Chapter 2

CARIBBEAN NATIONS

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1. INTRODUCTION

There are many countries surrounded by the waters of the Caribbean Sea. These countries vary widely in size, topography,. ethnicity, language spoken, agricultural production systems, main sources of income, income levels and styles of governance, to name a few.

This analysis covers only the countries where English is spoken as the first language. These countries are linked through a grouping of Caribbean Communities, called CARICOM, an organization of 15 Caribbean nations and their dependencies. It starts with Jamaica in the North to Trinidad and Tobago in the South, but also includes Belize in Central America and Guyana and Suriname in South America. Although French speaking Haiti and Dutch speaking Suriname belong to CARICOM, they are not discussed because of the language barrier. The other French speaking islands (Guadeloupe and Martinique) and the Spanish speaking islands (mainly the Dominican Republic, Cuba and Puerto Rico) have different administrations for agricultural development. CARICOM countries stretching from the tip of Florida, USA, in the North to Venezuela in South America. CARICOM includes Belize in Central America and Guyana and Suriname in South America.

2. COUNTRY AND AGRICULTURE SECTOR OVERVIEW

The importance of agriculture as a major economic sector has declined within the Caribbean Community (CARICOM) countries over the past two decades. Agriculture, based on traditional commodities such as rice, sugar and bananas, which once dominated the region's economies, has been replaced by tourism and services in a number of countries. Significant challenges resulting from loss of preferential markets for traditional commodities, poor competitiveness of Caribbean farm enterprises in a global trading environment and high levels of risk associated with natural disasters (particularly hurricanes), have also contributed to great losses to farmers and producers. Changes in trading arrangements at the global level, climate change, new phyto-sanitary standards and issues relating to intellectual property rights, have created major challenges for Caribbean farmers. In addition, other factors such as an aging farmer population, use of outdated production technologies, high costs of inputs and unavailability of labour, among others, have contributed to the decline of regional agriculture.

The farming community comprises a multiplicity of farmers operating on small holdings, small defined as less than two hectares, is characteristic of most of the islands. Production and marketing systems exist for the traditional commodities, whereas those for root crops, herbs, vegetables, small ruminants

and other non-traditional commodities are not well defined. Many of these challenges have been summarised into ten key binding constraints in *the Jagdeo Initiative* - the current regional agricultural policy framework adopted by the CARICOM Community in 2005. The policy identifies a series of recommendations for implementation to improve the competitiveness of the region's agricultural sector (Antoine, 2009; Bourne, 2008).

In the Caribbean region, the role of agricultural extension services has moved from that of passive transfer of information and has been evolving to that facilitator, service provider and information broker. The Information and Communication Technology (ICT) revolution of the past two decades has certainly had an impact' on extension services in the Caribbean region.

This chapter will provide an overview of extension services and systems and highlight the challenges. It will also trace some key developments in ICT use in the agricultural sector, with special reference to extension services. Challenges and recommendations for ICTs in Caribbean agricultural extension have also been identified.

A brief overview of the general economy, with highlights of the agriculture sector is presented below for each country. The main source of information for the country description detailed is the website of the Caribbean Agricultural Research and Development Institute (CARDI, 2009), a regional Research and Development organization serving CARICOM countries. Population statistics and economic data are from websites of the United Nations (UN, 2008).

Antigua and Barbuda

The larger of the twin island state, Antigua, is 281 square kilometers in area. Barbuda covers 161 square kilometers and lies forty-eight kilometers due north of Antigua. Together, they have a population of 83,000. The economy is service-based, with tourism, financial, and government services representing the key sources of employment and income; tourism is the leading foreign exchange earner. Agriculture contributed 3 per cent of GDP in 2007. The main agricultural products are cotton, fruits, vegetables, bananas, coconuts, cucumbers, mangoes, sugarcane and livestock, mainly focused on the domestic market. There is an organized Extension system as part of the Ministry of Agriculture. This division faces a number of challenges such as staffing and equipment.

Belize

Belize is located in Central America, bordering the Caribbean Sea to the east, with Mexico and Guatemala bordering on the northwest and southwest,

respectively. Belize covers a total area of 22,960 square kilometers and includes many small uninhabited islands called cayes. The tourism industry is the primary foreign exchange earner and is becoming the country's second most important industry, next to agriculture. The agricultural sector accounted for 28.4 per cent of GDP in 2007 with the chief crop, sugar, generating almost half of the exports. There are just about 20,000 farmers in Belize and while the government is the main extension service provider, a number of other organizations, including several NGOs also provide extension services.

Barbados

Barbados is the eastern most island of the Lesser Antilles, situated 160 kilometers east of St. Vincent, with a total land area of 430 square kilometers. It has a population of 295,000. Historically, the Barbadian economy was dependent on sugarcane cultivation and related activities, such as cotton and vegetables. However, the economy has shifted from an emphasis on agriculture towards the provision of mainly tourism, business, finance and general services, and manufacturing. As part of the county's "sugar adaptation strategy", a sugar-based ethanol industry is being developed together with non-sugar agriculture and manufacturing. The agricultural sector accounted for 4 per cent of the GDP in 2007. There are just about 3,500 farmers in Barbados and the government is the main provider of Extension services.

Commonwealth of Dominica

Dominica is the largest and' most northerly of the Windward Islands. Geographically, Dominica is distinctive in many ways. The country has one of the most rugged landscapes in the Caribbean, and is also among the earth's most rain-drenched lands. The island, home to rare species of wildlife, is considered by many as a beautiful, unspoiled tropical preserve. The country is approximately 751 square kilometer in area and has a population of about 70,400. There are less than 10,000 farmers. The agricultural sector accounted for 18 per cent of the GDP in 2007, mainly from bananas, citrus, coconuts, cocoa, herbal oils and extracts. Historically, banana production has employed over one-third of the labour force, directly or indirectly. However, the sector has been facing challenges with the loss of the preferential European Union markets for bananas. There has been diversification into other crops such as citrus fruits, vegetables, coffee, patchouli, aloe vera, cut flowers, mangoes, guavas, and papayas. Increasingly the Government is promoting the island as an "ecotourism" destination. Agriculture Extension services are provided mainly by the government, but other special interest organizations and groups also provide extension services.

Grenada

Grenada and its largely uninhabited outlying territories are the most southerly of the Windward Islands. The Grenadine Islands chain consists of Some.600 islets. Grenada and its territories occupy a total area of 433 square kilometers and are known as the Spice Isle because of its production of nutmeg and mace: Grenada is the second largest producer of nutmeg in the world after Indonesia, and even after devastation by Hurricane Ivan in 2004, remains a significant producer of mace, cinnamon, ginger and cloves. The economy of Grenada is dependent on agriculture and tourism, and while tourism is the main source of foreign exchange, historically, the island has been- an agricultural society. In 2007 the agricultural sector accounted for 6 per cent of GDP. Agricultural export products are nutmeg mace, cocoa, bananas; other fruits, vegetables and fish, while agro-processing is becoming more important. There is an organized Extension system coordinated by the Ministry of Agriculture, pursuing mainly commodity based extension programs.

Guyana

Guyana is located in northern South America, bordering the North Atlantic Ocean, between Suriname and Venezuela, covering an area of 214; 969 square kilometers; with a population of 736,100. It is a sparsely populated country. Over 90 per cent of the population reside in the narrow coastal plain that comprises only five per cent of the total landmass. Agriculture in Guyana contributed to 31 per cent of GDP in 2007. The major industries are sugar, bauxite, rice, timber, fishing (shrimp), old mining, and diamonds. The government provides extension along with commodity associations,' farmers' groups and other organizations.

