

Concept Paper



Issues and Challenges of Climate Change for Women Farmers in the Caribbean: The potential of ICTs

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Abbreviations

CARICOM	Caribbean Community
CCCCC	Caribbean Community Climate Change Centre
CWB	Canadian Wheat Board
FAO	Food and Agriculture Organization
GHG	Greenhouse Gas
GIS	General Intelligence Service
GPS	Global Positioning System
GPT	General Purpose Technology
GSM	Global System for Mobile Communications
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
ICT	Information and Communication Technology
IDRC	International Development Research Centre
INSMET	Cuba Met Service
IPCC	Intergovernmental Panel on Climate Change
ITU	International Telecommunication Union
JOAM	Jamaica Organic Agriculture Movement
MACC	Mainstreaming Adaptation to Climate Change
NID	Networked Intelligence for Development
SMS	Short Messaging Service
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization

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The paper also draws on discussions and evaluations arising from a pilot workshop on Organic Farming, ICTs and Climate Change that took place in Kingston, Jamaica from June 27th to July 1st 2009. The workshop was co-sponsored by the UNDP regional office, by the Jamaica Organic Agriculture Movement (JOAM) and by Networked Intelligence for Development (NID), and enabled the author to have direct access to women farmers and to their perspectives on ICTs and climate change.

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The writing of the paper, its omissions, observations and recommendations remain the sole responsibility of the consultant and author, Nidhi Tandon.

Objectives and methodology

Section I outlines the paper's research assumptions and discusses the potential role of organic farming for regional food security and for addressing climate change impacts in the Caribbean. The correlation between access to quality information and livelihood security is also explored and the particular implications for women farmers. Section II summarizes findings from a primary survey undertaken by NID that highlights climate change trends experienced by Caribbean women farmers and their usage of ICTs. Surveys conducted by email were supplemented with results from a pilot workshop in Jamaica that took place at the end of June, 2009 and follow-up conversations with key stakeholders, including meteorologists, IT specialists, insurance brokers and other development practitioners. Based on findings, the section also discusses the need for climate change research, resources and information, and fundamental gender considerations for ICT applications. The section concludes with profiles of women farmers to demonstrate the range of age, activity and ICT experience of farm entrepreneurs in the Caribbean region. Methods for the profiles included primary farmer surveys and follow-up conversations over email.

Section III reviews current research and documentation through a comprehensive literature review that was undertaken to assess evolving practices for using ICTs for climate change. Section III also presents several case illustrations and examples of ICTs specifically being used in climate change/rural contexts to highlight possibilities and evolving practices. The section concludes by asserting an urgent need for capacity building at both grassroots and policy levels.

Terraced farming on steep slopes, using bamboo supports - organic greens, Jamaica



SECTION I: Understanding and perception

With no explanation for climate change or the abrupt shifts in weather, farmers may think this is 'God's work' - and beyond the control of mere mortals. By extension, farmers might not consider themselves actors of consequence whose actions could have direct impacts for climate change and for our collective futures on this planet. In fact, nothing could be further from the truth!

1. From the ground up!

Many of our global environmental issues are directly related to Earth's natural resource base. According to James G. Speth², today's major global scale challenges include climate disruption, losing forests, losing land, losing freshwater, losing marine fisheries, losing biodiversity, and over-fertilization with nitrogen (leading to large areas of dead soils and ocean). All of these challenges and losses are inter-linked and inter-dependent, resulting from modern methods of land use and the relentless exploitation of resources for consumption and profit. Poverty aggravates the issue; the chopping away of coastal sea grape or mangrove swamps for coal for personal use damages the coastline's natural defense systems against the ravages of hurricane-related erosion. The long-standardized and established principles of land use methods need to be 'unlearned' and reversed, the vested interests of an entrenched agro-industrial system³ and its system of subsidies dismantled, and by the same token, those people who could be the natural stewards of land and natural resources need to be recognized, valued and empowered to take new strides in the context of climate change.

Three fundamental assumptions inform the premise of this paper:

1. Field research shows that small-holders in general and women farmers in particular are generally left out of emerging discussions and decisions around farming, food security and climate change. This needs to be redressed.
2. Comparative research has proven that compared to non-organic farming systems, organic farming methods positively address a range of factors related to climate change. Organic farming, however, is not mentioned in the Intergovernmental Panel on Climate Change (IPCC) 2007 report and continues to be isolated from mainstream agricultural discourse. This also needs to be redressed.
3. Interactions and communications with farmers, small holder farmers and women farmers prove that they are a critical part of the solution to contain greenhouse gas (GHG)

emissions. They are not mere receivers of information or instruction but are valuable record keepers, watchful data collectors, and on-the-ground pulse takers of the impact of climate change on the biosphere. This needs to be recognized and supported.

Through engaging with women farmers, it is abundantly clear that ICTs need to be further diffused into rural areas, and diffused deliberately among women users. While anticipated growth in Internet infrastructure in the region looks positive (see Annex I for details) access by small scale farm holders and in remote areas still present a major challenge. These women are eager not only to use wireless phones for a host of personal reasons, but are keen to learn to use the Internet; to share information, stories and images; and to become engaged participants in the digital age as knowledgeable farmers. Taking the laptop into the farm to train farmers and farm workers, through video clips, powerpoint presentations and other audio-visual means is a tool that is both highly effective and under-utilized.

The participants at the climate change pilot workshop in Jamaica were introduced to a number of on-line tools to measure farm carbon footprints, and could see how ICT tools could track and measure climate change – which would have an immediate impact on their own activities and decisions if they had access and connectivity. At the time of writing, there are a host of compelling audio-visual materials, data, and weather maps, as well as carbon footprint tools available on line. These are, however, primarily from the USA or from a western farm perspective. What are lacking are similar materials relevant to the Caribbean context that speak to the Caribbean farmers and their issues.

