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de las  
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para la  
Agricultura  
y la  
Alimentación

## COMMITTEE ON AGRICULTURE

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## AGRICULTURE AND ENVIRONMENTAL CHALLENGES OF THE TWENTY-FIRST CENTURY: A STRATEGIC APPROACH FOR FAO

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## I. Introduction

1. At its Twentieth Session in 2007, the Committee on Agriculture (COAG) considered the document Environment and Agriculture (COAG/2007/6) which examined key interactions related to agriculture and environment, namely biodiversity, climate change and bioenergy.
2. The Committee generally supported the proposal of the Secretariat to conduct a study on possible elements of an “FAO Strategic Framework for Agriculture and Environmental Challenges of the 21<sup>st</sup> Century”, pending the outcome of the FAO Independent External Evaluation (IEE).
3. The Thirty-fourth Session of the FAO Conference in November 2007 “underlined the need to reconcile increasing levels of agricultural production, in order to feed a growing world population, with that of a sustainable use of our natural resource base and of preserving the provision of crucial environmental services. It expressed particular concern over the impact of climate change and variability, especially on the poorest and most vulnerable countries and populations. It noted that agriculture while itself contributing to greenhouse gas emissions, was also likely to be one of the sectors most affected by climate change and could also offer possible solutions”. The Conference “recognized that, while biofuel development could present opportunities for agricultural producers in developing countries, it also risked having negative consequences on food security...”<sup>1</sup>.
4. The High-Level Conference (HLC) on World Food Security: the Challenges of Climate Change and Bioenergy (Rome, 3-5 June 2008) and preceding expert meetings and stakeholder consultations addressed many issues of relevance for the study agreed to by COAG. This document draws on the results of this consultative process, the findings of the IEE, the decisions of the 35<sup>th</sup> (Special) Session of the FAO Conference (November 2008), in particular the adoption of an Immediate Plan of Action for FAO’s Renewal (IPA), the 2005 UN Millennium Ecosystem Assessment and several FAO reports<sup>2</sup>.
5. This paper has to be seen in the light of another document submitted to the present session of COAG presenting elements of FAO’s Strategic Framework and Medium-term Plan 2010-13 of relevance to the Committee<sup>3</sup>, based on the new results-based programming framework approved in the IPA. The Strategic Framework includes proposed overarching Strategic Objectives for the Organization and deals *inter alia* with the application of the main core functions of FAO to the implementation of these Objectives. Final decision of the Governing Bodies on the new Strategic Framework and Medium-term Plan 2010-13 is to take place at the 36<sup>th</sup> Session of the Conference in November 2009. In order to avoid potential ambiguities, the expression “Strategic Framework” is reserved to refer to the overall forward looking policy document, while the present document, in addressing its intended scope, talks preferably of a “strategic approach”.
6. This paper considers the complementary aims of meeting the increasing demand for food and other agricultural products and of maintaining the natural resource base for future generations. Within the context of FAO’s new vision and global goals as approved by the Special Session of the Conference in November 2008, the paper primarily relates to the third goal: *sustainable management and utilization of natural resources, including land, water, air, climate*

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<sup>1</sup> Report of the 34th Session of the Conference (C 2007/REP, paras 44 and 45).

<sup>2</sup> The State of Food and Agriculture 2007 - Paying farmers for environmental services; The State of Food and Agriculture 2008: BIOFUELS: prospects, risks and opportunities; World Agriculture towards 2015 /2030 (FAO 2003); and World Agriculture towards 2050 - An Interim Report (FAO, 2006).

<sup>3</sup> COAG/2009/6

and genetic resources, for the benefit of present and future generations, while recognizing the need for a sustained increase of agricultural production to meet the requirements of a growing world population. It focuses on the proposed Strategic Objective (SO) F: “Sustainable management of land, water and genetic resources, and improved responses to global environmental challenges affecting food and agriculture”, also taking account of proposed SOs A: “Sustainable intensification of crop production”, and B “Increased sustainable livestock production”<sup>4</sup> (the latter is also addressed in the separate livestock segment of COAG<sup>5</sup> and will be subject to further detailed review in the *State of Food and Agriculture (SOFA)* 2009).

