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**Policy options and actions for expediting progress in
implementation: drought****Report of the Secretary-General***Summary*

Policies to reduce the impacts of drought need to be developed and adapted at all levels with the participation of all stakeholders. In addition to natural resources conservation and structural adaptation to climatic variability, policies that focus on exploiting alternative sources of water such as rainwater harvesting, water treatment and reuse, including measures for water recycling, and reclamation of waterlogged land will be crucial. A more sustained impact can be ensured if policies are consistent with traditional community-based strategies for coping with the challenges posed by drought and climate change. Improving access by developing countries to drought-tolerant crop varieties is essential for agricultural production and food security in drought-affected regions. Traditional knowledge and methods concerning soil and water conservation need to be promoted as a cost-effective solution. Reducing pastoral poverty will require governments, non-governmental organizations and development partners to shift their focus from relief efforts to strategies aimed at resource mobilization, infrastructure development and capacity-building. Partnerships at various levels could result in increased investment in the establishment of early warning and monitoring systems.

* E/CN.17/2009/1.



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I. Introduction

1. At its sixteenth session, the review session of the third implementation cycle 2008-2009, the Commission on Sustainable Development conducted a review and assessment of the progress achieved towards goals in the selected cluster of issues relating to agriculture, rural development, land, desertification, drought and Africa, as contained in Agenda 21,¹ the Programme for the Further Implementation of Agenda 21² and the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation).³ The Commission identified constraints and obstacles as well as new challenges to, and opportunities for, implementation in the selected thematic cluster of issues.

2. At its seventeenth session, the policy session of its current implementation cycle, the Commission will take policy decisions and practical measures aimed at expediting implementation in the selected cluster of issues. The session will be preceded by an intergovernmental preparatory meeting.

3. The present report is a contribution to the discussions to be held at the intergovernmental preparatory meeting on policy options and possible actions to expedite progress in mitigating the effects of drought. It responds to the challenges and obstacles highlighted in the report of the Commission on its sixteenth session (E/2008/29-E/CN.17/2008/17). The cross-cutting issues identified by the Commission at its eleventh session, including the means of implementation, are addressed throughout the present report. The report benefited in particular from inputs from the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme, the International Fund for Agricultural Development (IFAD), the Economic Commission for Africa, the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification, and major groups. The report should be read in conjunction with the reports of the Secretary-General on agriculture, land, desertification, drought and Africa, which will also be before the intergovernmental preparatory meeting of the Commission.

II. Policies for Drought Management

4. The impacts of drought can be reduced through the implementation of adaptation strategies and measures to improve preparedness. While adaptation has generally been tackled through drought-management plans and coping strategies, preparedness should be managed mainly through the development of climate predictions and early warning systems. China, for example, has developed an operational system for drought early warning for the North China plains that integrates drought models, remote sensing and meteorological data to produce a series of drought maps and reports.

¹ *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions Adopted by the Conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

² General Assembly resolution S-19/2, annex.

³ *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex.

5. Past attempts to manage drought risks have often been implemented through a reactive crisis-management approach, in which ad hoc emergency drought responses are identified and enacted as the drought develops. However, the severe human and environmental impacts of past droughts, together with the increasing perception of threats posed by climate change, have led to more proactive risk-based management approaches that allow for better drought monitoring, prediction and adaptation. At the national and regional levels, comprehensive drought planning now covers risk evaluation, impact assessment and impact management.

6. Many drought-affected developing countries are still encountering difficulties in integrating drought-management plans and coping strategies with national development and budgetary frameworks. Weak institutional structures, lack of technical capacity, limited progress in mobilizing stakeholders' participation and investment, and lack of in-depth understanding of the benefits of effective drought management for poverty reduction and economic development continue to slow progress in effective integration in some countries.

7. Drought-risk-reduction policies and practices often fail to take sufficiently into account social factors such as gender, age and social and economic capacities. Women, children, the elderly and the poor are especially vulnerable to the effects of drought. Special consideration must be given to those populations and those livelihoods least able to cope with drought.⁴

8. Australia, India, New Zealand and the United States of America have developed successful models for the elaboration and implementation of drought policies and plans from the community to the national level. Those models include a strong institutional infrastructure to support policy implementation. Likewise, the European Drought Centre, which promotes collaboration and capacity-building between scientists and the user community so as to increase society's preparedness for and resilience to drought, is a regional cooperation model that could be followed. The Centre has become a virtual knowledge centre in coordinating drought-related activities in Europe with a view to better mitigating the environmental, social and economic impact of droughts.⁵

Box 1

Reducing vulnerability to drought and climate change: the Global Environment Facility pilot project in Africa

The Global Environment Facility Strategic Priority on Adaptation is piloting a range of drought-coping mechanisms in Ethiopia, Kenya, Mozambique and Zimbabwe aimed at reducing the vulnerability of farmers and pastoralists to drought and future climate shocks. The components of those coping strategies include: (a) improving early warning systems; (b) assisting governments in the implementation of drought-management strategies and adaptation plans and integrating climate change/drought issues across sector policies; and (c) providing opportunities for the sharing of information on successful outcomes. The

⁴ "Drought Risk Reduction Framework and Practices: Contributing to the Implementation of the Hyogo Framework for Action", p. 44, available at www.unisdr.org.

⁵ <http://cordis.europa.eu/fp5/about.htm>.

mitigation strategies such as agricultural diversification and the building up of food and water reserves.

