Policy Paper

Stuart I Starting Resources Management and the Environment in DEVELOPING STATES (SIDS)



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The First United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 (also known as the Earth Summit) acknowledged that SIDS are a special case for sustainable development (given their unique and particular vulnerabilities). This gave rise to the First International Conference on SIDS in 1994 and the Barbados Program of Action (BPOA) which is the main policy framework addressing the economic, social and environmental vulnerabilities facing SIDS. The sustainable development of SIDS was also at the heart of the Second International Conference on SIDS held in Mauritius in 2005, and the "Mauritius Strategy for the further implementation of the Programme of Action for the Sustainable Development of Small Island Developing States" was adopted and subsequently endorsed by the United Nations General Assembly.

The United Nations Conference on Environment and Sustainable Development held in Rio de Janeiro in June 2012 (Rio+20) agreed to convene the Third International Conference on SIDS in 2014. This was later endorsed by the UN General Assembly (UNGA). "The Sustainable Development of Small Island Developing States (SIDS) through Genuine and Durable Partnerships" will be held in Samoa in September 2014.

FAO has been involved in supporting SIDS in addressing sustainable development issues and has contributed to the regional preparatory process (i.e. Caribbean, Pacific and AIMS regions) as well as the inter-regional and global consultation process held at the UN Headquarters in New York in February 2014. The outcome documents of these preparatory meetings specifically mention topics that are relevant to FAO's core areas such as coastal zone management and ecosystem based approaches, institutional capacity to deter illegal, unreported and unregulated fisheries and increased attention to small-scale fisheries. Climate change is also highlighted as a threat to food security, natural resources (land, water, forest and biodiversity) and marine and coastal resources.

This paper focuses on the environmental challenges of sustainable development issues with particular attention to natural resource management, environment and climate change in the food and agriculture sector (including crops, livestock, fisheries and forestry). FAO's agriculture, fisheries, forestry and technical assistance programmes provide considerable resources to assist member countries promote conservation, sustainable use and management of natural resources and to reduce the risks associated with climate extremes as well as resilience building.



FAO AND SUSTAINABLE Management of Natural Resources and Increasing Resilience

One of FAO's three global goals is the sustainable management and utilization of natural resources for the benefit of present and future generations. FAO defines agricultural development as the management and conservation of the natural resource base. New technology is used to achieve continued satisfaction of human needs for present and future generations. Sustainable agriculture conserves land, water, and plant and animal genetic resources, and is environmentally non-degrading, technically appropriate, economically viable and socially acceptable. This will contribute to all four pillars of food security in a sustainable way.

In 2012 FAO launched the Strategic Thinking Process which resulted in the new Results Framework that defines FAO's work in 5 trans-sectoral Strategic Objectives (SOs) and two cross-cutting themes (gender and governance). These represent the renewed ambition and purpose of FAO to help member countries make the transition towards sustainable food and agriculture ensuring world food security while promoting the sustainable use, conservation and management of natural resources and ecosystem services. These five strategic objectives (highlighted in the paper on Food Security and Nutrition in SIDS which can be found in the same folder as this paper) provide a holistic vision of agriculture and natural resources and the synergies which ensure food security and make agriculture part of the solution to achieve sustainable development. Although the synergies among these five strategic objectives are important, Strategic Objective 2 (Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner) and Strategic Objective 5 (Increase the resilience of

livelihoods to threats and crises) are more closely linked to addressing the environmental, natural resources and climate change challenges facing SIDS.

STRATEGIC OBJECTIVE 2

Increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner

This objective emphasizes the integration of FAO's work relating to the three "pillars" of sustainable development (environmental, economic and social) and helps countries make the transition to more sustainable practices. This objective also reflects the outcome of the RIO+20 Conference, and the contribution of agriculture to the concept of sustainable production and consumption.

STRATEGIC OBJECTIVE 5

Increase the resilience of livelihoods to threats and crises

The main goal of increasing the resilience of agriculture and natural resource based livelihood systems has been consistently pursued by FAO. This strategic objective builds on multidisciplinary collaboration underpinning the FAO Disaster Risk Reduction (DRR) for Food and Nutrition Security Framework Programme.