Jamaica

Jamaica is the largest island of the Commonwealth Caribbean and the third largest of the Greater Antilles. The country lies 145 kilometers south of Cuba and 160 kilometers west of Haiti. Its capital city, Kingston, is about 920 kilometers southeast of Miami. Jamaica occupies an area of 10;911 square kilometers. Jamaica's economy is heavily dependent on services, which account for 70 Per cent of GDP. The main income earners are tourism, the bauxite industry, hinds from remittances and agriculture. At five per cent, agriculture was the lowest contributor to GDP in 2007, but it employs 20 per cent of the workforce. Major commodities produced include sugar, bananas, coffee, cocoa, citrus, pimento, yarns, vegetables, poultry and goats. Jamaica has several commodity extension programs for traditional Commodities, for example: banana, cocoa, coffee, and sugar. Extension services are provided by an

autonomous government authority, the Rural. Agricultural Development Authority (RADA), which has been fairly successful. RADA coordinates the delivery of services to rural communities along with providing advice and technical support to farmers.

St. Kitts and Nevis

The islands of St. Kitts and Nevis are part of the Leeward Islands group of the Lesser Antilles. A narrow strait, of 3.2 kilometers wide separates the two islands. The total land area is 269 square kilometers, and together both islands have a population of 46,000. Sugar was the traditional Mainstay of the St. Kitts economy until the 1970s when the commodity became increasingly unprofitable. The Government of St. Kitts and Nevis embarked on a programme to diversify the agricultural sector and stimulate the development of other sectors of the economy. By 1987, tourism had surpassed sugar as the major foreign exchange earner for St. Kitts and Nevis, with export-oriented manufacturing and offshore banking also playing key roles. The agricultural diversification programme has continued with emphasis on crops such' as hot pepper, white and sweet potato and vegetables, in addition to livestock-dairy, beef, mutton, pork and poultry. Agriculture contributed 3 per cent of the GDP in 2007.

Saint Lucia

St. Lucia lies to the north of, Martinique, south of St. Vincent and northwest of Barbados. It covers a total land area of 616 square kilometers. St. Lucia's economy depends primarily on revenue from banana' production and tourism with some input from small-scale manufacturing. The contribution of agriculture to the GDP has declined over the years. However, although agriculture contributed only four per cent of the GDP in 2007, it still accounts for a significant number of jobs, with the majority related to the banana industry. Other agricultural products of economic importance- are: cocoa, coconut, citrus fruits and livestock. The banana industry is faced with low prices and a new, less favourable, set of rules for the European Union market which has made economic diversification increasingly important. Efforts to this end include the establishment and promotion of fruit crops such as mangoes and avocados; a variety of vegetables are being produced also for local consumption. This diversification programme is supported by the extension services which is largely provided by the Ministry of Agriculture. There are also a number of important commodity associations which provide extension services to their members.

Saint Vincent and the Grenadines

St. Vincent is the largest of a chain of small islands, known as the Grenadines, which extends to Grenada. St. Vincent covers a land area of 344 square kilometers. The islands altogether, they have a population of 121,000 persons. The economy of St Vincent and the Grenadines is based largely on agriculture, which contributed seven per cent of the GDP in 2007. Banana is the main crop and accounts for over 50 per cent of the work force and exports. There is a growing service sector which includes tourism, telemarketing and offshore financial services. The Government has been implementing a series of structural reforms within the agriculture sector as part of a diversification programme, including promotion of private sector growth and restructuring of the banana industry. Among the agricultural products are: coconuts, sweet potatoes, eddoes, dasheen, arrowroot starch, spices, as well as small numbers of cattle, sheep, pigs, goats and fish; the output for plantains, pineapples, yams and peppers is increasing. There are about 7,000 farmers and while extension service is provided mainly by the government, a number of other agencies exist to provide service to the farmers.

Trinidad and Tobago

Trinidad and Tobago, a twin island state, is situated nearer to mainland South America than any other Caribbean island and comprises an area of 4,828 square kilometers. Tobago is located thirty kilometers northeast of Trinidad, and separated by a channel thirty-seven kilometers wide. Trinidad and Tobago has a population of 1.3 million with one of the highest per capita incomes in the Caribbean. The country is a producer of oil, natural gas, steel, and petrochemicals. Agriculture contributed 0.6 percent. of the total Gross Domestic Product in 2007, and the value of crops grown for the domestic market is believed to be considerably greater than that of the export crops. Since 2003, with the divestment of the industry, sugar has declined as the main export crop cultivated on large estates employing a large number of persons. Trinidad is also world famous for its "fine or flavor cocoa" which fetches a premium price on the world market. In recent times, rice, citrus, corn, cassava, peanuts, and pigeon peas are being cultivated on large estates both private and state managed, as part of a programme to diversify agricultural output and promote food security and sovereignty. The Ministry of Agriculture has historically been the main provider of Extension services to farmers. However, in recent times a number of state-assisted agencies and organizations have begun to provide specialized extension support to farmers.

3. MAIN EXTENSION PROVIDERS AND SYSTEMS

In most countries, the extension service is attached to the Ministry of Agriculture or a similar ministry. They are national in scope, cover most agricultural commodities and in some instances, Forestry and Fisheries. Jamaica, however, has an alternative national system, known as the Rural Agricultural Development Authority (RADA) which is a semi-autonomous statutory authority of the Government. Limited services are .provided by commodity associations, farmers associations and other special service groups. Seepersad (2002) described in detail the variety of Extension systems in the English-speaking Caribbean and this publication is used extensively in the section below.

3.1. Ministry of Agriculture (MoA) Extension Services

3.1.1. Structure

Various models are observed in various countries. For example, in St. Kitts and Nevis extension officers are located within the crops and livestock units respectively. In Barbados, the extension service was once merged with the Research Division. They are now separate. Trinidad and Tobago (TT) has attempted decentralization of extension and other services of the MoA through the use of regional offices. However, this resulted in some problems with the overall management of the extension staff and coordination of extension programs. In Grenada and Barbados, the Extension Division is further subdivided into crops extension and livestock extension. In St. Vincent and the Grenadines, there has been a move in recent times to have extension services pursue a commodity focus. Most countries hive information or agricultural communication units attached to the Extension division for the production of publications in all instances, radio programs in some instances, and audio-visual material in few cases.

3.1.2. Scope of Extension Programs

Most MoAs have a national mandate for almost all commodities and the main focus of the Government's programme over the years has been on increasing production and productivity of the agricultural sector. Extension programmes provide services for the most part to the vast majority of small farmers producing a variety of crops and some livestock as part of the farming system. Commodity extension services exist for main export crops like; cocoa banana, and sugar. Such services are usually provided by Commodity Associations and extension officers are not heavily involved in Technology Transfer and other support services related to that commodity. The poultry industry is dominated by contract farming, and the processors provide the

contract farmers with advice, inputs and technical assistance. However, the MoA has continued to provide information for those farmers who are outside the contract farming system along with a host of other commodities. Farmer training programmes are also conducted as a means to provide technical information and farming techniques to farmers.

Extension staff often has an understanding of rural development issues although most organizations, with the exception of RADA in Jamaica, are not set up for delivering rural extension or rural development services. Even so, RADA's role is limited to coordinating services and or liaison to ensure better delivery of services offered -by various agencies involved in rural development.