Source: Martin Krause, “Coping with Drought and Climate Change”, Project Inception Meeting, Nairobi, 2005.

9. Building up the resilience of farming and pastoral communities to drought has increasingly been recognized as an essential element of drought-management plans. Evidence suggests that policies and measures that support resilience-building are particularly effective if they integrate community-based traditional drought-coping practices.

A. Growing drought-tolerant crops

10. Heavy dependence on mostly rain-fed agriculture has rendered many developing countries particularly vulnerable to the impact of drought on rural communities, especially in Africa. Food shortages and even famine have resulted from a sharp drop in agricultural production, high food prices, and increased water scarcity and variability. If farming communities are to adapt successfully to climate change, they will need crop varieties with greater tolerance to drought.

11. Research on and the development of drought-tolerant crop varieties, carried out mainly through regional and international partnerships, have yielded practical results. Working in cooperation with the International Maize and Wheat Improvement Centre and national partners in sub-Saharan Africa, scientists of the Consultative Group on International Agricultural Research have developed more than 50 such varieties, which are being grown on a total of about 1 million hectares. Researchers at the International Institute of Tropical Agriculture have made significant progress in developing early-maturing maize varieties that can grow in regions with short rainy seasons. As a result of the work of the Africa Rice Centre and its national partners, rice varieties that are resilient to drought have been developed which combine the high productivity of Asian rice with the ability of African rice to tolerate harsh growing conditions.

12. Many developing countries consider drought-resistant crops as a promising adaptation option to increase food production and food security under extreme climatic conditions. There are noteworthy examples of the successful growing of drought-tolerant crop varieties. Drought-tolerant barley developed at the International Centre for Agricultural Research in the Dry Areas is being grown in the Middle East, including the Syrian Arab Republic, and North Africa. Drought-tolerant crops developed at the International Centre for Tropical Agriculture and grown in Latin America have yielded roughly double the maximum yield that farmers get from commercial varieties grown under the same climatic conditions.⁶ In Morocco, more than 75 varieties of cereals, including drought-resilient crops, have been released by the National Institute for Agricultural Research. These new varieties have allowed farmers to increase their grain yield of bread wheat and barley by 35 and 50 per cent, respectively. Over the past 20 years, yield

⁶ Consultative Group on International Agricultural Research (CGIAR), CGIAR and Climate Change, Research and Impact: CGIAR on Global Issues (Briefing Dossier, 2007-2008).

improvement of cereals has corresponded to an increase of 2 to 4 quintals per hectare.⁷

13. In Israel, researchers have identified through genetic research the factors that enable plants to tolerate and survive the harsh desert conditions of heat, drought and salinity. That discovery has led to the development of staple crops such as corn and rice that can cope with the climate changes associated with global warming. Israeli experts estimate that by 2025, crop yields would have to increase by 40 per cent to support the ever-growing population of the world.⁸ This could counteract the impacts of global climate change that result in a loss of fertile areas and an increased prevalence of desert-like soil conditions.

14. Despite good initiatives such as the ones mentioned above, access by many developing countries to drought-tolerant crops remains limited, constraining their ability to maintain food security at the community and household levels in times of drought.

15. As vulnerability to drought has increased globally, greater attention has also been directed to seasonal cropping patterns and seasonal agricultural prices. Developed countries, including the United States of America, are using seasonal indexes to calculate agricultural price forecasts in order to develop their marketing plans. So as to deal with crop seasonality, governments should consider the introduction of various cropping patterns. Many researchers today consider mixed cropping the most efficient land-use strategy. In India, for instance, breeders are developing pulse and oilseed plant types with good compatibility with row crops. In the case of plantation crops, intercropping with pulses and fodder crops is common and has proved successful. To expand and sustain their agricultural markets, the Governments of developing countries also must continue to develop viable fertilizer industries.

B. Conservation and management of water resources

16. The central element of drought is water deficit with competing claims for water for domestic, pastoral, industrial, agricultural and energy needs. Water deficits are primarily and directly linked to a steady decrease in rainfall and surface water resources. It is expected that climate change will increase the intensity of the water cycle, resulting in particular in more severe and prolonged droughts. This will increase the risk of the rapid depletion of surface-water resources and diminish the ability of groundwater to “recharge” in already water-stressed drylands.

17. Water scarcity causes dislocation, ethnic tensions and disputes over cross-border water use. The management of transboundary water resources, whether surface or groundwater, has technical, cultural, legal, economic and social dimensions that are linked by the hydrological cycle. It is essential to avert potential conflicts that could lead to refugee situations and the exacerbation of regional conflicts by maximizing the potential for cooperation among countries and by diversifying livelihood strategies for vulnerable communities.

⁷ Mohammed Karrou, “Climate Change and Drought Mitigation: Case of Morocco”, available at www.fao.org/sd/climagrimed/pdf/ws01_38.pdf.

⁸ “Israeli researchers close in on drought-resistant crops”, 11 February 2008, available at www.mfa.gov.il.

18. Managing competing claims for water is an integral part of planning for drought management, taking into account surface water which flows in rivers or is stored in lakes and reservoirs. This can require measures to restrict, through cooperation with the main actors involved, the allocation of water from dam reservoirs for different uses. Priority should be accorded to domestic use; other priorities should include livestock and perennial crops. Water rationalization and conservation at all levels is key, especially in irrigation and industrial uses. Restrictions on allocations from multi-purpose reservoirs could be rationalized on the basis of other factors such as marginal economic values for other uses in agriculture, energy, industry, recreation or navigation, as well as for the environment.