NATURAL RESOURCES Management and Environment in SIDS

Natural Resources and their degradation in SIDS

Biodiversity resources: small island states have a unique biological diversity. The Caribbean hosts 2.3 percent of the world's known endemic vascular plant species and 2.9 percent of the world's endemic vertebrate species, while occupying only 0.15 percent of the earth's surface. The rich flora of the Caribbean region is estimated to comprise 7 000 endemic species (Day, 2009). However the recent spread of invasive alien species is regarded as a significant transboundary threat to the health of biodiversity and ecosystems. This has emerged as a major factor in species decline, extinction and loss of biodiversity goods and services in SIDS (Kueffer *et al.*, 2010).

Forestry resources: Forests harbour the vast majority of terrestrial biodiversity in SIDS. This biodiversity is characterized by high levels of endemism and the only way to preserve these endemic species is to preserve the environment. Forests are not only important resources for flora and fauna biodiversity but also provide important environmental services (carbon storage, soil and water protection, tourism, etc.).

Island forests provide significant livelihood opportunities for people in rural areas. As these resources are mostly concentrated on land with limited suitability for agriculture, forest based income is often the only income for persons living in or close to the forest. The high importance of forests for local people also comes from the availability of freshwater; on Caribbean islands, for example, most of the drinkable water is collected from surface water coming from forests.

Coastal forests, including mangrove forests, play an important role in coastal protection from storm surges and high tides. Coastal forests including both endemic and exotic species, especially mangroves are seen as 'bioshields' (Feagin *et al.*, 2010). In coastal zones, various non-wood forest products (NWFPs) are used for subsistence purposes and some are also sold commercially. Tree crops such as coconut, banana, pandanus and breadfruit are dietary staples in many SIDS. **Mangroves:** Mangroves are found along sheltered coastlines in the tropics and sub-tropics. They are important for providing wood and non-wood forest products, coastal protection, mitigation of pollution, conservation of biological diversity and provision of habitat, spawning grounds and nutrients for a variety of fish and shellfish. Communities also depend on them for hunting, fishing, handicrafts, tour guiding and other nature based activities. Sea level rise is the most significant climate change threat to the survival of mangroves (Waycott *et al.*, 2011).

Freshwater resources: Apart from freshwater being in short supply, it is also being contaminated with salt water and waste water. Agricultural lands are undergoing significant salinity changes which are affecting agriculture productivity. Managing freshwater resources in SIDS implies facing several challenges including increased population pressure, increased water demand due to urbanization and expanding tourism, increasing sectoral competition for water and land resources, increased climate variability and frequency of natural disasters and reduced water quality due to pollution from industrial, agricultural and municipal wastes among others. It is also very likely that sea water flooding will degrade fresh groundwater resources (IPCC 2014).

Marine resources: SIDS are responsible for a significant portion of the world's oceans but have limited means to manage their marine resources. Often fisheries are an important "last resource" for the poor and/or used in emergency situations. However, these resources are often fully exploited or overfished especially in coastal waters. Coastal areas are also badly damaged by inappropriate infrastructure development, poor waste water management and pollution. Coastal biodiversity is being reduced in many parts of SIDS. Climate change means that this will probably continue severely threatening livelihoods.

Coral Reefs: Coral reefs are an important marine resource in SIDS. They shelter 25 percent of marine species, protect shorelines and support fishing industries. Many island communities depend on these systems for livelihoods. Reefs also supply sediment to shorelines and in doing so help to reduce the impact of waves and lessen erosion. They provide a habitat for a wide range of marine

species providing subsistence foods for many island communities as well as reef based tourism and economic activity (Bell et al., 2011). A recent study in the Caribbean highlighted the fact that coral reef ecosystems provide more than just food and income. Coral reef associated fisheries are also seen as a way of life and have cultural and social significance. These also have a safety net role in some communities enabling them to cope with sudden crises (Whittingham et al., 2014, Future of Reef in Changing Environment Project). The majority of the world's coral reefs are now damaged through poorly managed exploitation, storm damage, coral bleaching or disease. A possible 2°C temperature increase has potentially far reaching consequences for coral reefs which are important to tropical islands.

Sustainable Management of Natural Resources and Coastal Ecosystems in SIDS

SIDS are small islands and low-lying coastal countries that share similar sustainable development challenges. Many SIDS are already faced with crises in managing their limited and degraded natural resources. Strategies for conserving, protecting, and enhancing these resources should be based on the specific resource constraints faced in any given location, as well as the current and desired improvements in reversing depletion and degradation. The challenge for sustainable management of natural resources is to find a balance between protecting ecosystems and meeting society's growing needs.