There are limited arrangements for Subject Matter Specialists (SMS) to provide backstopping and technical assistance for extension officers. Trinidad and, to some extent, St. Lucia have experimented with such arrangements. In other countries, staff members of Research Divisions serve in a limited way as SMS.

3.1.3. Role of the Extension Officer

Frontline Extension officers operate as "generalists" in most countries and address a range of problems of the farming community - from providing technical advice to serving as a channel for matters which require the wider attention of the Ministry. Thus from time to time they are required to carry out responsibilities which are important, but are not strictly informational or educational. Across countries duties may include assessment of flood damage, collection of data, administration of subsidies, and regulation of land issues, to name a few. The extension officer is usually seen as the representative of the Ministry and even of the Government since he or she is the, first line of contact with the public. This means that they could be asked to carry out functions that are needed that are not carried out by any other agency. Often these activities take precedence over information and education delivery. In a number of cases, therefore, where there is stated dissatisfaction with Extension services, it may be a reflection of general dissatisfaction with the response of the Ministry of Agriculture as a whole, rather than with the Extension officers themselves.

3.1.4. Staff Qualifications

All frontline officers in the MoAs in Jamaica, Guyana, Barbados, and Trinidad and Tobago have at least a two year diploma in agriculture at the tertiary level. In Trinidad and Tobago, anumber of the frontline officers have

undergraduate (first degrees) in agriculture. This is so because the Faculty of Agriculture of the University of the West Indies is located in Trinidad making access for Trinidadians much easier. In most other countries, the majority of staff have been trained in agriculture science *via* two-year diplomas from various national agricultural colleges, with the ultimate aim of training everyone at that level. The remaining staff have Certificates in agricultural science, acquired after two years of training. All the staff at the senior levels have at least undergraduate (first degrees) in agriculture, while others also possess post graduate qualifications including Master's degrees in various agricultural disciplines. While a number of Extension Officers also have specialized qualifications in Extension at the diploma level, there are Very few persons trained in Extension at the post graduate level.

3.2. Commodity Extension Services

Commodity associations bring together all the functions for one particular commodity *i.e.* research, extension, input supply, marketing and training under one umbrella. The Extension function is usually carried out by a separate unit which is normally referred to as a commodity extension service (CES). This is perhaps the second most important type of Extension service in the region. Commodity associations still exist for most of the traditional commodities such as banana, sugar, rice along with coffee, cocoa and coconut

3.2.1. Banana

All the countries that export bananas—the Windward Islands (Dominica, Grenada, St. Lucia, St. Vincent), Jamaica and Belize have commodity associations for this commodity. Extension is mainly for the purpose of technology transfer in that specific practices are promoted for higher yields and improved quality. Overall farm management is also addressed. Extension staff is also involved in regulatory functions *e.g.* inspections related .to fruit quality and certifying farmers. The Banana Extension Officer is also responsible for recommending additional inputs when warranted and ensuring proper marketing arrangements.

3.2.2. Sugar

The sugar industry is the largest agricultural industry in the Caribbean with large companies (State owned and otherwise) responsible for all the processing and most of the production. Guyana's sugar industry is the largest agro-industry in the Caribbean producing over 300,000 tons of sugar, most of it being produced by the state. In Jamaica, sugar cane commodity extension service is operated by the Sugar Industry Research Institute (SIRI) which has field staff throughout the producing areas. They carry out technology transfer

and assist with providing technical services to farmers. In Belize, there is also some level of support for sugar by dedicated extension officers.

3.2.3. Rice

Guyana is by far the Caribbean's largest producer and exporter of rice, which is produced by both large and small farmers. The industry is managed by the Guyana Rice Development Board which runs a research station and a rice extension service. Extension Officers are posted throughout the rice growing areas and are engaged in technology transfer as well as working with seed growers. In Belize, there is also some level of support for Sugar by dedicated extension officers. As with sugar, there also some level of support for *rice* farmers by dedicated extension officers.

3.2.4. Poultry

Contract farming is practiced largely in the broiler industry. It is probably the second largest agricultural industry in the Caribbean and is certainly the fastest growing industry. The industry is dominated by vertically integrated businesses involved in feed manufacturing, processing and production. The contracted farmers are serviced by technical representatives who are responsible for technology transfer, monitoring supplies of feed and other inputs and providing other forms of support. It is a very intensive system and technical representatives have to visit the farms at least twice a week.

3.2.5. Other Commodities

Jamaica has commodity extension services for coffee, cocoa, and coconuts. Trinidad has, within the last five years, started to provide a specialized extension service for cocoa in an effort to revitalize the industry. Grenada also has a cocoa commodity extension service in addition to banana, and another Commodity association responsible for the nutmeg industry. With agricultural diversification away from traditional commodities, a number of small commodity associations or groups are being formed across the region:

3.3. Extension by Farmers' Associations

3.3.1. National Associations

The most prominent national associations over the years are the Agricultural Societies—the Jamaica Agricultural Society (JAS), the Barbados Agricultural Society (BAS), and the Agricultural Society of Trinidad & Tobago (ASTI). They are all over 100 years old, and at their peak wielded considerable influence on agriculture. They tend to command the most attention from governments as the voice of farmers. These groups receive funds or a

subvention from the national governments but may sometimes also get funds from various other agencies. JAS receives considerable funding from government and is the only one that has several field staff in the various communities. ASTT has minimum field staff. The Agricultural Societies get information to members and the public in various ways such as agricultural exhibitions, field trips and various types of publications and strong advocacy.

3.3.2. Commodity Based Associations

A number of commodity- based organizations exist in the various countries that represent the interest of the farmers in their various enterprises or commodities, assisting them to better manage challenges with a common front. They have also been important for sharing information especially where the "official" knowledge systems had not been able to provide access to relevant information or mechanisms to advance the industry. For example, the Horticultural Society of Trinidad and Tobago, which is almost 100 years old, has been credited with providing information and services which support the development of the floriculture industry.

Some other farmers' associations that have field staff are the Guyana Rice Growers Association, the Toledo Cocoa growers association in Belize and to a lesser extent the Grenada Cooperative Nutmeg Association and the Citrus Growers Association in Trinidad. They liaise mainly with farmers and do provide some limited extension support.

3.4. **Other Extension Providers**

3.4.1. Research and Development (R&D) Institutions

In general, there are limited technology transfer opportunities associated with on-farm trials, workshops and publications, and research institutions have little or no extension staff. However, some projects have "Technology Transfer and Adaptation Specialists" or similar staff who may interact with farmers on an ongoing basis, through their research programs. Generally, they are few in number and can only reach a limited number of farmers. Some R&D institutions also have information and communication units which produce publications such as factsheets, technical bulletins, manuals and other types of materials in print or electronic format, to disseminate research findings. The main R&D institution in the region is the Caribbean Agricultural Research and Development Institute (CARDI), which provides on-farm demonstration and on-station demonstrations and trials, through principal scientists. In the few countries where national Research Stations exist, staff may occasionally provide some limited extension service to farmers.

.3.4.2. Input Suppliers

Agricultural Input suppliers, also called "agro-shops" - those who sell various types of agricultural chemicals, animal feed, machinery and equipment - now promote themselves as going beyond selling products. They consider themselves as "friends" of the farmer who have genuine concerns for overall agricultural development. They participate in and help to sponsor agricultural events. Some do R & D as well but their activities are largely technology transfer on the products they sell. They are generally quite willing to collaborate with government, the University of the West Indies (UWI), and other organizations in the agricultural sector.

