistical tools to improve the performance of crops. Plant breeders must also be able to ask the relevant agronomic questions about each system to find realistic ecological and economically viable solutions to produce crop improvements.

CREAM Project

On last April 18-19, MAI Zaragoza co-organized a follow-up meeting of CREAM Project (Coordinating Research in Support to Application of Ecosystem Approach to Fisheries and Management Advice in the Mediterranean and Black Seas). The meeting was held in Varna (Bulgaria), involving 24 institutions from 17 different countries and the European Union. MAI Zaragoza is the Coordinator of this EU FP7 Coordinating and Support Action.

The project will establish an effective collaboration network among key role players in Mediterranean and Black Sea fisheries research and management. The participants in the project include national research institutes from Mediterranean and Black Sea countries with a long history and active participation in fisheries research and assessment, who provide advice to national, regional and international fisheries management organisms.

The project will seek the active collaboration of regional and international fisheries management organisms as external participants in the project, in order to identify the gaps (in terms of data, knowledge, training, coordination) which hamper at present the full application of the Ecosystem Approach in the management of Mediterranean and Black Sea fisheries. The project will have a strong training and capacity building component in order to help harmonize data collection and methodologies used in fisheries assessment and management in the Mediterranean and Black Sea. The project will serve to establish the guidelines for the application of the Ecosystem Approach to Fisheries in the Mediterranean and Black Sea, both in EU member states and third countries.

Contact: gabina@iamz.ciheam.org

Activities of our Institutes

Latest publications on www.ciheam.org

Mediterra 2012

The Mediterranean Diet for sustainable regional development, Paris, Ciheam/Les Presses de SciencesPo, March 2012

CIHEAM Analytical Note

L'Europe, la Politique Agricole Commune et le Monde, Colette Alcaraz, n°65, April 2012.

Enjeux de la filière oléicole en Tunisie et axes de développement dans le nouveau contexte politique, Boubaker Karray, n°66, April 2012

CIHEAM Briefing Notes

Santé animale: réapparition de la fièvre aphteuse en Afrique du Nord, Matthieu Brun, n°79, May 2012

La logistique dans la filière marocaine d'exportation de tomates fraîches: enjeux économiques et environnementaux, Imene Kellou, n°80, May 2012

Commerce agricole euro-méditerranéen: déséquilibre des échanges et différenciation des relations, Sébastien Abis, n°81, May 2012

Watch Letters

Agri-Food Chain and Logistics in the Mediterranean, n°20, April 2012

Labelling Mediterranean Foodstuffs: Risks and Opportunities, n°19, April 2012 (Arabic Version)

NewMedit

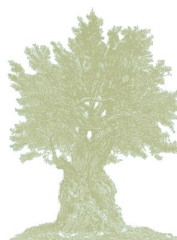
Summary of 04/2011 issue of the review, April 2012

Summary of 01/2012 issue of the review, May 2012

Currents events in Euro-Mediterranean Agriculture, Food and Environment

Press Review, April 2012

Press Review, May 2012



International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM)

General Secretariat
11 rue Newton, 75116 Paris, France
www.ciheam.org

The CIHEAM's Watch Letter

Editorial Director: Francisco Mombiola
Editor in Chief: Sébastien Abis
Email : abis@ciheam.org - Tel : +33 (0)1 53 23 91 00

Collaborators on this issue:

Pierre Blanc, Mathieu Brun, Gianluca Manganelli, Ana Perez.

The opinions expressed in this publication are the author's and do not necessarily represent the view of CIHEAM