## II. Challenges to Sustainable Agricultural Production

7. World population continues to grow and is predicted to reach about nine billion in 2050. The demand for agricultural produce will continue to grow, needing to double the production by 2050, driven by population growth and changing food habits. FAO estimates that “the future may see some drastic decline in the growth of aggregate world production, to 1.5 percent p.a. in the next three decades and on to 0.9 percent p.a. in the subsequent 20 years to 2050”<sup>6</sup>. An increase in demand for biofuels could further increase pressure on inputs, prices of agricultural produce, land, and water.

8. Meeting the demand for agricultural produce “should not be taken for granted, as land and water resources are now more stretched than in the past and the potential for continued growth of yield is more limited”<sup>7</sup>. “Pressures on the resources and the environment will continue to mount. The challenge facing humanity is how to produce the quantum increases of food in sustainable ways (preserving the productive potential of the resource base) while keeping adverse effects on the wider environment within acceptable limits. *A priori*, the task looks more difficult than in the past [...] and the magnitudes involved suggest that the increases in production and associated progress in food security cannot be achieved at zero environmental cost. The issue is whether any threats to the resource base of agriculture and the generation of other environmental «bads» associated with more production and consumption can be contained within limits that do not threaten sustainability that is the ability of future generations to have acceptable food security levels within acceptable more general living standards”<sup>8</sup>.

9. The 2005 *Millennium Ecosystem Assessment* reported that about 60 percent of ecosystems studied (including agri-ecosystems) are being degraded or used unsustainably<sup>9</sup>. If agriculture is to meet the twin challenges of increased food production and maintaining and managing ecosystem services, there is a need to accelerate the transition to sustainability.

### *A limited resource base*

#### *Land use change*

10. Land is a finite resource. The overall area of land considered generally suitable for rainfed agriculture is about 33 percent of the Earth’s land surface (FAO 2003)<sup>10</sup> and about 12 percent of total land surface is presently under crops (FAOSTAT).

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<sup>4</sup> C 2008/4

<sup>5</sup> Livestock Policy and Institutional Change for Poverty Reduction (COAG/2009/2)

<sup>6</sup> World Agriculture towards 2030/2050 (FAO 2006)

<sup>7</sup> World Agriculture towards 2030/2050 (FAO 2006)

<sup>8</sup> World Agriculture towards 2015/2030 (FAO 2003)

<sup>9</sup> [www.millenniumassessment.org](http://www.millenniumassessment.org)

<sup>10</sup> World Agriculture forwards 2015/2030 (FAO 2003)

11. FAO/IIASA (2002)<sup>11</sup> asserted that enough food can be produced on currently available land, if sustainable management principles and adequate inputs are applied. FAO (2003)<sup>12</sup> estimated that 79 percent of the increase in developing countries would originate from increases in yield and intensity of cropping, while 21 percent would be produced through expansion of land under cultivation. This would represent a net increase in developing countries from 1997/2000 to 2030 from 848 million hectares to 1076 million hectares, not taking into account losses due to soil degradation, urbanization and industrial use.

12. In Western and Eastern Europe and parts of North America land available has few agricultural constraints, but large expansion of currently cultivated areas is unlikely in the near future, partly due to environmental concerns. In developing countries, the largest potential for an increase in arable area is in South America and in sub-Saharan Africa, while opportunities for expansion in Asia and the Near East are extremely limited.

13. At a global level, between 15 and 20 percent of the land shows significant signs of loss of ecosystem services and is considered degraded. Desertification (i.e. land degradation in dryland areas) affects between 10-20 percent of global drylands (Millennium Ecosystem Assessment). Land degradation will most likely continue to advance.

#### *Water scarcity and pollution*

14. 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. Rapidly growing urban areas and industries increase pressure on the quality and quantity of local water resources.

15. The agricultural sector (including livestock) accounts worldwide for about 70 percent of all withdrawals of water, and up to 95 percent in some developing countries. Irrigated agriculture provides some 40 percent of the global food supply on 20 percent of cultivated land. FAO estimated that in developing countries, in the next thirty years, the effective irrigated area will increase by 34 percent and 14 percent more water will be withdrawn for agricultural purposes<sup>13</sup>.