19. Inland wetlands constitute an important land and water interface and provide an opportunity to mitigate the effects of hydro-climatic variations. Lakes, surface-water reserves and groundwater reserves are a strategic source of water and should be used for development opportunities and to enhance the resilience of semi-arid countries and water-stressed communities.

20. Where depletion of groundwater is acute, special attention should be paid to the sustainable use of deep groundwater resources. National Governments are required to put in place long-term strategies to protect existing aquifers. Such strategies should include the exploitation of alternative sources of water, including rainwater harvesting and water treatment and reuse. In India, for instance, rainwater harvesting is a centuries-old tradition. Traditional water-harvesting techniques are also used in West Africa to sustain agricultural production. Run-off water from adjacent catchments that is channelled to underground rainwater reservoirs (cisterns) remains an important source of water, including in the drylands of Egypt, Jordan and the Syrian Arab Republic. Rooftop water harvesting provides low-cost water for drinking and household uses for drylands communities in Latin America, the Middle East, sub-Saharan Africa and Asia. The successful implementation of integrated water-use strategies requires capacity-building, technology transfer and financial resources.

21. Other strategies for coping with chronic water scarcity in dry areas include water recycling, reuse and reclamation. A more positive public perception of the use of reclaimed or recycled water for non-drinking purposes can be promoted through education and awareness-raising measures. The expanded use of economic incentives and demand-management measures could lead to considerable water savings.

22. Several case studies in various countries demonstrate clearly that current methods for wastewater treatment and disposal and its partial reuse on agricultural soils can cause significant environmental problems. There is a need for strengthened local institutions and enhanced capacities if such difficulties are to be overcome. There is also a need to further develop and adapt treatment systems to local climatic and cultural conditions. Training courses and pertinent information should be made more available so as to educate students in this complex field.⁹ In that respect, a model to consider is the wastewater treatment research centre in Kuwait, which was created to promote the exchange of experience and technical know-how on the

⁹ United Nations Educational, Scientific and Cultural Organization, "Water Programme for Africa, Arid and Water Scarce Zones" (2005), available at <http://unesdoc.unesco.org>.

management of treated wastewater, particularly among countries of the Middle East, and to foster studies and research on wastewater treatment and reuse, with a special focus on agriculture.

23. Strategies for sustainable land management and planning, as detailed in the Secretary-General's report on land (E/CN.17/2009/5), can offer effective means of adapting to droughts. Conservation tillage systems have proved effective in maximizing rainfall infiltration and storage of water in the soil, enabling even crops lacking supplemental irrigation to bridge severe dry spells. Building resilience in rain-fed farming systems is also a means of water-demand management. More crops are produced per drop of water in resilient farming systems, which reduces the amount of water needed to produce food. Despite opportunities to build resilience to mitigate droughts, severe drought years are inevitable.¹⁰

24. Enhanced water management in agriculture requires the introduction of improved soil-moisture conservation measures and a reduction in wastage of local irrigation water. Reduction in water wastage also brings additional benefits in terms of minimizing the loss of applied nutrients, water erosion and the pollution of surface water and groundwater. There are many promising strategies for increasing water-use efficiency, including appropriate integrated land and water management practices. Irrigation technologies such as trickle/drip and sprinkler irrigation have been generally found to be feasible in the more arid regions, such as in the Punjab region of Pakistan.¹¹ Those technologies are used for the irrigation of high-value crops such as fruits or nut trees, grapes, sugar cane, flowers and vegetables and could be used in other drought-prone countries.

25. In order to mitigate the vulnerability of rural people, it is crucial to protect, integrate, enhance and validate traditional and local knowledge and practices in the area of water conservation. There is a need for a thorough understanding of the reasons for the success or failure of current practices and of approaches to risk prevention, reduction or shifting for those faced with drought. Such knowledge is needed at the grass-roots, national and international levels, so that policies can be properly translated into actions, planned in conjunction with local people, that are rich in local content. In Africa, for example, practices such as the construction of ridges (bunds or diguettes) with stones or earth and water pockets have proved to be successful and should be upgraded.

26. In countries that depend largely on agriculture for self-sufficiency and have seen their agricultural production devastated by floods and droughts in the recent past, an integrated and participatory approach to watershed management is essential. Bangladesh and other drought-affected countries have been applying knowledge gained from a forestry project on the sustainable development of upland water catchments and the use of marginal agricultural land to help reduce soil erosion, protect natural resources and increase agricultural output in the country.

27. The conservation and management of scarce water resources must be complemented by policies and measures aimed at the protection and rehabilitation

¹⁰ Johan Rockström, "Resilience building and water demand management for drought mitigation", September 2003.

¹¹ M. R. Akhtar, "Impact of Resource Conservation Technologies for Sustainability of irrigated Agriculture in Punjab-Pakistan", available at <http://www.jar.com.pk/pdf/11-Impact%20of%20Resource.pdf>.

of land resources. Replanting logged areas with trees that are tolerant of higher temperatures, thinning drought-stressed forests and developing pesticides have been shown to be successful strategies in this regard. India, for example, has developed a participatory forest-management approach aimed at strengthening rural livelihoods by improving the local natural resource base and by involving local populations in the protection and regeneration of degraded lands. Productivity is restored through tree plantations and soil and water conservation measures.

