Managing water wisely to feed the world

Policy brief

Water and food security are two major issues that are interlinked and now high up the international agenda. There can be no agriculture where there is no water and effective management of water is a basic condition to be met.

The 6th World Water Forum to be held in Marseille from 12 to 17 March 2012 offers an exceptional opportunity to address in depth the issues surrounding "water and food security" by highlighting examples of solutions and proposals for effective action. The Forum is also part of an international agenda on which the discussions focused on sustainable development, the management of water and food security converge to link into discussions in the G20 and the Rio+20 Summit.

The French authorities, who introduced the theme of food security into the G20 with a specific recommendation on the management of water, have asked the organisers of the 6th World Water Forum to give particular prominence to the issues surrounding "water and food security" by setting up, with the support of the FAO, a high level panel with four objectives:

- To arrive at an overview of the issues relating to "water and food security" on the basis of most recent research in this area,
- To foster international debate and define key factors for success in ensuring food security as part of a process of sustainable development,
- To put forward proposals for more effective consideration of water as a factor in achieving global food security,
- To draw up a prioritised set of highly operational proposals on water and agriculture to be made part of the forthcoming discussions in the G20 and the Rio+20 Summit.

The text that follows has been drafted by a group of French experts working within the General Council on food, agriculture and rural areas and in close conjunction with the FAO. Reviewed by the panellists prior to the meeting of the panel, it will form the basic document for the panel's discussions. It has been agreed that the panel's conclusions will form the subject of international meetings over the period to the next World Water Forum to be held in Seoul in 2015.

Executive summary

Water and food security are two major issues; they are interlinked and are now high up the international agenda. There can be no agriculture where there is no water and good water management is a basic condition to be met in combating food insecurity. In order to avoid suffering radical change passively, despite the foreseeable nature of those changes, their high cost, and the fact that they bring with them major political, economic and social risks, we must organise for radical change that is freely chosen. This is a matter for concern for all actors, whether they are directly or indirectly involved, and they must be mobilised around clear, operationally-focused objectives:

- Enhanced productivity of water and ecosystems through sustainable intensification,
- Strengthened resources for agricultural research and promotion of technical and organisational innovations,
- Support for "small agriculture" and vulnerable rural areas and the effective reduction of poverty and therefore hunger in developing and emerging countries,
- Promotion of regionalised governance of agricultural water, from global to local.

The above four operational objectives represent the four pillars of water policies aligned with local constraints, furthering food security while protecting the rights of all users.

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTÈRE
DE L'AGRICULTURE
DE L'ALIMENTATION
DE LA PÊCHE
DE LA RURALITÉ
ET DE L'AMÉNAGEMENT
DU TERRITOIRE

The global population is continuing to expand and is likely to reach 9 billion in 2050. Over the next 40 years, demand for products from agriculture will continue to be stimulated not only by population growth but also by rising consumption of meat in the diets of those living in emerging economies as they benefit from gradual improvements in their income, and by non-food uses for agricultural products (fibres, green chemistry, and biofuels).

The improvement of the world's food security is an issue dependent on land and water resources and the ways in which they are managed and used. According to the FAO (cf. the SOLAW report, 2011) irrigated and rainfed agriculture currently occupy 11 % of the planet's emerged land area for plant production and irrigated crops use 70% of all water taken from aquifers, watercourses and lakes. There is no agriculture where there is no water and by the same token there is no food where there is no water: we may drink 3 litres of water a day on average, but we "eat" 3,000 litres in the food we ingest.

According to the FAO, global agricultural production will need to increase by 70% by 2050 to meet growing needs for food. It must double in developing countries. Ten per cent of the required global expansion in production will come from putting more land under crops and the other ninety per cent from improving the productivity of land already farmed.

That being said however, the link between water and food security goes beyond agricultural production issues as such since it involves the four dimensions of food security as defined by the FAO: food availability (water being not only a factor for agricultural production but also for agrifood industries, the consequence also being that when food is wasted, the water used to produce it is also wasted), physical or economic access to adequate and sufficiently nourishing food (since the activity and income of rural dwellers depends on management of water and access to it), stability (water being a resource of non-uniform availability and accessibility) and the sanitary and nutritional quality of food (since drinking water is a key component of food).

The uncertainties surrounding the availability of water resources in the future due to climate change makes the situation even more worrying given the necessary expansion in agricultural production at global level and in developing countries in particular.