16. Climate change will modify and, in critical regions, increase future risk and vulnerability of crop production especially in rain-fed agriculture<sup>14</sup>. The large contiguous areas of irrigated land in river basin deltas are at risk from a combination of reduced inflows, salinity (Indus, Krishna, Godavari), annual flood cycles and sea-level rise (Ganges-Brahmaputra, Mekong, Yangtze) and urban and industrial pollution. These stresses on some of the prime productive land will reduce agricultural output, biodiversity and the natural ability to recover.

17. Agricultural runoff containing nutrients such as fertilizers and agrochemicals/pesticides is the main source of non-point source water pollutants. In the European Union (EU) the inorganic nitrogen use in agriculture rose from around one million tonnes annually in 1950 to a peak of 11 million tonnes in mid 1980 and more recently fell to approximately ten million tonnes. The nitrogen “pressure” on agricultural soils from animal husbandry is also estimated at eight million

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<sup>11</sup> FAO/International Institute for Applied Systems Analysis (IIASA) 2002. Global agro-ecological assessment for agriculture in the 21st century. Eds. G. Fischer, M. Shah, H. van Velthuizen, F.O. Nachtergaele. Laxenburg, Austria.

<sup>12</sup> World Agriculture towards 2015 /2030 (FAO 2003)

<sup>13</sup> World Agriculture towards 2015 /2030 (FAO 2003)

<sup>14</sup> By 2030, the broad trends in precipitation and evapotranspiration are expected to result in reduced runoff across South-western USA; the Mediterranean basin and the Near East; Central America, northern Brazil and the western margin of the Sahara; the Western coastal margin of Chile, Southern Africa and Madagascar; and south-western Australia. This drying trend will be offset by patterns of increasing runoff across Canada/North America, northern Europe, Siberia, Central Asia and northern China; East Africa, the southern Arabian peninsula, peninsular India, Myanmar and Papua New Guinea (World Agriculture towards 2015/30).

tonnes annually<sup>15</sup>. In high-income countries total commercial fertilizer consumption in agriculture slowed down since 1990, but emerging economies and developing countries still have high growth in fertilizer use.

*Biodiversity for food and agriculture*

18. Biodiversity provides the genetic material for crop and livestock breeding, as well as other ecosystem services that are vital for the success of agriculture, such as pollination, nutrient uptake, soil formation, mineralization, nitrogen fixation, and pest control. Modern agricultural cultivation technology has reduced the number of traditional varieties and animal breeds and other biodiversity.

19. *The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report*<sup>16</sup> concluded that there will be major changes in ecosystem structure and function, with predominantly negative consequences for biodiversity and ecosystem services. Roughly 20 to 30 percent of species assessed are likely to be at high risk of extinction, if global mean temperature exceeds pre-industrial levels by 1.5 to 2.5°C. These include wild crop relatives, which are essential to increasing agricultural productivity.

***Climate change, the need for adaptation and mitigation***

20. Climate change is an all encompassing challenge to food and agriculture. The challenge of adaptation and the necessity to mitigate through the reduction of greenhouse gas (GHG) emissions and enhancement of GHG sinks will transform agricultural production systems.

21. The IPCC Report 2007 found that forestry contributes approximately 17 percent and agriculture contributes an additional 14 percent of anthropogenic GHG emissions. These figures exclude production of fertilizers, transport and food industry, packaging, cooling and heating; overall figures may be in the range of 35 per cent. While direct CO<sub>2</sub> emissions from agriculture are relatively small, the sector accounts for approximately 60 percent of all N<sub>2</sub>O and about 50 percent of CH<sub>4</sub> emitted, mainly from soils and enteric fermentation, respectively.

22. Although there are uncertainties about changes in global food production, local variation will be substantial. At lower latitudes, especially in seasonally dry and tropical regions, crop and animal productivity is projected to decrease with temperature increases of 2 to 3°C, with yield decreases in some rain-fed African systems of up to 50 percent by 2020, declines of grassland productivity in semi-arid and arid regions from 40 to 90 percent, high levels of desertification and salinity in some Asian and Latin American areas, and increasing water stress, in particular, in irrigated areas. Certain areas may become unsuitable for agriculture or be flooded (e.g. coastal plains) (IPCC 2007).

