UNITED
NATIONS

Convention to Combat
Desertification

Distr.
GENERAL

ICCD/CRIC(3)/7
16 February 2005

Original: ENGLISH

COMMITTEE FOR THE REVIEW OF THE IMPLEMENTATION OF THE CONVENTION
Third session
Bonn, 2 – 11 May 2005
Item 6 of the provisional agenda

CONSIDERATION OF WAYS AND MEANS OF PROMOTING KNOW-HOW AND TECHNOLOGY TRANSFER FOR COMBATING DESERTIFICATION AND/OR MITIGATING THE EFFECTS OF DROUGHT, AS WELL AS OF PROMOTING EXPERIENCE SHARING AND INFORMATION EXCHANGE AMONG PARTIES AND INTERESTED INSTITUTIONS AND ORGANIZATIONS

EXECUTIVE SUMMARY

In the United Nations Convention to Combat Desertification (UNCCD) process, scientific provisions relating to technology transfer are broad. The subject of technology transfer is by its very nature interdisciplinary and has been approached in the following report from a variety of perspectives, but each approach, or pathway, has a direct connection to the issue of combating desertification. A significant number of events have taken place under the UNCCD process that support the promotion of dissemination of information and exchange of experience, with the secretariat playing the role of facilitator. The following are some of the key tasks that have been suggested and which may be taken into account in crafting a demand-driven scientific agenda in order to accommodate a particular approach or technology transfer technique:

(a) To encourage information-exchange networks that include not only Governments and intergovernmental organizations but also non-governmental organizations (NGOs), local communities and scientific institutions;

(b) To support data collection on biophysical and socio-economic aspects of combating desertification, and collect and disseminate local technology, knowledge and know-how and integrate them into modern technology;

(c) To ensure that collection and analysis of scientific information address the needs of local communities with a view to resolving specific problems, and also to ensure that local communities are involved in these activities;

(d) To support research activities which respond to well-defined objectives, meet the needs of local populations and lead to improved living standards for people in affected areas;

(e) To develop and strengthen local, national, subregional and regional research capacities in developing countries affected by desertification;

(f) To extend technology cooperation among affected developing countries, particularly in sectors that foster alternative livelihoods for dryland communities;

(g) To develop benchmarks and indicators of progress in combating desertification which encompass both traditional physical variables and measures of success at the community level; and

(h) To reorient extension services in affected developing countries toward participatory approaches for the conservation and sustainable use of natural resources geared towards the successful implementation of the Convention at the community level.

The approach to technology transfer may depend to a large extent on the above elements. Measuring the extent to which these activities are taking place can be interpreted as the performance measures for the utilization of science and technology as reviewed under the first and the second sessions of the Committee for the Review of the Implementation of the Convention (CRIC 1 and CRIC 2). Structuring and carrying out a sound scientific agenda will make a major contribution to the success of the national, subregional and regional action programmes which are the centerpieces of Convention implementation.

This document is an attempt to consolidate the information available from various sources which have stressed the importance of technology transfer, know-how, and the possible ways and means of advancing them within the UNCCD process. The report takes into account, *inter alia*, the deliberations of the CRIC on these matters during CRIC 1 and CRIC 2. The described thematic pathways to technology transfer include intergovernmental cooperation, cooperation and networking, private-public partnerships, small-scale enterprises, targeted training, direct public investment, financial incentives, enabling policy measures and education.

CONTENTS

I. BACKGROUND INFORMATION

1. Article 6 of the Convention commits developed country Parties to promote and facilitate access by affected country Parties, particularly affected developing country Parties, to appropriate technology, knowledge and know-how. Article 12, regarding international cooperation, states that cooperation should take place to ensure the promotion of an enabling international environment including in the field of technology transfer.

2. Article 18 addresses the transfer, acquisition, adaptation and development of technology and states that Parties will promote, finance and/or facilitate the financing of the transfer, acquisition, adaptation and development of environmentally sound, economically viable and socially acceptable technologies relevant to combating desertification and/or mitigating the effects of drought. Article 18 (a) requires Parties to the Convention to utilize fully relevant existing national, subregional, regional and international information systems and clearing houses for the dissemination of information on available technologies, their sources, their environmental risks and the broad terms under which they may be acquired.

3. Technology transfer has a broad definition and can include land management practices and techniques for soil and water conservation, as well as protected area management systems, pastoral systems, silvicultural (agroforestry, afforestation, reforestation) practices, genetically superior planting material, efficient harvesting, processing, end-use technologies and indigenous knowledge.

4. Traditional and local technical knowledge, know-how and practices, often collectively referred to as traditional technologies, represent accumulated cognitive and perceptual experience of interactions between a group of people, their physical and biological environments, and the production systems. The Committee on Science and Technology (CST) has been addressing traditional knowledge as one of its standing agenda items, and has made a number of observations in this respect. Key among these include the transfer of techniques for establishing narrow shelterbelts systems, the introduction of practices of straw checkerboards, clay/pebble/chemicals mulching for fixing drifting sands, extension of technologies for establishing bio-farms in steppe or rangeland areas, initiated to preserve overgrazed rangeland in semi-arid and dry sub-humid areas, application of practices for soil conservation, runoff harvest and terrace tillage systems, agroforestry for fertilizing soil and improving farmland.[1]

5. Moreover, the CST has also made recommendations on ways of introducing modern techniques such as water-saving techniques, greenhouse cultivation, solar energy development, biogas farms and gases exploitation, mechanization of afforestation and grazing land fodder harvest, new artificial materials for fertilizing soil and holding moisture, introduction of newly-developed soil conditioners to those regions with limited precipitation, the transfer of newly-developed water-release and conservation chemicals agents and the application of root-generating chemicals to increase the quality of seedlings.[2]

---

[1] ICCD/COP(3)/CST/3 (1999), Report of the first Ad Hoc Panel on Traditional Knowledge.

[2] ICCD/COP(4)/CST/2 (2000), Report of the first Ad Hoc Panel on Traditional Knowledge.

6. A further key to understanding the ways and means of promoting a particular approach to technology transfer is to recall that the Convention challenges the scientific community - social scientists as much as physical scientists - to put itself at the service of communities in dryland areas. "Demand-driven" science is a daunting challenge requiring a change in mindset and a different appreciation of the concept of technology transfer.[3] The Convention makes clear that a new philosophy of technological cooperation needs to replace the traditional top-down paradigm of technology transfer. One of the keys to successful technology transfer is building a cooperative partnership, beginning at the local level.

II. CONSIDERATION OF KNOW-HOW AND TECHNOLOGY TRANSFER BY THE FIRST AND THE SECOND SESSIONS OF THE COMMITTEE FOR THE REVIEW OF THE IMPLEMENTATION OF THE CONVENTION

7. The report of CRIC 1 references technology transfer under the topic Drought and desertification monitoring and assessment.[4] It is mentioned that capacity building is required in this field. It is noted that limited access to technology for geographical information systems (GIS) and/or remote sensing remains a widespread concern. Access to base-line information and data processing for an effective early warning system response is not easy, as benchmarks and indicators are often aligned to other processes.

