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Agriculture and Water Scarcity: a Programmatic Approach to Water Use Efficiency and Agricultural Productivity

Item 7 of the Provisional Agenda

Table of Contents

Pages

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I. Introduction

1. Agriculture is just one amongst many users of water, all of whom have to compete for water quantity and quality. Agriculture is responsible for the largest withdrawals and is therefore considered the main 'culprit' under conditions of local absolute scarcity (when raw water supplies cannot satisfy all demands). General failure for agriculture to account for its withdrawals is highlighted when global assessments of water scarcity are made. However, this should be distinguished from a lack of equitable access to water services (including irrigation services) and strict economic scarcity of a good or service. The lack of equitable access to water and related sanitation and drainage services, whether in municipalities or irrigation schemes, characterizes most if not all of the global water problems. However, strict economic scarcity for water and water related services is only apparent for bulk water trades – and these water trades only occur at the margin under highly regulated conditions. What is less apparent is the local, informal trade in water services where willing buyers and sellers engage. But these markets, particularly in groundwater irrigation services, are far from 'perfect' and tend to be skewed by rent-seeking monopoly suppliers and complex shadow pricing. Hence, the commonly accepted perception of water scarcity may have nothing to do with absolute scarcity, but rather a socio-economic failure of institutions to regulate public goods, manage assets and deliver services equitably.

2. Out of all sectoral users, agriculture has the largest scope to contribute to integrated water management through improved agricultural practices and the recognition that it has to account for its use in economic and environmental terms. The rationale for a focus on demand management rather than supply management should be self-evident, particularly when both raw water and capital to generate services are in short supply. However, this begs many questions on the capacity and willingness of the institutions to deliver services on the basis of demand rather than supply. The current experience in many developing countries with large irrigated sub-sectors is a continued reliance upon supply management approaches with little attention to the management of existing assets. This trend needs to be reversed if agriculture is to continue to account for its water withdrawals in the face of intensifying competition from other users.

3. In overall economic terms, the scope for managing demand for agriculture water use will need to focus on seeking gains in water use efficiency and agricultural productivity along the farm to market chain.This involves generating water use efficiencies and productivity increases with on farm water management, irrigation system performance and adjustments of national water and irrigation policies. However, certain supply management approaches are also valid for agriculture, particularly in relation to conjunctive use of surface and groundwater, re-use of wastewater and drainage water and desalination where appropriate. In allocating water resources, water quality criteria for different uses require a multiple-objective decision-making process. Beyond the national systemic response to water scarcity, the possible role of international trade to offset global water scarcity can also be taken into account.

4. Given the state of global water scarcity and the technical scope for agriculture to meet rising demand for food and industrial goods, agriculture is under severe scrutiny to account for the water it uses. Getting agriculture to perform with progressively smaller allocations of renewable water resources will remain a challenge. FAO needs to be in a much stronger position to advocate for agricultural demand management while also defending the critical role of water in maintaining global agricultural productivity. To better serve member countries, a case is made for establishing an explicit water programme as part of FAO's ongoing reform. A much more visible water programme within FAO that is designed to leverage all the multi-disciplinary capacities in the Organization is entirely consistent with the spirit of the FAO reform but, more importantly, will accelerate the adjustments that the agriculture sectors of member countries will have to make in order to cope with their own water scarcity.

II. Setting the Scene: Water Use and Users

5. Currently around 3 830 km^3 of freshwater is withdrawn annually for human use, which is equivalent to about 600 m^3 per person per year. Globally this represents about 9 percent of the renewable freshwater resources. However, large differences exist between continents and regions, ranging from less than 2 percent in Oceania to more than 20 percent in Asia, 52 percent in South Asia and up to 63 percent in the Near East and North Africa region. By far the biggest water user is the agricultural sector (including livestock), accounting worldwide for about 70 percent of all withdrawals, with domestic (municipal) use amounting to 10 percent and industry using 20 percent (Table 1).