Following the workshop in Jamaica, one of the farmers has begun recording short digital video-clips on organic composting on her farm. JOAM is in discussions with a local radio station in Jeffrey Town to link the audience with the 14 model farms across the country so that those on the farms can hear the broadcast and JT can use the experience to fuel their programmes. Materials like these, with men and women discussing and demonstrating specific farm methods are akin to taking the recipe and the cookery class into the field. Further examples in Section II serve to illustrate how ICTs could be especially useful in a climate change context.

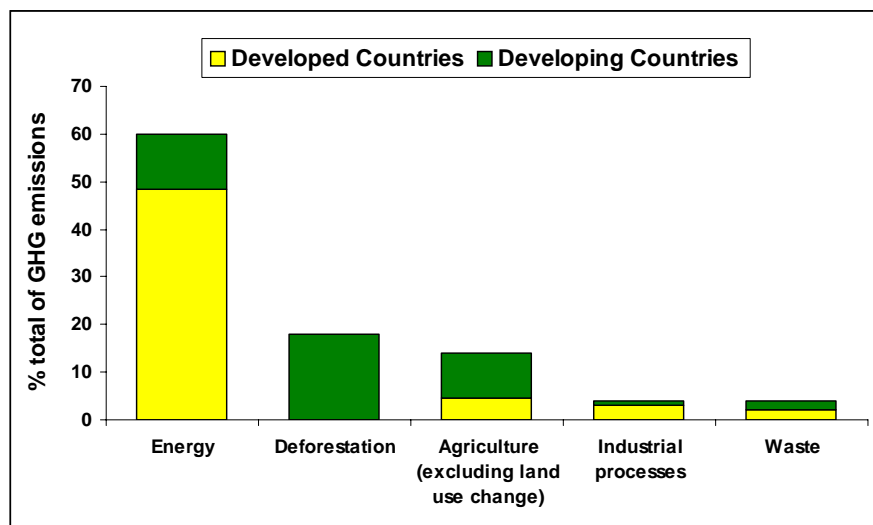
Farmers across the Caribbean are facing the direct and indirect effects of climate change. The Force 5 Hurricane Ivan in 2004 heralded an ominous change in weather patterns in the Caribbean with more frequent and severe storms devastating the region coupled with increased rainfall causing severe flooding interspersed with periods of drought. Small holder farmers are the most vulnerable of the agricultural community and have had little help to secure their farms, natural resources and assets in the face of increasingly unpredictable weather and rising sea levels. The same farmers, however, have a critical and yet unrecognised role to play in addressing climate change by changing their farming practices to use less energy, to care for and nurture biodiversity and by reducing GHG emissions.

2. Turning crisis into opportunity: Why organic agriculture is such a compelling option

The farming method identified by the United Nations Environment Programme (UNEP) and the United Nations Food and Agriculture Organization (FAO) as a fundamentally sound way to address climate change is organic production. This research paper regards organic farming, permaculture and other bio-friendly forms of farming (as opposed to chemical forms of farming) as the main viable long-term solution for healthy local food production and food security for developing country farmers.

Agriculture and deforestation (which often times go hand-in-hand) are significant contributors to GHG emissions (see Fig. 1). According to the IPCC 2007 Synthesis Report: Latin America/ Caribbean region: “By 2050, desertification and salinization will affect 50 percent of agricultural lands in Latin American and the Caribbean zone. If deforestation continues at today’s rate, approximately 40 percent of the existing 540 million hectares of Amazonian rainforest will have disappeared by 2050”.

Figure 1: Sources of GHG Emissions



The IPCC’s Fourth Assessment Report (WG3, 2007) also identifies a number of opportunities for mitigating greenhouse gases in agriculture. These options for mitigation fall into three broad categories, namely (1) reducing emissions; (2) enhancing removals; and (3) avoiding (or displacing) emissions (pp 505-508):

- **Reducing emissions:** Effective agricultural management can help reduce the emissions of carbon and nitrogen flows in agricultural ecosystems. The approaches that best reduce emissions depend on local conditions, and therefore, vary from region to region;
- **Enhancing removals:** Improved agricultural management such as practices that increase the photosynthetic input of carbon and/or slow the return of stored carbons can result in enhanced greenhouse gas removal; and
- **Avoiding emissions:** Crops and residues from agricultural lands can be used as a source of fuel. Emissions, notably CO₂, can also be avoided by agricultural management practices that forestall the cultivation of new lands now under forest, grassland or other non-agricultural vegetation.

Irrigated agriculture accounts for almost 70% of world water withdrawals and close to 90% of the total consumptive water use (the portion that is lost to the immediate environment for use)⁴. Water management for agriculture is an increasingly important concern as a way to cope with climate-related water-stress, particularly in rain-fed agriculture. Crop productivity will depend upon sufficient precipitation to meet both evaporative demand and soil moisture needs. The two sectors in the world that use the most water are chemical intensive agriculture and fossil fuel-based energy production.

Organic farming⁵ presents an important opportunity for the region, not only because of the non-chemical nature of the overall productive system, but also because data gained from modeling both long-term field trials and pilot farms⁶ show that:

- It has considerable potential for reducing emissions of GHGs (because it uses less energy than conventional farming); and
- It can make a significant contribution to CO₂ sequestration in the soil.⁷

The FAO reports that “Organic agriculture performs better than conventional agriculture on a per hectare scale, both with respect to direct energy consumption (fuel and oil) and indirect consumption (synthetic fertilizers and pesticides)”. Its 2002 report states that organic agriculture enables ecosystems to better adjust to the effects of climate change and has major potential for reducing GHGs.