8. Under the related topic of Access by affected country Parties, particularly affected developing country Parties, to appropriate technology, knowledge and know-how, the CRIC observed that the constraints most frequently identified remain the same:

- Weak networking among scientific institutions;
- Absence of early warning systems on drought and soil moisture;
- Limited exchange of data and work carried out at varying geographic scales;
- The chronic shortage of financial resources and limited access to appropriate technology, knowledge and know-how;
- Furthermore, the results of research, when available, are often not meaningfully absorbed by decision makers or end-users of natural resources.

9. The CRIC emphasizes that south-south cooperation, thematic programme networks (TPNs) and/or regional working groups are some of the mechanisms for disseminating traditional knowledge, and they may capitalize on existing initiatives on benchmarks and indicators with a view to achieving common standards for decision makers.

10. During CRIC 1, concerns were expressed about the limited impact of CST-related concerns in programme activities. It was recommended that the involvement of the international scientific community and the dissemination of pertinent data must be encouraged through the CST Group of Experts, and that the CST should, *inter alia*:

---

[3] Ryan, Robert (1999), Commentary – Scientific challenges in implementing the UNCCD, The Columbia Earth Institute.

[4] ICCD/CRIC(1)/10 (2002), Report of the Committee on its first session.

- Address issues of land degradation in its work programme;
- Encourage work on technologies for promoting sustainable soil management;
- Encourage a "basin-wide" approach to natural resource conservation and management; and
- Encourage cooperation with the private sector (presumably as a means of inducing technology transfer).

11. Also during CRIC 1, under a related topic, Access by affected country Parties, particularly affected developing country Parties, to appropriate technology, knowledge and know-how, it was noted that developed country Parties should provide developing country Parties with further access to new technologies and know-how for the implementation of their action programmes. Research institutions in affected country Parties need strengthening to develop innovative approaches and technologies, taking due account of, and adapting, as appropriate, traditional knowledge and knowledge systems of indigenous people, to develop both preventive and curative measures. Traditional knowledge and indigenous knowledge systems addressing local problems must be more systematically exploited, and innovations based on such knowledge should be encouraged and, where appropriate, in combination with modern technologies, adapted to local conditions. Findings must be recorded and shared, notably through the TPNs of the regional action programmes (RAPs) and the subregional action programmes (SRAPs), supported by regional and subregional institutions. The UNCCD secretariat was urged to assist this effort to facilitate replication of successful solutions.

12. Best practices should be actively promoted through the CST and its Group of Experts, the national coordinating bodies (NCBs) and the media, including all kinds of information platforms and TPNs, by highlighting these practices as points of reference. South-south and north-south cooperation as well as regional and subregional initiatives, backed by scientific research, deserve more consistent support in the form of capacity building and financial allocation. South-south initiatives for promoting training programmes would also welcome triangular arrangements with partners from the north and/or United Nations agencies as well as intergovernmental organizations (IGOs) and NGOs.

13. Activities such as the networking of scientific institutions, exchange of expertise, technology transfers, training at universities, and internships and scholarships in desertification should be systematically promoted through SRAPs and RAPs.

14. The CRIC emphasized that the TPNs should promote, with the continued support of the secretariat, the Global Environment Facility (GEF), the Global Mechanism (GM) and other interested agencies, best practices for combating desertification and implementation of the priorities and recommendations of the CST. Future meetings of the CRIC should be organized in such a manner as to facilitate input from scientists, such as the CST and its Group of Experts, and provide the Parties with outputs of all previous related meetings at the regional and international levels. This would provide an opportunity for the CRIC to examine in depth scientific issues emanating from the reports submitted for review by the CRIC. This could be achieved, for example, by way of informal working group sessions that would allow analysis and feedback.

15. Under the topic of Ways and means to promote know-how and technology transfer, it was recommended that the CST and its Group of Experts should consider provisions relating to access to relevant technology, knowledge and know-how, and that the Conference of the Parties (COP) at its sixth session may wish to take appropriate action on this matter. Governments were urged to enhance policy measures and incentives to encourage the private sector to be proactively involved in supporting technological and scientific cooperation.

16. Four case studies were presented during CRIC 1 that highlighted best practices and called attention to issues in technology transfer and the utilization of traditional knowledge. While not specifically addressing technology transfer issues, the case studies are examples of best practices that should be widely disseminated. The case studies were presented by Egypt, Honduras, Israel and Yemen.

17. The discussion on technology transfer during CRIC 2 was limited. It was stressed that inter-sessional meetings should attempt to reflect the emphasis given to priority areas such as resource mobilization and technology transfer, as well as socio-economic issues.

18. From the reports submitted to the Convention secretariat by African country Parties, it was possible to note that the gains made in implementing the Convention should not be obscure certain constraints which should be tackled as promptly as possible, so as to ensure the maximum effect of initiatives undertaken at different levels. These constraints derive primarily from a failure to integrate the various planning instruments for the integrated management of natural resources, the lack of available funding through either national budgets or external support, problems in concluding sustainable partnership agreements, and obstacles to the transfer of technology.

19. As far as new and renewable energy sources are concerned, attention was drawn to difficulties experienced by countries in discerning the interconnection between renewable energy and desertification, despite their efforts to ensure that their various energy, forestry, land and water policies are properly coordinated. The technology for the use of these renewable energy sources has been developed but its application has been impeded by several factors, including the excessive cost of certain back-up components, lack of the necessary background skills for maintenance of these back-up components, and insufficient political and economic support for initiatives to promote new and renewable energy sources. Sustainable management of energy resources is a high priority area for subregional and regional cooperation. CRIC 2 also observed that initiatives have been launched in various regions of the world to improve hydrological and meteorological monitoring networks and systems, to develop exchanges of data on land degradation, and to encourage the transfer of knowledge and technology by intensifying research into the interactions between climate, the hydrological regime and desertification. These activities benefit from support from several agencies, including the WMO and the United Nations Environment Programme (UNEP).

III. SOME EXAMPLES OF WAYS AND MEANS OF PROMOTING KNOW-HOW, TECHNOLOGY TRANSFER, EXPERIENCE SHARING AND INFORMATION EXCHANGE

20. Pursuant to the various COP decisions, and at the request of Parties, the Convention secretariat, with assistance from partners, has been facilitating the convening of workshops, meetings, seminars, expert panels and consultative forums as important avenues for addressing the issues of information exchange, experience sharing and dissemination of know-how and best practices. The GM of the UNCCD has also been supporting the convening of similar forums at both national and subregional levels. Through all these meetings, attempts have been made to build a foundation of ways and means to further promote this broad agenda at the various levels. The following are some examples.

A. Dissemination of information and exchange of experience

21. This type of ways and means of promotion would fully utilize relevant existing national, subregional, regional and international information systems and clearing houses on available technologies, their sources, their environmental risks and the broad terms under which they may be acquired.

