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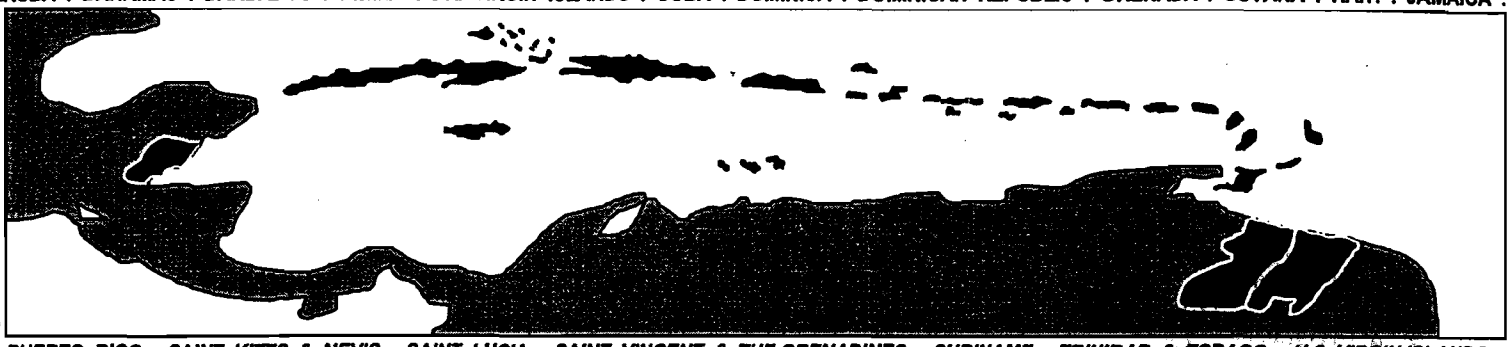

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LIMITED
LC/CAR/L.14
19 May 2004
ORIGINAL: ENGLISH

SURVEY OF POTENTIALLY NEW TECHNOLOGIES THAT WILL IMPACT ON CARIBBEAN DEVELOPMENT

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UNITED NATIONS
ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN
Subregional Headquarters for the Caribbean

CARIBBEAN DEVELOPMENT AND COOPERATION COMMITTEE

Table of contents

SURVEY OF POTENTIALLY NEW TECHNOLOGIES THAT WILL IMPACT ON CARIBBEAN DEVELOPMENT

PART I: INTRODUCTION

The pace of development in information technology, biotechnology and environmentally clean technologies require constant monitoring of new developments so as to avoid investment in and applications of technologies that do not have long-term utility, especially given the limited resources in the subregion. At the same time, present development of these technologies may require minor adaptations to be effectively applied in the subregion. One example is the research work in genetically modified organisms (GMOs) that can have implications for food security, nutrition, environment preservation and a redirecting of research and development priorities.

Summary

Agriculture

Biotechnology, irrigation, non-conventional energy sources and integrated pest management. While biotechnology covers many tools and techniques commonplace in agriculture and food production, it is the area of GMOs that are of concern to persons in both developed and developing countries at this time. Caribbean economies do not have the resources to invest in biotechnology research, so it is recommended that countries strive for increased technical collaboration and cooperation with countries that have the capabilities, especially countries such as Brazil, China, Egypt, India and South Africa. While high cost technologies and research associated with these technologies may not be an option for Caribbean countries, other technologies to increase agricultural production may be utilised and further developed, including irrigation technologies, use of non-conventional energy sources within the sector and integrated pest management, the other areas which are explored in the survey.

Natural resource management

Because the management of natural resources is the frontline of the struggle for more sustainable and equitable development, all our actions ultimately have consequences on the quality and quantity of natural resources on the planet. Environmental degradation is one of the first indications of unsustainable social and economic systems. There is one generally held view that non-renewable resources - minerals and petroleum - are unlikely to be depleted because as their costs rise, substitutes will be found, recycling will increase or new sources may become accessible. The fact remains, though, that the extraction of these resources places a heavy toll on natural and social systems.

Indicators show, however, that renewable resources - water, forests, topsoil, fisheries - are under extreme pressure under current practices and their productivity is in decline. These resources are the basis for life on this planet, and their exploitation constitutes the primary source of livelihoods for most of the world's population. As human population doubles and as we seek to improve the welfare of the three billion people who live on less than $2 a day, pressure on these resources will only increase.

Escaping this trap will require great ingenuity and cooperation across nations and cultures. Failure to manage these resources sustainably and equitably is in many cases already leading to conflict and disaster. Resolution of this challenge will be the key to sustainability.

Water

Competing demands are outstripping supply in many parts of the world, constraining development and laying the seeds for social tension and conflict. Water is vital to survival and is a key input to agriculture, industry and the maintenance of natural systems. Yet rainfall, rivers, lakes and groundwater aquifers are not always located where water demand arises. Moreover, industrial, municipal and agricultural pollution are decreasing the quality of available water sources, as is continued clearing of forests and draining of wetlands.