There is a high degree of dependency on limited natural resources because of the small size and economies of many SIDS; this is mainly within the agricultural sectors of crop production, livestock, fisheries, aquaculture and forestry. Higher and increasingly competing demands for food are accelerating the degradation of natural resources and ecosystems. This affects the food supply and income of smallholders. The situation often increases their vulnerability and creates a vicious cycle of poverty, further degradation and hunger. The future of many island communities is threatened without sound management of natural resources and the environment.

In SIDS exploitation by foreign fleets under licensing agreements (or outside of them) is often unchecked

and inshore and reef fisheries are often poorly managed. Coastal inshore areas are some of the most environmentally diverse and many ecosystems, especially coral reefs, are under threat from human activities as well as the impacts of climate change. Fishery resources are overexploited in many places, especially coastal waters.

The livelihoods of biodiversity dependent people are under increasing pressure. The ecosystem services that the natural environment provides are also under threat. Freshwater supplies are already stretched through rising population and industrial demand. Freshwater sources are also being contaminated by salt water and waste water. Coastal lands are undergoing significant salinity changes which are affecting agricultural productivity and freshwater resources.

Integrated Water Resources Management Planning (IWRMP) in SIDS demonstrates a pragmatic approach towards better and more sustainable water management (UNEP, 2012). IWRMP is a process which promotes the coordinated development and management of water, land and related resources, without compromising the sustainability of vital ecosystems. It is not considered as a plan to guide a country in using and managing its water resources with clearly identified milestones and timeframes. This process is about stakeholders finding ways to coordinate and address problems concerning the management of water resources.

Lessons learned from regional studies, local management and resilience and adaptation strategies of people may help design and implement improved management of natural resources and ecosystems that can be used by all SIDS. There is a need to develop national capacity to monitor, conserve and sustainably manage fisheries, coastal environments, coral reefs and associated ecosystems. These efforts will assist communities and governments to sustain food production and maintain biodiversity across different ecosystems. This will improve the resilience of ecosystems to climate change.

Direct action is needed to conserve, protect and enhance natural resources. If SIDS are to develop sustainably, the decline in the natural resource base and the environment will need to be reversed. Additionally, the delivery of ecosystem services is highly dependent on the structure of the ecosystems themselves. These differences need to be taken into account in the implementation of policies and practices by adopting a more comprehensive approach.

FAO's support and activities in sustainable management of natural resources

The task of FAO in advocating and promoting sustainability in the agricultural sector covers a wide range of situations. FAO adopts a territorial approach to natural resource planning and management. This is critical in order to achieve sustainability as the supply of soil, water and biodiversity for producing goods and services, as well as the political, economic, social, environmental and cultural contexts vary widely from one place to another. Locally it is easy to identify cause and effect relationships, agricultural production methods and possible interaction amongst different sectors.

The sustainable use of natural resources and the environment to produce goods and services in agriculture, livestock, forestry and fisheries depends largely on the way in which individuals, communities and other groups are able to gain access to land, fisheries and forests. Responsible governance of tenure of land, fisheries and forests is essential to ensure social stability, sustainable use of the environment, responsible investment for sustainable development and the eradication of poverty and food insecurity in rural areas.

FAO policy frameworks are generally "soft law" instruments that have emerged from FAO international conferences and members' declarations, leading to the adoption of voluntary codes and understanding. These instruments are not an easy way to produce international policy norms but their outcome reflects existing partial consensus and helps move negotiations forward when it is difficult to reach a consensus on any laws. They constitute a framework where countries can state what they agree with in principle and what they intend to do to the best of their possibilities. They have been used in FAO to design policy guidance and technical programmes.

FAO has also set up mechanisms that facilitate international collaboration on sustainable food and agriculture and established the transition to sustainability as a standing item on the agendas of the FAO Conference, the FAO Council, the Committee on Food Security and FAO Technical Committees on agriculture (COAG), fisheries (COFI) and forestry (COFO).

Box 1

Conservation of biodiversity in Trinidad and Tobago's mangroves

Mangroves are predominantly estuarine in Trinidad and Tobago, reaching 23m in height. They can also be found in lagoons, coastal fringe areas, basins and salt ponds. The largest single area is the Caroni Swamp on the west coast, which includes approximately 60 percent of Trinidad's mangroves. Despite their importance, there are a number of direct and indirect threats leading to significant mangrove loss in the country. Habitat loss, unsustainable use and overexploitation of resources, pollution and climate change constitute the main direct forces, while rapid economic growth has been the most important indirect driving force. Currently, the management of protected areas is the responsibility of a number of different government agencies, but coordination and capacities are very weak. There is also insufficient funding to meet the increasing challenges of protected area management and the lack of fully operational and effective policy and legal frameworks.