If the close relationship between food security and water management is not correctly factored into development policies with a view to increasing agricultural production, fair access to food, protection of the environment and social justice, the environmental and agricultural trends currently observed will lead to grave crises in many world regions and the United Nations' Millennium Development Goals for poverty, hunger and a sustainable environment will not be achieved.

There is therefore an urgent need to address those risks as of now. Changes must be made in resource management in the near future if the worsening insecurity of access to water and food is to be stemmed, if crises are to be prevented more effectively and if the billion people going hungry today are to be fed (70% of whom are rural dwellers, the majority women and young people) plus the additional two billion expected to arrive over the next forty years.

Continuing rapid population growth in water-poor regions, locally degraded ecosystems and inadequately supported family-based "small agriculture" all justify policies for agriculture and water management that are more robust, as well as better targeted and coordinated

Possibilities for action are more limited in dry zones, areas where the challenge posed by food insecurity will be the most difficult to overcome. Dry zones (arid and semi-arid areas) receive only 2.5% of continental water. The demographic growth under way there for several decades is proceeding at almost twice the rate observed elsewhere. Dry zone population has risen from 370 million in 1950 to 1.2 billion in 2000 and is projected to reach 1.8 billion by 2025 (an increase of 50% in 25 years). Some areas will be particularly hard hit by water shortages, especially the Maghreb, all the more so because over the period to 2050 it could suffer from a sharp drop in regular supplies of water, in the region of 30%, due to global warming. Moreover, dry zones are the areas with the most serious problems of overexploitation of water tables, salinisation, desertification and the rapid silting up of dam impoundment lakes.

Increasingly tight constraints will be imposed on natural resources in many other regions whose crop or pasture ecosystems and water resources have become degraded and insecure for sustainable production. This is so because global warming is accompanied by a worsening of droughts and floods affecting agricultural production in numerous regions, including important production areas (Australia, Argentina, and South Asia, among others). These climate-related problems are among the factors causing a global decline in the average growth of yields, and droughts are the most diffuse of the causes of food shortages, as is the case in the Horn of Africa for example. Developing countries will be particularly hard hit by global warming, with a possible reduction in agricultural production potential of between 10% and 20% by 2050. Sub-Saharan Africa will bear the full brunt of this.

Soil erosion, especially erosion due to water, is another source of difficulty: it is the cause of an annual loss of between two and five million hectares of land, worsening decline in yields, desertification and the silting up of dam impoundment lakes. Salinisation, pollution and overexploitation of water tables also threaten the sustainability of agricultural production. This is also true of urban sprawl, a cause of massive losses of excellent agricultural land, including irrigated land, estimated at 1.6 million hectares every year.

In what is an increasingly unfavourable context and given the fact that agricultural development policies have tended to fade over the last 30 years, family-based "small agriculture", a category into which most of the working agricultural population falls, will see a worsening in the difficulties it faces. Indeed, the world's agricultural population is not declining despite high levels of urbanisation and economic growth in the emerging economies. A large percentage of smallholdings are still marginalised, make little and frequently mediocre use of their water resources, find it challenging to sell their products on markets that are disorganised and therefore have difficulty in contributing to the economic development of their countries. That difficulty stems to a large extent from lack of secure access to natural resources (land and water), lack of rural infrastructure (roads, means of storage and processing) and an absence of access to education, vocational training, information, credit, agricultural inputs and markets.

Fast population growth, deterioration in vulnerable ecosystems and difficulty in mobilising small agriculture may further hold back the development of world regions already poor in water (Middle East and North Africa), in land and water (South and Southeast Asia) or in financial resources and institutional capacity (Sub-Saharan Africa). These three regions may encounter growing difficulty in feeding their populations. Their agricultural imports (virtual water imports) could increase very significantly during the decades to come.

Experience on the ground gives good reason for hope

The preparatory work for the 6th World Water Forum has shown that many solutions have been or could be found to cope with such challenges, there being three principal ways forward.