Ways and means of disseminating information	Venue
Séminaire national, Interconnexion des conventions de la génération de Rio (2001)	Cotonou, Benin
Atelier national sur la synergie entre les conventions de Rio (2001)	Ouagadougou, Burkina Faso
National forum on enhancing synergy among four selected global conventions on the environment (2001)	Kampala, Uganda
Atelier national sur la synergie entre les conventions de la génération de Rio et de Ramsar (2002)	Bamako, Mali
National level synergies workshop (2003)	Asmara, Eritrea
Local level synergies workshop (2003)	Grootberg, Namibia
National forum on developing synergies among the environmental conventions (2003)	Bagamoyo, Tanzania
Workshop on the development of local level synergies between environmental conventions (2003)	Nairobi, Kenya
Atelier de concertation sur les synergies entre les conventions issues de Rio (2003)	Marrakech, Morocco
Africa region TPN 1 Integrated management of international river, lake and hydro-geological basins launch meeting (2000)	Accra, Ghana
Africa region TPN 2 Promotion of agroforestry and soil conservation launch meeting (2001)	Lomé, Togo
Africa region TPN 3 Rational use of rangelands and promotion of fodder crops development launch meeting (2001)	Maseru, Lesotho
Africa region TPN 4 Ecological monitoring, natural resources mapping, remote sensing and early warning systems launch meeting (2002)	Tunis, Tunisia
Africa region TPN 5 Promotion of new and renewable energy sources and technologies launch meeting (2004)	Nairobi, Kenya

Ways and means of disseminating information	Venue
Africa region TPN 6 Promotion of sustainable agricultural farming systems launch meeting (2004)	Tunis, Tunisia
Subregional meeting on community level best practices in agroforestry and soil conservation in the context of the implementation of the RAP in Africa (2003)	Palapye, Botswana
Subregional workshop of central African countries on the implementation of the UNCCD (2003)	Libreville, Gabon
Subregional meeting on procedures of the GEF in the context of the implementation of the UNCCD (2003)	Parakou, Benin
Fourth forum on cooperation between Africa and Latin America and the Caribbean (LAC) (2004)	Tunis, Tunisia
Workshop on synergy and enhancing cooperation between conventions – United Nations Framework Convention on Climate Change (UNFCCC), Convention on Biological Diversity (CBD), UNCCD (2003)	Espoo, Finland
National level synergy meeting (2003)	Islamabad, Pakistan
National level synergy meeting (2003)	Colombo, Sri Lanka
Asia region TPN 2 Agroforestry and soil conservation in arid, semi-arid, and dry sub-humid areas meeting (2003)	Bangalore, India
Asia region TPN 5 Strengthening capacities for drought impact management and desertification control launch meeting (2003)	Ulan Bator, Mongolia
Interregional Africa/Asia forum on agroforestry (2003)	Cotonou, Benin
National consultation on synergetic implementation of the UNCCD, UNCBD and UNFCCC (2004)	Addis Ababa, Ethiopia
Forest and forest ecosystems: promoting synergy in the implementation of the three Rio conventions (2004)	Viterbo, Italy
Regional workshop for Africa on synergy among the Rio conventions – CBD/UNCCD/UNFCCC (2004)	Gaborone, Botswana
CST Asia region experts meeting (2004)	Tokyo, Japan

B. Facilitation of access and creating favourable conditions

22. A primary consideration must be to have technologies that are most suitable for practical application to the specific needs of local populations, paying special attention to the social, cultural, economic and environmental impact of such technology. Moreover, creating favourable domestic market conditions and incentives conducive to the development and transfer of suitable technology is imperative. In many cases, for technology transfer to be considered effective, several basic preconditions need to be taken into account, such as cost effectiveness. The benefits of technology transfer should exceed its acquisition costs.[5] Reducing the perceived risk of a "higher" technology may play an important part in the benefit-cost consideration, and serve as an incentive for utilization of traditional knowledge or hybrids. In most cases of effective technology transfer, there is need for adequate financing as one of the incentives. The financing can be in the form of commercial bank loans, capital provided through the equity markets, or any one of a number of new and innovative financing

[5] Rosenberg, N. (1982), *Inside the Black Box: Technology and Economics* (New York: Cambridge University Press).

schemes. In addition, financing could be provided by public sector organizations such as countries' official development assistance (ODA), the GEF or the GM.

C. Facilitation of technological cooperation through financial assistance

23. The role of the GM in technology transfer is initially specified in the annex to decision 24/COP.1 which mentions the following as part of the functions of the GM:

- Identify and then provide information and advice on financing sources for the transfer, acquisition, adaptation and development of environmentally sound, economically viable and socially acceptable technologies relevant to combating desertification and/or mitigating the effects of drought;
- Facilitate the financing of information exchange on best practices utilized in combating desertification and/or mitigating the effects of drought at the local level in affected developing country Parties;
- Promote and facilitate the transfer, acquisition, adaptation and development of environmentally sound, economically viable and socially acceptable technologies, knowledge, know-how and practices relevant to combating desertification and/or mitigating the effects of drought in affected developing countries, in conformity with the Convention;
- Promote and facilitate the use of indigenous and traditional knowledge and technologies, as well as local expertise, at all levels in affected developing countries.

24. The funding of projects by the GM may be considered under this category of "ways and means". Specific examples relating to the work of the GM and technology transfer include GM support to civil society through its Community Exchange and Training Programme (CETP). The CETP, developed as a joint partnership between the GM and the International NGO Network on Desertification (RIOD), aims at facilitating the contribution of civil society to national action programmes (NAPs) and SRAPs. Working through small-scale community exchange and training projects, it focuses on enhancing policy dialogue, transfer of technology and building on indigenous knowledge among communities, for better natural resource management and alternative income generation. Another activity is the support through the German Technical Cooperation Agency (GTZ) for the formulation of a project between the Sahara and the Sahel Observatory (OSS), GTZ and the GM on the use of remote sensing for monitoring and management of water resources, thus promoting new opportunities for resource mobilization for technology transfer. The following table contains GM projects funded during the 2001-2004 period which contain objectives in the field of technological cooperation.

GM-funded projects	Country/agency recipient
Country Support Strategy - African, Caribbean and Pacific Group of States (ACP)/European Union (EU) Cotonou Agreement (2002)	Burkina Faso
Africa-Asia Forum (2003)	Benin
Implementation of Desertification Information System for the Mediterranean (DISMED) activities - DISMED Project (2002 and 2003)	Mediterranean countries
Land and water initiative (2003)	Niger