A range of direct and indirect impacts include:

a) Healthy eco-systems:

- Organic soils have better water-retaining capacity which explains why organic production is more resistant to climatic extremes such as floods or droughts;

- Carbon sequestration in soils is promoted by organic methods due to the addition of compost, mulches, manures and cover crops;
- Organic farming systems promote and nurture a range of biodiversity. Rowan's Royale Organic Coffee farm in Jamaica for instance, was the smallest farm of a study sample but had the most birds native, endemic and visiting and the least coffee berry borer;⁸
- Other related benefits include healthy eating, local foods, lower overall food carbon footprint.

b) Income diversity and security:

- Organic farming systems require regular and methodical recording of farming data for organic farm inspectors to monitor. This systematized data method lends itself to systematic recording of weather-related data for use by local and national meteorological stations and can feed into climate risk insurance data. Potential impacts for small-holder farmers after disaster strikes are multi-fold;
- As organic farming comprises highly diverse farming systems, the diversity of income sources also increases potentially buffering farmers from adverse effects of climate change and variability such as changed rainfall patterns. Coffee planted under banana trees alongside asparagus for instance, protects the coffee bush from the ravages of a hurricane wind;
- Future carbon sequestration programs that seek to offer farmers environmental fees for stewardship of soil, land and biodiversity may have an easier time of measuring economic value, cost and payments;
- Organic farming offers a low-risk farming strategy with reduced input costs and lower dependence on external inputs such as fertilizers. By extension, this often means reduced financial risk, reduced indebtedness alongside increased diversity.

Global trends in the organic sector

The organic sector is, on average, under half a percent of the total agricultural sector in most of the countries, the exceptions being Germany and Austria which have between two and three percent of their agricultural area under organic production. According to a provisional *Research Institute for Biological Cultivation* (FiBL) survey, almost 4.8 million hectares in the European Union were under organic management on 31 December 2002. The main organic products sold in global markets include, in order of importance: dried fruits and nuts, processed fruits and vegetables, cocoa, spices, herbs, oil crops and derived products, sweeteners, dried leguminous products, meat, dairy products, alcoholic beverages, processed food and fruit preparations. Non-food items include cotton, horticulture and livestock. Among the major markets for organic produce, the

USA is leading retail sales with a total market capitalization of US\$ 4.2 billion. While this accounts for only 1.25% of the total retail sales in USA of food, the average growth rate is estimated at 10-15% per annum.

The Caribbean context

The *Inter American Institute for Cooperation* reports that many countries in Latin America and Caribbean have 0.5% of total area under cultivation in organic production and that the rate of growth is accelerating sharply. The *Jamaica Organic Agriculture Movement* (JOAM) undertook its first, small, organic survey in 2003. It indicated that of 148 farmers interviewed, 98% assessed themselves as using organic methods. 71% said they wanted to move over the next 3 years to full organic production as the “right way to go”. 15% want to go for organic inspection and certification. As of August 2005 there are 3 internationally certified organic farms, seven in conversion applying for international certification and this represents approx 3290 acres. An IICA self-study CD indicates that Trinidad and Tobago recorded 80 organic farms but gave no acreage or % of market share. Dominica has a number of organic farms, as do St Lucia, Barbados, Guyana and St Vincent. In the eastern Caribbean many are tied to the banana export market, while others are smallholder farms where women play an important role.

The market for organic products originating in the Caribbean is a potentially large one. There are regional opportunities, which could be explored and pursued by targeting the Green Globe certified hotels and the growing eco-tourism market.

It has been suggested that Europe’s area of preference for tourism is increasingly in the Caribbean and that this link could help to drive demand for organic exports into those markets. IICA and CARICOM Market Surveys indicate that the best products for farmer concentration would include: Bananas, Banana and plantain chips, Cane sugar, Dry spices, Fermented cocoa beans, Ginger root, Palm oil, Pineapple chunks, Pulp and purees of mango and papaya.

Opportunities exist to tap into export and local and regional tourism markets but women farmers tend to be isolated from regional and global market information. They are not producing to organic export standards, and they do not yet recognize themselves as entrepreneurs or farming as a viable business and thus are unable to translate their interest into real economic returns. A good number of women farmers would like to make this leap but lack the opportunity.

3. Information and security go hand in hand

Now, more than ever, there is a direct correlation between security of livelihood and holistic and complete information. Those who are marginalized from information or who have incomplete information are disengaged from forming decisions about their long term security. The confluence of rural poverty and environmental degradation are well documented - and environmental degradation and poverty become more widespread often because documentation and information is lacking. "Security" now means not just food security and livelihood security, but also the security of sustained natural resource resilience, of the predictability of information, of the provision for those in need in the community (such as the frail and elderly) and of financial insurance to cover times of need and recovery.

In traditional small holder society, crop diversity was not an accident of history or geography, but a product of management and stewardship of particular cultures and communities. Many First Nation groups across North America for instance, grew a combination of corn, beans and squash (referred to as the 'three sisters') whose converging properties took care of both soil and crop. Farmers need to be able to build upon these traditional agricultural systems relying on historical information and their farm 'memory' of risks and trials while adopting new practices based on scientific data and our current understanding of the climate system. In other words, the evidence of climate change needs to be made a part of farmers' future planning scenarios and realities, and needs to be expressed in terms familiar to them.

When knowledge and resources are easily available, farmers will choose to conserve those assets that sustain their livelihoods. Based on our field experience, it is clear that women are not only keen to get information, they are swift to apply what they learn and are pragmatists when it comes to securing assets, natural resources, capital and markets for the livelihoods of their communities. At the same time, women farmers who are looking to improve their livelihood security also often face:

- Incomplete information and poor access to data and intelligence;
- Limited recourse to regulations or legal instruments that support their interests;
- Limited access to services including credit, computer access, land tenure;
- Limited access to insurance or disaster relief benefits; and
- Limited negotiating power as a result of the above.

With the diffusion of wireless into rural areas in the region, information communication technologies (ICTs) could provide an important set of tools for addressing information gaps because they have the potential to allow women to be part of the communication value chain and to break through information bottlenecks. In the digital age, sources of information should no

longer be 'top-down' nor single-sourced. They are multidimensional and multi-sourced which is why it is especially dangerous when myths, misperceptions or incomplete information abound. In discussions at Networked Intelligence for Development (NID) training workshops,⁹ Caribbean women noted how they use their cell phones to pass along daily psalms to their family and friends; in times of crisis or emergency it is very likely that similar methods of transmitting messages and warnings would take place.