23. Food security has to be one of the priority areas in National Adaptation Programmes of Action (NAPAs). Adaptation requires diversification of farming systems, introducing well adapted crops, varieties and livestock breeds, and ensuring regular supply of improved cultivars that are more tolerant and responsive to increased drought stress, higher levels of heat and cold stresses, and salinity and water logging. Adaptation is also likely to require additional investments in water control to offset the increased variability of precipitation and runoffs.

24. From the mitigation potential of agriculture, 89 percent is assumed to be from carbon sequestration in soils. Techniques include improved soil biomass and crop and grazing management to increase soil carbon sequestration; restoration of cultivated peat soils and degraded lands; improved rice cultivation techniques and livestock management; improved

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<sup>15</sup> EC Report COM (2002) - Implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources.

<sup>16</sup> IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment. Report of the Intergovernmental Panel on Climate Change . IPCC, Geneva, Switzerland, 104 pp.

fertilizer application; use of natural nitrogen fixing processes; improved energy efficiency; and improved management and recycling of biomass.

25. Most effective systems in developing countries will combine adaptation with development and mitigation. Mitigation implementation is a challenge because of the large number of small farm units involved. Better methods of reaching farmers are necessary to ensure adaptation and mitigation practices are successful.

### ***Biofuels<sup>17</sup>***

26. Investments in liquid biofuels have grown rapidly since 2000, especially in OECD countries and Brazil. Global ethanol production tripled between 2000 and 2007, to reach 62 billion litres, and the production of biodiesel increased more than ten-fold during the same period, to more than ten billion litres (SOFA 2008)<sup>18</sup>.

27. Brazil and the United States of America dominate the growth in ethanol production, while the EU has been the major source of growth in biodiesel production. However, many other countries have also begun to increase their output of biofuels.

28. Many governments have initiated or updated existing policies to encourage use of liquid biofuels for transport, sparked mainly by high energy prices. Policy objectives include agricultural and rural development, enhancing domestic fuel security, and addressing concerns for climate change. However, policy development is increasingly facing concerns on the impact on food security and the environment, particularly on net GHG emissions, land-use changes and water depletion. Diversion of grain from food and feed to liquid biofuel production contributes to upward pressure on grain prices, which have a direct impact on the food security especially in food-importing developing countries.

### ***The need for an ecosystem approach to agriculture and environment***

29. The challenge to world agriculture is to realize simultaneously FAO's global goals (i) overcoming hunger and malnutrition; (ii) food production and rural development as contributors to economic and social development; and (iii) sustainable management of the natural resource base for the benefit of present and future generations. These goals, with multiple stakeholders having different and sometimes conflicting interests, require compromises and trade-offs and need to be handled in an integrated systems approach.

30. Actions need to recognize the integrated and multi-disciplinary character of agriculture, and require the management of infrastructure, natural resources, landscapes and biodiversity, at local, national and regional scale and an enabling environment for the protection of national resources through national and international legislation and regulation as well as through international cooperation.

31. Many of the ecosystem services that were considered as free inputs to agriculture are becoming scarce, disrupted or dysfunctional. System failures like pollution and depletion of the resource base have evidenced the economic value of ecosystem services. Among other reasons, the recognition of the importance of ecosystems services, the high costs of their disruption, and the necessity to secure them as significant and economically important products, have emphasized the need for an ecosystem approach. The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and

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<sup>17</sup> Liquid biofuel (bioethanol and biodiesel) has been the subject of most recent work and debates on biofuels but it is actually only a small fraction (less than 5 percent) of all available biofuels which FAO defines as "fuel produced directly or indirectly from biomass such as fuelwood, charcoal, bioethanol, biodiesel, biogas (methan) or biohydrogen".

<sup>18</sup> The State of Food and Agriculture 2008: BIOFUELS: prospects, risks and opportunities.

interactions among organisms and their environment, and recognizes that humans, with their cultural diversity, are an integral component of ecosystems.

32. An ecosystem approach to agriculture and natural resource management explicitly identifies opportunities and trade-offs. It can preserve or increase the capacity of an ecosystem to produce benefits for the society, fairly apportion benefits and costs, and is sustainable over the longer-term. The ecosystem approach to agriculture requires adjustments in institutional and governance arrangements that ensure informed, balanced, transparent and legitimate decision making in relation to trade-offs and stakeholder participation.