GM-funded projects	Country/agency recipient
Strengthening capacities and mitigating drought impacts (2004)	Mongolia
Support within the framework of the Niger-Italy Project (2004)	Niger
LAC region TPN 3 launch meeting on water resource management (2004)	Venezuela
Launch meeting of Asia region TPN 3 Rangeland management in arid areas including fixation of shifting sand dunes (2002)	Iran (Islamic Republic of)
Asia region TPN 5 workshop in Mongolia (2003)	Mongolia
Support for Asia region TPN 2 activities (2004)	India
Implementation activities for Asia region TPN 3 (2004)	Kyrgyzstan
Publication of the proceedings of Asia region TPN 5 (2002)	Mongolia
Organization of Asia region TPN 6 stakeholders' meeting (2004)	Pakistan
Launch meeting of Asia region TPN 6 Assistance for the implementation of integrated local area development programme initiatives (2004)	Pakistan
Launch meeting of Asia region TPN 3 (2002)	Iran (Islamic Republic of)
Launch meeting of Asian region TPN 4 Water resources management for agriculture in arid, semi-arid, and dry sub-humid areas (2002)	Syrian Arab Republic
Launch meeting of LAC TPN 4 (2004)	Guatemala
Establishment of a website for Asia region TPN 4 related activities (2003)	International Center for Agricultural Research in Dry Areas (ICARDA), Syrian Arab Republic
Transboundary pilot projects between Burkina Faso and Mali (2002)	Organization of Walde Ejef
Transboundary project between Algeria and Tunisia (2001)	*Association d'Intérêt Collectif de Hazoua*
Transboundary project between Burkina Faso and Niger (2003 and 2004)	United Nations Development Programme (UNDP), Niger and Association Nodde Nooto
Workshop on agroforestry and soil conservation (2003)	Botswana
Workshop on agroforestry in dry ecosystems (2003)	Peru
Workshop on drought preparedness in the Balkans (2004)	Romania
Subregional workshop on benchmarks and indicators (2002)	St. Lucia
Subregional meetings on GEF procedures (2003)	Benin
Support to the organization of the 3rd meeting of the CST Group of Experts (2004)	Chinese Academy of Forestry
Support to the Asia agroforestry workshop (2003)	India
Regional meeting on land resource management (2003)	Belarus
Sectoral consultation on the environment (2004)	*Conseil national de l'environnement pour un développement durable (CNEDD),* Niger (through UNDP Niger)

GM-funded projects	Country/agency recipient
Organization of workshop on forests and forest ecosystems (2004)	University of Viterbo, Italy
Organization of workshop on benchmarks (2003)	Honduras
Hosting of workshop on desert storms (2002)	China
Youth Corps for the rehabilitation of degraded lands (2003-2004)	UNDP Niger
Youth Corps project on rehabilitation of degraded lands in Mozambique (2003)	Mozambique
Youth Environmental Management Programme (2004)	Eritrea
Youth unemployment and land degradation (2003)	Cape Verde
Environmental youth project on rehabilitation of degraded lands (2002)	Benin
Establishment of environmental youth project (2002)	Mozambique

25. Moreover, under this category "ways and means of promotion", the bilateral and multilateral agencies could consider how to attract additional financial support and how they might best enhance their contribution to specific projects where technology transfer is an integral component. The role of private sector funding of projects would be also considered under this type of promotion activity.

D. Extending technological cooperation

26. Extending technological cooperation with affected developing country Parties should be pursued, including, where relevant, joint ventures, especially to sectors which foster alternative livelihoods. Many well-designed projects and activities having technology transfer components can contribute and extend to other environmental impacts such as biodiversity conservation, watershed protection, and socio-economic benefits to urban and rural populations through access to agroforestry products and the creation of jobs, ultimately promoting sustainable development and amelioration of the process of land degradation and desertification.

27. Governments and private sectors in both affected developing and developed countries, as well as multilateral agencies, have a critical role in extending technology cooperation and setting up financial and regulatory mechanisms, monitoring, verification and certification arrangements, and capacity building for technology development, transfer, diffusion and assimilation. Under this type of promotion activity, particularly in affected developing countries, Governments could prepare guidelines and set up institutional mechanisms to process, evaluate, sanction and monitor sector mitigation and technology transfer projects in both north-south, and south-south contexts.

IV. APPROACHES TO TECHNOLOGY TRANSFER

28. In the chapters above, the discussion has focused primarily on ways and means of promoting the transfer of technology. A significant number of events have taken place in the UNCCD process that support the promotion type of "dissemination of information", as would be expected given the role of the UNCCD secretariat and the GM as facilitators. The subject of technology transfer is interdisciplinary and has been approached in the following section

from a variety of perspectives, but each approach, or pathway, has a direct connection to combating desertification and is supported by reference to a field initiative. In this document the thematic pathways to technology transfer include intergovernmental cooperation, cooperation and networking, private-public partnerships, small-scale enterprises, targeted training, direct public investment, financial incentives, enabling policy measures and education.

29. These thematic approaches could be further interpreted as *government-driven pathways* where technology transfer is initiated by Government to fulfil specific policy objectives, *private sector-driven pathways* which involve transfers between commercially oriented private-sector entities (which has become a dominant mode of technology transfer in the world today) and *community-driven pathways* where technology transfers involve community organizations with a high degree of collective decision-making.[6]

30. This report employs the technology transfer system with its ways of promotion (described above) as a framework for analysis by the CRIC. In this system, technology is transferred as knowledge, resources (investment) and goods (remote sensing equipment for example) which flow among different stakeholders: Governments, private-sector entities, financial institutions, NGOs and research/teaching institutions. The success of the transfer through a particular pathway will also depend on the promotion (ways and means) and the selected policies of Governments.

A. Intra- and intergovernmental cooperation in south-south collaboration

31. Countries which require financial resources, infrastructure, trained personnel and expertise may benefit from pooling resources among themselves to obtain the information and technologies they need. This may be through south-south cooperation, or among the countries within a particular region or subregion. As well as being an effective mechanism for sharing solutions to common problems, this cooperative approach to technology transfer may increase the quality and level of information and technology that can be obtained. In essence, technology transfer through intra-governmental cooperation would also be promoted by disseminating relevant quality information.

Ways and means of promotion Technology transfer initiative	Partners	Coverage
Disseminating information Sustainable Management of Marginal Drylands; transfer of expertise on rehabilitation of degraded drylands in two regions affected by desertification, through south-south cooperation (2003)	UNESCO	Interregional north Africa and Asia; workshops in Egypt, I.R. of Iran and Russia
Disseminating information Africa region TPN 1 Integrated management of international river, lake and hydro-geological basins	SADC-Water Sector Coordination Unit	Southern Africa subregion

[6] Carman, B. (2000), Chapter 4, Conclusions and Recommendations. *Approaches to Technology Transfer and Capacity Building*, the International Development Research Center (IDRC-CRDI) of Canada.

Ways and means of promotion Technology transfer initiative	Partners	Coverage
Disseminating information Cuba 2002 national report. National Strategy to Combat Desertification and Drought, and the continuation of the Cauto River Basin Project; multinational workshop on synergies and saline soils contributed to strengthening the south-south cooperation.	Global Mechanism, National System of Science and Technological Innovation	Germany, Venezuela, Colombia and Haiti
Disseminating information Mongolia 2002 national report. Interregional conference and regional meeting, Asia-African Conference to Combat Desertification, and Regional Meeting of the Asian Focal Points of the UNCCD	UNCCD	Mongolia, Asia and Africa Parties
Facilitating access Uzbekistan 2002 national report. Rural extension work - international experience has been introduced for applying Holland technology for growing potatoes, and technology from China for sowing cotton under film	State Committee on Science and Technology	Public universities
Facilitating access Case study, Traditional Water Management in Dry Areas, comparing traditional/modern water management systems according to evolving socio-economic patterns, south-south collaboration (2004)	UNU	Tunisia

B. Cooperation and networking

32. The cooperative networking approach can be used at a number of levels within the SRAP, RAP and TPN. Countries sharing common resources (for example, catchment basins, mountain ranges) or common problems can cooperate to achieve an efficient pooling of resources and accomplish what no single country could do alone. Intrasectoral cooperation has also been successful within larger countries (for example, agricultural research stations in different regions, with shared computer systems for accessing satellite data or traditional information sources). Networks are an effective mechanism for pooling and sharing government resources but can also be an effective and cost-efficient structure for donor-supported activities.[7] Cooperative arrangements of this type can make important contributions to education, training, infrastructure development and institution building. Features of successful technology transfer under this approach would include:

- *Common goals and common methods*. It is essential that all cooperators share common goals and that the goals be clearly addressed by the specific information or technology to be shared by the institutions or individuals. International agencies, while providing advanced information from satellite remote sensing, need to ensure that the information is provided in an appropriate form and is focused enough to address the specific needs of individual countries.

