

## **Minutes of the WUEMED Workshop held in Rome (CNR) on September 29-30, 2005**

The WUEMED workshop included an opening panel discussion, three sessions and poster presentations (see website for further details). The website includes also the file with all the abstracts and most of the files with the presentations.

### ***Opening panel discussion.***

In the opening panel discussion Abraham Blum (Chair of InterDrought-II) summarized the main conclusions/recommendations presented during the conclusive session of InterDrought-II. The main conclusions and recommendations of InterDrought-II are available at [www.plantstress.com/id2](http://www.plantstress.com/id2). Following Abraham Blum's comments Enrique Playan analyzed the impact of FP5 activities on dryland agriculture in the Mediterranean basin and commented on a number of INCO-MED projects which dealt with water issues in agriculture.

### ***Session 1.***

The invited presentation of Thies Wittig and the eight short presentations (by Jordi Bort, Carlos Cantero, Helena G. MacPherson, Theib Oweis, Martin Parry, Juan A. Sagardoy, Federico Vagliasindi and Netij Ben-Mechlia) focused on various aspects relevant for optimising the management of water resources in agriculture. The presentations not only covered scientific and technical aspects but also dealt with the questions of water/irrigation sustainability and related policies, too often neglected in the past.

The prevailing common take-home message and recommendation was to involve to a greater extent the end-users, i.e. the farmers. This same recommendation was mentioned throughout the workshop during the subsequent discussions. For example, Helena MacPherson presented the concept of participatory research that can ensure fast development and adoption through close co-operation with farmers. This approach had been successfully applied both in Europe and developing countries.

Martin Parry presented a summary of the conclusions reached during OPTIMISE, an INCO-MED SSA that in 2003 focused on interdisciplinary approaches between scientists, policy-makers, farmers and other stakeholders involved in agriculture in the Mediterranean basin. One of the conclusions was that more efforts are required in order to (i) more appropriately implement the links between the various stakeholders and (ii) facilitate their communication.

Netij Ben-Mechlia underlined the importance of the learning process that farmers have to undergo for adopting new methods and experiences. This, however, appears not as difficult as one may assume; in fact, a rapid adoption of new practices has been observed following clear governmental policy commitments on this matter. The view highlighted by these presentations was strongly supported in all debates: without the integration of policy makers, stakeholder and in particular the end-users, adoption of new methods and techniques will remain slow and much less effective.

### ***Session 2.***

The invited presentation of Richard Richards and the seven short presentations (by Mladen Todorovic, Cevat Kirda, Nick Sigrimis, Wafa Choumane, Dimah Habash, Massimo Iannetta and Paolo Pasimeni) focused on water management and breeding approaches for improving drought tolerance. To mitigate the negative effects of drought at the water management level the main recommendation was to replace traditional methods of water supply (e.g. rotation and proportional supply) by more demand-oriented methods, with monitoring systems even at the crop level and always depending on local circumstances. Moreover, cheap and easy-to-handle monitoring systems were encouraged to ensure adoption by farmers.

Among a number of technologies/approaches aimed at improving WUE, deficit irrigation appears as one of the most promising ones. At the crop level, even if empirical breeding for water-scarce situations has been successful and will continue to be the most important route to increase yield and

WUE, emphasis was given on the importance of a more “holistic” approach for breeding, combining crop physiology with marker-assisted selection and with other biotechnology and molecular approaches.

Though in limited number, the successful deployment of physiological traits for improving yield in water-scarce environments has been reported in some cases. Among such examples for Mediterranean environments, the following are worth mentioning: the extended crop duration (earlier planting) in wheat; early flowering in wheat; an increased axial resistance in wheat; transpiration efficiency in wheat; anthesis-silking interval in maize; stay-green in sorghum; root health (e.g. nematode resistance) in cereals; acid soil tolerance in cereals; nitrogen fixation in soybean.

As to the traits to be considered and to be incorporated into new cultivars the following examples deserve attention:

- new dwarfing genes able to improve crop establishment;
- wheat with an early vigorous growth that reduces soil evaporation;
- tiller inhibition in wheat in order to increase the rate of tiller survival and carbohydrate storage in stems for grain filling.

The common feeling was that marker-assisted selection and a more targeted and informed breeding will soon contribute to yield progress while transgenic technologies appear unlikely to improve yield/WUE in the short term. This notwithstanding, efforts in transgenic approaches should continue, provided the evaluation of transgenic materials is carried out in the appropriate agronomic/physiological context.

One important message was that improvement of WUE in Mediterranean agriculture is only partly a question of technology or techniques; it needs to be supported by appropriate policies that reflect the socio-economic needs of the society. Thus, substantial changes to adopt more sustainable practices are needed not only in on-farm water management but also in national policies.

Commercialisation, release, marketing, ownership of achievements and education level of stakeholders are all important parts of the process aimed at producing and adopting new technologies. Consequently, participatory research in agronomy and breeding should be fostered to fasten development and adoption of viable options, particularly under marginal, low-input conditions characterized by low yield potential.

### ***Session 3.***

This session included (i) four short presentations (by Manuela Chaves, Giuseppe Rossi, Jaume Casadesus, Mark A. Bacon) related to the improvement and sustainability of crop production in Mediterranean countries plagued by drought, (ii) a keynote presentation by John Passioura on farmers’ adoption of new technologies and (iii) a panel discussion with Bruno Basso, Johan Ruane and Neil Turner who presented their reflections on the workshop and provided insights on the major issues dealt during WUE.