C. Improving the livelihoods of poor communities, including farmers and pastoralists

28. The social impacts of drought on vulnerable communities are enormous. In Ethiopia, a recent quantification of the economy-wide impacts of drought and of water-resources variability has shown their disastrous consequences in terms of poverty, hunger, migration and social instability. In semi-arid countries, one structural adaptation measure that could be taken is the promotion of more dynamic and sustained growth through greater investment in multi-purpose hydraulic infrastructure development. That would allow for a shift towards greater water resilience. At the same time, and with the same level of priority, it is necessary to develop efficient institutions and interventions aimed at decreasing the vulnerability of the economy to drought shocks.

29. In addition to drought-tolerant crops and water conservation, livelihood strategies for local populations should also include the introduction of and support for income-generating opportunities as an important incentive for farmers, including women farmers, in drought-affected areas to invest in sustainable agriculture and natural resources management and to reduce migration from rural to urban areas. There is a particular need to improve access by farmers to appropriate and affordable agricultural technologies and corresponding field training so as to increase food production and grow drought-tolerant crops while maintaining soil productivity. For example, FAO and the Asian Disaster Preparedness Centre started a project in 2006 aimed at undertaking an assessment of livelihood adaptation to climate variability and change in drought-prone areas of north-west Bangladesh. The project, which developed a good practice adaptation option menu, includes the evaluation and field testing of locally selected options that provide income to communities.¹²

¹² R. Selvaraju, A. R. Subbiah, S. Baas and I. Juergens, "Livelihood adaptation to climate variability and change in drought-prone areas of Bangladesh: developing institutions and options", Rome, 2006.

Box 2

Integrating sustainable development and drought management in India

The Government of India developed the Indo-German Watershed Development Programme between 1992 and 2001. The programme was widely successful in many regions of the country, particularly in Darewadi, where, after five years of restoration activities, 65 per cent of previously denuded terrain was covered with trees and grass, and grazing biomass increased by 170 per cent. Crops including maize, wheat and other vegetables were being sustainably grown, and the number of irrigated hectares of land increased from 197 to 342. The seasonal migration of villagers also ceased as a result of stabilized agricultural production and wages.

Source: World Resources 2005, available at <http://www.grida.no/wrr/047.htm>.

30. The adoption of policies aimed at converting degraded land into economic assets should be considered. The protection of drylands biodiversity, which represents a significant economic and cultural asset, is important in combating land degradation and desertification. Restoration activities could include the planting of trees and medicinal plants with genetic material that has cosmetic, pharmaceutical or scientific value. The pecuniary returns from the sustainable use of such valuable plant species could help dryland rural communities create income-generating opportunities and contribute to poverty eradication.¹³

31. Policies and practical measures are being implemented to improve access by small-scale farmers to local and global markets. For example, the International Fund for Agricultural Development and the African Development Bank are developing a programme in Uganda to facilitate farmers' access to markets through the development of infrastructure projects and technical assistance. To promote a sense of ownership, the decision-making process will involve grass-roots communities.

32. Women farmers are main food producers in developing countries, yet they are one of the most vulnerable groups. Their economic empowerment to produce more and to participate in policy formulation is critical to addressing poverty and food insecurity. Most smallholder farmers in sub-Saharan Africa are women in need of training and education, especially in the areas of agricultural productivity and environmental preservation. Norway has developed a strategy aimed at promoting equality in the agricultural sector that encourages women to remain in the countryside by promoting diversified economic activities in rural areas and creating new job opportunities. The project aims to achieve a participation rate for women of 40 per cent in all agricultural businesses and uses cooperation between local authorities and farmers' organizations to increase women's participation in the sector. Norway also provides financial support to young women farmers and encourages the participation of women in farm cooperatives.

¹³ National Forum on Combating Desertification and Promoting the Synergistic Implementation of Interlinked Multilateral Environmental Conventions, Mongolia, June 2001 (report summary).

33. Policies aimed at helping farmers mitigate the effects of drought should include capacity-building. Training should enable farmers to determine the timing of planting. In periods preceding droughts (during El Niño years), farmers may be advised to invest more in either drought-resistant crops or in crops which may be planted earlier in the year or season. That would allow crops to take root and be able to get deeper moisture by the time the drought starts. Since stream flow and water levels in basins are significantly affected only when a drought persists for a long time, developing irrigation systems in drought-prone areas as a backup in order to mitigate the effects of short droughts may be a worthwhile investment. For short droughts, the irrigation source may be needed only for a short time (the first several weeks or months following planting), until the roots penetrate far enough to access deeper moisture.

34. Policies in support of market development are important in the fight against poverty. The success of smallholder farmers in selling their goods at competitive prices depends on their ability to access markets. Efforts to expand road infrastructure must be intensified, and there is a need to resolve issues related to unfair trade. Huge financial subsidies by developed countries to their farmers make it virtually impossible for smallholder farmers to compete effectively in the marketplace; this is an ongoing problem that needs to be addressed. The main incentive for small holder farmers to produce more than what they require for family consumption is the prospect of selling the excess produce. If the markets are nonexistent, productivity will naturally decrease.