FAO with the support of the Global Environment Facility (GEF) is implementing a project to consolidate the protected area system and enhance the coordination capacities and finance for conservation management. Mangroves will be considered as a part of the pilot sites, along with sites that are important for watershed protection. Monitoring and research activities will be carried out to explore changes in the water regime in mangroves and suggest ecosystem based measures of improvement. Management measures will also be put in place to minimize the incidence of fires. The capacity building activities will draw on the experience of other GEF projects and the technical assistance and support provided by FAO. All these activities will result in local economic benefits from the maintenance of fisheries and soil productivity as well as the maintenance of water quality which will support the livelihoods of local communities.

A recent development within FAO has been the provision of support to SIDS to access funds from the Global Environment Facility (GEF) to support conservation within protected areas and measures to improve biodiversity, reduce land degradation and mitigate or adapt to climate change in productive landscapes. For example, FAO is currently implementing a USD 6.4 million regional project in the Pacific Islands to promote forest conservation and sustainable management of natural resources in Fiji, Niue, Samoa and Vanuatu, and has just started a second USD 2.3 million project in Trinidad and Tobago. Further GEF projects are also being prepared for the Solomon Islands and Vanuatu, as well as a project on sustainable forest management in Fiji, funded by the European Commission.

REDUCING VULNERABILITY AND RISKS AND ENHANCING RESILIENCE OF LIVELIHOODS

Major drivers of vulnerability and risks for SIDS

Climate change is and will be one of the most important factors influencing food supply in SIDS. In spite of differences in geographical, physical, social and economic development, SIDS share a common characteristic on their vulnerability to climate change. About 90 percent of SIDS are located in the tropics and are affected by extreme weather events such as tropical storms, cyclones and hurricanes, droughts and other weather related phenomena. IPCC 5th Assessment Report highlights that sea level rise, tropical and extra tropical cyclones, increasing air and sea surface temperature, and changing rainfall patterns are expected to cause loss of adaptive capacity and ecosystem services critical to food security and livelihoods in SIDS (IPCC, 2014).

In SIDS, estimated average annual losses from tropical cyclones are significant, from more than USD 12 million in Fiji to around USD 60 million in the Dominican Republic. Given their small size, individual hazard events, such as cyclones, may affect the entire territory and economy. The United Nations International Strategy for Disaster Reduction (UNISDR) has highlighted that disasters can destroy decades of development gains UNISDR, 2013). Sea level rise coupled with extreme climate events will present severe sea flooding and erosion risks, degradation of fresh water resources, increased coral bleaching and reef and ecosystem degradation. This will negatively impact island communities and their livelihoods. Over much of the 20th century, global mean sea levels rose at a rate between 1.3 and 1.7 mm/year and since 1993 at a rate between 2.8 and 3.6 mm/year. However rates of sea level rise are not uniform across the globe. In the tropical western Pacific where a large number of small island communities exist, rates up to four times the global average have been reported between 1993 and 2009 (IPCC, 2014).

Climate change may cause increased frequency and intensity of extreme events. Many SIDS are considered amongst the most environmentally vulnerable nations in the world. Natural disasters, such as cyclones, floods and droughts are not new and local farmers have adapted to working with highly variable climate and weather extremes through farming practices, traditional knowledge and experience derived knowledge. However, any changes outside of their sphere of knowledge and experience can have significant implications for agricultural production. Climate projections for the 21st century and beyond, suggest an increase in events outside of current experience with heatwaves, droughts and floods increasing in frequency and intensity, cyclones increasing in intensity, extreme high tides and storm surges continuing to threaten low-lying islands and the continuing sea level rise threatening contamination of groundwater.

The production of high value crops such as banana and plantain plays an important role in the lives of rural communities in many SIDS, as a significant proportion of the labour force still depends on this industry for its livelihood. There is now a new threat to add to the annual risks of hurricanes, flooding and droughts. The Black Sigatoka Disease (BSD) is a fungus that has spread rapidly through Guyana and the main banana producing countries of the Lesser Antilles, affecting farmers' livelihoods and the very sustainability of the already weakened banana and plantain industries of these countries (FAO, 2013a). BSD is best managed through a regional approach, bringing together key stakeholders (farmers, technicians, marketers and other industry players) to enhance coordination. It is essential that all affected

countries use common procedures to collect and record these data in a regional, publicly shared database.