Table 1 - Freshwater withdrawal by sector (year 2000)

Region	Renewable freshwater resources km^3/year	Total volume of freshwater withdrawal km^3/year	Freshwater withdrawal by sector (year 2000)						Withdrawal as % of renewable resources
			Agriculture		Industry		Municipalities		
			km^3/year	%	km^3/year	%	km^3/year	%	
World	**43 659**	**3 830**	**2 664**	**70**	**785**	**20**	**381**	**10**	**8.8**
Africa	3 936	217	186	86	9	4	22	10	5.5
Asia	11 594	2 378	1 936	81	270	11	172	7	20.5
Latin America	13 477	252	178	71	26	10	47	19	1.9
Caribbean	93	13	9	68	1	9	3	23	14.4
North America	6 253	525	203	39	252	48	70	13	8.4
Oceania	1 703	26	19	72	3	10	5	18	1.5
Europe	6 603	418	132	32	223	53	63	15	6.3

6. In the 1960s, about two-thirds of the world population lived in rural areas and 60 percent of the economically active population was engaged in agriculture. By 2050 an estimated two-thirds of the world's people will live in cities. While at a global level the percentage of water withdrawn for municipal and industrial uses remains small compared to the amount of water withdrawn for agriculture, this partition masks intense competition for land and water resources (and water quality) in the peri-urban zones and urban hinterlands of many capital and secondary cities of developing countries. Peri-urban agriculture is an important user of local water resources but is also associated with specific wastewater re-use and prevention in the degradation of potable supplies. Population is growing and more food is needed, but also more people move to cities, and more water will be required for domestic and industrial purposes. In Europe and North America, already half of the water withdrawn goes to industries, compared to less than 10 percent in regions mainly depending on agriculture in Africa and Asia (Figure 1).

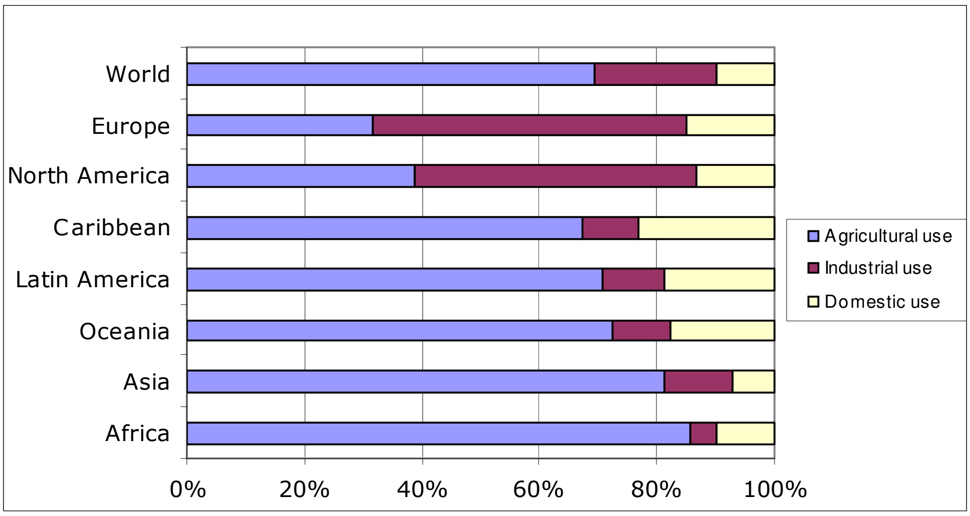

Figure 1 - Distribution of water withdrawal between sectors (year 2000)

7. Agriculture, industry and municipalities/households are the three major water users, extracting water either by diverting it to a distribution network or by directly using it. Of the water

withdrawn for agriculture, roughly half is consumed by evaporation and transpiration from plants. Water that is abstracted but not consumed flows back over the surface to rivers or infiltrates the ground and is stored in aquifers. However, this water is generally of a lower quality than the water that was withdrawn. Up to 90 percent of the water withdrawn for domestic purposes is returned to rivers and aquifers as wastewater. Industries consume about 5 percent of the water withdrawn. Wastewater from domestic sewage systems and industries needs to be treated before it can be reused.