Particular emphasis was given to deficit irrigation for improving WUE. Research has shown substantial increase in the return for water both in terms of quantity and quality under appropriate levels and timing of deficit irrigation (DI). However, criticisms were raised that the positive effects from experiments dealing with DI may have been biased by excessive irrigation volumes provided to the controls. Response to DI depends on the crop, the season, the climate, the management, etc.; furthermore, optimal results should be obtained with local conditions in mind. DI can be practiced in various ways such as alternative furrow irrigation, partial root drying (PRD), depending on the available irrigation system and crop specific requirements.

New guidelines are needed to schedule irrigation under water scarcity, particularly when adopting deficit irrigation; more research is needed on this topic. Moreover, the impacts of drought on the most vulnerable societies can be reduced through an integrated approach that includes the establishment of drought-monitoring systems and a careful selection of water-shortage mitigation measures feeding into a multi-criteria analysis for decision making.

One key point underlined during the discussion was that the effectiveness of the research continuum and the most difficult, but the most essential operation of technology adoption by farmers is dependent on the mutual understanding of researchers and farmers. The constraints to technology adoption are multiple and vary on a case-by-case basis but the common key toward developing an adoptable technology that can be adopted by farmers is to understand such constraints and develop a common language among scientists to address them. One recommendation was to produce standardized research outputs in order to evaluate, compare and transfer the results from one environment to the other.

### **WUEMED outcome and recommendations to the European Commission**

Numerous EU-funded projects have targeted water use in Mediterranean agriculture and many of these projects have been represented at the workshop. These projects were/are aimed at increasing WUE in agriculture. While the overall scientific results obtained in these projects are remarkable from a technological point of view, in most cases the widespread adoption of the results and the analysis of the possible socio-economic impact of the new methods remain open issues.

Taking an overall perspective and integrated view of all presentations/discussions at this workshop, the most relevant points as to "what limits the adoption of new technologies" are the following:

- European research on water issues in agriculture lacks mechanisms to ensure that final users adopt the technological developments. Dissemination of results is not guaranteed: lack of extension services at national level hinders such dissemination. A rapid adoption of the results is not ensured because policy-makers and the other stakeholders are not fully involved. Highly industrialized farms tend to readily adopt new technologies if they are sufficiently profitable and with an acceptable return-of-investment period. New seeds that produce higher yields are rapidly taken up by farmers - the economic impact is obvious. Conversely, small, low-tech farms are much slower in adopting new technologies; small farms provide the vast majority of agricultural production in rural areas in South Mediterranean countries. Introducing new technologies in such environments, testing their sustainability or even measuring the socio-economic impact is difficult and usually requires the help of local organizations that can do the necessary ground work. This, however, does not relieve EU-funded projects of their responsibility to disseminate their results - a fact that was generally recognised and accepted during the various discussions at this workshop. The subject of research projects does not derive from a consensus between researchers, stakeholders, policy-makers and end users. A more direct involvement of farmers, helping to target more accurately research activities is required. As a matter of example researchers from Australian CSIRO organize periodical meetings with farmers.
- Strictly correlated with the first reason, is the short life-time of many EU-projects. There is a lack of continuity of funded research in the Framework Programmes of the EU. It was commented that it was actually better in the early days of the Framework programmes when 5-year-long projects were more common, split into 2 or 3 contractual periods to reduce the risk of wasted funds. As long as a project team is not given another 3- to 4-year period for exploiting the results, carrying out a socio-economic impact analysis and/or supporting local and regional policy-makers, it might be better not to consider funding such activities in the first place.

**In the light of the above context, more participatory schemes (e.g. participatory breeding approach) are urged in order to enhance the adoption of new technologies.**

- What the WUEMED workshop made also clear, was a lack in visibility and coordination across INCO projects. It is nearly impossible to find out which projects are running at any given time and what they have achieved. There are and have been specific support projects, but none covered all existing and past projects and hence only provided snapshots. As long as this policy remains unchanged, it is up to workshops like WUEMED to bring the scientific community together in order to exchange views, discuss problems and identify new approaches.
- There was an overall consensus among participants that the Commission should stimulate clustering activities (using instruments such as Coordination Actions and Networks of Excellence) involving researchers from different disciplines (e.g. agronomy, breeding, physiology, biotechnology, molecular biology, geography, social sciences and economy), as well as policy makers, farmers and end users. Up to now, INCO has supported several Coordination actions of such nature (e.g. WASAMED, MELIA), plus the building up of a more general clustering on water (e.g. Medaqua-1 and Medaqua-2). However, such initiatives focused on how to optimise irrigation agriculture, whereas ignored agronomical practices in rainfed environments (e.g. water harvesting) and even more so breeding for drought adaptation. As the only exception, a small SSA (OPTIMISE) has attempted covering the major issues pertaining to agriculture and WUE in Mediterranean countries. Therefore, it is recommended that DG Research should encourage the clustering of activities with a wider research vision. Emphasis in a more multidisciplinary research is needed, with better balance across fields of expertise. This appears particularly relevant to research aimed at integrating molecular biology with breeding activities; such projects should be preferentially funded when molecular and breeding approaches are integrated in a broader context.

As to the dissemination of what has been presented at WUEMED, the following options are available through the journal “Annals of Applied Biology”.

1. Peer reviewed manuscripts in a special section/issue of the journal *Annals of Applied Biology*. On the basis of impact factor this journal is now ranked 3<sup>rd</sup> in multidisciplinary agriculture list. <http://www.blackwellpublishing.com/aab>
2. Short manuscript (up to 8 printed pages) for *Aspects of Applied Biology*. For an example, see see <http://www.aab.org.uk/contentok.php?id=310>

Those interested in pursuing either of these options are requested to send us before 15 January 2006 the provisional title of their manuscript together with an estimated completion date. All manuscripts to be included in the special section of *Annals of Applied Biology* must be received by 30 April 2006; manuscripts for *Aspects of Applied Biology* must be received by 15 March 2006.