### **III. Possible Elements of a Strategic Approach to Sustainable Management and Utilization of Natural Resources**

33. The Declaration of the High-Level Conference on World Food Security: the Challenges of Climate Change and Bioenergy, identified medium and long-term measures that address the environment/agriculture nexus and recognize the importance of a people-centred policy framework and the need to increase investment in agriculture. In particular, it stated that “It is essential to address the fundamental question of how to increase the resilience of present food production systems to challenges posed by climate change. In this context, maintaining biodiversity is key to sustaining future production performance”. It recognized the importance of adaptation and mitigation to climate change, and of creating opportunities for smallholders to participate in, and benefit from financial mechanisms and investment flows to support climate change adaptation, mitigation and technology development, transfer and dissemination. It recommended increased investment in science and technology for food and agriculture directed to researching, developing, applying, transferring and disseminating improved technologies and policy approaches. It also considered it essential to address the challenges and opportunities posed by biofuels, in view of the world’s food security, energy and sustainable development needs. It emphasized the need for in depth studies and identified the desirability of exchanging experiences on biofuels technologies, norms and regulations. It called “upon relevant intergovernmental organizations, including FAO, within their mandates and areas of expertise, with the involvement of national governments, partnerships, the private sector, and civil society, to foster a coherent, effective and results-oriented international dialogue on biofuels in the context of food security and sustainable development needs.”

### **IV. What FAO Can Do**

34. As mentioned in the Introduction, this section looks primarily at the Strategic Objective (SO) F : “*Sustainable management of land, water and genetic resources, and improved responses to global environmental challenges affecting food and agriculture*”, while taking account of SO A : “*Sustainable intensification of crop production*”, and SO B : “*Increased sustainable livestock production*”. In illustrating the scope of FAO’s action, the text is articulated around the main core functions defined in the new results-based programming framework approved in the IPA as the critical means of action to be employed by FAO to achieve results, drawing on the Organization’s comparative advantages.<sup>19</sup>

35. In effect, the sub-sections below are developed around the first six core functions; the other core functions “*Bringing integrated interdisciplinary and innovative approaches to bear on the Organization’s technical work and support services*” and “*Working through partnerships and alliances where joint action is needed*”<sup>20</sup> are more process oriented and are not included in this analysis. The FAO activities below are highlighted by the Secretariat as representing major but not the only ones which are significant in the context of identifying elements of a strategic approach.

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<sup>19</sup> C 2008/4 p. 16

<sup>20</sup> C2008/4 Box 4, p.20



36. The High-Level Conference was preceded by a series of expert meetings, with the objective to assemble the state-of-the art of scientific knowledge and to draw upon the experience of relevant networks, as well as stakeholder consultations with representatives of civil society, non-governmental organizations and the private sector. These expert meetings were composed of technical experts, participants from relevant international and regional institutions and UN Organizations. Subjects of these Consultations were: Bioenergy Policy, Markets and Trade and Food Security; Global Perspectives and Food and Fuel Security; Climate Change, Water and Food Security; Climate-Related Transboundary Pests and Diseases including Relevant Aquatic Species; Climate Change Adaptation and Mitigation; Climate Change and Biodiversity; Climate Change and Disaster Risk Management; Climate Change and Fisheries and Aquaculture. At the Conference the results of expert groups were discussed in round tables.

37. Key aspects identified by the expert meetings preceding the HLC are grouped according to the selected core functions and have heavily influenced the proposed elements of a strategic approach, as presented in this document. The text also covers those areas of direct support to Members that appear to be especially pertinent and as such might receive relatively more emphasis in the future.

***Providing long-term perspectives and leadership in monitoring and assessing trends in agriculture and environment***

38. One of the core functions of FAO is to provide long-term perspectives and leadership in monitoring and assessing trends in food security and agriculture, fisheries and forestry. In this context, FAO currently (i) monitors trends in global level assessments of land resources, land use, land suitability, land degradation and soil/land management practices and water resources, and (ii) assesses interactions between land and climate change, including GHG emissions and carbon sequestration, and payments for environmental services. It also analyzes the use of exchange mechanisms in genetic resources for food and agriculture facilitating decision-making on relevant international, regional and national mechanisms for access and benefit sharing, as well as crucial topics for the environment, such as on Payment for Environmental Services and liquid biofuels.