8. Beyond the productive sectors, there is a growing awareness that part of the available surface water should be left to follow its natural course to ensure effluent dilution and safeguard conservation and productivity of the aquatic ecosystems. How much water is needed for this varies with the time of the year and depends on the specificities of the river basin. While a better understanding of the river basin ecological services is still pending, in-stream flow needs are estimated at 2 350 km^3/year globally. If this annual flow is added to total water withdrawals, the combined figure amounts to around 15 percent of the total renewable water resources. All this is calculated without taking into account the inter-annual variance in global freshwater circulation that can be anticipated under climate change or significant shifts in water use resulting from large scale uptake of bio-fuels, for instance.

III. Global Water Scarcity: the Issues

9. Water use has been growing globally at more than twice the rate of population increase in the last century, and an increasing number of regions are reaching the limit at which reliable water services can be delivered. Essentially, demographic growth and economic development are putting unprecedented pressure on renewable, but finite, water resources, particularly in arid regions. By 2025, 1.8 billion people are expected to be living in countries or regions with less than 500 m^3 of renewable water per year per capita, and two-thirds of the world population could be under "stress" conditions (between 500 and 1000 m^3 per year per capita). The situation will be exacerbated as the demands of rapidly growing urban areas place increased pressure on the quality and quantity of local water resources. In addition, environmental services and ecosystem functions are now being given explicit water allocations rather than being treated as residual users. However, it is important to distinguish between the absolute scarcity of renewable water resources (in watercourses and aquifers) and the relative scarcity of reliable water services – which may have nothing to do with the availability of water resources, but everything to do with <u>access</u> to water services and performance of those services - including irrigation.

10. Societies cope with water scarcity by developing progressively adaptive capacities from increasing supply through negotiation – through storage management and inter-basin transfers, for example, and the management of demand through technical innovation and economic incentives. Options for supply management are now limited as most economically viable development sites have been exploited and hence the marginal cost of increasing supply is rising.

IV. The Instrumental Role of Water in Agriculture

11. Today's agriculture uses 70 percent of all fresh water withdrawals globally, and up to 95 percent in several developing countries, to meet the present food demand. To keep up with growing food demand and shifting diets over the next 30 years, FAO estimates that the effective irrigated area will need to increase by 34 percent in developing countries, and 14 percent extra water needs to be withdrawn for agricultural purposes. It should also be remembered that irrigated agriculture provides some 40 percent of the global food supply on 20 percent of cultivated land.

12. Historically, large-scale irrigation projects have played a major role in ensuring food supply for a rapidly growing population, and in contributing to poverty alleviation by providing food security, protection from flood and drought, and expanded opportunities for employment. In many cases, irrigated agriculture has been a major engine for economic growth and poverty reduction.

13. In arid and semi-arid regions, where water scarcity is almost endemic, groundwater has played a major role in meeting domestic and irrigation demands. In many regions, massive use of groundwater has been made for some time for irrigation. However, groundwater mining and the lack of adequate planning, legal frameworks and governance have opened a new debate on the sustainability of the intensive use of groundwater resources.

14. Most countries in the Near East and North Africa suffer from severe water scarcity, as do countries such as Mexico, Pakistan, South Africa, and large parts of China and India. Irrigated agriculture, which represents the bulk of the demand for water in these countries, is also usually the first sector affected by water shortage and increased scarcity, resulting in a decreased capacity to maintain per capita food production while meeting water needs for domestic, industrial and environmental purposes.

15. Thus, growing scarcity and competition for water stand as major threats to future advances in food security and poverty alleviation. In semi-arid regions, increasing numbers of the rural poor are coming to see entitlement and access to water for food production, livestock and domestic purposes as critical as access to primary health care and education. There is thus need to also focus on issues relating to equity and rights in access to water.