[7] Metz, P. et al. (1999), IPCC Working Group III. Methodological and Technological Issues in Technology Transfer, chapter 12.

The technology must be sufficiently flexible to provide useful results at many different levels of technological development.

- *Commitment by all partners*. Building a base of trained and experienced personnel with the supporting technical infrastructure requires serious financial investment and long-term commitment of personnel and institutional support. Potential cooperators must be willing to make a commitment to a sustained effort before being allowed to participate. Programmes require commitment in order to succeed.

- *Neutral administrative structure*. Successful cooperation requires that all partners be treated equally and that none dominates the resources or the selection of goals. To avoid any single partner's dominating the cooperative, structures with neutral and independent administration or rotating leadership are essential. Care must also be taken to respect and legally protect the intellectual property rights of participants.

Ways and means of promotion Instances of technology transfer	Partners	Coverage
Disseminating information IUCN Regional Office for Southern Africa (ROSA) - promoting use of ecosystem approach in drylands management through transboundary conservation initiatives (2003)	IUCN	Greater Limpopo Transfrontier Park, Zambia, Zimbabwe and Mozambique
Disseminating information Niger/Nigeria Shared River Basins Initiative on transboundary land degradation (2003)	FAO/GM/ UNEP/GEF	Niger, Nigeria
Disseminating information Mediterranean Coastal Land Project: information exchange relating to land use between participating countries and promoting participatory management of land systems (2003)	ACSAD/EU	Mediterranean countries
Disseminate information Australia 2002 national report. Remote sensing technology (drought forecasting systems) developed by Commonwealth Scientific and Industrial Research Organization (CSIRO) for monitoring land degradation, modified and evaluated for effectiveness in assessing land degradation; integrative technologies for assessing the extent and cause of degradation in arid rangelands	ACIAR, CSIRO	Central Australia, southern Africa
Disseminating information India 2002 national report. Under Asia region TPN (Agroforestry management and soil conservation in arid, semi-arid and dry sub-humid areas), information dissemination by website for different agroforestry models in different agro-climatic zones	Government of India	Central Arid Zone Research Institute (CAZRI), Jodhpur, Rajasthan, India

Ways and means of promotion Instances of technology transfer	Partners	Coverage
Disseminating information Indonesia 2002 national report. Rural extension: forest and land rehabilitation activities implemented through a series of technical assistance workshops; central and local government form the enabling environment in which local community is main player relying on national experts	Government of Indonesia	Bogor Agric. University (IPB) and Asia Soil Conservation Network for the Humid Tropics (ASOCON)
Facilitating access Programme on management, protection and sustainable use of groundwater and soil in the Arab countries; technology transfer regarding protection of soil and groundwater resources (2001)	ACSAD/BGR	Syrian Arab Republic, Lebanon, Tunisia
Facilitating access 2002 Arid Lands Initiative Programme (technical expertise to UNCCD Parties to implement and monitor NAPs)	IUCN	Global

C. Private-public partnerships

33. The private sector can make major, mutually beneficial contributions to research and development (R&D) and infrastructure building in ways that support an integrated approach to land management. The mechanisms by which this can occur are highly varied:

(a) A banking credit for implementing proven technologies or developing new technologies is a powerful tool for linking sustainable land use with economic development. Successful investment programmes based on community lending and women's cooperatives show how capital can be provided to support technology transfer.[8]

(b) Joint private-public support for R&D institutes to develop new technologies or products, or to investigate specific issues of importance to the private sector, is already implemented in many developed countries, as well as in some developing countries. This type of private investment goes hand in hand with market development and will tend to increase as markets develop.

(c) Fellowship programmes can build in-country expertise.

(d) Companies offering product incentives can help develop markets while making technology available and providing experience and training. For example, with the purchase of a certain product, schools and municipalities might also receive computers or technical training.

[8] UNCCD (2004), Report of the Fourth Forum on Cooperation between Africa and Latin America and the Caribbean, Tunis, Tunisia.

34. Public-private partnerships may prove effective in technology transfer, particularly as national and international corporations adopt the long-range goals of sustainable development.[9] For instance, in Uzbekistan (2002 national report) there is an initiative involving the State Committee on Science and Technology on the introduction of an autonomous solar power system, to show the advantages and peculiarities of such systems to potential consumers. This is an example of development of an effective strategy for dissemination of a new power engineering technology on a market-oriented basis.

D. Small-scale enterprises as catalysts for technology transfer

35. Many Governments and development organizations have focused on the promotion of small-scale enterprises (SSEs) as a way of encouraging broader participation in the private sector. The promotion of SSEs and especially those in the informal sector, is viewed as a viable approach to sustainable development. In Africa, great creativity has been demonstrated in starting enterprises with minimal resources. SSEs have characteristics that justify promoting them in a development strategy. They create employment at low levels of investment per job, lead to increased participation of indigenous people in the economy, use mainly local resources, promote the creation and use of local technologies, and provide skills training at low cost to society.

36. It is generally recognized that SSEs face unique problems which affect their growth and profitability and hence diminish their ability to contribute effectively to sustainable development. Many of these problems have implications for technology transfer. Lack of access to credit is almost universally indicated as a key problem for SSEs. This affects technology choice by limiting the number of alternatives that can be considered.

37. Many SSEs may use an inappropriate technology because it is the only one they can afford, yet the sector plays an important role, particularly in various African countries. Furthermore, the need for information about appropriate technologies in situations relating to land degradation or inadequate managerial and technical skills are some of the barriers that need to be addressed. It has been observed that technologies used by SSEs in developing countries may also be inappropriate, especially where their choice is based on insufficient information and ineffective evaluation.

E. Targeted training and technology-support programmes

38. Unsustainable land-use practices constitute one of the major threats to sustainable food production on much of the Earth's marginally productive lands. Specifically-targeted application of technology can help remove the primary constraint on planning for sustainable land use - lack of information. Effective integration of land-use planning activities may be hampered at the village level, for example, by a lack of necessary information, and this can be made more effective by local training programmes on data collection and assessment, along with the provision of appropriate tools and technology.

---

[9] Siddiqi, Toufiq A. (1990), "Factors Affecting the Transfer of High Technology to the Developing Countries", in *Technology Transfer to the Developing Countries*, edited by Manas Chatterjee, (London: The MacMillan Press Ltd.).