3.4.3. NGOs

The importance of NGOs in agriculture in the region has been growing, especially those with an emphasis on rural development. However, they are not yet widespread and the reach of those that exist is generally small. In mainland countries such as Belize and Guyana there are greater numbers of NGOs than other countries. While NGOs have special mandates; they often have extension staff who work with target clientele (farmers, women and children).

3.5. **Fisheries and Forestry Extension,**

.Fishery and Forestry extension are relatively new in the region. Some units have had to "borrow" staff trained in agricultural extension to develop their services. However, increasing emphasis is now being placed on fisheries and the extension units are developing regionally. Forest conservation is now on the agenda in the region and it is expected that extension capacity will improve.

4. CHALLENGES OF EXTENSION SERVICES IN THE CARIBBEAN

de Freitas (2006), noted that extension involved empowering farmers to identify and articulate their needs and to obtain the required knowledge and skills necessary to negotiate and manage their environment. Hence, Extension Officers are expected to become facilitators in a relationship between the client/producer. They are charged with the responsibility of addressing not only issues relating directly to farming, but also supporting the delivery of other services to facilitate the overall development of the farm family and rural community. Several challenges face the Caribbean Extension community, some are historic and some are new issues arising from more recent developments:

- High expectations due to changed view of agriculture. Extension officers are now expected to deal with the production cycle as well as food and non-food products along the entire value chain of a range of commodities:
- Weak linkages between agricultural research and extension.
- Large numbers, of small farmers with a wide range of commodities and farming systems.
- Varying levels of functional literacy and low levels of computer literacy among farmers.
- Decentralisation of extension services suffering from poor coordination and management.
- Extension infrastructure, systems and approaches not yet reconfigured to embrace a new culture of participation and empowerment.. ,
- Limited access to and application of new and- appropriate farming techniques for the region.
- A general trend of poor human and financial resources for Extension Services throughout the region making for low contact levels with clients on a timely basis.

It is with respect to this last challenge that the advent of ICTs has most meaning, providing greater opportunities for interaction, more in keeping with current extension practice. Furthermore, with more actors involved in the development process, Extension Officers are no longer the sole voices reaching farmers. Thus modern tools and techniques must be adopted that will enable extension to be the source that clients turn to in quick time to provide timely information, clear up conflicting information, validate information sourced elsewhere *etc.*

5. NEED FOR ICTs IN CARIBBEAN AGRICULTURE

The role of Information and Communication Technologies (ICTs) is popularly held to be very critical to economic development, with potential to be used as both an engine of economic growth and for delivery of products and services. ICTs facilitate collection, organisation, storage and dissemination along with communication and exchange of data, information and knowledge between and among groups. While the "old" or traditional technologies such as the fixed line telephones, radio, television, print, video and film are still widely used, there has been increased, albeit. slow, adoption of "new" technologies such as computers .and telecommunication tools including the Internet and Mobile telephony.

ICT is a major cross-cutting issue in development. So important is the issue that Caribbean Community (CARICOM) Ministers responsible for Information and Communication Technology agreed "to an aggressive and focused strategy to accelerate the adoption of ICT for development" (CARICOM, 2004). A Regional ICT Steering Committee was formed in 2007 and has secured funding from the European Development Fund as part of a project to develop the Caribbean Information Society (CARIB-IS). The CARIB-IS project is programmed to involve key Information Society (IS) stakeholders including ICT/IS personnel, ICT and telecommunications regulators and operators, thematic stakeholders, the private sector and civil society (Eurostrategies, 2004). To date, both Trinidad & Tobago and Jamaica have begun to implement national IT policies. In the Organisation of Eastern Caribbean States (OECS), a sub-grouping within the CARICOM, countries operating within the framework of the Eastern Caribbean Telecommunications Authority (ECTEL) have initiated but not yet completed work on ICT policies.

The use of ICTs in agricultural extension in the Caribbean region, similar to many other developing regions, will be influenced by its use within the wider society and particularly in the agricultural sector. All the countries have recognized the value of an information based society and the opportunities it provides to citizens in the areas of business, education, personal development and entertainment. Definitely, the work of Agricultural Extension in the region has been enhanced over the years with the introduction of *new* ICTs.

There are however, some challenges which impact on the rate and extent of ICT adoption and use in the Caribbean region, and to the extent to which these challenges are not addressed, farmers, rural producers and indeed overall agricultural development will be affected. de Freitas (2007) outlined the following challenges faced by the ECIEL states, challenges which are also present in the wider Caribbean region:

- Lack of comprehensive quantitative data on ICT use at national and regional level
- Low levels of ICT penetration

  Absence of a well coordinated approach to ICTs both nationally and regionally
- No single entity responsible for ICT
- Significant shortfall in deployment of ICT

These challenges must be addressed so that the region and the Extension services in this case, can reap greater benefits from the application and use of ICTs. The following section provides an overview of the use of ICI's within agricultural extension in the Caribbean region presently.

6. USE OF ICTs WITHIN AGRICULTURE AND EXTENSION

Campbell (2003), in a paper prepared for the CTA ICT Observatory, noted that information about use of ICTs has not been widely researched to date. This situation still exists today; hence information for the purposes on this paper was obtained based on presentations made by Extension staff and other Ministry staff at workshops, reports, feedback from colleagues in Extension across the region and participation in joint projects executed with the involvement of Extension agents. Experiences and outcomes from several studies spearheaded by CTA and completed with support from CARDI were also used extensively in this chapter (CTA,1997; CTA,2005(b); CTA, 2008(b)).

Since the 1990s, Extension Divisions or units, usually located within the Ministries of Agriculture, have moved from a situation of very limited access 'to hardware and software to a position where there is increased emphasis on the acquisition and use of ICTs on a day-to-day basis. Extension agents within the respective Ministries of Agriculture in the region are often in charge of Information or Communication Units, and are responsible for dissemination of information. These officers now use ICTs to provide support for the preparation of factsheets, brochures, for mounting exhibitions, in providing training, delivering public lecture presentations, and for the development of radio and television programmes. These units are good examples of the integrated use of old and new ICTs where more traditional printing and reprographic technologies are still in operation.

Several countries have benefited from donors and technical support from equipment supplied *via* projects through agencies such as the Commonwealth of Learning (COL), the CTA, the Inter American Institute for Cooperation on Agriculture (IICA), and other technical support agencies (COL, 2002). Local governments also continue to provide ICT tools as part of basic printing and communication equipment such as desktop computers, laptop computers, printers and photocopy equipment. Digital scanners, cameras and video equipment are less popular.

6.1. Country Status

Extension officers in *Antigua & Barbuda* have been providing technical assistance and manpower to facilitate training through courses offered by a

local NGO, the Gilbert Agricultural Research and Development Centre (GARDC). GARDC has a fully equipped networked computer lab, but very limited full time staff, while the Extension Officers do not have access to the training facilities and ICT equipment available at the GARDC. Courses are conducted in use of ICTs for record keeping, for the preparation of business plans and for accessing information relevant to the business *via'* the Internet. The Centre also hosts a Website that can support presentation of courses, and materials that can support agri-businesses or community projects. This present situation provides an ideal opportunity, for collaboration by Government Extension Officers and GARDC, all to the benefit of the local farmers. Extension division uses e-mail for correspondence and presentation software for training, and has the potential to place information on the website as part of a Government of .Antigua & Barbuda gateway. A bibliographic database provides access to information held in the GARDC Library. In 2007, the Government of Antigua & Barbuda agreed "to invest in development of traditional media (radio, TV) and modern ICT infrastructure, which is widely accessible", as part of efforts to build their national capacity in technology and to promote "Antigua as the Regional Centre of Information Communication Technology Excellence". Plans are in place to reduce the digital divide and provide ICT access at the community level (CARICOM, 2009).