Sustainable intensification of rainfed and irrigated agriculture: the aim must be to enhance such productivity ("more crop per drop") and rural income levels ("more income per drop")

Plant breeding for crop varieties with increased tolerance to drought is an element in the strategy to meet global food demands with less water and the development of agricultural techniques more protective of natural resources such as "precision agriculture" or "sustainable and ecological intensification" makes substantive advances possible in terms of efficiency (resource productivity). A combination of good water and soil management techniques "local land management", "agroecology" or "conservation agriculture", founded on the reduction or elimination of tilling, permanent soil cover and crop rotation, can allow soil, water resources to be preserved, natural fertility to be restored and the resilience of rainfed crops enhanced in the face of climate change (drought resistance). Nevertheless, the development of such forms of sustainable intensification or productivism is still too slow due to the absence of research into the adaptation of approaches to local conditions.

It is therefore imperative that research continue in order to ensure that the possible gains in efficiency are made through progress in techniques. In order to ensure more effective dissemination of the innovations most suited to each individual context, it is also necessary to reinforce schemes for popularisation and to make them more operationally effective, allowing farmers and growers to organise for themselves.

The examples that have been documented also demonstrate the strategic importance of the storage of water, at the surface, in the soil and in the subsoil, and the progress that could be made in the agricultural reuse of "grey water" from towns and cities and "drainage water". In the regions destined to become the driest due to climate change, storage is destined to become a "tool for risk management" and adaptation to provide essential supplemental irrigation.

Efficiency gains are also feasible both upstream and downstream in production and throughout the food supply chain "from field to fork" by reducing food wastage, losses following the harvest and, upstream, sustainable protection of periurban farmland. And lastly, further efficiency gains can be made through integrated analysis of consumption and production, reductions loss and wastage, use of high-quality water and treatment of polluting discharges from these activities.

Possible efficiency gains for irrigated crops in Asia

The new tools for fine-tuning irrigation currently being finalised in France point to possible efficiency gains of 20 % for example and in Africa technical progress relating to seed stocks means that new varieties of rice can provide extra yield of between 50 % and 200 % . IRF (Intensive Rice Farming), an entirely natural technique now developed and available to small farmers which is based on a proper understanding and respect for the plant's physiology (e.g. low-density pricking out of young plants, cropping systems that include regular dry-out periods) can provide average gains in yields of 400 % in Madagascar (8 tonnes/hectare compared with 2 tonnes) using local seed stock and with no mineral fertiliser input. A recent evaluation of this approach in eight Asian countries (including India, China, Indonesia) shows an increase of 47 % in average yields, a saving of 40 % in water, a 23 % reduction in costs per hectare and an additional 68 % of revenue per hectare.
This type of expert work benefits from prior analysis of irrigation systems (MASCOTTE) and existing multiple uses (MASMUS) as preparation for a modernisation programme (FAO).

The Juanon storage basin in France

The Juanon reservoir created in 2005 with a capacity of 700,000 cubic metres and covering 10 hectares provides a good example of the potential multifunctional advantages of irrigation in a Mediterranean climate. Farmers in the lower Drôme valley, organised in two federations each covering 600 hectares, grow grain crops, maize, sunflower and garlic seed stock, fruit and aromatic plants, and they all need water. Before the storage basin was in place, farmers took water from the Drôme river and in three out of four years during the driest period (July and August) the river's flow would be below its "minimum acceptable level" (i.e. the minimum rate needed to maintain its natural bed and guarantee constant presence of living organisms, and the movement and reproduction of the species living in the relevant areas of water). Since no connection to other irrigation supply networks was possible, the only solution was to store water. Upstream, two agricultural federations irrigating 1,600 hectares have access to a much more copious resource, the Bourne river, part of which could be easily stored and transferred downstream. Once the storage basin was filled in 2006, the farmers in the formerly water-poor federations could begin to water their crops seven days out of every seven in summer and the Drôme receives a million cubic metres in order to ensure that acceptable flow is maintained during dry periods.

Support for small producers and the development of vulnerable rural areas must be a priority in developing and emerging countries.

This is a major issue for successful water policy furthering food security. Smallholdings provide a living for two-fifths of humanity and on the African continent account for the majority of the 60% of the working population for which agriculture provides a living. Small producers are absolutely key actors for access to food through on-farm consumption and the generation of income in rural areas. They make a major contribution to global agricultural production – in the region of 70% according to IWMI – and provide access to food in the most isolated areas. Such "small agriculture" has very considerable room for progress in terms of

yields and efficient water use. Support for smallholdings can make it possible to progress in this way in terms of sustainable development and the mitigation of hunger and poverty. It requires recognition of its rights of access to natural resources and the setting up of effective support organisations.