35. Since developed countries remain reluctant to cut back on farming subsidies, the Governments of developing countries may wish to consider incentive programmes of their own. A well-targeted package of incentives by those countries whose economies are dependent on agriculture would be helpful, especially if such incentives focus on a few key agricultural products. Such incentives would provide the necessary support to farmers in times of low productivity. Another way for the Governments of developing countries to invest in agricultural productivity is to pursue the expansion of local industry in food-processing and food-preservation technologies. That would reduce the pressure of trying to sell farm produce before it deteriorates, thereby giving farmers more time to market perishable produce. This strategy would also give farmers more control over the pricing of their produce.

36. To expand and sustain the markets, productivity needs to increase and remain high. Sustained high productivity requires the use of fertilizers and other agricultural inputs. Governments of developing countries need to develop a viable fertilizer industry by strengthening demand and increasing supply. In certain areas where the concept of using fertilizers has already been put into practice, fertilizer is very expensive, mainly because the marginal cost of importing small quantities is very high. Also, the limited number of market participants concentrates market power in the hands of a few, who can more easily manipulate prices by manipulating demand and supply. Furthermore, local transportation of fertilizer is often not cost-effective. Indeed, owing to poor road networks, it often costs less to ship fertilizer from a Western country to an African port than to transport it the relatively short distance inland to the farmer. Governments need to develop national fertilizer strategies to promote the emergence of a sustainable fertilizer production and/or distribution industry.

37. In order for smallholder farmers to sell their goods at competitive prices, Governments will have to facilitate the provision of agricultural inputs and technologies as well as financial incentives. Towards that end, in Bangladesh, small farmers have benefited from credits disbursed on highly concessional terms. In Nigeria, the Alliance for a Green Revolution in Africa and the International Centre for Soil Fertility and Agricultural Development launched in October 2008 a project involving bulk credit and support for rural agro-dealers who operate small businesses that reach farmers in remote areas. Training in safe food handling and packaging will also be provided.¹⁴

38. Currently, coping strategies for drought include nomadism, feed stocking and shifting grazing, and livestock selling. Reducing poverty and improving sustainable livelihoods in the pastoral sector requires that Governments and development partners improve livestock production and ensure greater access by pastoralists to forage and water resources and to markets for livestock trade. The possibility of promoting the supplementation of livestock grazing with other feed should also be explored; for example, Ethiopia started the practice of growing fodder banks as dry-season feed reserves for calves and small ruminants. In Jordan, the system of allocating subsidized feeds has created a major incentive to increase herd sizes. Since forage resources cannot support large herds, the desert is increasingly used to keep animals while sacks of feed are trucked in. The Ministry of Agriculture of Morocco has also introduced animal-feed distribution to farmers so as to safeguard livestock and encouraged farmers to use improved and adapted management packages to acquire subsidized inputs and agricultural equipment in order to secure 60 million quintals of cereals in moderately dry cropping seasons.¹⁵

39. The promotion of other rural livelihood activities such as small agro-based activities, in addition to pastoralism, is equally important and must be underpinned by investment in enabling infrastructure such as roads, rail links and marketing routes.

40. In Africa, for example, Governments should also consider improving water supply as a way of evening out the variability in precipitation that leads to periodic crashes in livestock numbers. Arid rangelands have generally been the object of extensive well and borehole implantation, which has encouraged herd expansion beyond the capacity of rangelands to support them. Arid areas in Somalia and Ethiopia have also been the recipients of local investment to build cemented underground water cisterns, or *birkeds*, around which settlements often develop.¹⁵

41. Stock numbers can continue to be governed by the pastoralists' traditional strategy of enhanced mobility and accessible communications, which optimize the advantages and opportunities offered by changing climatic and episodic conditions. Grazing systems could remain essentially event-driven. However, efforts should be made to understand the special needs of pastoral nomads, taking into account in particular their cultural values and the need to involve them in processes of change and development that have the potential to affect them.¹⁶

¹⁴ See <http://www.agra-alliance.org/content/news/detail/868>.

¹⁵ Watkins and Fleisher, "Tracking pastoralist migration: lessons from the Ethiopian Somali National Regional State" (1998).

¹⁶ Squires, V. R. and Sidahmed, A. E. (eds.) "Drylands: sustainable use of rangelands into the twenty-first century", IFAD Series: Technical Reports (Rome, IFAD) (reproduced with permission).

D. Introducing index-based weather insurance schemes

42. Drought has become an important risk factor in the investment decisions of both the agricultural producers and financial institutions working with farmers, making it necessary to develop and use investment schemes that take account of drought in financial risk management. Index-based weather insurance represents an emerging innovative market scheme for managing risks associated with drought.

43. While traditional crop insurance schemes exclude the weather factor, index-based weather insurance contracts are written against an index that describes an established relationship between measurable weather variables such as temperature and rainfall, and crop failure. Pilot programmes of index-based insurance products for agriculture have been successfully implemented. In Ethiopia and Malawi, such insurance schemes have proved to be economically viable (see box below) in some pilot cases.

Box 3

Introducing index-based weather insurance: the case of Malawi

In 2005, 892 groundnut farmers in Malawi bought weather insurance to increase their ability to manage drought risk and in turn access credit for better inputs. The pilot programme, while successful enough to be repeated in 2006, was designed to be a win-win project for all stakeholders. Weather insurance gave farmers the ability to mitigate drought risk and therefore secure access to finance and inputs for improved production as an alternative to lower-income subsistence farming. It also protected loan providers from weather-related production risks and allowed the banks to expand their lending portfolios into the rural areas in a managed way. With no regulatory impediment and with reinsurance potential, insurers, which in the past had limited and unsuccessful experience with traditional agricultural insurance, saw the pilot as an exciting opportunity to re-engage with farmers.