ICTs are and will continue to be an integral part of any climate change management plan. In general, there are three main aspects of communication that ICTs can be used for:

- **Localized information:** *Time sensitive, simplified and multiplied* localized information is the bedrock to planning for and managing climate change. Farmers depend on daily weather reports or the Farmer's Almanac to forecast weather, now that farm security is increasingly linked to the ability to forecast or anticipate climate change, dependable, localized and current information is needed. The micro-climatic nature of Caribbean weather means that information needs to be drawn from a range of sources for it to be valid and useful to farmers.
- **Data collection, record keeping and transparency:** *Verification, benchmarking and measuring* agricultural, natural resource and climatic data requires a solid commitment by scientists, farmers and analysts alike to share information and data. This means a continual flow of information – a feedback loop – from ground up to satellite and back down. The old system of extension service from the urban to the rural is no longer valid. At the same time, it is clear that government legislation needs to be updated to conserve forests and farmlands alike and to respond to the needs of land management in the context of climate change. There is, furthermore, a clear link between organic farming and its record-keeping, transparency and data collection aspects - organic farmers are already acclimated to this type of process and required to do so. They therefore are very likely to be in the vanguard of localized data collection such as weather data collection systems
- **Networking, cooperation and advocacy:** *distribution and engagement* of information among farmers, within communities, across islands and countries will strengthen the regions' resilience and capacity to handle the crises that we can expect with climate change. Local media, community radio and phone use are increasingly important as new ways of sharing and learning about these momentous shifts. Radio is a 21st century media solution as it couples up with other technologies such as Global System for Mobile Communications (GSM) phones and Short Messaging Service (SMS) technology. A radio and text messaging mash-up allows any villager with a cell phone to respond to what they hear on relevant community issues broadcast over radio in low literacy/limited Internet environments.

All facets and aspects of the above, from the very local cell phone call to the Global Positioning System (GPS) – are much simplified and made possible by the range of potential ICTs at our disposal.



From the computer room (Grenada 2006) to the field (Jamaica 2008)



4. Women's farm roles and participation: Traditional and emerging

Women farmers sit at a junction between two different frames of understanding:

- The contextual inherited knowledge created and applied through daily 'doing';
- The cumulative empirical knowledge of modern science which is now being applied in the context of climate change and its unknowns.

A March 2009 news report¹⁰ on a collective of 5000 women spread across 75 villages in Andhra Pradesh, southern India accounts the chemical-free, non-irrigated organic agriculture practiced by the women as a response to climate change. "The women grow as many as 19 types of indigenous crops to an acre, on arid degraded lands that they have regenerated." Between rows of sunflowers are grown linseed, green pea, chick pea, various types of millets, wheat, safflower and legumes. The sunflower leaves attract pests and its soil depletion is compensated for by the legumes which are nitrogen fixing. The women now run a uniquely evolved system of 'crop financing' and food-distribution that they have mapped out themselves. The organic produce is certified by the global Participatory Guarantee Scheme (PGS)'s Organic India Council. This is an example of women applying their local knowledge within a context of changing climates and emerging systems.

In India, sheer numbers and scale, and a tradition within the lower caste communities of women to pull together, lend themselves to collective action and voice. The dispersed island economies, low population densities, recent cash crop legacies and the relatively low attention to agriculture minimize collective action in the Caribbean region. Nonetheless the similarities outweigh the differences although the specific problems may be different, the magnitude of impact and the need for concerted action are the same.

If organic farmers in the Caribbean are to be active players in the global trend towards organic farming, then it is essential that they have access to the Internet, and that they begin to use ICT based applications for their information management and communication needs. ICTs afford relatively inexpensive access to a wealth of information and networks, market information; comparative data on farm gate prices; consumer analyses, as well as organic methods. The latter include not only producing organic products but also ensuring that the products are stored, processed, handled, labeled and marketed accordingly. In addition, information management software affords easier record keeping and by extension, more efficient means of forecasting supply and demand for products and produce.

To help women take advantage of computerization and digitization in the context of existing and emerging organic and natural products markets, there is an urgent need to build on current

initiatives. Existing nodes of activity need to be developed into a strong interactive marketing network. This requires training in basic ICT skills, e-marketing skills, website management, vision building, and exposure to ICT service providers, marketing organizations and regulations and standards bodies. One of the main concerns of new entrants into the organic market is the small consumer base and the lack of market premium. An effective way of creating and maintaining these markets would be to put buyers in direct contact with growers, and this is where information technology and connectivity are a key medium of exchange.

Information communication technologies can reinforce gender differentials or help to overcome them. Those development initiatives that involve the full and equitable participation of women as planners, managers, stakeholders and beneficiaries are far more effective than those that do not. Similarly, those initiatives that incorporate an ICT component as an integral part of project planning and deliverables lend themselves better to addressing inequities than those that do not. In other words, it is just as important to address the fact that women and girls continue to constitute nearly 70% of the world's poor and 65% of the world's illiterate, as it is to address their information and communication needs in an increasingly networked world.

The digital divide compounds income disparity further; increasingly those who are “connected” are more likely to have a choice and a voice in the decisions that affect them than those who are not. Enabling marginalized groups to appropriate ICTs is as much about overcoming the “information divides” as it is about pushing forward the processes of social inclusion. ICTs¹¹ are key tools to transforming the way women can communicate, give expression to their needs and priorities, and negotiate or advocate for change and the way development takes place. The use of ICTs enables women to access more information, to discern useful information and to determine ways to distribute information strategically. Even more importantly, women are now in a better position to contribute their knowledge – indigenous and otherwise – as a result of the continued diffusion of ICTs.

Members of the Knowing and Growing¹² network fit a particular profile (see farmer profiles in Section II), a good portion of the women farmer entrepreneurs are typically involved in more than one enterprise, often combining their farm activities with other related enterprise to make ends meet and diversify their income sources. They are also literate, education levels range from secondary school to higher level education, and they seek information from local and national media. The younger generation of woman farmer is active on the Internet, and a small minority uses the Internet to blog and to use social marketing tools such as Facebook. The three profiles below from Belize, Guyana and Jamaica demonstrate a spectrum of age, activity and ICT experience, as examples of the kinds of farmers working in the region.