Ways and means of promotion Instances of technology transfer	Partners	Coverage
Disseminating information Management programme for protection and sustainable use of ground water and soil resources in the Arab region; disseminating of technical know-how through training courses and awareness raising (2003)	ACSAD/BGR	Syrian Arab Republic/ Lebanon/ Tunisia/ Morocco
Facilitating access Pilot project - implementation of technology transfer in utilization of brackish saline water in north Africa, (2003)	ACSAD/IFAD/NARS	Ougala Province, Algeria
Facilitating access Fiji 2002 national report. Rural agroforestry/ agricultural extension on preventing soil loss; research on leguminous tree varieties as soil fertility improvement species tested on acid soils; technologies adapted to meet conservation and economic needs; effectiveness of vetiver grass and pineapple with the inclusion of leguminous and nitrogen-fixing tree species	Government of Fiji/GTZ/ International Board for Soil Research and Management (IBSRAM)/ Pacificland Network	300 farmers in uplands of Fiji/ Pacific Regional Agriculture Program (PRAP)
Facilitating access Fiji 2002 national report. Rural extension awareness and training in land degradation, disseminating information and transferring of low-cost sustainable land management technologies for sloping land	Foundation of the People of the South Pacific, University of the South Pacific, WWF	Farmers, youth and other stakeholders in Fiji. Land Use Section of LRPD, Research and Extension Division of AFF/MASLR, other Ministries
Facilitating access Training workshop/policy guidelines - vulnerability of soil and water to pollution; maps for soils and water pollution with heavy metals and nitrate (2003)	ACSAD/BGR (Earth Science Institute in Germany)	Arab States
Creating domestic market conditions and incentives Field project Acacia operation project: supporting food security, fight against poverty, and soil degradation in the gums and resins producing countries (2004)	FAO	Kenya, Burkina Faso, Chad, Sudan, Niger and Senegal

F. Direct public investment in resource protection

39. Stopping unsustainable land uses before they permanently degrade the land's carrying capacity may require public-sector promotion of sustainable land uses. Deterioration of marginal lands has repercussions for populated regions and productive lands, and so Governments often make major investments in economically marginal regions. For example, over the centuries Governments in the Netherlands have made massive investments in the dyke and canal infrastructure which provides protection for cities and agricultural regions far from the locations where the investments have actually been made.

40. Likewise, the Chinese Government has supported extensive tree-planting programmes in semi-arid regions to prevent the wind erosion and dust storms that cause serious problems in major urban areas to the east. Appropriate agricultural policy incentives can help to ensure sufficient input of resources in marginal regions to allow sustainable agricultural practices, rather than continuing land degradation. Such incentives may also be needed to help with the transition from unsustainable agricultural practices to sustainable methods that will eventually become self-supporting. Direct investments in specific land uses to support the economies of marginal regions may offer cost-effective solutions to the problems caused by unsustainable land use.

41. Another type of public investment is the establishment of research institutions to address the specific problems of marginal regions, such as issues relating to sustainable agriculture, forestry, mining and the use of other resources. When these institutions are located in the marginal regions as well, they can contribute also to local education and infrastructure development. This type of direct public investment is particularly important in situations where the short-term market solutions that motivate the private sector are inadequate to address land-use problems.[10] A pertinent example is in China where a new International Training Centre (ITC) on combating desertification has been opened in Beijing, whose primary objective is to offer cross-border exchange and capacity building opportunities for experts who develop sustainable land management solutions. In this joint effort, the Chinese Academy of Forestry and the secretariat of the UNCCD seek to boost the ability of affected country Parties to deal effectively with threats caused by desertification and land degradation as well as poverty issues. Activities to be organized through the ITC are wide-ranging and include international workshops, multilateral research projects and knowledge-pooling seminars involving stakeholders from all regions affected by desertification. Training on drought-resistant crop species or promising soil conservation techniques will be among the top priority courses on the curriculum.

---

[10] Kobori, I. and Z. Adeel, (1997), *United Nations University and its Role in Desertification*, UNU, (Tokyo, Japan).

Ways and means of promotion Instances of technology transfer	Partners	Coverage
Facilitating technology cooperation through financial assistance Mongolia 2002 national report. Distribution of 2,500 kg of vegetable and flower seeds to 10 "agro-parks" in eight districts under the condition of repayment; hand tools, small-scale irrigation equipment and other items including tractors with ploughs, a potato digger and a harvester were also distributed	USA Government/ ADRA	Mongolia
Facilitating technology cooperation through financial assistance Field project - technology transfer on irrigation practices, best-fit irrigation systems and fertilization, field salinity monitoring using electromagnetic instruments (2004)	Arab Development Bank (Africa) BADIA/ ACSAD	Several African countries

G. Financial resources allocation as incentives

42. Adoption of sustainable land management practices and efficient processing and recycling technologies could be promoted by providing financial incentives such as preferential market access, lower taxes or duty and low-cost credit to companies adopting such technologies. An initiative by the World Food Programme (WFP) and IFAD in Kenya in 2003, Fund for disaster preparedness activities, demonstrates extended technology cooperation through the use of a monetary fund for projects on soil and water conservation, new technologies and tools to pastoral communities and new livelihoods.[11] Food assistance complemented technical input and financial resources.

H. Enabling policy measures

43. Improved capability for policy review and evaluation by decision-making bodies at all levels is essential in developing an integrated land-use plan for sustainable development. Effective policy evaluation requires accurate information on current land conditions and on the capability of the land to support the future needs of society, including agricultural production, energy sources, mineral resources, clean and abundant water supplies, wildlife and conservation, and recreation and tourism. Country Parties may consider it beneficial to adopt appropriate policy and regulatory measures to safeguard sustainable land management and the sustainable use of natural resources. Such measures would also be geared to ensuring efficient processing, recycling of agricultural and forest products, product certification, and regulating a number of industries, among other things. This could improve the transfer of technologies for sustainable practices, high yielding agricultural crops and efficient processing technologies.[12] Regulations to enhance the coverage of protected areas would ensure the transfer and adoption of suitable protected area management practices. The following are just a few of the examples available.

---

[11] World Food Programme 2004, Report to the UNCCD on anti-desertification activities in Africa in 2003.

[12] Metz, P. et al. (1999), IPPC Working Group III, *Methodological and Technological Issues in Technology Transfer*, chapter 12.