16. Typically only 30 to 50 percent of the water diverted for irrigation is actually used by crops. Best management practices and technology for irrigated and rainfed farming systems (not only limited to water-related practices) have still to play a significant impact on the productivity of water. Trade has not been fully explored in the optimization of water use. Therefore, within this sector, the wider range of options to cope with water scarcity exists.

17. The extent to which agriculture has been responsible for generating water scarcity and using/degrading some of the world's highest quality surface and groundwater for marginal output is not disputed. What is often ignored is the scope, which sound management of agricultural water use has to open up more options for reallocation. Much of the international debate on water scarcity has to do with the chronic lack of water supply and sanitation services (which consume a fraction of renewable resources) when it is agricultural water that offers most scope to alleviate stress. The fact that water is instrumental in many aspects of rural development has been stressed in FAO's recent reform proposals, and a Natural Resources Department in which water resources development, control and management is centred, has now been established. Consequently there is need for a more explicit water programme to leverage water expertise across the Organization with specific contributions from units dealing with fisheries, forestry, agriculture, environment and economics. This will set a much more coherent framework to inform national policy and prepare national investment programmes for responsible agricultural water development.

V. Establishing a Programmatic Framework

18. Given the responsibility of agriculture to account for water withdrawals and the subsequent impacts on water quality, it is proposed that any water programme in FAO is built upon a water use framework that is multidisciplinary in approach but systemic in application. Any FAO water programme is necessarily bound by the Organization's agricultural and rural livelihoods focus and has to reflect the specific food and agriculture concerns of member countries. Nevertheless, this must be done within a realistic and responsible water management context. The economic competition for water, the requirement to mitigate environmental externalities, account for resource costs, and the recognition of the productive value of in-situ hydro-environmental services are all shaping the local and global discourse over basic water allocations and environmental regulation. Agricultural water use will continue to be the largest variable in the reconciliation of such allocations and regulation, and therefore needs to be brought into the discourse on the basis of a well articulated framework for evaluation of impact and negotiation of allocation. This will necessarily require system boundaries to be defined and key quantitative indicators of performance to be applied. What would such a framework need to include?

19. First, that agricultural water use and management is understood in all its dimensions. The technical aspects of crop production, aquaculture, livestock watering, forestry and watershed management need to be adequately represented and diagnosed, drawing on specialist skills across the Organization and respective counterparts at country level and in regional organizations.

20. Second, that the overall contribution of water use to agricultural productivity, rural livelihoods and environmental externalities is correctly analysed through commonly accepted, but scientifically robust, water accounting methods. This involves a consideration of water use efficiency at field and irrigation scheme level, engages additional productivity dimensions, and extends to macro-economic assessments of the water-related agricultural economy to GDP and global trade, i.e., from the point of direct water use to the point of effective consumption in foodstuffs and industrial commodities.

21. Third, that the institutional (including legal) implications of raising the productive level of the water economy are fully addressed and that the agriculture sector is adequately aligned and compliant with competing users and water regulators. These are prerequisites for improving the quality of investment into agricultural water management.

22. Here we will illustrate a programmatic framework for an analysis of water productivity over the continuum from water sources to final uses, including trades and markets of agricultural products. A programme of linked thematic elements would permit the efficiency of water use of the various parts of the complex agricultural production process while also allowing the scaling up to the different spatial levels (from farm to basin). It would also serve as a tool to examine the current levels of efficiency along the pathways of agricultural water use, to analyse where inefficiencies lie, and to assess the potential improvements that may be achieved in various parts and their impact on the overall efficiency. It will provide the means to determine how to allocate limited resources available (of given quality) to maximize water use efficiency and boost agricultural productivity.

23. The elements of the framework are described in Figure 2 below and the scope of the framework, together with an indication of FAO capacities, is indicated in the following sub-sections A to F.