Barbados's Ministry of Agriculture used ICTs mainly for accessing information, for correspondence, compilation of trade and production data as well as for information dissemination. These activities are carried out in collaboration with other stakeholders in particular the Barbados Agricultural Management CO. Ltd. (BAMC), using customized software called *AGRICAST*. The Website is used as a conduit to the Ministry's Question and Answer Service (QAS) and for online searches of its Library (Ministry of Agriculture and Rural Development, 2009).

In Belize ICTs were used mainly to access technical information from the Internet, for word processing, for messaging and reporting between supervisors and staff and to access information from the agricultural library's database. Presentation software is becoming popular for use in training and seminars. A limited number of NGOs, farmers' and commodity associations maintain websites which provide access to information and news for their members. The Ministry of Agriculture Website, still in development, may be accessed through the gateway for the Government of Belize (Government of Belize, 2009).

The Ministry of Agriculture in *Dominica* has developed a plan called Agricultural Information and Management System (AIMS) designed to

support the provision of a reliable agri-business intelligence service to key stakeholders in the agricultural sector, including improved management and production of local agricultural statistics. Implementation of the plan has been limited by funding and access to skilled personnel. At this time, ICTs are used for development of databases, for presentations, to provide information to farmers, and for publication of newsletters and fact sheets.

Grenada's Ministry of Agriculture has continued efforts to use ICTs for the establishment of databases, including a marketing database for analysis and dissemination of user friendly marketing information. An Information Resource Center was organized in 2008, .while the Ministry initiated policies designed to capture important local data and reports. A Public Relations Officer was employed to disseminate information. The Communication Unit in the Ministry has acquired more advanced equipment, and a decision has been made to improve staffing levels and skills in ICTs. This will contribute to the Ministry's efforts to work in collaboration with the local marketing agency to develop a single platform or Agri-business Information System (AGBIS) to provide timely and accurate production, market and trade information. Information on weather, e-learning opportunities, events, technical information related to livestock, crop and fisheries sub sectors is planned, along with a discussion forum. This forum aims to bring the farming community, scientists, policy makers and extension workers together onto a single platform to exchange ideas.

In *Guyana,* more traditional ICTs are mainly used. However, there is increasing use of presentation software such as PowerPoint by extension for training, fairs and exhibitions. The St. Stanislaus College Farm has put a number of agriculture-related information on CDs and these are being used as teaching tools for both farmers and students. Students in the Faculty of Agriculture at the University of Guyana are being taught the use of presentation software for use in Extension and other outreach activities. ICTs were used to assist in the running of small scale-enterprises and to support the preparation of business plans, and the production of articles, brochures, reports and photographs. The Government of Guyana has developed Agri-Net - Guyana's Agriculture Information Network (GAIN), in collaboration with the IICA, to provide information to users including farmers and extension officers (Agri-Net Guyana, 2009).

Jamaica's Rural Agricultural Development Authority (RADA) established a website which is a "One-Stop-Shop" for the provision of business counseling, technical and marketing services, and the facilitation of investment. It features an Agricultural Business Information System (ABIS), described as "a web

based information system to provide information on crops, livestock and agricultural production, markets and stakeholders to support the business of agriculture" (Ministry of Agriculture Jamaica, 2009). ICTs are indeed at the heart of its implementation approach and support activities such as providing continuous training for farmers, providing marketing intelligence services to farmers and intermediaries, and facilitating liaison with research• and development stakeholders to deliver technology to farmers. The RADA is also making use of ICTs to update the farmers' database. Some frontline extension agents are provided with Blackberry mobile phones through which the officers can communicate with farmers and provide timely responses to requests for information and advice to farmers. Some Extension staff also have some experience with GPS for collecting and recording farmer data. Other government_ agencies such as the Land and Surveys Division use ICTs for land registry thus making it easier for farmers to better manage land. At the local level, Internet cafés are accessible *via* district offices, *e.g.* post offices, facilitating Internet access at a community level.

St Kitts/Nevis is one of the countries which benefited from the training provided to Extension Officers in the use of cameras and audio/ visual reproduction equipment under a Commonwealth of Learning Media Empowerment (COLME) programme. Studies by the COLME project team, local extension staff and farmers, recognized that video was the best medium since many of the farmers already owned television sets and VCR/CD players. Use of multi-media technology greatly extends the reach of each extension officer and allows the capture of local content.

ICT use in *St Kitts and Nevis* is mainly centered on print and broadcast, with a relatively slow emergence of e-mail, websites and electronic networking by Extension agents. Standard radio and TV programmes are aired (Walker, 2003). The Public Library in Nevis makes local factsheets and other technical information available to Extension agents and farmers through searches on its bibliographic database.

Extension services in *St Lucia* are well serviced by the Information Unit, comprised of the Documentation Centre and Communication Unit, which has a reasonably well developed capacity of print and multi-media, with less capacity for managing text, maps and databases. The basic hardware and software for developing information products is available, however access to facilities for dissemination of information - reprographic and audio-visual equipment - is limited. Human resource constraints are also experienced due to under-staffing and a limited range of in-house skills in the use of ICTs. The Extension Division is developing a model to use the Ministry's website to feature

local multi-media training material developed specially for farmers. ICTs are expected to enhance efficiency and effectiveness, facilitate monitoring and evaluation, assist with programme planning, and support training for users. Efforts continue to upgrade the Information Centre and use the Website as an interactive portal for information dissemination and training to farmers and other stakeholders (Ministry of Agriculture, Forestry and Fisheries, 2009).

In *St Vincent and the Grenadines,* the Ministry uses ICTs for traditional information sources such as technical advisory services, reports, statistics, publications and databases. Dissemination of information is *via* conventional media, print and extension services. Within the last five years there has been increasing recognition and integration of new and 'old' ICTs. The use of radio call-in programmes for farmers, coupled with providing answers to questions *via* mobile phones has been proposed. An innovative model of farmers' organizations partnering with Extension services to digitize and publish factsheets has been successful. ICTs have also been used to support the implementation of a Question and Answer Services (QAS) in collaboration with CARDI and CTA. The bibliographic database allowed easy access to information, which was used to answer questions put to the Agricultural Information Resource Centre.

Trinidad & Tobago is one of the few countries in the Caribbean that has a National ICT Policy. The Ministry of Agriculture has developed a national initiative to integrate its information into a one stop shop, as part of the national e-Government Programme. Within this Ministry and among key statutory agencies, ICTs are used for database development, including farmers' databases, training, and managing state lands. Software development has been customized for various institutional activities *e.g.* to manage contact lists, prepare and maintain farmer databases and collect, organize and disseminate production, marketing and other statistical data. The Website presents information on upcoming farmer training courses and provides access to technical information for farmers (Ministry of Agriculture, Land and Marine Resources, 2009). The marketing aspect of the NAMDEVCO programme is ICT driven, where price and volume information is collected on a daily basis with the use of Palm Pilots. The information is then computerized and disseminated close to real time on a daily basis, for the benefit of farmers and consumers. Since 2005 an information system called the National Agricultural Marketing Information System (NAMIS) has provided this information to all stakeholders in the agricultural sector *via* their website. The Extension Division has a Mobile Learning Unit which is essentially a modified fully air conditioned 25-seat bus, fully powered and equipped with computer and presentation equipment, which goes to rural areas. A facilitator uses prepared multimedia

CDs on various topics to provide training to communities on board the bus. Recently, in Trinidad, a curriculum has been developed for the training of farmers to enable them to access information *via* the internet and training is due to begin shortly, since many farmers have access within their homes mainly for their children's use.