Priority Actions in SIDS to reduce vulnerability and risks and improve livelihood resilience

Agriculture based livelihoods are already negatively affected by the impacts of a changing climate. The IPCC 5th Assessment Report (IPCC AR5, 2014) summarized that adaptation to climate change generates larger benefit to small islands when delivered in conjunction with other development activities such as disaster risk reduction and community based approaches. Appropriate international assistance to undertake adaptation and mitigation programmes should be strengthened, but caution is needed to ensure such assistance is not driving the climate change agenda in small islands. The risks and vulnerabilities of SIDS come from well beyond their borders and this is why the challenges facing SIDS need to be seen from a global perspective.

SIDS have been described as "data poor", and policies adopted and implemented have been derived on the basis of little or no data and less information (ECLAC, 2003). Sound predictions on the effects of climate change on the regions' natural resource base require support from models using local data. Often such information is very limited reflecting the scarcity of local climate records of sufficient length and accuracy. However, these data are essential for promoting policies, technologies and practices that build producers' resilience to climate change and contribute to sustainability. Resilience can be enhanced through co-constructed policies, strategies and plans and measures, such as flexible fishing strategies and the introduction of pest-resistant varieties and breeds.

It is also essential to diversify agricultural livelihoods to enhance domestic production and consumption in support of food security. In some cases it may not be possible to modify existing livelihoods and so new livelihood options may be necessary. A priority activity, common to all SIDS to reduce vulnerability and increase resilience in rural areas is through diversification of agriculture. Diversification through integrated farming systems remains a key action for smallholders. This requires the identification and



adoption of appropriate adaptation approaches for their needs.

In the Pacific SIDS, coconuts can tolerate salinity and are highly adapted to the coastal zones. Priority should be given to planting them in these areas to mitigate coastal erosion and sudden sea water intrusion due to tsunamis and typhoons. Breeding for drought tolerant varieties, high lauric oil content and high nut production are also important priorities.

In the Caribbean SIDS, characterized by a high exposure to natural disasters, it is necessary to enhance their climate change adaptation and promote policy reform. Some proposed measures include emergency assistance for small farmers, more sustainable and adaptive use of agricultural biodiversity, sustainable management of land, water and other natural resources through the development of diversified farming systems such as agroforestry and freshwater aquaculture, and the use of natural resources for bioenergy.

SIDS in the AIMS region have established national early warning systems and disaster mitigation plans, including national and regional oil spill contingency plans. However, national capacity is unlikely to cope with the growing frequency of extreme weather events and the costs associated with rehabilitation. Inadequate freshwater resources are a critical development challenge for SIDS in the region. Several factors such as rainfall variability, high runoff, porous soil and poor watershed management contribute to the scarcity of freshwater. Climate change continues to reduce freshwater availability in countries such as Cape Verde and Sao Tome and Principe, which already suffer from extended periods of drought.

BOX 2

FAO's support to a more food secure Haiti

Haiti remains a priority country for FAO, as the levels of food insecurity are very high (around 30 percent of the population). Natural disasters, such as the devastating earthquake in January 2010 and hurricane Sandy in October 2012, and other occasional external shocks (food prices), result in sudden large increases in food insecurity. The FAO programme has contributed significantly to the reduction of food insecurity levels, through activities such as the rebuilding of irrigation systems and access roads, the reinforcement of the banks of rivers and streams and the relaunching of activities associated with watershed management particularly, tree planting in order to prevent flooding.

Recently the emphasis of FAO's programme has shifted more towards development operations. Improving food and nutrition security remains the cornerstone, but the range of activities has been widened and includes support to food and nutrition governance, improving overall resilience, structural improvement of the seed and dairy sectors and integrated participatory watershed management. The Haiti Resilience Initiative was developed for the 2014/15 biennium, to increase resilience of family farmers, contribute to the eradication of hunger and malnutrition and reduce rural poverty. Particularly significant is Government's request for FAO assistance in support of its Agricultural Recovery Plan. In November 2013, FAO convened a Regional Technical Meeting (in Panama) with South-South Cooperation partner countries to facilitate increased support for the Agricultural Recovery Plan. This set the stage for much stronger coordination of the assistance provided by countries in the region in support of Haiti.