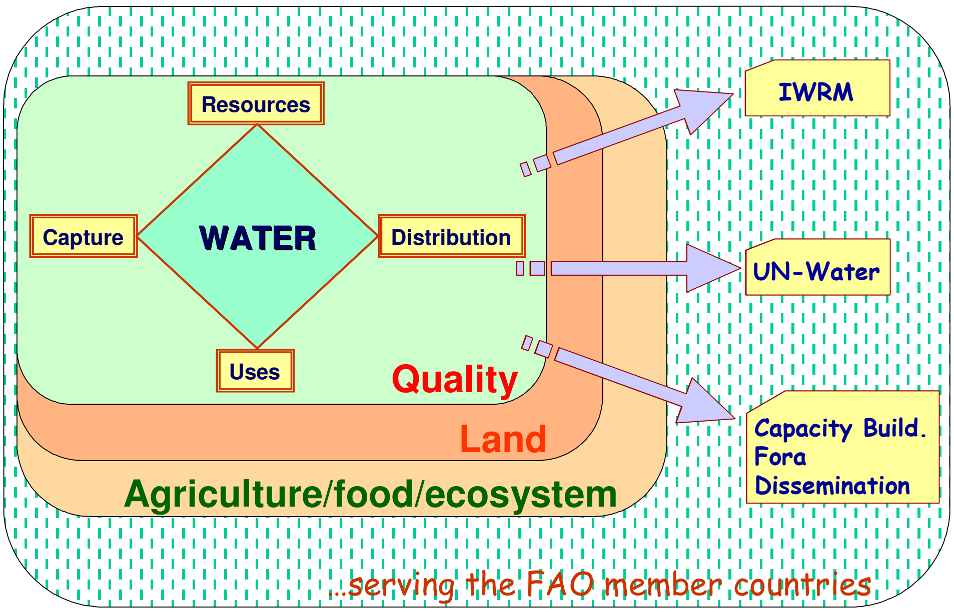

Figure 2 – Elements of the proposed Framework

A. Improving on-farm water management

24. In practice, agricultural water services are just one of many crop production inputs, but they are a critical lead input without which intensification and diversification of agricultural production would be impossible. Managing the application of water to the root zone and obtaining higher overall productivity is contingent upon soil fertility, cultivar selection, cropping density, pest and disease management and then post-harvest controls up to the farm gate. This sets the systemic value added chain in which water use efficiency can be evaluated and the scope for on-farm systemic improvement analysed. Under conditions of limited water availability at the farm gate, the improvement of on-farm water management becomes an imperative. Sprinkler and trickle irrigation methods, deficit irrigation and other water saving irrigation technologies have demonstrated viable financial and health safety returns. Biotechnology can provide further advantages as well. The benefits of these technologies are increased further when combined with accurate determination of crop water and irrigation system requirements, with well established irrigation scheduling, and with the above-mentioned agricultural practices.

25. Improvement of on-farm water management calls for an integrated use of water conservation practices, and economic incentives to influence water use – both the total level of water use and the pattern of use. Under the circumstances of limited water supply, maximizing the crop yield per unit of land should give ways to achieve the maximum yield per unit of water use. The latter is achieved at a water supply at least 20-30 percent less than the amount needed for maximum yield. Another important factor affecting on-farm water management is related to the skills of human resources that also deserve due consideration in the future.

26. FAO's capacity in on-farm water management is spread across the technical divisions in Agriculture, Fisheries, Forestry, Natural Resources and Technical Cooperation departments. While specific in-house initiatives such as farmer field schools and the water control component of the SPFS bring together many of the agronomic and water control specialists, including rice intensification and aquaculture, other initiatives such as the Livelihoods Support Group focus on the direct socio-economic aspects of local water management.