The Extension divisions are all making use of both old and new ICTs in delivering current services to a greater or lesser extent based on resources invested in the technologies. Integrating old and new technologies is the current practice, but with low penetration of hardware and software, use of new ICTs is not ideal. Some 50 per cent of countries presented have websites dedicated to the agricultural sector, while the Ministry has a presence as part of the Government gateway. To date, the Extension Services in Jamaica appear to have the most targeted use of ICTs for the purpose of communicating with their clients. St Lucia and Trinidad & Tobago feature Extension Services as part of the Ministry of Agriculture Website. Barbados and Guyana have dedicated links to sources of agricultural information and data. There is also some use of ICTs in related areas which will ultimately contribute to more effective extension services such as production and marketing agencies, trade and bi-lateral entities, research and development organizations and other government agencies.

7. TRACKING INFORMATION, COMMUNICATION AND TECHNOLOGY NEEDS AND CAPACITIES

The information revolution has resulted in a proliferation of better information access, tools, and facilities. Hence, according, to Gachie and Ruault (2006), a larger volume and range of information is available through portals, websites and gateways. Publications can be done by anyone with access to the hardware and software. Communication is available in real time allowing easy networking, sharing and exchange of information. Within the agricultural sector, ICTs have been used to support activities in the following broad areas (IICD, 2006):

- Facilitate a conducive policy environment
- Obtain increased profitability of small farms
- Provide increased market access
- Support improved production efficiency
- Enhance and empower farmers and the rural community in general

They have been used specifically to:

- Coordinate and develop systems for managing various projects and activities within the agricultural sector
- Disseminate technical information relevant to agriculture
- Post prices and other market information
- Identify markets and sell online
- Manage agricultural and information resources
- Better communicate and network between and among stakeholder groups

The use of ICTs should be determined by needs. These include direct and indirect information needs, communication needs as well as the need to solve problems and manage challenges. Information needs of key stakeholders including farmers and extension agents have been identified *via* evaluation at workshops and seminars, feedback at meetings, direct requests from respective stakeholders, formal surveys, consultations and trend analysis.

ICT was identified as a major cross-cutting issue affecting agricultural development and thus was seen as a means to an end and not an end in itself. A long standing partnership between the Caribbean Agricultural Research and Development Institute (CARDI and the Technical Centre for Agriculture and Rural Cooperation (CTA), made significant contributions to meeting information needs and providing policy support linked to Information and Communication Management (ICM). A two-pronged approach emphasized improving both access to relevant information products and services, and developing the capacities of regional stakeholder groups in information and communication management.

Historically (CTA, 1997), extension agents highlighted the need for further technical support for the delivery of information and advice to farmers. They pointed specifically to the need for information on pests, diseases and marketing, and for training in photography techniques, radio broadcasting, script writing and mounting exhibitions. Farmers indicated they required access to information on pests and diseases management, marketing and trade. The farmers also preferred information delivered *via* on-farm visits or personal contacts, although they also utilized radio, television, video and printed materials. This 1997 agricultural information needs survey confirmed that there was a general lack of formal mechanisms for organizational collaboration, accessing and managing information, and not much use of electronic information sources for disseminating and communicating

information. In addition, there were no strategic marketing and communications plans for developing and targeting existing agricultural information products and services.

Campbell, (2003) recorded that 'agricultural extension relied on face to face, print and radio communication (CTA, 2005b). A report on Agricultural Information Needs (CTA, 2005; (a)), identified "word of mouth", personal connections, extension visits and publications as the preferred channels of communication for users. Meetings, workshops, email and press releases were also used to exchange information. However, radio programmes, TV and multi-media were still not well utilized as key information sources. The report also showed that although the use of the Internet had greatly increased, there was still a dearth of information relevant to the Caribbean farmers available on the Internet. A few agricultural libraries continued to provide access to technical information mainly in print formats, although the organization of some in-house collections had improved to some extent. Even in 2008, stakeholders continued to indicate a preference for personal communication to obtain information. While there was more significant use of the Internet, email and online information sources, information gaps still existed in relation to current technical agricultural information in a variety of subject areas, particularly local information and data (CTA, 2008;(a)).

7.1. Farmers' ICT Needs, Capacities and Use

ICT capacity, information needs and other challenges of Caribbean farmers are also important since farmers are the main clients of the extension services. In 1999, CARDI worked with the German Agency for Technical Cooperation (GTZ) and the Jamaica Agricultural Society (JAS), to pilot the use of Information Cafés to provide information to farmers in rural communities. The results of that exercise revealed that more use was made of the Information Café's services by students and teachers than by farmers. Even when farmers used the service, it was to request non-farming information and or obtain services such as photocopying and printing for other purposes.

A number suggestions were offered based on these findings, including the need to provide assistance to access the information - either to guide in the use of the computers and Internet for searching, or for interpretation and analysis of the volume of materials accessed by farmers in the Internet cafés. Locally relevant information with advice on specific commodities and conditions most often requested, was not available on the Internet. There were also difficulties in accessing information which was not packaged in a manner that would facilitate easy understanding by farmers (CAIS, 2004).

Seepersad (2003) noted that while small farmers were making limited use of the internet, the highly educated floriculturists were using it regularly for their development. Users of a CTA/CARDI-supported Question and Answer Service (QAS) across six Caribbean countries comprised approximately 7-9 per cent of farmers and 5-13 per cent extension officers over the period 2005-2006 (CTA, 2005a; 2006b).

The report on the Survey of over 150 farmers' organizations and rural NGOs in 13 Caribbean countries highlighted the ICM/ICT status of groups ranging from less than 100 members to those with upwards of 10,000 - 50,000. Approximately 76 per cent of the groups owned telephones, while 68 per cent had computers, with less than 50 per cent with cameras, VCR/ DVDS, televisions, radios, or photocopy machines. Over 50 per cent of employees in farmers associations had communication skills in computer science, audiovisual use and journalism. The main sources of information for those farmers' groups were meetings/conferences, followed by Extension Officers, newsletters, magazines and the Internet. Information exchange was identified as one of the main purposes for setting up a regional network of farmers' groups. Marketing information, information on training and education, as well as access to information on general agricultural production, was stated as the top three priorities. Problems linked to communication capacity of the respective organizations related to lack of proper infrastructure such as office space, basic communication equipment, insufficient human resources numbers and range of skills, along with limited finances (Rajack-Talley and Lawrence, 2004).