39. In order to ensure follow-up to the HLC preparation process, FAO should be asked to carry out global assessments on biodiversity for food and agriculture taking climate change into account as well as an analysis of water use in all water-using sectors and the value and productivity of water in the various agricultural sub-sectors assessing competition, complementarities and relative contributions to food security. In addition, it should be asked to identify what tools should be created in order to measure, monitor and verify soil carbon pools and fluxes of GHG emissions (namely nitrous oxide) from agricultural soils, including croplands and pastures.

***Stimulating the generation, dissemination and application of information and knowledge, including statistics – provision of global data, including geospatial data***

40. In order to reinforce national capacities and support national decision making, FAO develops information on the land characterization and classification systems and global statistics on water availability, including exploitable groundwater reserves, use and quality (AQUASTAT). It also supports country-driven overall water use assessments as well as strengthening of relevant national research and extension systems.

41. The HLC preparation process identified the following subjects of importance for follow-up:

- Integration of water management, agriculture and food security databases in FAO and at national level, with a clear identification of irrigated and rainfed production and a clearer distinction between the sources of water supply (rainfall, surface water, and groundwater), while impact of climate variability should also be monitored.
- National biodiversity inventories, including relevant spatial information assessing climate change threats to species, populations or genotypes of relevance to food and agriculture.

Information systems on genetic resources need to be strengthened as a fundamental basis for sustainable use.

- Risk assessment, prevention, monitoring and control of exotic animal and plant diseases, pests, weeds and invasive alien aquatic species will further gain in importance under climate change. Global data exchange mechanisms that cover their distribution and related ecological conditions are required.
- Increasing understanding of climate impact on food security and access to natural resources, systematic national and local risk assessment is required combining downscaled climate models that focus on projected changes, with local-level vulnerability assessments that concentrate on current threats, particularly to coastal, riverine and drought-prone areas.
- A substantial increase in the development and dissemination of relevant agricultural technologies is urgently needed to meet the requirements for sustainable intensification and adaptation to and mitigation of climate change.
- Global studies must be complemented by comprehensive national assessments of climate change impacts on agriculture and food security to support decision making. Studies should consider a wide range of crops and livestock and take into account local farming dynamics and resource bases, food marketing chains and delivery systems, food prices, and the implications of agricultural policies.

42. Considering the above, FAO should be asked to develop, in collaboration with other relevant international organizations, a globally-based information and data clearinghouse on liquid and other types of biofuels, and the issues and challenges they pose to food security, poverty reduction and the environment. Specifically, with regard to liquid biofuels, FAO, in collaboration with the Organisation for Economic Cooperation and Development (OECD), the World Trade Organization (WTO) and other organizations such as the United Nations Environment Programme (UNEP), should be asked to produce technical reviews on food insecurity, the influence of subsidies and the environmental impacts.

43. In addition, in its Comprehensive Framework for Action (CFA), the UN High-Level Task Force on the Global Food Security Crisis recommended several actions aimed at developing an international biofuel consensus, placing particular emphasis on (i) the promotion of research for and development of first generation technologies for non-food biofuel crops as well as second-generation technologies, especially those adapted to developing countries, that focus on cellulose from stalks and leaves, and waste and residues rather than food sources, and (ii) that studies should be carried out on efficiency improvements for biofuels production.

***Negotiating international instruments, setting norms, standards and voluntary guidelines, supporting the development of national legal instruments and promoting their implementation***

44. FAO can and does provide support for strengthening national and global capacities for the development and implementation of regulations and standards. In particular, it:

- Develops guidelines for soil use, participates in meetings of international agreements and conventions where land use, land use change and land degradation are relevant and assists countries in their reporting obligations under these international instruments.
- Provides an inter-governmental forum for policy making on genetic resources through the Commission on Genetic Resources for Food and Agriculture (CGRFA) and supports the implementation of the CGRFA's Multi-year Programme of Work and the development of global instruments for the conservation and sustainable use of genetic resources.
- Provides the Secretariat to the International Treaty on Plant Genetic Resources for Food and Agriculture.
- Has adopted or is negotiating other agreements and guidelines that are important in the nexus agriculture/environment and assists member countries in their implementation; these include the International Plant Protection Convention; the FAO/UNEP administered Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; and the International Code of Conduct

on Distribution and Use of Pesticides. In relation to the latter, FAO and the World Health Organization (WHO) recently signed a memorandum of Understanding on its promotion and implementation. Further, work has been initiated on voluntary guidelines on the responsible governance of tenure.