B. Improving the performance of irrigation system services

27. At the very minimum, the supply of water within large irrigated systems has to be reliable. The farmer has to be able to predict the timing and volume of supply. At best, supply has to be available on-demand and just-in-time to give the farmer maximum flexibility in crop choice and growing season. This explains the farmer preference for groundwater supplied irrigation in the face of unreliable water service. However, the irrigated sub-sector is characterized by large scale irrigation systems that are publicly financed and operated. These are generally systems that were designed to offer employment and alleviate poverty when water supply was not considered to be a constraint or the necessity of long-term commercial viability was not considered to be a primary objective. Circumstances have changed. Pressures to modernize irrigation system technology and related institutions have built up in response to increasing competition among water users, better articulation of farmer needs, and more generally due to political reforms and policy shifts with respect to responsibility and cost sharing in management of natural resources.

28. Consequently, the evaluation of the performance of large irrigation systems is no longer limited to crop related indicators. It is now recognized that water management in irrigation is multi-objective, providing a wide range of benefits to both farmers and local communities, from recharge of local aquifers for potable supplies to the maintenance of shelter belts and orchards. Therefore increasing the performance of irrigation systems implies the genuine recognition that irrigation systems can complement the natural systems over the annual water cycle.

29. Improving performance implies that irrigation management needs to refocus on water delivery to farmers while looking for paradigm shifts such as:

- enlarging the concept of performance to multiple uses (positive and negative externalities);

- encompassing the conjunctive use of water;
- extending the participative management to various local actors;
- developing cost-effective management of water;
- mitigating environmental externalities associated with waterlogging and salinity, and the disposal of drainage water.

30. The current capacity for this work is centred in the Land and Water Division (NRL) with its out-posted staff in the regional offices. The Water Development and Management Unit (NRLW) team in RAP is the main repository of expertise with its irrigation modernization programme (http://www.fao.org/world/regional/rap/agriculture_land_water.asp) while the NRLW team in Headquarters provides input on associated water quality and environmental impacts. In addition, the specific investment implications for rehabilitation and modernization of irrigation schemes are frequently analysed under project cooperation arrangements with TCI.

C. Augmenting supply: the use of non-conventional waters

31. Since significant volumes of drainage water are produced in many irrigation schemes, reuse of drainage water is becoming more apparent in water scarce countries. For example, in the Nile Delta, reuse is practised to cover the gap between water demand and available conventional resources. The volume of drainage water reused by pumping from the main drains to the irrigation canals is expected to increase from 4 400 million m^3 per year (1996/97) to 8 000 million m^3 per year. FAO has provided guidelines for the management of agricultural drainage water in arid and semi-arid areas, covering the aspects of water conservation at the field level, reuse at the scheme level and safe disposal and treatment of the drainage effluent.

32. Agriculture's use of water resources of marginal quality, such as treated wastewater and saline water (mainly groundwater and drainage water) has also become an important issue. This is especially the case for irrigated agriculture in the arid and semi-arid zones of water scarce countries and in rapidly growing peri-urban settings in both humid and arid climates. In reducing the gap between supply and demand, water scarce countries have been compelled to develop non-conventional water resources as measures to improve efficiency of water use, reduce losses and increase recycling. Marginal quality water in irrigated agriculture plays an important role in reversing negative impacts, and its usage aims towards sustainable development by protecting the quality of aquatic ecosystems in the prevention of coastal and groundwater pollution and over-abstraction (some of the FAO work is done in partnership with UNEP).

33. Non-conventional water such as wastewater is a valuable resource for millions of smallholders for its water and nutrient value as well as supplying constant flows of water across seasons; thereby, offering also a drought-resistant coping strategy. In a semi-arid area, a city of one million people would produce enough wastewater to irrigate approximately 1 500-3 500 ha of crop land. To protect and sustain high quality water for drinking water purposes, the need to increase the use of treated wastewater in agriculture requires the development of water saving irrigation systems and management that allow safe use of low quality water resources to safeguard health and environment. The selection and subsequent investment in suitable technology for water treatment should result from an evaluation process that takes into account health protection, minimizing pollution, costs, the scale of operation (rural/household vs. urban), as well as the quality of water needed for specific purposes. FAO has collaborated with the World Health Organization (WHO) in the development of new health guidelines for the safe use of greywater and wastewater for agriculture recognizing its use as an immediate response to the needs of resource-poor communities and an alternative to lack of access to clean water in peri-urban and rural areas. NRLW links to Food for the Cities interdisciplinary activity (nutrition group, food marketing and processing, land tenure, urban forestry, etc.) and UN-HABITAT.