Coordination among institutions and development partners is essential to improve resilience. Regional mechanisms for policy coordination need to be strengthened, including environmental and climate change policies for agricultural development and their relationship to policies for food security and the eradication of hunger, poverty and malnutrition.

FAO support to reduce vulnerability and risks and enhance livelihood resilience in SIDS

People who rely on agriculture for their livelihoods are often the worst affected when a crisis or a disaster strikes. For FAO, disaster risk reduction is about protecting people's livelihoods from shocks and strengthening their capacity to absorb the impact of and recover from disruptive events. Natural disasters can destroy lives and wipe out years of development in a matter of hours or even seconds. Rural and urban populations in SIDS are increasingly exposed to natural hazards (drought, floods, hurricanes, earthquakes, epidemics, etc.), to human induced crises (socio-economic shocks, conflicts, etc.) and to protracted crises (complex, prolonged emergencies that combine two or more aspects of the above-mentioned crises).

FAO's Disaster Risk Reduction for Food and Nutrition Security Framework Programme expresses FAO's corporate commitment to reducing risks and building livelihood resilience in order to protect development gains. It aims to scale up and accelerate action for disaster risk reduction at local, country, regional and global levels, by building on FAO's existing technical capacities as well as on disaster risk reduction initiatives and good practices worldwide. Activities include protecting, restoring and improving livelihoods, developing the capacities of families, communities and institutions through measures to avoid (prevention) or limit (mitigation and preparedness) the adverse effects of hazards and to provide timely and reliable hazard forecasts.

The Framework Programme promotes an interdisciplinary approach that integrates the agriculture, livestock, fisheries/aquaculture, forestry and natural resource management sectors. It responds to the needs of poor and vulnerable households and to the complex set of factors that contribute to disaster risks. It adopts a sustainable livelihoods and ecosystem perspective that includes the integrated management of land, water and living resources, promotes the conservation and sustainable use of natural resources in an equitable way, and ensures sustainable livelihood outcomes.

Countries receive enhanced support in programme formulation and implementation. At the global level, priority is given to advocacy and partnership promoting greater interest and commitment on the part of the international community to increase financial resources for DRR for FNS in favour of member countries, and particularly for vulnerable small-scale farmers.

The following examples illustrate some actions aimed at reducing the high vulnerability of the agricultural and natural resources sectors faced by SIDS as well as enhancing the resilience of their agriculture based livelihood system on which food security and ecosystem integrity depends.

PARTNERSHIPS

For many SIDS the cost and technical difficulties of developing national systems for addressing sustainable development, protecting the environment and developing diversified and resilient livelihoods are too high to be achieved easily. Partnership between SIDS in and across regions, and between SIDS and the international community is needed. It is only through such partnerships that innovation can be developed within the urgent time scales that development needs and climate change dictates.

Transformative actions in the field and across regions will depend considerably on the partnerships established with local actors, including Civil Society Organizations (CSOs) and Non-Government Organizations (NGOs) that will support the implementation of activities, ownership of processes and sustainability of the

BOX 3

Climate services for reducing the impacts of climate risks

Agriculture and fisheries constitute the principal livelihood of the poor in SIDS and are the primary means of food security. The rural poor and coastal communities, who depend on agriculture for sustenance and livelihood, are often vulnerable to the impact of adverse climate variations. Improving timely and accurate climate information services for agriculture presents opportunities for managing climate risks and for strategic decision making relevant to climate resilient adaptation and food security.

FAO is providing technical support to improve climate information products and services for agriculture. In Jamaica, the Rural Agricultural Development Agency (RADA), with technical guidance from the Jamaica Meteorological Services (JMS) and assistance from FAO, has acquired and installed automated weather stations in all major production areas of the country. The equipment records parameters that influence crop growth – rainfall, temperature, wind speed, relative humidity, solar and ultraviolet radiation. It also calculates derived parameters such as evapotranspiration and dew point, and could house more sensors, e.g. soil temperature and leaf wetness.

The RADA/JMS agrometeorology programme has many objectives: guide development of agrometeorology

forecasts/advice, enable farmers to better determine and time operations that are weather/climate dependent, (e.g. planting, irrigation, fertilizer application, pest management). It will also provide farmers with agrometeorological information for efficient and competitive agricultural production and enable better assessments and estimates of crop productivity/production levels (FAO, 2013b).