National policies for the mobilisation of small agriculture: the example of Vietnam

Countries that have made a political choice to support their smallholders have reaped the benefit. For example, in Vietnam the empowerment over the last 20 years of 10.4 million agricultural households farming an average of 0.3 hectare on the Red River delta and 0.7 hectare on the Mekong delta has led a doubling of rice production and reduced from 31 % to 11 % the percentage of the population suffering from food insecurity.

Nevertheless, alongside such examples of virtue, small agriculture (growers, livestock farmers/shepherds and fishermen) often see their rights of access to resources (water and/or land) challenged rather than acknowledged. All too often the consequence of this is a major loss of agricultural production, greater food insecurity, growing conflict with other users and deterioration in networks and ecosystems, along with worsening migration to urban shanty towns.

A major cause of poor rural development is often to be found in the absence of effective local support organisations in direct contact with and attentive to the needs of men and women farmers and communities and serving agricultural and rural development policies aimed at ensuring proper management for natural resources.

A search for agreement on the fair sharing of water in Chambo River Valley in Ecuador

In the Chambo River catchment area in Ecuador's Central Andes region, as is the case in many other regions of the world, the problem with water is not so much its quantity as the way in which it is shared and managed. Against the backdrop of major upheavals in water policy (debate on a new law, new State institutions), rural local communities, the town of Riobamba, a fast-growing provincial capital with a population of 150,000, private enterprise and peasant families are all in competition for access to water.

In 2007, the NGOs CESA (Ecuadorian central organisation for agricultural services) and AVSF (agronomists and veterinarians without borders, France) decided to support the creation of a consultation scheme to allow negotiation of mutually beneficial agreements and the pooling of technical and financial resources with a view to collective protection of the resource. A lengthy period of diagnostic research and local leadership ultimately led to discussions beginning in an atmosphere of calm, enabling the stakeholders to see for themselves potential practical ways forward for the removal of main barriers to agreement as identified and agreed by all. The results are now promising: the setting up of a catchment area committee with a membership of representatives of the various users, the implementation of a financial instrument, the first signs of policy agreements on water sharing between the town and irrigating farmers, and the collective building of a water management plan.

For all these reasons it is essential to make sure that small farmers and growers and their organisations are properly involved in policies relating to water and agricultural and rural development.

Regionally-based governance of water

Organisational and institutional progress in managing agricultural resources is perhaps even more important for our shared future than progress in terms of agronomics, technology or infrastructure development. Many documented examples do indeed show that progress in terms of organisations, institutions and processes for dialogue is a crucial condition for sustainable enhancement of the productivity of resources, for both irrigated and rainfed systems, as well as improved access to food.

Institutional progress for sustainable rural development: examples in Cambodia and Tunisia

The Prey Nup project in Cambodia provides a striking example: the election of village representatives to build what was to become a community of irrigation water users which has 15,000 members today, the securing of land tenure with the establishment of 22,000 ownership titles and access to credit, both individual and collective, have made it possible to increase production from 12,000 to 27,000 tonnes in the space of eight years (+165 %) and 74 % of all households are now either self-sufficient or in surplus. The dynamic thus generated has restored the social cohesion that was lost during the Khmer Rouge collectivist episode.

Tunisia provides another good example of how useful it can be to move from technocratic "top-down" approaches to genuinely participative approaches. The innovative "Prodesud" rural development project in the south-east of the country, supported by IFAD, has recognised for the first time the reality of social/land-related uses of local grazing by parts of tribal communities. This has made it possible to entrust the rural communities concerned with effective responsibility, including financial, for the restoration and sustainable management of pastures in accordance with their own proposals. Where the Tunisian strategy on water economy is concerned, this has proved to be capable of combining tools for raising awareness and training, economic incentives for economic irrigation and measures for income support, decentralisation in favour of self-managed organisations, and pricing. This strategy has led to a gradual catching up in cost recovery and an increase in production and agricultural value-added, while at the same time stabilising demand for agricultural water, which in turn has enabled water to be made available for tourism, a source of foreign currency and for towns, sources of social peace.

These examples demonstrate the crucial importance, especially in regions suffering from water shortages, of moving away from traditional supply policies and toward policies for management of the demand for water that involve all stakeholders and ensure that people are once again the central concern.