D. Water Harvesting

34. Water harvesting, which can be defined as a process of collecting and concentrating runoff from a runoff-area into a runon-area, also has the potential to contribute substantially to increased food production, both in rainfed and irrigated agriculture, by making best use of available rainfall while securing the natural resource base and easing pressure on available resources. Recent FAO studies have shown that increasing the return to household labour determines the economic success of water harvesting systems. The flexibility to shift labour requirements for establishment and maintenance of water harvesting systems to seasons with low opportunity costs as well as the availability and alternative uses of crop inputs, the market value of crop by-products and the transport cost of materials for construction are the main factors affecting the economic viability of water harvesting. If the short-term decline of returns to labour during the establishment phase can be overcome, water harvesting offers considerable opportunities for investment by resource-poor farmers.

35. FAO's expertise in these areas is spread across the house, notably in the technical divisions of Agriculture and Forestry but also through networks of related UN-system and CGIAR institutions.

E. National policies: water allocation to agriculture

36. Agriculture has been highly successful in capturing the bulk of the world's freshwater resources, but with little accountability. Since agriculture will continue to be the main water user, improved agricultural water use in irrigated and rainfed agriculture will have a direct impact on local and regional water availability. Allocation of raw water out of agriculture to other higher utility uses – municipal supplies, environmental reserves, hydropower generation, etc. is already taking place, but there is still scope for these allocations to be optimized in economic and environmental terms and this challenge has to be taken up by progressive agriculture policy as much as water policy. To this extent, agricultural agencies need to be in a much better position to negotiate reallocation of bulk water resources before access and control is simply withdrawn through compulsory reallocation. This position can only be established through the following avenues:

- the provision of clear information on agricultural water use;
- a commitment to engage with key water sector players, including environmental agencies;
- establishing robust and transparent methods to negotiate allocation amongst competing uses.

37. Current obstacles to making progress on optimal intra and inter-sectoral water allocations are institutional, technological and economical. Institutional rigidity continues to impair the performance of irrigated agriculture and the improvement of rain-fed systems. The uptake of improved systems is also inhibited by inconsistent macro-policies that fail to provide sufficient incentives for increased production efficiency. There is continued reliance on supply-side solutions and limited analysis of the changing factors of demand. Many existing systems of irrigated agriculture and, to a lesser extent, rainfed agriculture, are predicated on technologies designed to maximise supply inputs, and are simply not flexible enough to respond efficiently to individual farmer demands. What can be done to address these tendencies?

38. At a technical level, irrigated production will need to be re-thought in order to raise water use efficiency and close crop yield gaps. But institutional shifts will also be required to enhance the economic mobility of water both within agriculture and across competing economic sectors. Irrigation is under pressure to perform as a service to agriculture, not as an end in itself. This will involve a shift in approach from a supply, or input-driven, activity to a much more demand responsive activity.

39. Principal thrusts remain the following:

- A much more strategic development of the available land and water resources will be needed in order to service effective demand for food products and agriculture commodities at local, national and regional scales. This needs to be based on much broader economic awareness of the efficiency and productivity gains that can be made in improving irrigated and rainfed agriculture, thereby creating opportunities to conserve the resource base – rainfall, surface and groundwater.
- A readjustment in the balance between formal irrigation water management and pro-poor, affordable agricultural water management. Low cost, small-scale options in water harvesting, irrigation and drainage are necessary to impact poverty alleviation and local food security in small rural communities but also need to be matched by complementary improvements in rainfed production.
- Programmes of irrigation modernization that adapt institutional and technical practices are needed to turn existing rigid command and control systems into much more flexible, service delivery systems.
- A structured and regulated participation of water users – individual farmers and farmer groups – is essential to protect public interest in land and water resources.
- The experience in the transfer of irrigation assets and operational responsibilities from public control to private user associations has been mixed. Such transfers need to be negotiated on the basis of declared rights in use and a clear understanding of the respective obligations and liabilities between pubic and private actors.
- A realization that agriculture has to be much more proactive in shouldering the negative environmental and health impacts of irrigated agriculture, but also realize the opportunities for restoring the productivity of natural ecosystems through good agricultural practice.