The value added services include local weather forecasting along with lunar phases, forecasting crop yield and production levels, scheduling of crop planting and irrigation dates, estimation of crop irrigation needs, development of pest and disease management programmes including early warning systems, determination of crop (and livestock) zone production potential, agricultural drought management advice and timing of interventions, wind monitoring for parametric agricultural risk insurance and development of a database for future historical and trend analyses. RADA is planning to expand the programme to facilitate crop assessment, natural resource management and improved services to the most vulnerable communities in mountainous and coastal areas.



project beyond its finalization. The process of establishing and strengthening partnerships needs to be documented, impacts assessed and lessons learned and recommendations disseminated across SIDS, thus maximizing the benefits of establishing collaborative arrangements. While some partnerships exist to address specific issues, partnerships operating at multiple levels are necessary to create the supporting environment for the sustainable development of SIDS. Without this the potential of individual SIDS to progress is very limited.

The path towards environmental sustainability in small island states requires coherent action and decisions by both producers and consumers. Policy and institutional frameworks and mechanisms help ensure social justice, equity and a long-term perspective on the protection of natural resources. This path crosses different areas of public policy at regional, national and local level. Therefore, it is essential to develop an understanding of the current policies and the potential intersectoral links, so that these may be incorporated into an enhanced institutional structure.

The institutions that govern agricultural production determine what is produced, who produces it and which type of technologies and practices are key levers for regulating agricultural products and services. Supporting the associated policy and policy implementation processes at the national, regional and inter-regional levels needs to be developed, strengthened and mainstreamed, thus providing the basis for larger-scale investments.

For SIDS, it is important to promote South–South cooperation programmes on regional information and surveillance systems, information sharing on pest and disease control, regional early warning and emergency response systems and approved standards between countries for trade in agricultural forestry, fishery and aquaculture products. Progress can only be achieved through coordination. Resource mobilization strategies need to be promoted to encourage greater public and private investments in research, technological development and innovation for the sustainable production of goods and services in the above sectors and in climate change adaptation.

CONCLUSIONS AND PRIORITY TECHNICAL AND POLICY ACTIONS

The International Conferences on SIDS have been organized in the context of sustainable development. This is because SIDS face multiple economic, social and environmental stressors in their development effort. As highlighted in this paper the challenges related to management of natural resources and environment are many and are exacerbated by climate change. This is a global problem but has a much more devastating impact on SIDS.

Efforts to sustainably manage natural resources and increase resilience of livelihoods to threats and crises contribute to sustainable development in SIDS. All these efforts rely on the management capacity of institutions and on coordination and governance mechanisms established to develop and implement judicial, legal and regulatory frameworks. They also rely on policies and policy instruments that facilitate the involvement of the social, economic and environmental sectors and institutions in planning development and in preparing an agenda of institutional strengthening and capacity building at regional, national and local levels.

 Partnerships for building regional and national systems for natural resources management and adapting to climate change: The policy and institutional dimensions of natural resources management should focus on building regional and nationwide systems that are able to equitably sustain and multiply the benefits of good practices of natural resources management and resilience building for all members. This must be achieved through partnerships among SIDS in and across regions, and between SIDS and the international community. Strengthening local actors such as CSOs and ensuring local stakeholder participation and ownership and community based approaches have proved to be important elements in the sustainable use and management of natural resources. This includes protection and conservation of biodiversity and critical habitats such as coral reefs as well as adapting to climate change.

- **Enabling environment and incentives** for managing natural resources: Policies and institutions need to provide the enabling environment and incentives for managing natural resources to reflect scarcities and their full ecological and social values. Strategies for conserving, protecting and enhancing the natural resources should be based on the specific resource constraints faced in any given location, as well as the current and desired improvements in reversing depletion and degradation. As noted in the most recent case study experience on coral reefs in the Caribbean, policy decisions that restrict access to coral reefs should also enable communities to find alternative means of livelihoods, as coral reefs are an important safety net and resource for coping with sudden seasonal changes. It is important to improve the role of communities and community based natural resources management by enhancing participation and benefit distribution. In the Pacific SIDS for example, where there are different systems of land tenure, alternative livelihoods for communities from sustainable use of biodiversity and natural resources are needed. Payment for ecosystem services and responsible tourism are sources for generating income, all of which require appropriate policies and institutional support.
- Main drivers of adverse changes and impact on natural resources and ecosystems: There is a strong need to work with governments, communities and regional organizations to identify the main drivers of adverse changes

on the environment and how these affect ecosystems services and biodiversity in the different sectors of agriculture. Existing natural resource management systems that have demonstrated positive resource and ecosystem management benefits from a range of different countries and situations should be reviewed, and systems that have specific application to SIDS, designed and tested through a participatory approach.