Ways and means of promotion Instances of technology transfer	Partners	Coverage
Disseminating information Policy workshop - developing rules and regulations for Arab water resources use and development (2000)	Arab Organization for Agricultural Development (AOAD)	Tunisia, Algeria, Sudan, Libyan Arab Jamahiriya, Egypt, Mauritania
Disseminating information Workshop on coordination and development of policies and regulations concerning protection and development of range and forest resources in the Arab region (2002)	AOAD	Algeria, Morocco
Disseminating information Regional development of the Fouta Djallon Highlands – legal component for management of common water resources and a number of activities on integrated development at local level (2003)	FAO/GEF/GM	Fouta Djallon Highlands
Facilitating access Indonesia 2002 national report. Enabling legal framework - Groundwater Management Policy 1998; policy focuses on resources exploration, monitoring, protection, sustainability and quality control, development, priority allocation, regulations and control, legislation and institutional arrangement, R&D and technology transfer, public awareness, and private sector participation	Government of Indonesia	National legislation
Facilitating technology cooperation through financial assistance Brazil 2002 national report. Legal framework – institutionalizing of state policies on desertification control; effective means of attaining resources, cooperation and the establishment of partnerships	Government of Brazil	States of Pernambuco, Ceará, Piauí, Rio Grande do Norte and Paraíba
Extending technology cooperation Publication/dissemination of policy guidelines, Extractive Industries in Arid and Semi-arid Zones: Environmental Planning and Management. Issues and problems associated with extractive industries in arid and semi-arid lands (2003)	IUCN/UNCCD	Global – arid, semi-arid, dry sub-humid zones

I. Methods for monitoring, verification and certification

44. One of the most important approaches to enhancing the credibility of the transfer of technologies and field projects is to develop and transfer methodologies for monitoring, measurement and verification. It may be necessary to develop credible institutional arrangements for monitoring and verification in field projects aimed at combating desertification and mitigating the effects of drought.

Ways and means of promotion Instances of technology transfer	Partners	Coverage
Disseminating information Africa region TPN 4 Ecological monitoring, natural resources mapping, remote sensing and early warning systems	African Organization of Cartography and Remote Sensing (AOCRS), Algiers, Algeria	Africa-wide
Facilitating access Pilot demonstration project on integrated approach for biophysical and socio-economic measurements of driving factors and impact of desertification using rapid appraisal and field measurement techniques adapted to African capacities and local conditions (2002)	FAO/LADA/ *Centre de suivi écologique (CSE)*	Senegal
Facilitating access Africa region Global Land Cover Network (GLCN) workshop on harmonization of land cover classification systems (2003)	FAO/UNEP	Senegal, Africa-wide
Facilitating access Asia region GLCN workshop on harmonization of land cover classification systems (2003)	FAO/UNEP	Thailand, Asia-wide
Facilitating access Soil and terrain mapping in Arab states for appropriate land use (2003)	ACSAD/UNEP	Libyan Arab Jamahiriya/ Yemen/ Jordan/Syrian Arab Republic

J. Awareness, education and capacity building for technology development, transfer and assimilation

45. It is necessary to create awareness among the various stakeholders, including local communities, NGOs and the general public, in order to have an enabling environment where technology development, transfer and diffusion can be facilitated. An enlightened public is more likely to accept measures to address land degradation and to adopt sustainable land management practices. Equally important is building the necessary capacity at all levels, individual and institutional as well as systemic, with a view to creating the conditions conducive to appropriate technology.

Ways and means of promotion Instances of technology transfer	Partners	Coverage
Disseminating information International conference on sustainable agriculture and environment in the Arab region (2002)	AOAD	Algeria, Tunisia, Morocco, Egypt, Libyan Arab Jamahiriya, Djibouti, Sudan
Disseminating information Africa region TPN 3 Rational use of rangelands and promotion of fodder crops development	OAU/IBAR Nairobi, Kenya	Africa-wide
Disseminating information FAO publication Towards sustainable livelihoods in the drylands (2002)	FAO/WSSD	Global - drylands
Disseminating information IUCN publication/dissemination: Gender in Dryland Management - integration of gender consideration into dryland management with aim of alleviating poverty and conserving biodiversity (2003)	IUCN Regional Office in Meso-America	Global - drylands
Disseminating information Lebanon 2002 national report. Rural extension - introducing and testing *in situ* and on-farm mechanisms and techniques for the conservation and sustainable use of agro-biodiversity, the promotion of alternative land-use practices, awareness-raising of importance of indigenous crops and capacity building, and modification of legislation and land-use rights to promote agro-biodiversity, promoting conservation and preservation of wild relatives and land races of agricultural species	Governments of Lebanon, Syrian Arab Republic, Jordan and Palestinian Authority	Lebanese Agricultural Research Institute (LARI) and ICARDA, in cooperation with IPGRI and ACSAD, the American University of Beirut, NCRS
Disseminating information China 2002 national report. Government programme 100 Science and technology professionals go to the rural areas. Village-based extension workshops to provide technology services to increase the scientific and technological content of the combat against desertification; transfer of scientific and technological achievements to practical productivity forces	Government of China	Scientific research institutes, rural areas
Facilitating access Philippines 2002 national report. Field project - Management and rehabilitation of degraded hilly lands in the Philippines; rural extension to promote conservation farming technologies through farmer adoption	International Board for Soil Research and Management (IBSRAM)	Upland communities in Luzon
Facilitating access Publication/dissemination of Food security, sustainable development and desertification control – perspectives for the drylands (2003)	FAO	Global - drylands

Ways and means of promotion Instances of technology transfer	Partners	Coverage
Facilitating access Publication/dissemination of Gender and sustainable development in drylands: an analysis of field experiences (2003)	FAO	Global - drylands
Facilitating access Joint Master's degree programme, Integrated Land Management in Drylands (2002)	UNU	Tunisia, China
Facilitating access Enhancing Social Sustainability in Activities to Combat Desertification – REDUSO (2003): publication on intensive experimentation with approaches and the development of tools aiming to involve grassroots communities better in desertification control activities	IUCN and German Ministry for Development Cooperation (BMZ)	Global
Facilitating access CD-ROM database on desertification control, compilation of success stories (2003)	UNEP	Global
Facilitating access UNCCD Education kit in combating desertification: twelve multi-lingual case studies (2003)	UNESCO and UNCCD secretariat	Global - primary schools of affected countries
Facilitating access Compilation/dissemination of success stories on rehabilitation of degraded rangeland, soil and water conservation and use of marginal lands (2003)	ACSAD/ IFAD/BGR/ GTZ	Arab States
Facilitating access Africa region TPN 2 Promotion of agroforestry and soil conservation	INSAH/ CILSS (Bamako, Mali)	Countries involved in African Land and Water Management Initiative
Facilitating technology cooperation through financial assistance Distribution of CD-ROM on desertification and personal computers to 315 institutions in 56 countries (2003)	FAO	Global
Extending technology cooperation Publication/dissemination of policy guidelines: Practical guidelines for the assessment and measurement of criteria and indicators for sustainable forest management in the dry-zone of African countries (2003)	FAO Forestry Department	Forests in dry zones of Africa

V. SUMMARY OF RELEVANT CONCLUSIONS AND RECOMMENDATIONS OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY AD HOC PANELS ON TRADITIONAL KNOWLEDGE

46. Based on the previous work of the two CST ad hoc panels on traditional knowledge to combat desertification, a number of recommendations for technology transfer at national and subregional levels have been put forward for implementation.