Source: "Developing index-based insurance for agriculture in developing countries", Sustainable Development Innovation Briefs, Issue 2, United Nations Department of Economic and Social Affairs, March 2007.

44. Initial experience with index-based weather insurance schemes suggests that their effectiveness depends on the presence of a network of secure, high-quality weather stations and reliable information-management systems. Currently, many drought-affected developing countries, in particular in Africa, have neither the expertise nor the facilities to design index-based products locally. An increased focus on technical training for participants in the insurance and finance sector is therefore needed.¹⁷

¹⁷ "Developing index-based insurance for agriculture in developing countries", Sustainable Development Innovation Briefs, Issue 2, United Nations Department of Economic and Social Affairs, March 2007.

E. Drought monitoring and early warning

45. Understanding the underlying causes of vulnerability to extreme weather events has also been an essential component of drought management, because the ultimate goal is to determine the risk of drought for a particular location and for a specific group of people or economic sector.¹⁸ There is a need for comprehensive and integrated approaches to effective drought monitoring, drought impact assessment and early warning. At the global level, the FAO Global Information and Early Warning System on Food and Agriculture meets the requirements of an integrated information, monitoring and early warning system. The Famine Early Warning Systems Network, sponsored by the United States Agency for International Development, represents a noteworthy regional system. The system focuses mainly on Africa, but also covers parts of Central Asia, Central America and the Caribbean.¹⁹

46. At the national level, drought-monitoring systems based on a single indicator or climatic index have been developed in Australia, China and the United States of America. Each of those countries has developed unique monitoring systems adapted to its needs and capacity to deal with drought. For example, China relies heavily on the Standardized Precipitation Index to monitor drought occurrence, and Australia quantifies precipitation percentiles. The United States Drought Monitor and the North American Drought Monitor utilize multiple climate indices and indicators to assess drought conditions.²⁰

47. Monitoring of meteorological and hydrological drought and early warning systems must have the capacity to forecast or detect with a certain level of probability, signs of change in weather and climate, for example, in terms of temperature and rainfall. This requires systems that integrate precipitation and other climatic parameters with water information such as stream flow, snowpack, groundwater levels, reservoir and lake levels, and soil moisture into a comprehensive assessment of current or forecasted drought and water-supply conditions.²¹ Attention needs to be paid to other critical economic and social indicators, including market data such as grain prices and the changing terms of trade for staple grains and livestock as an indicator of purchasing power in rural communities, and the threshold for migration of household members to search for work or for selling non-productive assets.

¹⁸ "Drought monitoring and early warning: concepts, progress and future challenges", p.12, available at www.wmo.ch/pages/publications/showcase/documents/1006_E.pdf.

¹⁹ See http://www.un.org/esa/sustdev/csd/csd16/rim/escap_drought.pdf.

²⁰ Ibid.

²¹ "Drought monitoring and early warning: concepts, progress and future challenges", p.13, available at www.wmo.ch/pages/publications/showcase/documents/1006_E.pdf.

Box 4

Drought monitoring in the United States and North America as a whole

Drought monitoring for the United States and North America as a whole involves collaboration and cooperation on the part of many groups, agencies and universities. The United States Drought Monitor is a weekly project that allows for the depiction of drought conditions across the country. The National Drought Mitigation Centre, along with the National Oceanic and Atmospheric Administration and the United States Department of Agriculture, share responsibility for the information, with the help of more than 200 contributors each week. The data used relates to precipitation, drought indices, soil moisture, river/stream flow, satellite data, snow-depth information and reservoir storage. These efforts have allowed for drought depictions for large areas on the basis of information, data and feedback from the affected regions.

Source: Brian Fuchs, National Drought Mitigation Centre, United States Drought Monitor, available at <http://drought.unl.edu/dm>.

48. The development and improvement of relevant monitoring and preventive measures should include the promotion of a full and open exchange of ideas and information and the dissemination of data on assessment, monitoring, and early warning systems for drought at the international, regional, national and local levels. This encompasses the development of decision-support models for the dissemination of drought-related information to end-users and appropriate methods for encouraging feedback on climate and drought assessment products, and on other forms of early warning information. Training end-users about the value of such information in the decision-making process is essential. Once drought conditions are known, information should be disseminated on the severity of conditions, potential impacts and possible mitigation or emergency response actions in order to better respond to drought conditions.²²

49. The effective gathering and sharing of such information among regions and subregions is needed and will require the promotion of institutional development and the skills necessary for effective collaborative research and planning among the relevant scientific groups (i.e., physical and social scientists), policymakers and stakeholders. Where possible, scientists should also encourage the prudent use of climate and forecast information to foster a shift from reactive to proactive management of drought risks.

50. Drought-affected developing countries need assistance in establishing drought-monitoring systems and in building early warning capacities so as to increase their ability to take informed decisions to respond to drought, including drought impact assessments.

51. Networks should also continue to be established to support the sharing of basic climate and early warning information across borders and regions. For example, the

²² “Investing in drought preparedness”, World Bank Agriculture and Rural Development “Water for Food” team (February 2006).