7.2. Regional Responses to Support ICT Use — Training and Use of Networks

Based on the results of the various needs analyses, efforts were made to create an entity called the Caribbean Agricultural Information Service (CATS), which was designed to improve capacity for information and communication management (ICM). ICTs were identified as only one aspect of ICM with efforts to support network development, design and development of information on products and services, as well as provide technical assistance in ICM. The CTA/CARDI partnership organized and hosted several courses in the last few years, which provided regional training courses and seminars to build capacity in ICM. Training included topics such as:

- Web design and development
- Strategic management of ICTs
- Communication management

- Public awareness
- Management of electronic networks
- Management of question and answer services (QAS)

One course was especially for Extension agents in the field of communication - electronic production and publishing of agricultural extension materials. Over twenty extension agents from across the Caribbean were exposed to using ICTs to design and develop customized solutions to meet information needs and empower farmers. The concept of using a participatory approach and involving farmers/clients in the design of the products was promoted (CTA, 2006a).

Other institutions such as the Inter American Agency for Cooperation on Agriculture (IICA) spearheaded the development and hosting of online and CD-ROM training courses for farmers and technicians in areas such as computer literacy, farm management, and production of selected commodities. National governments also launched training programmes in computer literacy and use of basic software and hardware. Staff members of several Ministries of Agriculture, NGOs, farmers associations, and research and policy institutions were able to improve skills in ICM and identify potential use of ICTs in their day to day operations.

Some 12 commodity and thematic networks were set up over the period 1998-2004 to encourage networking, including via face to face, print and electronic means, and for ongoing exchange of ideas and information. A 200304 evaluation of PROCICARIBE - the Agricultural Science and Technology Networking System (established in 1996) - pointed to weak capacity for research and development and a poor culture of networkirig among the reasons for the failure of all but a few of these networks (Asiedu, 2005). Many Extension Officers and farmers were included among the stakeholder groups in these networks.

8. CHALLENGES FOR ICT USE IN EXTENSION SERVICES

Studies on Agriculture, Science, Technology and Innovation (ASTI), spearheaded by CTA, determined that the Caribbean region, as with African Caribbean and Pacific (ACP) countries, "do not sufficiently and adequately apply science, technology and innovation to facilitate meeting the challenges associated with improvements in agriculture" (CTA, 2006c). This also applies to the use of ICTs which have already been identified as having great potential to support development and poverty alleviation.

On a more global level, while ICTs have been used to support the development of industry and delivery of services, there has been very limited application in development matters such as poverty alleviation and rural development. However, pre-requisites for ICT use are not only the access to the equipment and tools, but also the knowledge and skills for application and use of same. Relevant institutional frameworks, together with appropriate strategies and policy frameworks are also critical for success.

The ICT Development Index, a statistical tool designed to measure the relative application and use of ICTs on a comparative global scale developed by the International Telecommunications Union (ITU), revealed that while the Caribbean region is among the top 50 per cent of countries in the area of ICT access and infrastructure, they fall below the expected level of ICT use based on their current GDP levels (ITU, 2009). From a global perspective, the region is lagging behind its potential position in becoming an information society. This is reflected in the relatively slow adoption of ICTs at regional and national level in both business and development projects.

Insufficient attention has been paid to targeted training to increase the skills of the users overall. Issues relating to the sustainability of systems, work flow processes and how the activities within respective institutions would or could change with the introduction of new technologies, are not greatly considered. There is at present low capacity to promote greater application and use of ICT for productive development. This speaks to the need to increase human resources and equipment, strengthen institutional and policy framework, further develop local content, strengthen the integration and networking among key stakeholder groups and address socio-cultural issues such as 'information insensitivity', indigenous knowledge and the use of more participatory approaches (Henry, 2009). All of the above must be addressed at a national or even sectoral level.

9. THE WAY FORWARD FOR INCREASED ICT USE IN CARIBBEAN EXTENSION

There is a real risk that in times of global food and financial crises, poverty and hunger could be experienced in developing countries including the Caribbean region. At both the regional and international level, there has been recognition that in response to the global crisis in food security and energy, agriculture must change (World Bank, 2007). Chesney posits that the Caribbean region must respond appropriately and quickly to meet potential opportunities, along with the challenges that accompany them. He recommended a "new agriculture", which should examine activities along the value chain and view agriculture as both food and non-food items (Chesney, 2007).

Results from studies by the International Institute for Communication and Development indicated that ICT's can increase empowerment and income of participants in the agricultural sector, based on its experience over two years (IICD, 2006). ICT interventions provide support for the development of the agricultural sector in areas such as improving knowledge on poliCy environment of the agricultural sector, increasing market access and productivity efficiency of farms, and increasing empowerment and social inclusion of rural communities.

Barker, (1997) suggested that production on small farms increased if more attention was paid to improving the quality of the frontline extension worker. His research pointed to the need to intensify support from research, involve personnel from other relevant agencies that support the implementation of extension programming, and the need to establish co-ordinating mechanisms at the local, national and regional levels. Based on this preamble, several suggestions to enhance ICT use in improving the impact of extension on farming are detailed below.

9,1. Reconfigure Extension

Agricultural Extension is changing worldwide, with emphasis on innovation (Saravanan, 2008) and increased involvement of other rural groups besides farmers. Access to information is critical to rural communities in this new global environment, if they are to constructively participate in new opportunities and successfully manage the challenges. The "new agriculture" being promoted in the region requires a different set of extension, educational and research skills and programmes, and is organically linked to other economic sectors including tourism, education, health, transport, trade and
finances (Chesney, 2007).

In the context of ICT use, we embrace and promote an extension service that is configured to facilitate the transfer of information from both the global knowledge base and local research, to farmers and rural communities, with the objective of development. Such development includes empowerment of the local communities and equipping them with tools and skills to manage their growth and maximize the use of their resources (Richardson, 2007).

The region therefore needs to reexamine and restructure Extension if it is to serve the needs of all of its clients in the context of the new global environment. A situational analysis might be useful to support this. Such an analysis should include an inventory of ICTs for extension, and must detail the skills, infrastructure, resources, capacity of farmers and officers that are

needed to transform the sector. Extension workers must be empowered through technology to:

- Be able to reach out and work more closely with each other and also with other agricultural professionals, especially those in Research organizations at national, regional and global levels.
- Design and develop appropriate learning experiences to reach and educate farmers.
- ***Be*** in direct link with specialist officers in the country and elsewhere in the region to respond quickly to farmers' problems and queries.
- Continue to assist in development and repackaging of materials such as videos, factsheets, technical manuals, and in supporting services such as databases, skill banks and question and answer services, specifically tailored to the needs of clients.

Moreover, extension officers require an expanded skill-range for them to better understand ICTs and their potential for use to provide innovative solutions to the host of challenges being faced in the community. Extension agents must also develop the capacity to act as conduits to bring ICT tools to their communities. Training for Extension officers should include the use of multi-media, alternative media, and other ICTs relevant and appropriate to their needs such as preparation of CDs/ DVDs, participatory video, web 2.0 tools, Internet Radio, streaming video, and other evolving technologies. Skills training must also cover methods to wisely integrate old and new technologies and use that effectively and appropriately given the content and the audience.

This is a medium term to long term development as most countries will require some time to move forward given the present ICT situation in each country. In the short to medium term however, in the extension institutions, experts are needed to repackage, analyse and make information more locally relevant to the various audiences, in particular, farmers and rural communities. Skills in advocacy and sensitization, networking and collaboration will be necessary since a multi-disciplinary approach will be necessary to address the range of needs and audiences. This will assist the institutions in extension to become better users of ICTs, while raising awareness of the potential the technology provides to meet the objectives of the work programmes and empower farmers and the rural community.