- Supports the implementation of relevant treaties, standards and guidelines, either concluded within the framework of FAO or in other Organizations, in particular, the Cartagena Protocol on Biosafety and the Convention on Biological Diversity also following closely the development and implementation of private standards.
- Provides the Secretariat and technical inputs to the Global Bioenergy Partnership (GBEP), in which countries collaborate with the private sector and civil society and multilateral agencies to establish science-based sustainability criteria and indicators for bioenergy.

45. During the HLC preparation process, it was underlined that regional agreements, organizations and cooperation were important elements for neighbouring countries that share similar problems, in particular in relation to transboundary water management and transboundary plant and animal diseases and pests. It was also stressed that both developed and developing countries will need to ensure environmental sustainability of bioenergy development by adopting policies through which bioenergy will have a positive impact on the GHG balance, protect land and water resources from depletion and environmental damage, and prevent new release of pollutants. To support such policies, there is an urgent need for international agreed standards that address the global environmental implications of bioenergy production.

46. Concurrently, the CFA recommended that biofuel guidelines and safeguard measures be developed which minimize adverse impacts on global food security and the environment and mitigate risks of biofuel development in the short and medium term.

#### ***Articulating policy and strategy options and advice***

47. FAO can provide support by assisting member countries in defining policy options for sustainable production intensification and mainstreaming the ecosystem approach, and provide policy advice on sustainable land and water use, in support of national and regional policy and strategy formulation and implementation. FAO can also assist governments in mainstreaming of measures addressing climate change in national policies, strategies and programmes and in ensuring environmentally, economically and socially sustainable biofuel production by introducing policies that protect the poor and food-insecure, taking advantage of opportunities for agricultural and rural development, ensure environmental sustainability and review existing biofuel policies in line with the recommendations of the SOFA 2008 report.

#### ***Providing technical support, promoting technology transfer, catalyzing change and building effective and sustainable institutional capacity***

48. FAO can provide assistance to member countries to strengthen their capacity to generate and use soil, land and land use data and to monitor and report on national water resources and water use (quantity and quality), including the use of geospatial information. It also assists member countries to address issues related to land evaluation, land degradation, land use planning and sustainable land management; water scarcity, irrigation and water efficiency options; irrigation performance and modernization of water use efficiency and productivity; and in the formulation, implementation and monitoring of inter-sectoral adaptation and mitigation policies, strategies and programmes.

49. FAO supports sustainable agricultural development through advice and capacity building on integrated pest management (IPM) strategies, integrated crop-livestock systems and conservation agriculture. Through the Global Partnership Initiative for Plant Breeding Capacity Building (GIPB), FAO also provides support to strengthen national capacity to ensure a better use of plant genetic resources in order to produce improved cultivars adapted to the increasingly heterogeneous and variable climatic and weather conditions.