The survey therefore addresses the issue of Integrated Water Resources Management (IWRM), as well as the various technologies that may be put to use in the Caribbean, given the patterns of rainfall in the subregion. Also addressed in the survey is the issue of sanitation, even though there may not seem to be a sanitation crisis in the majority of Caribbean countries. There is still, however, a need to find sustainable alternatives to conventional approaches, some of which have been identified.

Fisheries management

An ecosystem approach to fisheries resources management is highlighted as opposed to the traditional approach which considers the target species as independent, self-sustaining populations.

Forestry resource management

Constraints to the sustainable use of forest resources are common to all Small Island Developing States (SIDS) regardless of the geographic, biological, social, cultural and economic characteristics. Some of these constraints and the possible solutions have been identified in the survey.

Energy

Solar energy and more specifically new technologies in solar energy systems have been highlighted as an alternate source of energy for the Caribbean. Included as information to solar energy use is an introduction to the concept of environmental design or green buildings.

While the technologies outlined herein can by no means be described as comprehensive, it provides some insight as to the options available for the use of technological innovation in sustainable development in the areas that are crucial to the subregion's development. In the Small Island Developing States Programme of Action (SIDS POA), particular attention was given to such areas as freshwater, marine resources, land resources and agriculture and science and technology as areas that were crucial to development of small islands. The technologies mentioned here address these issues and how they can help the development process and at the same time help to preserve the fragile ecosystems of Caribbean States.

PART II: SURVEY

Agriculture

Biotechnology

Biotechnology can be broadly defined as *"using living organisms or their products for commercial purposes"*. As such, biotechnology has been practiced by human society since the beginning of recorded history in such activities as baking bread, brewing alcoholic beverages, or breeding food crops or domestic animals. A narrower and more specific definition of biotechnology is *"the commercial application of living organisms or their products, which involves the deliberate manipulation of their DNA molecules"*. The Convention on Biological Diversity (CBD) defines biotechnology as: *"any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use"*. Interpreted in this broad sense, the definition of biotechnology covers many of the tools and techniques that are commonplace in agriculture and food production. Interpreted in a narrow sense, which considers only the new DNA techniques, molecular biology and reproductive technological applications, the definition covers a range of different technologies such as gene manipulation and gene transfer, DNA typing and cloning of plants and animals.

In the Caribbean, most of the work in agricultural biotechnology has concentrated on tissue culture to provide clean planting materials. However, biotechnology can also be used to help farmers produce more by developing new crop varieties that are drought-tolerant, resistant to insects and weeds and able to capture nitrogen from the air. Biotechnology can also be used to improve the nutrient content in the edible portion of plants.

In order to make informed choices, consumers have a right to know the contents of their food. Questions about safety must be addressed for people in both developed and developing countries. It is therefore recommended that developing countries invest in strengthening bio-safety testing and developing agricultural biotechnology suitable for their needs and their environments. In addition, research collaboration, both within and among countries, is essential if economies of scale are to be realized. Currently, biotechnology research in the developing world is taking place in only a few countries such as Brazil, China, Egypt, India and South Africa. It may be necessary for Caribbean countries to strive for increased technical collaboration and cooperation with these countries, rather than enter into agreements with the few private

corporations that focus on the agricultural sectors of industrial countries, and which expect the highest rate of return on their investment.

Irrigation

Irrigation may very simply be defined as supplying dry land with water. More specifically, irrigation is the application of water (or wastewater) to land areas to supply the water (and sometimes nutrient) needs of plants. Techniques for irrigating include furrow irrigation, sprinkler irrigation, trickle (or drip) irrigation, and flooding.[1] Irrigation may be also defined as the controlled application of water for cultural purposes through man-made systems to supply water requirements not satisfied by rainfall.[2]

The World Vision of Water for Food and Rural Development (Hofwegen and Svendsen, 2000) showed that by 2025 the world population would increase by 2 billion inhabitants to a total of approximately 8 billion people. The water requirement critical to livelihood, including food production, is 1700 m3/capita. This water is not available for everybody. Nearly one third of the world's population will live in regions that will experience severe water scarcity. Recent assessments by the Food and Agriculture Organization (FAO) of the United Nations put the world's area of potentially suitable cropland at some 3200 million ha (FAO, 1996). Agriculture in areas with artificial water management (irrigation and drainage) contributes to about 50% of present food and fiber production (FAO 1998). To improve the productivity (in terms of crop yield per m3 water consumed) water resources need to be more alertly managed.

Given the above scenario, the importance of irrigation cannot be over-emphasized. New tools are continuously being developed to facilitate integrated water resources management. Managers have to be able to assess to what extent targets are met and evaluate their strategy. This management process requires an advanced quantitative approach and a well-thought data acquisition system. The use of satellite images to support land and water management is beginning to be put into place. The success of remote sensing (RS) applications in land and water management is limited, and far behind the successes of RS applications in weather and climate studies.

Because accurate, timely and cost-effective information for the planning and monitoring of drainage systems are badly needed, it is recommended that a review of the possible contribution of advanced space information technologies in irrigated and drained agriculture be done. Remote sensing in irrigation and drainage related studies can be broadly grouped into