(a) The transfer of techniques for establishing narrow shelterbelts systems which were developed in the arid Xinjiang and Gansu Provinces and play a large role in preventing farmland from wind hazards and sand disasters, should be carried out in semi-arid and dry sub-humid areas in the regions where the physical conditions are similar;

(b) The introduction of practices of straw checkerboards, clay/pebble/chemicals mulching for fixing drifting sands should be conducted in the watershed areas of loess and in hilly areas for re-planting eroded landscapes where the prevailing wind is frequent, the sand source is rich and soil and water loss is serious;

(c) Extension of the technologies for establishing bio-farms in steppe or rangeland areas, which were initiated to preserve overgrazed rangeland in semi-arid and dry sub-humid areas, should be conducted in desert steppe regions where there is a risk of desertification in the regions of the Far East, Central Asia, East Africa and South America;

(d) Application of the practices for soil conservation, runoff harvest and terrace tillage systems, which occur in the watershed areas on loess and hilly regions facing creeping sands, should be popularized in areas affected by problems of rangeland degradation and soil erosion;

(e) Adaptation of windmill and solar energy should be encouraged in the regions facing a lack of fuel wood, coal and gas, and wire-fence protection should be carried out in the arid preservations and biodiversity reserves located in regions with dense animal populations;

(f) Air-seeding techniques for fixing shifting sands and re-planting gully loess hills should be widely adopted in the overgrazed steppe areas for creating fodder-farms and shed-fed animal breeding and restoring the interrupted ecosystem in countries characterized by problems of mobile dunes and shifting sands;

(g) Agroforestry, which was successfully practised in China's north central plain regions for fertilizing soil and improving farmland, and the agro-fertilizer approach in Brazil, should be operated on a trial basis in the newly-developed arable land in oases or along the periphery of deserts where annual rainfall varies from 350-500 mm;

(h) Practices for further harvesting runoff on piedmont or in foothills should be introduced to the loess areas for managing watershed, seasonal river and depression areas with runoff afforestation.

47. The expert panels on traditional knowledge also recommended that the following modern technologies should be introduced, particularly in those countries to have established

international and regional cooperation programmes with the other partners and developed countries:

(a) Water-saving techniques, such as sprinkler irrigation, drip irrigation, micro-drop irrigation and fertilization systems;

(b) Greenhouse cultivation, the introduction and silviculture of pioneer plants;

(c) Solar energy development, biogas farms and gases exploitation for avoiding the plunder collection of fuel wood, and innovation of cooking/heating facilities;

(d) Mechanization of afforestation and grazing land fodder harvest;

(e) New artificial materials for fertilizing the soil and holding moisture in sandy soil;

(f) Introduction of newly developed soil conditioners to those regions with limited precipitation, particularly the arid and hyper-arid areas of north-west China, the Sahelian States, west Asia and the Middle East regions;

(g) Transfer of newly-developed water release and conservation chemical agents to the Nile Valley, the Yellow River and Yangtze River basins, the Amdaya Valley, the Ganges River, Arab Gulf countries, and the Sahelian and north Africa regions for carrying out large-scale planting and landscaping;

(h) Continue to popularize the application of root-generating chemicals to increase the quality of seedlings, widen the scale of revegetation and increase cultivation on a traditional farming basis.

48. As one of the international efforts to transfer traditional knowledge and modern techniques for combating desertification, the following scientific and technological exchanges should be stressed:

(a) A qualified personnel exchange programme, including professors and postgraduates in fields relating to combating desertification, State laws and policies, new technology development and pioneer species innovation;

(b) A technician and decision-maker exchange programme in specialized fields at national, subregional and regional levels through international efforts and interregional initiatives on re-training and education;

(c) A students exchange programme, including university study and awareness education and public awareness raising at senior/junior schools;

(d) A demonstration and extension service exchange programme, including technical training, study tour and ground observation, and grass-roots technical show.

49. Information exchange and information sharing are important elements in establishing international linkages and communication between the affected developing and developed countries. The following activities should be encouraged between the interested parties of the UNCCD.

(a) The exchange and utilization of information on appropriate technology, knowledge, know-how and practice among the affected countries should be encouraged and the involvement in this exercise of relevant partners, including international institutions, NGOs and other civil societies and community-based organizations, should be fostered through the GM, UNEP, UNDP Drylands Development Centre, the World Bank, the GEF, UNESCO, FAO, WMO, and other United Nations bodies;

(b) Periodic exchange of knowledge of the methodologies for developing benchmarks and indicators for implementation of the UNCCD, impact indicators of desertification and experiences in desertification monitoring and assessment should be made through every communication means between national departments and subregional and regional institutions.

VI. CONCLUSIONS AND FURTHER SUGGESTIONS ON POSSIBLE ACTION BY THE COMMITTEE FOR THE REVIEW OF THE IMPLEMENTATION OF THE CONVENTION

50. Article 6 of the Convention obliges developed country Parties to promote and facilitate access by affected country Parties, particularly affected developing country Parties, to appropriate technology, knowledge and know-how. The scientific provisions of the Convention relating to technology transfer are reflected in the broad area of scientific and technical cooperation, as well as in R&D, and information collection, analysis and exchange. The development and transfer of technology depends on appropriate incentives. Governments and the private sector, as well as multilateral agencies, have a critical role in facilitating awareness raising, education, capacity building and provision of the necessary financial resources for technology development, diffusion and assimilation.

51. Technology transfer demands changes not only in the way resources are used in combating desertification and land degradation, but also in the way information is managed. Decision makers are expected to make technical decisions that are ecologically, economically and socially acceptable. On the other hand, information sources for making such decisions should be easily available, organized, timely, accurate and dependable.

52. The following elements, in no particular order of preference, constitute some of the emerging key tasks which the CRIC may wish to consider in supporting the further development of a demand-driven scientific agenda which can then accommodate a particular approach or technology transfer technique:

(a) To encourage information-exchange networks that include not only Governments and intergovernmental organizations but also NGOs, local communities and scientific institutions;

(b) To support data collection on biophysical and socio-economic aspects of combating desertification, and the inventory and disseminate local technology, knowledge and know-how and integrate them with modern technology;

(c) To ensure that collection and analysis of scientific information address the needs of local communities with a view to resolving specific problems, and to ensure that local communities are involved in these activities;

(d) To support research activities that respond to well-defined objectives, meet the needs of local populations and lead to improved living standards for people in affected areas;

(e) To develop and strengthen local, national, subregional and regional research capacities in developing countries affected by desertification;

(f) To extend technology cooperation among affected developing countries, particularly in sectors that foster alternative livelihoods for dryland communities;

(g) To develop benchmarks and indicators of progress in combating desertification that encompass both traditional physical variables and measures of success at the community level; and

(h) To reorient extension services in affected developing countries toward participatory approaches for the conservation and sustainable use of natural resources geared towards the successful implementation of the Convention at the community level.

53. The approach to technology transfer may depend to a large extent on the above elements. Measuring the extent to which these activities are taking place can be interpreted as the performance measures for the utilization of science and technology as reviewed under CRIC 1 and CRIC 2. Structuring and carrying out a sound scientific agenda will make a major contribution to the success of the NAPs, SRAPs and RAPs which are the centrepieces of Convention implementation.

54. An important part of furthering the scientific agenda is the transfer of technology, which may take place on a north-south as well as a south-south basis. The exchange of experience in technology flow and adaptation among countries with similarities in ecological and socio-economic conditions is likely to be beneficial. It is noteworthy that encouraging and facilitating open discussion and dialogue on this broad subject is a prerequisite to charting the true course of technology transfer. Regional and subregional activities may include evaluating the requirements for technology transfer and promoting the adaptation and use of such technologies.

- - - - -