Regional Training Centre for Agrometeorology and Operational Hydrology and their Applications, a specialized centre of the Permanent Interstate Committee for Drought Control in the Sahel, along with the African Centre for Meteorological Applications for Development and the Niger River Basin Authority, is providing agro-meteorological monitoring services across West Africa, in Burkina Faso, Cape Verde, Chad, the Gambia, Guinea-Bissau, Mali, Mauritania, Niger and Senegal.²³ Another regional drought-monitoring system and early warning established by the World Meteorological Organization and the United Nations Development Programme is the Drought Monitoring Centre in Nairobi. The Centre is responsible for climate monitoring, prediction, early warning and applications for the reduction of climate-related risks in the participating countries of Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, the Sudan, Uganda and the United Republic of Tanzania.²⁴ Those centres contribute to climate monitoring and prediction services for early warning and mitigation of the adverse impacts of extreme climate events on various socio-economic sectors in the region, such as agricultural production and food security, water resources, energy and health, and will enable users to put mechanisms into place for coping with extreme climate and weather-related risks.

52. There is a need to enhance the effective use by communities of seasonal weather and climate information to increase agricultural and livestock production. The rapidly improving prospects for early warning offered by remote sensing and climate forecasting are very important. In Mongolia, it has been shown that ordinary herders can listen to and make use of government-funded, scientifically driven weather forecasts. The scientific prospects for early warning vary by climatic region across the world. There is a need, therefore, to integrate technological early warning with a local understanding of drought and its impacts, with field-level monitoring and with appropriate local-level planning and action.²⁵

III. Strengthening the enabling environment for implementation

A. Scaling up financial and technical assistance

53. Reducing drought risk requires a commitment to a long-term investment of resources. Governments, the private sector, development partners and other stakeholders must consider drought a significant natural hazard and take action to cope with the challenges it poses. Many studies have shown that investing in natural-hazard preparedness and mitigation strategies is more cost-effective than relying solely on response activities. Hence, any investment in drought risk reduction, mitigation, and preparedness measures to reduce the effects of drought appears to be a good investment. Governments and other stakeholders should allocate adequate funds in their budgets for meaningful drought-risk-reduction efforts.²⁶

²³ See http://www.unisdr.org/eng/about_isdr/isdr-publications/10-drought-risk-reduction/drought-risk-reduction.pdf and www.agrhymet.ne.

²⁴ "Drought monitoring and early warning: concepts, progress and future challenges", p. 17, available at www.wmo.ch/pages/publications/showcase/documents/1006_E.pdf.

²⁵ Morton, J., "Report of a consultancy on pastoral risk management"; report to the World Bank and the Ministry of Food and Agriculture of Mongolia (2001).

²⁶ "Drought Risk Reduction Framework and Practices: Contributing to the Implementation of the Hyogo Framework for Action", p. 52, available at www.unisdr.org.

54. In addition, national Governments need to improve the investment climate for domestic and foreign investors, upon which many developing countries depend heavily to strengthen the public and private institutions of financial governance. Capacity-building is a matter of urgent priority in the areas of financial analysis, contract dispute adjudication and corporate governance. These areas should be brought into deeper partnership with development assistance agencies and multilateral institutions with respect to both the strategy for and delivery of such assistance.

55. Countries should actively participate in the Financing for Development Initiative follow-up process, which provides a good opportunity to bring the relevant public- and private-sector actors together for a sustained look at how cooperation programmes on risk management could be developed. Such programmes should be aimed at strengthening institution-building in developing countries in areas such as drought management, drawing on the comparative strengths and capabilities of development agencies, multilateral development banks, private financial institutions and academia.

56. Regional development institutions, including regional development banks, could also be encouraged to partner with the Global Environment Facility (GEF) to create further opportunities to blend bank lending for development projects directly related to drought management (baseline financing) with grant and concessionary financing from GEF resources to protect the global environment in the areas of biodiversity, climate change (including adaptation), and land degradation.

B. Enhancing the value of traditional knowledge in drought management

57. One of the most important principles of the United Nations Convention to Combat Desertification has been the recognition of the value of the traditional knowledge relating to drought management that local communities and indigenous people have accumulated over time in their interaction with nature. Traditional and indigenous mechanisms and methods for coping with the impacts of drought are well adapted to local conditions. There is evidence that traditional knowledge and methods remain an integral part of indigenous strategy for the development and implementation of drought-management policies and measures at the local level.

58. Many government and local entities may lack the capacity and resources to support community-based efforts aimed at drought mitigation. The ability to assess and incorporate local indigenous knowledge, capacities and needs into drought mitigation and preparedness strategies is essential in order to develop and implement equitable, community-based solutions. As gaps in capacity are identified, resources and expertise should be targeted to meet those needs. Appropriate long-term investment of financial and technical resources into capacity-development and drought mitigation and preparedness activities will be required to sustain such efforts. For example, vulnerable communities in the drought-prone Tonk district of Rajasthan, India, use traditional adaptation practices for drought management. These include: growing new crops such as vegetables, fodder and higher-value medicinal crops for commercial sale; the use of environmentally sound fertilizers (vermiculture); improved storage for fodder and food grains; and improved water-

conservation and harvesting techniques involving the bunding of fields, the construction of anicuts and the digging and deepening of ponds and wells.²⁷

C. Strengthening regional and international cooperation

59. Some regional mechanisms already exist and are engaging in capacity-building. The involvement of donor agencies and development organizations in the provision of assistance in the context of preventive and humanitarian emergency responses remains vital. The Swiss Agency for Development and Cooperation, for example, has a proactive regional strategy in place and has provided \$1 million a year from 2004 to 2008 to increase awareness in the area of disaster reduction, including with respect to drought mitigation; the capacity to increase the performance of risk assessments and contributions to disaster reduction; and support for development projects in Central Asia.²⁸ The European Commission has a general humanitarian plan of action to strengthen the capacity of local communities to foresee, respond to and cope with drought. The continued involvement of other agencies in providing country-specific assistance is valuable. The multilateral development banks also have policies for disaster assistance which may be streamlined into development policies at the regional and international levels.