Computer demonstration: agricultural software (above) and mapping exercise at the drawing table (below)



5. Women and organic farming: a natural alliance?

In the Caribbean women own and control less land and means of production than do men. The majority of female farmers are smallholders. Although there are few figures on acreages and hectares in organic agriculture in the Caribbean, existing data indicate that a high percentage of women farmers show an interest throughout the region. Many of these women believe in farming in traditional and holistic methods but, although having the basis for entering the organic market, do not have access to the standards and production processes required for certification.

Women farmers find it challenging to compete effectively in regular markets. For example, regulations for import of tubers into the USA require investment of funds for pre-clearance of goods and for washing and packaging at the airports. Unable to cover these clearance fees, women are anxious to match their limited resources to other markets that do not require upfront costs, and are de facto excluded from the potential tuber markets. ICTs comprise tools that can assist women to optimise their production, distribution and marketing plans and to making effective use of scarce land by planting for market demand rather than continuing to be tradition-led.

To date, agricultural extension technical training for women tends to limit itself to the traditional craft and post-harvest production of jams and jellies etc. The institutional set ups for technical training for women, such as through the IICA, remain few and far between.

In NID's field work, most small-scale women entrepreneurs are often *social entrepreneurs* first and foremost. Their business motives are driven less by profit earnings and more from a need or desire to earn essential income in order to carry the costs of providing for the health and welfare of their immediate communities. The majority of small-scale women entrepreneurs often bear several community responsibilities beyond the household; in for instance, the local orphanage, the local faith institution, environmental awareness groups, information and advocacy groups. These women need to build on existing modes of informal community-based networks and extend their reach to business intermediary agencies, to wider markets and to engage with their competitors, in order to secure their business livelihoods. This means that women need a range of support provisions to connect the big picture with their business objectives; to draw on leadership resources for effective execution, and to connect strategic communications and networking¹³ with implementation.



Coffee Farm: Blue Mountains, Jamaica

SECTION II: Farmers and ICT appropriation: Survey results

6. Interpreting the findings

Twenty-one women and two men responded to the survey (age range 21 to 60+) – a summary of the sample profile, their activities and the crops grown are reproduced in the Annex 2. Because of the nature of the survey (5 pages with primarily open questions sent by email), the respondents were limited to those who have regular access to connectivity. While the large proportion of respondents are farmers, others described themselves variously as agricultural assistants, farm managers, consultants, extension officers, film producers, trainers, and researchers. The results of this survey therefore are somewhat skewed in favour of those who are already accessing the Internet. That said, this is also an indication of the reach of the Knowing and Growing network which is able to reach women farmers even if they do not have easy or readily available access to the Internet.

Climate change evidence

The 23 farmers who participated in the June 2009 survey (survey questionnaire reproduced in the Annex) provided tangible examples of the impact of climate change not only on their farms, but also in their communities. Increased flooding, wind damage and soil erosion have left small farmers struggling. Examples of issues facing farmers are:

- Heavy rains followed by severe droughts;
- Flooding on roads and damage to infrastructure;
- Shade trees damaged by Hurricane Iris which adversely impacted cacao production for more than 5 years;
- The usual rain cycles have changed and weather patterns are shifting. We are in rain shadow much of July and August save for hurricanes;
- Annual flooding and landslides in areas not prone to flooding;
- Need to evacuate the farm several times in recent years;
- Cost of transportation to and from the farm increases as roads are washed away and the farm becomes highly inaccessible;
- Increased wind stripes leaves off the coffee trees, causing berries to fall, resulting in lower production levels;
- Increased costs incurred from repairs to farm and buildings;
- Changes in insect's behaviour.

Awareness of government measures and/or programs on climate change	
Aware of a program/strategy	64%
Unaware of programs	36%

Involvement in local climate change action	
Yes Involved	59%
Not involved	41%

The unpredictability of seasons and increasing economic costs are the two biggest issues facing these farmers. Of those surveyed, 64% were aware of a program their local

or national government had adapted in order to prepare for climate change, and 59% were involved at some level. Most telling is that 73% were actively managing climate change on their own initiative and resourcefulness. Herein, is a

gap to be filled not only with appropriate knowledge but also in a timely and technology efficient manner. It is evident the small farmer is ready and willing to be engaged in affirmative action to adapt to or manage climate.

Management of climate change issues	%
Actively managing	73%
N/A	9%
Not doing anything yet	18%

Examples of climate change management

- Planting trees to prevent seaside and river erosion and to control runoff, also to provide shade due to increased temperatures;
- Building drains;
- Adjusting planting times;
- Composting instead of burning; and
- Change of crops to suit new environment.

Use of ICTs

- 76% use a cell phone daily compared to 43% who use landlines daily;
- 62% use a computer with internet connectivity on a daily basis, however only 13% use a social network or blog and no one had used e-conference facilities; and
- 62% use the TV and radio either daily or weekly.

ICTs used / frequency	Daily	Weekly	Monthly	Rarely	Never
Cell phones	76%	14%			10%
Satellite phone				10%	90%
Land line	43%	19%		24%	
Computer without internet	29%	10%		19%	14%
Computer with internet	62%	29%			0%
Video, film, DVD	29%	33%	5%	14%	10%
TV or radio	52%	10%		19%	
E conferences	0%	14%	5%	33%	24%
Blog/social networking	19%	19%	5%		24%

Effective dissemination of information on how to manage and address climate change will greatly aid farmers in their daily activities. Text updates with weather warnings could be invaluable tools.

For those who are regularly connected, blogs and social networks provide innovative ways to share information on mitigating the effects of climate change. Radio is a cost effective method of spreading information quickly.

Survey responses to identifying the links between climate change and organic agriculture

The overwhelming majority of responses indicated a strong link. For example: "The link in which I am interested is the ability of organic farmers to be on the front of the curve of detailed observation of farm dynamics and subsequent development of new relevant farmer-developed strains and varieties that are more resilient to changing conditions.."

"Yes. Less use of chemical which aids in the breaking down of marine animals and other environmental significant organisms."