- Capacity development initiatives: There is limited capacity in SIDS to implement the conventions related to natural resources management and the environment and to benefit from participating in them. To meet the requirements of these international conventions capacity development activities need to be strengthened. The capacity development programmes should be designed to generate competence and improve the effectiveness of the institutions that work with the conventions and implement natural resources management projects, as well as to promote a better functioning political, economic and social system. There should be a broad assessment of capacity needs (in the areas of biodiversity, climate change, land degradation, and cross-cutting issues), the extent and nature of bilateral and multilateral efforts to assist in meeting those needs and a specific Action Plan for enhancing those efforts. There is a strong need in SIDS to integrate capacity development with specific areas of activities along with increasing the scale of support for sound economic development and environmental sustainability.
- Priority technical actions for natural resources management and resilience building: The priorities at country level include improved fisheries management systems, reef management and regeneration, marine protected areas, coastal zones, and mangrove and other coastal forestry systems. Agricultural land priorities include land governance, erosion management, disease control, and pest management. Priorities for forest resources include improved harvesting management, improved forest governance, integrating non-timber forest products into livelihood diversification systems, the establishment of protected areas (terrestrial and marine) and

sustainable land and forest management. Water resource management requires improved water catchment, transportation, storage and use, enhanced by better waste management. In the Pacific SIDS for example, improved management of groundwater and water harvesting for atoll countries are some of the areas that require priority attention. It is important to promote and support an integrated approach crossing multiple sectors, applications and scales to tackle these issues. Integrated Water Resources Management (IWRM) systems could help address the multiple use of water resources

 Improving monitoring, data and information systems: The lack of adequate data and information on natural resources and development indicators should be approached in an integrated manner. A consultation should be convened on data and information management as an essential input into sound decision making for natural resources management and resilience building. The viewpoints of the community and institutions on a wide variety of the data should be synthesized. This would provide direction at the highest levels of government and the international community, especially those that fund SIDS activities. SIDS governments should also acknowledge the need for the design of integrated data and information systems, including capacity for data and information systems, but they need strong coordination and strengthening.

• Linking Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA) and **Development:** SIDS are highly vulnerable to disaster risk and climate change impacts. The experiences of SIDS are a precursor to what other countries might face in the future. Greater attention is needed to evaluate the complementary factors and synergies of disaster risk reduction actions and climate change adaptation. As momentum builds towards framing disaster risk reduction and climate change adaptation within the post-2015 development agenda, and in the follow-up to the outcomes of Rio+20, it is vital that any goals and actions reflect the reality of the vulnerabilities of SIDS to disaster risks and climate change.

BOX 4

Implementation of Agricultural Disaster Risk Management Plans in the Caribbean

In recent years, floods, landslides, droughts and hurricanes have crippled agricultural production in the Caribbean, where agriculture is the main livelihood activity for a significant number of people. To strengthen community preparedness and resilience to natural disasters in the region, FAO launched a project to support the implementation of local disaster risk reduction plans in selected locations of Haiti, Dominican Republic and Jamaica. The initiative was aimed at increasing the resilience of farming and fishing communities through the implementation of community Agricultural Disaster Risk Management (ADRM) plans, location specific good practices and technology and knowledge sharing of good practices and experiences (FAO 2013c)

The project was able to strengthen ADRM farming and fishing capacities, making the communities

better prepared and more resilient to disasters. The project's main achievements included the establishment of a participatory methodology to prepare community based ADRM plans and of community level ADRM committees that actively participated in the preparation of the plans. Local partners and farmer organizations were trained in the ADRM process, including communication based strategic planning and tools. The immediate priorities identified during the participatory assessment process were addressed through the community based ADRM plans implemented at pilot sites. Contingency stocks and supplies were provided in every single community based on the needs identified. Good agricultural practices for disaster risk reduction were also identified in selected communities in three countries.

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This policy paper focuses on the environmental challenges of sustainable development issues with particular attention to natural resource management, environment and climate change in the food and agriculture sector (including crops, livestock, fisheries and forestry). FAO's agriculture, fisheries, forestry and technical assistance programmes provide considerable resources to assist member countries promote conservation, sustainable use and management of natural resources and to reduce the risks associated with climate extremes as well as resilience building.

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