Box 5

Regional cooperation for drought management in the Lower Mekong Basin

In December 2006, the Mekong River Commission, under the regional framework for cooperation and collaboration with the member countries of the Commission (Cambodia, the Lao People's Democratic Republic, Thailand and Viet Nam) formulated a drought management programme. Four key issues in drought management in the Lower Mekong Basin are: (a) drought forecasting; (b) drought impact assessment; (c) drought management policy; and (d) drought preparedness and mitigation measures. The formulation of the drought management programme process is a clear example of the need for a coordinated effort in the area of drought planning and management at the regional level, so as to promote intergovernmental and inter-agency cooperation on the basis of integrated water-resource-management principles. The strengthening of such regional and international cooperation requires the concern and the role of participating countries and the commitment of the countries concerned to such collaboration.

Source: www.mrcmekong.org.

60. Since the entry into force in 1996 of the Convention to Combat Desertification, a great deal of attention has been given to strengthening the

²⁷ Institute of Development Studies, "Community Adaptation to Drought in Rajasthan", *IDS Bulletin*, October 2005.

²⁸ Regional Cooperation on Disaster Management and Preparedness, Senior Officials' Meeting on Central Asia Regional Economic Cooperation, 28 and 29 August 2006.

capacities of government institutions to enable the more effective implementation of the Convention mandate. There is therefore a need to support the efforts made in the framework of the Convention to advance such strategies by fostering greater awareness, public commitment, knowledge and partnerships and to coordinate the implementation of drought mitigation and management measures. Support should include the enhancing of centres of excellence in drought monitoring and early warning systems, and improving systems for the dissemination of meteorological, agro-meteorological and agro-climatic analyses, forecasts and warnings.²⁹

IV. The way forward

61. The global economy has become increasingly sensitive to fluctuations in weather and climate, thus making drought management a complex challenge. Overcoming this challenge requires the implementation of sound policies and measures involving different actors at various levels of implementation.

62. An important first step in that direction is the improvement of drought forecasting through the establishment of appropriate drought monitoring and early warning systems, duly supported by capable national institutions and with the necessary technical backstopping from international institutions. In this regard, the systematic collection and analysis of updated, accurate and timely information on climate, weather, river flows, water stocks and soil moisture can enhance countries' capacities to deal with uncertainties resulting from lack of information necessary for drought-related planning and decision-making.

63. To complement the above capacities, national Governments also need to improve their seasonal forecasting skills, taking into consideration agro-climatic zones, and improve their information-dissemination systems. Such dissemination systems and mechanisms must be geared towards providing updated information to farmers, water and energy utilities, municipalities, and local communities, so that they can take the appropriate steps to cope with the drought events, including actions to manage water stocks.

64. The improved capacities realized as a result of the above actions will greatly enhance the effectiveness of the planning, monitoring and implementation of drought-management plans and coping strategies, including their impact. To achieve their capacity-building objectives, Governments need to tap the resources and expertise resulting from North-South and South-South cooperation and partnerships.

65. Improving access by developing countries to drought-tolerant crop varieties is essential for agricultural production and food security in drought-affected regions. Ongoing research efforts on the development of drought-tolerant crop varieties and inter-cropping systems should be intensified and broadened at the national and regional levels.

66. To cope with the risks posed by drought, national Governments need to integrate sustainable development and drought-risk-reduction programmes, including in the area of climate variability, into climate change adaptation strategies. There is also a need to promote increased awareness of the importance of water

²⁹ "Drought management and mitigation assessment for Central Asia and the Caucasus: regional and country profiles and strategies", World Bank, 6 December 2006.

policies in managing responses to climate change, which may require global cooperation. Nevertheless, drought-prone countries need comprehensive water-resources conservation and management strategies to help mitigate the effects of drought. Water rationalization and conservation will be needed at all levels and in all uses, but with special emphasis on the agriculture sector.

67. Taking a proactive, risk-based approach to drought management has proved to be effective in preventing or reducing the physical or economic losses associated with drought and climate change. This requires drought-management plans and coping strategies that integrate mitigation, adaptation and preparedness in a systematic manner. Such integrated plans and strategies offer valuable platforms for awareness-raising; the development of cross-sectoral policies at the national level; structural adaptation to climatic variability, with greater investment in multi-purpose hydraulic infrastructures; and the mobilization of the resources needed for their implementation.

68. Policies in support of market development are important in the fight against poverty. It is vital to improve access to markets for farmers, including women farmers. This may be pursued through the elimination of subsidies that make it virtually impossible for smallholder farmers from developing countries to compete in the marketplace.

69. Enhanced access to appropriate and affordable technologies and the corresponding capacity-building for the effective management and conservation of land and scarce water resources would assist farmers and pastoralists to maintain food production and food security under drought conditions, while at the same time encouraging them to invest in soil and water conservation. Traditional knowledge and methods in the area of soil and water conservation need to be further encouraged as a cost-effective solution.