"Organic farming is sustainable agriculture which helps to maintain, enhance, and protect the environment. So it is a positive move against climate change"

"Organic farming involves the sustainable use of natural resources and managing them, climate change now calls for the sustainable use of land, soil, environment to prevent degradation"

"Reduce emissions, enhances soil fertility, increases soil water retention, highly adaptable to climate change due to the application of traditional skills, requires less fossil fuel"

"A great deal. Climate change can be mitigated through organic farming practices. Organic farming can reduce our global gas emissions greatly and save on our global energy use. This is because conventional farming is heavily dependant on fossil fuels. It is the main source of the potent green house gasses nitrous oxide and methane."

The top three measures farmers requested in order to cope with climate change are education and public awareness; ICT tools to share knowledge; and access to weather data as well as instruments to collect data.

Need for research and information

Information paucity: The rural poor face narrow choices of information and low perceptions of the value of indigenous knowledge. The negative impacts this poverty of information has for health, for agriculture and livestock farming systems, for harvesting and

marketing, for environmental resource management etc. put the typical rural poor person at a distinct information disadvantage in the emerging knowledge economy;

Dependence on environmental income: Rural poor derive a significant portion of their total income on ecosystem goods and services (forests, grasslands, lakes and marine waters provide resources such as building materials, fuel, fish, medicinal plants) as well as from small-scale agriculture. Due to this dependence on environmental income, the poor are especially vulnerable to eco-system degradation, and to the physical disasters brought on by climate change such as hurricanes, droughts, erosion, and/or flooding;

Feminization of poverty: Poverty, food insecurity, and environmental degradation have a disproportionately negative impact on rural women, due to their inferior socio-economic, legal and political status as well as their critical roles as producers and household managers. The

causes and effects of these impacts are systemic, with far-reaching implications for agricultural and rural development as a whole and for all initiatives aimed at raising levels of nutrition, improving production and distribution of food and agricultural products, and enhancing the living conditions of rural populations;

Lack of disaster resilience: Requires local knowledge, expertise, and resources to build further disaster resilience and capacity at the local level. Lack of interests representation, whether through intermediary agencies, local government bodies, farmers associations; micro credit institutions; capacity building organizations, the rural poor lack a voice in determining or negotiating their strategic needs. The World Bank's "Voices of the Poor" report stated that if there is one thing that differentiates poor people from rich people, it is their lack of voice and the lack of opportunity to be represented. Access to information is thus not a luxury, it is not an extra. It is absolutely at the core of equitable development.

Despite being better informed than most, the survey respondents noted the need for further information resources, examples are listed below:

Desirable climate change resources (survey results):

- Calculations about levels of agricultural emissions in a simple on line form so that you can fill in the form and get an answer about your carbon footprint so that you can plan to cut back, improve energy efficiency etc.
- Caribbean climate experts have found that there is no longer night-time relief in Jamaica, that is, the temperature does not drop in the night as it did before. We need to know how this affects crops and livestock as some plants need a temperature drop at night to carry out their biological functions. We need to know how to select the right agricultural breeds that will be able to survive this new phenomenon of hot days and hot nights.
- May-June and September-October were the traditional rainy seasons in Jamaica. However Caribbean scientists have discovered that the intensity and duration of rainfall has changed. We are experiencing greater flood damage, changes in the amount of water in our rivers, and extended periods of drought. How do we implement new technologies that help us to conserve and better use water for agricultural purposes in light of new rainfall patterns?
- We are experiencing fiercer and more frequent hurricanes. How do we help protect our crops and animals from these storms? Are there models being used elsewhere that may be applicable to the Caribbean?
- Bulletins, reports, and up to date information.
- Need more readily-available info on permaculture and bio-dynamic agriculture.
- Organic farming practices.
- More information on how climate change is affecting each island in the Caribbean region.
- Materials to assist with weather forecasting report; materials to tap into the GIS and GPS data base; instruments to measure wind movement and temperature change.
- Information on conservation of land, deforestation, soil erosion, rising sea level, drought.
- A list of Caribbean links to relevant climate sites.

- Information on how to keep certain insects away from plants/crops.
- Information on soil type classification and recommendations for most suitable crops.
- An almanac that tells you what month is good for planting specific crops.

7. Farmer profiles from the Knowing and Growing Network

The three profiles that follow will show some common features despite the differences in age, educational background and ICT access.

Farmer Profile: Rodlyn Semple from Guyana

Rodlyn Semple is 29 years old and supports 4 household members (ranging in age from 7-52 years). Her family resides in the city (on the coast), which is 6' below sea level. The weather conditions are generally wet and dry, averaging 32 degrees Celsius. Rodlyn accounts that recently, due to climatic changes, Guyana has seen irregular rain and weather patterns, and is more susceptible to floods. Since the last major flood destroyed numerous homes, crops, livestock, and lives, the government now advises that all planting should be built to a standard height above ground to account for flooding.

Rodlyn has access to farmland and maintains a 10x20' shade house that has been constructed with wood and plastic. The house is covered by a shade net with six 3x14' boxes (4' off the ground). She currently grows lettuce, calaloo, pakchoi, and celery. Rodlyn explains that farming in an urban area brings extra challenges because of the dense population. Another pen is only 15' away from her shade house, where they rear 200 birds every 6 weeks, for example. She is in the process of purchasing her own land and intends to extend the size of her operation. She manages the shade house alone, which requires daily watering and general agronomic activities.

Rodlyn is also employed full-time as Technical Officer with the Standards Bureau in quality management systems. She is President of the Guyana Forum for Youth in Agriculture (GFYA) where her roles include agriculture advocacy and assisting young people to establish agricultural activities, such as training through the Ministries or the International Institute for Cooperation on Agriculture. Rodlyn also develops and implements an annual work program under the areas of entrepreneurship, agricultural awareness, fundraising, and collaboration with key agricultural agencies throughout the country.