50. The HLC preparation process underlined the importance of the following issues:
- Extension, which was neglected in the last decades, will need to be strengthened substantially to provide an efficient interface between policy-makers, research and the farming community.
  - Identification of management options that revise operating procedures for water storage systems; improvement of watershed management and soil moisture conservation practices to increase infiltration and soil water storage; increase of surface and groundwater storage options and of water productivity; improvement of national risk management through better monitoring networks, risk assessment, early warning, risk sharing and participatory response mechanisms; and consideration of alternative sources of water supply.
  - Economic and financial systems need to document and quantify current patterns of water use and water entitlements, develop transparent water allocation mechanisms to protect water use rights while providing greater flexibility to respond to climate change and develop innovative insurances products.
  - Local institutions need to manage agricultural biodiversity and strengthen community capacity to access genetic resources and associated information to cope with climate change.
  - Genetic resources need to be monitored *in situ*, to increase understanding of threats and vulnerability due to climate change. *In situ* and on-farm conservation measures need to guarantee the dynamic evolution of genetic diversity to changing conditions.
  - Farmer adaptation strategies need to harness farmers' ecological knowledge and local institutions to enable development of more effective adaptation. This will also allow farmers and rural communities to play a role in climate change discussions and policy.
  - Adaptation measures will need to be developed and extended ranging from temporal and spatial variations in production systems (e.g. adjusting planting dates, rotations, multiple cropping/species diversification, crop-livestock pisciculture systems, agroforestry) to conferring better protection against temperature changes, changing rainfall variability and patterns, salinization, and pest attacks and to investing in soil, water and biodiversity conservation and development (e.g. building soil biomass, restoring degraded lands, rehabilitating rangelands, harvesting and recycling water, planting trees, developing adapted cultivars and breeds, protecting aquatic ecosystems).
  - Disaster risk management plans and risk transfer mechanisms for adaptation need to be developed, such as crop insurance and diversified livelihood systems.
  - Land tenure constraints, and pressures and conflicts over resources need to be managed aiming at securing land and rights to resources of groups and individuals, facilitating community involvement and establishing solid institutions for governance and conflict resolution.
  - Strengthening of national veterinary and plant health systems requires targeted legislation, enforcement, adequate infrastructure, diagnostic expertise, surveillance, border control and emergency preparedness.

***Undertaking advocacy and communication, to mobilize political will and promote global recognition of required actions in areas of FAO's mandate***

51. Through various forms of communication and meetings, FAO draws the attention of member countries to the need for sustainable agricultural production, the sustainable use of natural resources and the trade-offs of biofuel and other issues related to the interaction between agriculture and the environment. It also actively participates in and provides inputs to intergovernmental sessions and processes to ensure that the dimensions of food, agriculture, forestry and fisheries are reflected in the negotiations and implementation of international instruments addressing global challenges.

## V. Expected Committee Guidance

52. The Committee on Agriculture may wish to:
- Recall the challenges to sustainable agricultural production and natural resource use that need to be overcome through ecosystem approach to meet increased demand for agricultural produce.
  - To this effect, recall the need for an ecosystem approach to agriculture and environment and recommend that FAO take steps to ensure its further development, continue to advocate the mainstreaming of the ecosystem approach to agricultural production and provide assistance (including validation, capacity building and policy reform) to countries in its application.
  - Recommend a review of the International Code of Conduct on the Distribution and Use of Pesticides that addresses pesticides in both the agricultural and health sectors.
  - Recommend that sustainable use and conservation of natural resources (land and water) be set as a priority in FAO's efforts to increase the productivity of agriculture.
  - Recognize that biodiversity plays a fundamental role in ensuring increased production in a sustainable manner and recommend that high priority be given by FAO to biodiversity activities.
  - Recognize the decline in agricultural and agro-ecological research and extension and recommend that the Organization strongly advocate investment in public and private international and national research and extension to meet the challenges of the 21<sup>st</sup> century.
  - Recall that the 34<sup>th</sup> Session of the FAO Conference expressed particular concern over climate change and variability and that the HLC recognized (i) the importance of adaptation and mitigation to climate change, and (ii) of creating opportunities for world's smallholders to participate in, and benefit from financial mechanisms and investment flows to support climate change adaptation, mitigation and technology development, transfer and dissemination; recommend that the Organization give high priority to these issues and develop global monitoring on impact of climate change on food security.
  - Recall that the CFA recommended to seek international consensus on liquid biofuel development and that the HLC called "upon relevant intergovernmental organizations, including FAO, within their mandates and areas of expertise, with the involvement of national governments, partnerships, the private sector, and civil society, to foster a coherent, effective and results-oriented international dialogue on biofuels in the context of food security and sustainable development needs and recommend that FAO take the lead in this process".
  - Recommend that FAO support the sharing of knowledge on small-scale bioenergy technologies and adoption of bioenergy by small-scale farmers for local development where appropriate.
  - Identify issues among the elements provided in Chapter IV above that should be given a high priority.