Water tables that have suffered from overexploitation or pollution raise other "sustainability" issues that call for regional approaches to resource management that must begin with a demarcation of the relevant aquifer systems and user populations.

The examples below highlight the strategic importance of the "regionalisation" of policy visions and of planning at infranational levels since most countries include highly diverse areas in terms of climate, water and agriculture. Regionalisation makes it possible to take the specific features and issues of each major region more effectively into consideration and in many cases to restore coherence and much improved effectiveness to sectoral policies (water, agriculture, food security) defined at national level. The regionalisation of strategies is also likely to encourage the major agroindustry groups, especially those investing in low-income countries, to give more consideration to the issues at the infranational levels of food security (access for poor rural dwellers to food and to progress), or indeed the imperatives of water security.

Regionalisation, both at local level for empowered resource management and broader geographical areas for planning purposes, is also a way of combining efficiency and sustainability, thereby reconciling economics with the dual imperatives of water security and food security.

Reconciling water security and food security using regionalised approaches in France and Morocco

Experience with the water table in France's Beauce region demonstrates the potential merits of contract-based management of water volume: farmers grouped in irrigation associations in the départements, all equipped with water meters, agreed to limit their water take-off, the total volume available for use being set by government each year at the beginning of spring in accordance with the level in the water table.

The example of the Souss Massa Draa region in Morocco confirms that progress must involve the "regionalisation" of strategies, policies and measures, combined with the use of formal contracts, especially with agricultural cooperatives. Faced with increasing aridity and a dramatic decline in water table level threatening the entire economy and the stability of the region, the regional council laid down a new and ambitious vision for agriculture, mobilising all the actors to commit to a "frame agreement" combining progress on efficiency (a switch to drip feed irrigation), transfers of water from another catchment area with higher levels, a ban on new water take-off points, inspections and sanctions and regular follow-up on progress by a monitoring body. The region also decided to support smallholders in the mountain areas by adding extra value to "local produce" as products highly adapted to local water constraints and increasingly sought after on markets. This added value, which also involves the use of recognised "geographical indications", can generate substantially greater income per cubic meter of rainwater or irrigation water, thereby mitigating poverty.

And lastly, countries that share a "common destiny" (e.g. countries in West Africa, the countries of the Euro-Mediterranean area, Latin America) have begun to formalise in greater detail and to deepen shared visions of agriculture and water policies. It is important that such joint approaches should continue and be allowed to lead on to common strategies and policies across such "major regions". This is so because uncoordinated national responses can aggravate problems of water and/or food insecurity and where countries are divided they will be unable to exert influence in international negotiations or build new "deals" between groups of neighbouring water-poor or water-rich countries.

Conclusion : Four objectives for mobilisation

If we want our world to avoid suffering radical change passively, changes that are foreseeable, costly and which bring with them major political, economic and social risks, it is in its interests to engage without delay in freely chosen radical change.

What this presupposes is a clear vision of the changes to be brought about and assisted, as well as the commitment of all concerned to act in a responsible and mutually supportive way at every regional level from the most local to the global. This concerns all actors in agricultural water, whether direct or indirect, including city dwellers, who have all too often forgotten farmers' major role in providing their food and ensuring their good health.

We must redefine objectives for shared mobilisation that are directly operational and mutually complementary in furtherance of food security:

- **Enhanced productivity of water and agrosystems through sustainable intensification** (management of soil fertility and humidity, supplemental irrigation and increased storage capacity, reduction of loss and wastage throughout the chain "from field to fork") in order to produce sufficient food at affordable prices.
- **Strengthened resources for agricultural research and promotion of technical and organisational innovations** reliant on better-trained farmers and growers and stronger popularisation schemes suited to all forms of agriculture.
- **Support for "small agriculture" and vulnerable rural areas** in developing and emerging countries by recognising and adding value to rural communities' and small producers' rights of access to natural resources, information, vocational training, markets, credit, agricultural inputs and public services in order to ensure effective reduction of poverty, and therefore hunger.
- **Promotion of regionalised governance of agricultural water,** from global to local, applying the principle of subsidiarity for the effective mobilisation of all actors on the ground with a view to agriculture that combines economic efficiency, environmental sustainability and social justice.

The above four operational objectives represent the four pillars of water policies aligned with local constraints, furthering food security while protecting the rights of all users.