Education and ICT Training: Rodlyn is a trained agriculturist with a Bachelors of Science in Agriculture from the University of Guyana (2001). She has also participated in two ICT trainings (Knowing and Growing, Grenada 2006; Mona Campus University of West Indies 2008) as well as computer training as part of her degree and through her employment as a Market Research Officer (in Internet and Market Information Systems) directly after graduation.

ICT Use and Access: Rodlyn uses a computer and cell phone (for calls and text messages) daily. She also has daily internet access at work and uses the computer for employment activities,

related to both her roles as Technical Officer and GFYA President. Rodlyn owns a personal computer that she also uses almost daily, but does not (yet) have access to the internet. Despite submitting an application 3 years ago, Rodlyn has continued to encounter issues with the local telecommunication company. She can access the internet on her cell phone, if needed, for a charge. She uses television, community radio, and video/film/DVD on a daily basis as well. Rodlyn started her own blog but has not added new information for quite sometime. She also engages with other social networking tools such as Facebook, Hi Five, and Guyana Palace.

ICTs and Climate Change: Rodlyn finds the internet, television, and community radio important and helpful in adapting or mitigating the impacts of climate change. The major challenges she experiences in accessing these tools are cost and accessibility.

Women's Role and Traditional Knowledge: Rodlyn explains that ICTs help to put her in an advantageous position with having first hand knowledge of significant issues. She is also better equipped to guide others in making better decisions for their own agricultural activities. Rodlyn asserts that the most important agricultural knowledge for effective adaptation to climate change includes knowing both the technical and practical aspects in different subject areas such as soil sciences, crop husbandry, and soil and water management.

Farmer Profile: Verna Samuels from Belize

Verna Samuels is 56 years old and there are 3 people in her family (ranging in age from 21 to 30), of which she supports 1 member. Verna owns and manages a lodge in Belize. The lodge is situated in the heart of the Crooked Tree Sanctuary, a top birding site in Belize and maintains over 250 resident or migratory exotic neotropical birds. The lodge also has guided tours, camping sites and now has 18 rooms (up from the original 5 rooms).

Verna built the business from scratch in 1993. In the low-season, Verna also makes homemade jams and jellies to sell in the gift shop. She is always looking to grow her business and to improve upon what she is already doing. Additionally, Verna maintains a farm where she grows vegetables and fruit organically, including hot/sweet peppers, okras, spinach, callaloo, thyme, melon, squash and fruit trees.

Climate Change Adaptation: Verna encounters significant ongoing challenges, due to climatic changes including flooding or water-related change, hurricane or wind damage, soil erosion or land degradation, price increases and the unpredictability of seasons. A few times a year, she also experiences destruction of crops or buildings and finds that there are more pests than usual.

She has made some changes with her farm to manage the effects of climate change such as planning short term crops and using trees that live in flooded areas. Verna has additionally moved some plants to higher ground. She accounts that the top three measures she needs to cope with climate change are: (1) a water system; (2) a resource person or centre where you can access local information; and (3) access to small loans or grants.

ICT Use and Access: Verna uses a cell phone, land line phone, computer (with internet), television or radio and video/film/DVD every day. She rarely uses blogging or social networking tools and has never used an e-conference or online debate.

ICTs and Climate Change: Verna finds that information from the television is most useful for information on climate change and local weather warnings. She also uses some information from the national radio station. Verna asserts that her access to information would be more effective if she could access it when she needs it, and sometimes even before she needs the information so that she can plan properly, especially because Belize is prone to flooding.

Verna explains that certain materials would be especially useful in helping her to prepare for climate change such as: (1) information on how to keep ants away from plants; (2) an Almanac that tells you what month is good for planting specific plants; and (3) information on her soil type and recommendations for most suitable crops.

Dorienne Rowan-Campbell is 64 years old and supports 3 household members (ranging in age from 64-93 years). They live in Silver Hill Gap, Portland, Jamaica, which is in the Blue Mountains at an altitude of 4,000 feet. The climate is traditionally cool, averaging in low 70s F in the summer but drops to 50-60 with mists, rain, and heavy cloud cover from November to May. The region has started to experience unusually high temperatures, with this past summer ranging from 80 F in the shade to 90 F in the sun. Dorienne asserts that they are changing their farming practices to accommodate these climatic shifts. For example, leaf lettuce is now being planted in beds under shade trees. They have also been using permaculture techniques over the past year to increase terracing, water retention, and runoff. The parish of Portland has the highest annual rainfall on the island, averaging about 2134 mm (80").

Additional climate changes that Dorienne has seen include a collapsed road (caused by a hurricane), making it impassable (since 2005) on the north end of the island. The road closure has cost the community dearly as costs to trade have increased. She notes that coffee had been planted in an unsustainable manner below the land slippage and thinks this may have assisted in the collapse. They have started to use rain gutters to collect rainfall, which is stored in drums. They have also started constructing "dewponds" in hollows on the farm to prepare for upcoming rain irregularities. Since 2004, they have weathered 5 hurricanes so a great deal of the large shade and coffee trees have also been lost.

Dorienne owns her farm where three of her staff have attended training for organic farming. The main crops are coffee and asparagus but they also farm leaf green, beans, cho-cho, bananas, plantains, cocas, and dasheens.

Education and ICT Training In addition to managing the farm, Dorienne works as a Gender Consultant and organic farm inspector. She has studied in both Canada and the United Kingdom. Dorienne has taken additional computer training through participation in activities with Jamaica's ICT4D and with the CIVIC network.

ICT Use and Access Dorienne uses a cell phone for personal use and for the farm. It is the only mode of communication she has with her workers so it's a fundamental farm management tool. She also uses both text and voice. Dorienne uses a computer (without internet) to keep in touch with family and friends or to update accounts but usually uses a computer with internet ADSL high-speed for both personal and business use. She also uses Quicken for her business accounting and consulting work and can also link to her bank accounts. Dorienne also keeps an electronic farm diary and uses digital photos to illustrate and keep track of work completed on the farm. She can also check on the farm via GIS satellite.