9.2. Develop Policy and Institutional Frameworks

Much of the effort required to address the broader issues of communication and knowledge exchange falls beyond the remit of researchers,

extension and the Ministries of Agriculture in the region. An holistic approach is needed. Given the cross-cutting nature of the ICTs, Government policy on ICT in each country must be designed to ensure that all benefit; individuals and farmer groups, NGO's, and state assisted organisations must all have the opportunity to move ahead. Extensive country-consultations followed by regional consultations with all potential users, to identify needs and current uses of ICT in agriculture, is a good starting point, even for countries which already have national ICT policies. Ministries of Agriculture and Extension Services in particular should 'piggy-back' on existing projects and activities such as the CARICOM Regional ICT Steering Committee. This committee will support the development of appropriate policy frameworks for the region through use of networks, development of appropriate ICT and information society indicators, and also promotion of information-sharing, discussion, sharing of experiences and fostering innovation (CARICOM, 2007).

9.3. Improve Access and Build Capacity

Ministries of Agriculture and other statutory agencies are still major repositories of information useful for agricultural production and farmers. There is also only one major research institute (CARDI), governed by CARICOM which has a mandate to work in collaboration with respective national governments and other regional and national research and development stakeholders. While some information resides with Commodity Associations and other special interest organizations, the present situation is clearly insufficient to meet ICT needs of the region.

According to the ICT Development Index, the Caribbean region has relatively high scores in ICT access and skills, but somewhat lower than expected application and use in business, education and development. It will also be necessary to ensure that users of modern ICTs use these tools in pursuit of their agricultural development goals. Further, ensuring that users are able to use and or reach relevant information through intermediaries or combination of old and new ICT technologies is vitally important. This will truly facilitate better access to information by those most in need.

There is a need to fuel innovation by improving the capacities of persons to retrieve and interpret information. The region should strive to go beyond computer literacy to reach information literacy, where users are better able to access, evaluate and use information in their everyday life. In addition, ICTs should be examined for options to improve systems, processes and business models currently in existence.

9.4. Promote a New Culture

Cultural changes, including the development in the region of "information sensitivity" - an appreciation of the usefulness of information - and willingness to think outside of the box, will support innovation (Henry, 2009). Critical thinking, participatory approaches and feedback mechanisms are also to be encouraged. Such innovative approaches are necessary, along with the design and development of modern information and communication management strategies that would identify the best policies, frameworks and resources to support implementation of Extension programmes. And, while, as this paper shows, general capacity issues are known, to address the problem requires more explicit information. Information and Communication management (ICM) strategies should be prepared to support the implementation of Extension plans in the context of Ministries' strategic programmes.

9.5. Build on Present Strengths

The Internet is a key source of information for extension agents and farmer associations. As such, the development of local and Caribbean content suitable for the Internet should be encouraged. Much of the present documentation, technical information and data relevant to the Caribbean should also be collated, displayed and digitized for access. In addition, recognizing that the use of the mobile telephone has become so wide-spread, it can become a cost-effective tool for accessing information by the population including rural persons. Increased efforts must be made to develop ways to provide relevant information and structured networking *via* this method. -

There are a few organized interventions using ICTs for extension support. For example, the use of Blackberries to collaborate with farmers in Jamaica, the use of FDA's to capture and transmit data by the NAMDEVCO, and the use of a Mobile Learning unit for farmer training in Trinidad and Tobago, have been identified as more formal and institutionalized examples. There also seems to be a number of new approaches and pockets of innovation being implemented or championed either individually, at unit, or department level that may not yet be mainstreamed at the institutional level. Some examples include the exploration of mobile phones for supporting question and answer services and the linking of QAS to radio talk shows focusing on agriculture in St Vincent and the Grenadines, use of interactive multi media training materials on the Web in St Lucia, use of interactive CDs for training farmers in Trinidad and Tobago, and the partnership between the GARDC and Extension Services in Antigua & Barbuda. All these initiatives require appropriate institutional frameworks, policy support, adequate funding and

human resources. These are certainly examples that can be shared and perhaps replicated elsewhere in the region where appropriate, through networking of Extension Officers.

9.6. Encourage Youth

Encouraging youth may assist the use of ICTs in the agricultural sector, and at the same time encourage or attract the addition of a younger pool of farmers to a group where the average age is over 60 years. As elsewhere in the world, youth and ICT use seem to be almost natural. ICTs can therefore be used .to encourage wider participation of youth in agriculture, not only to attain technical, professional and business skills in agriculture, but also to promote opportunities for innovation by youths to assist the development of the agricultural sector. Such opportunities are available at the UWI, and various colleges of Agricultural education in Trinidad, Jamaica, Guyana and Belize, as well a range of Youth in Agriculture Programmes in the region *e.g.* the Youth Apprenticeship Programme in Agriculture (YAPA) in Trinidad and Tobago, which targets young people 17-25 years of age and the host of 4H programmes which targets a wider age category and is particularly strong in Jamaica.

9.7. Develop and Use Networks and e-Forums

Communication is necessary to share and exchange information and ideas, and to support innovation. Therefore, the encouragement of linkages and exchange of information/discussions both within extension groups and also across stakeholder, cultural, country and institutional barriers must be encouraged (Gandelsonas, 2002). A number of national and regional networks already exist; however, it is recommended that a network or Community of Practice for Caribbean Extension Officers be established. This network should position itself to link with other existing networks.

Local, national and regional producer networks such as the Caribbean Farmers Network (CaFAN) and the Caribbean Association of National Fisherfolk Organisations (CANUFO) can provide good fora for community learning, social interaction, collaboration and resource sharing (de Freitas *et al.,* 2006). Other groups such as the Caribbean Agricultural Forum for Youth (CAFY), the Caribbean Network of Rural Women (CANROP) and the Caribbean Agri-business Association (CABA), all have the potential to become increasingly important as vehicles for sharing information among and between stakeholders groups such as producers, youth, women and business groups. Networks and groups could also serve as important channels for training using the application of ICTs in the rural areas. e-Forums can

become important means by which expertise between and among extension in the region and already existing producer/stakeholder networks, can be shared.

The Food and Agriculture Organisation (FAO) has developed a model known as the Virtual Extension and Research Communication Network (VERCON) for promoting networking and communication between agricultural research, extension, farmers and their associations, and policy makers (O'Farrell, 2003). The Caribbean may examine this existing model for experiences and relevance to the region. While policy frameworks are being developed, the Extension agents can begin to network, support each other and also learn from one another. The consequent benefit expected is improved human resource capacities and a stronger interface with farmers and rural communities.

10. SUMMARY AND CONCLUSION

The use of ICTs in Extension services in the English speaking Caribbean .in the future will be based on the vision for agriculture in the region. IICA (2007) noted that agriculture must be seen as more than helping poor farmers and must be viewed as a strategic sector in Caribbean development; that there is sufficient market demand for the output of the sector to make it potentially profitable. Bourne (2008) stated that public policies which address structural constraints on agricultural performance and on the marketing and distribution of agricultural output are required. Extension Services should make every effort to build on the current strengths and experiences from application and use of ICTs both within the agricultural sector and other sectors in society. The existing capacity and infrastructure with respect to equipment, education and literacy levels puts the region in a position of readiness to make good use of ICTs in its development programme. However, greater emphasis must be placed on raising awareness, improving the relevant skill sets and improving 'information sensitivity', so that both extension officers and their potential clients can benefit from the use of ICTs in helping meet key objectives within the agricultural sector of the region.

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