40. Water policy expertise is spread across NRLW and its outposted staff, but also in the Field Programme Development Service, TCAP (EasyPol) and the Development Law Service (LEGN) and draws upon much detailed economic analysis undertaken by the Economic and Social Development Department (ES). This policy work is also closely associated with project preparation activities of TCI on national irrigation programmes and thereby with the operational policies and safeguard provisions of the development banks.

F. Trade as a variable in agriculture water management

41. Many countries confront the prospect of emerging water scarcity in the long term. Countries in the Middle East and North Africa have already passed the point at which no more water can be applied to land and hence have resorted to commercial food imports. A water-scarce country pursuing food security may be forced to import water at some point. If water becomes the scarce factor, it may be more sensible to 'import' it embodied in products in general and food in particular, especially if food is available on favourable trade terms. Egypt, a water-scarce country, regularly imports food. California obtains 73 percent of its daily water input by importing food, though it also 'exports' water by selling cotton, fruit and vegetables. It should be remembered that macro-economic policies and sectoral policies that are not aimed specifically at the water sector can have a strategic impact on resource allocation and aggregate demand in the economy. A country's overall development strategy and use of macro-economic policies - including fiscal, monetary and trade policies - directly and indirectly affect demand and investment in water-related activities. The most obvious example is government expenditure (fiscal policy) on irrigation, flood control or dams. But a less apparent example is trade and exchange rate policies aimed at promoting exports and earning more foreign exchange.

42. Therefore, efficiency gains in the global food trade in terms of water resource utilization are possible and the consequence of increasing reliance on irrigation for food production in many countries, including food exporting countries, need to be well understood before such policy commitments are made.

43. Much of the basic information on water requirements and commodity trades needed to analyse the impact of irrigated production on global trade is compiled in FAOSTAT and AQUASTAT, in ES and NRLW respectively.

VI. Invited Views and Guidance from COAG

44. The scope of FAO's involvement with water resource management is extremely wide, from the precise application of water to the root zone, to the development of livestock watering points and aquaculture. A case can be made for the establishment of an explicit water programme in FAO to leverage expertise across the Organization in addressing global water scarcity. We strongly believe that FAO has the highest comparative advantage in tackling water scarcity issues since no other specialized agency of the UN system can deliver the range of technical analysis and support that is required. This has been already recognized by UN-Water, having assigned to FAO the lead on their water scarcity initiative.

45. Given the fundamental and continuing importance of the water variable in boosting agricultural productivity and maintaining environmental services, the Committee is thus invited to provide its views on the present paper and the proposed framework to address water scarcity. In particular, it may wish to give guidance on the following:

1. The need to consolidate existing water related activities under an explicit water programme. Given the dispersion of water related expertise across the Organization, a more coherent water programme would enhance the delivery of technical and policy advice to member countries and regional groupings, particularly those having to reconcile water scarcity with agricultural development. Such a programme would necessarily implicate all technical departments in the Organization and require a much sharper, systemic focus from the relevant units to be built into a substantive programmatic framework.
2. Content and form of the programme. The proposed framework is expected to be relevant to investigations, assessments, diagnosis and perspective studies, in both concept and approach.
3. The adequacy of FAO's human and financial resources. To deliver advice to member countries and regional economic organizations these resources should be adequate for FAO to support countries in optimizing water allocations in the face of increasing scarcity.