Dorienne uses film and video for training purposes on a laptop or computer with her farm team. She can also video any usual activities on the farm for later viewing or analysis. Most recently, she videoed high winds that they were experiencing on the farm. She watches television programs for "greening information" and BBC Development Competitions, for new ideas or applications. She is also a member of the Jamaica Organic Agriculture Movement (JOAM) and part of the Closed User Group, which connects 20 farmers and JOAM board members. JOAM also works with the community radio so she is linked with them and uses this tool.

Dorienne has long been using listservs and e-groups that have e-conferences, e-training, etc. Recently, she participated in a webinar on goat rearing, for instance. She also reads various blog sites and uses Facebook.

ICTs and Climate Change Dorienne says the internet is her main source of information on climate change and local weather warnings. The Jamaica Met office has an interactive weather map online, which allows her to check on reports close to the farm. She also uses the National Hurricane Centre's reports on television and local, shortwave radio. For broader climate change issues, she uses a variety of sources such as the World Wildlife Fund or United Nations. The Huairou Commission also often posts important information for women farmers in the region.

Women's Role and Traditional Knowledge ICTs are very influential in persuading others when you use video or are able to show them something that you have been trying to explain. She asserts that women tend to have to manage the hazards at the domestic and farm levels, including climate change. Thus, women need greater access to information so that their management choices are appropriate. Information and assistance are critical to put their information into practice.

Road collapsed after hurricane - Jamaica



SECTION III: Solutions, evolving practices and capacity building

8. Current ICT applications for climate change

To date ICT applications for climate change have tended to focus on data compilation, mapping and simulation software. There are new applications being tested out in the agricultural sector, which may be of relevance to the Caribbean context. Due to time limitations in writing this paper, these examples have not been assessed in terms of long term viability or gender impacts, and are listed here only as a broad illustration of the ways in which ICT tools can be applied.

- **Existing applications and initiatives in the Caribbean and Latin American region**

Cuba Met Service (INSMET): INSMET has been producing regional climate change scenarios for the Caribbean using the PRECIS system and posts various information on their website. *Source: Adapted from Cuba Met Service* <http://www.met.inf.cu/asp/qgenesis.asp?TBO=PLANTILLAS&TB1=INICIAL>

Studying Rainfall Patterns in Southern America: Favourable rainfall patterns over the past 20 years, in South America's southern cone (Brazil, Bolivia, Chile, Uruguay, and Paraguay) have allowed formerly marginal lands to grow crops. Such climate changes have led to significant agricultural shifts with the region becoming one of the most important producers of staple crops such as corn, wheat, and soybeans. Further, rising food prices have provided economic incentive for farmers to focus on these crops and to transition land traditionally used for raising livestock. However, if climate patterns change, the region could face devastating losses in its economy, livelihoods, and infrastructure.

This Earth Institute research project will compile and examine the climate history of the Southern Cone over the past 80 years to understand how it has varied across the decades and how it can possibly vary in the future. Researchers assert that by studying how climate change can alter rainfall, we will have a better understanding of the nature and magnitude of the current and future risks that threaten farming and other livelihoods in the region. This information will also inform what technologies, production systems, and water resource management practices are available to people to help reduce those risks. *Sources: Adapted from The Earth Institute, <http://www.earth.columbia.edu/articles/view/2461> and International Research Institute from Climate and Society, http://portal.iri.columbia.edu/portal/server.pt/gateway/PTARGS_0_0_4248_0_0_43/http%3B/iriportal3.lde.o.columbia.edu%3B7087/publishedcontent/preview/development/home/new_home/homebody/2009_spotlight_features/betting_on_the_rains.html?fbr=1239630512300*

MapAction

MapAction works in disaster zones providing frequently updated situation maps showing where relief help is most urgently needed. The UK-based company was established in 1997. In a

humanitarian crisis, relief agencies need rapid answers to questions about 'where'. For example, where are the greatest needs or where are the gaps that need to be filled?

Source: Adapted from MapAction, <http://www.mapaction.org/>

Satellite Technology Available to Aid Relief Workers in Guyana, Caribbean

Relief workers in Guyana and the Caribbean can now access geographic data about displaced persons or downed infrastructure during disasters with the recent launch of MapAction Latin American and the Caribbean (MapLAC), a newly established arm of MapAction. When disasters strike, coordinating relief efforts hinge on the rapid transfer of situation information. MapLAC can deliver that information in the form of maps created and distributed in the field, greatly aiding the delivery of rescue, response and aid. The maps provide satellite derived high resolution images, in real time, where objects and areas as small as one square metre are visible. For instance, displaced people, damage to buildings, downed bridges, road and rail disruptions, and newly established food depots or hospitals can all be displayed on the GIS image.

In addition to being at the ready to respond to the emergency needs of local disaster-relief agencies, MapLAC is also interested in assisting government agencies with preparatory measures and training to use GIS technology during disasters. For example, the organization had assisted in the Suriname flood in 2006 and also in Jamaica when Hurricane Dean had struck the island. The organization also works closely with the United Nations Office for the Coordination of Humanitarian Affairs.

To date, MapLAC had not taken deliberate steps to engage farmers in mapping their farms.

Source: Adapted from Stabroek News, November 2007

▪ **Accessibility and engagement with the general public**

Combining Web 2.0 Tools with Local Knowledge to Build a Clearer Picture of Climate Change (Global - private sector)

Combining web 2.0 tools can provide the opportunity for information to become part of people's lives so that governments, international agencies and local NGOs will all be able to take information provided by weather centres and combine it with local data. Tools such as wikis, mashups, and blogs all provide other means whereby people can examine and make use of the information that is generated.

At the 2007 Web2forDev International Conference, Paul Saunby presented simulations on maps using open data around the issue of climate change. He explained that such maps could provide planners with valuable information on where to build roads or homes, but they could also give farmers a better idea of where to plant next season's crops or how to best irrigate their fields. The particular tools he is developing is still experimental but looks at the impacts of climate change in certain areas, along with seasonal weather forecasts that look six months into the future. Saunby explains that these weather details can then be merged or 'mashed up' with other

we 2.0 tools such as Google Maps or blogs to produce local maps to show, for example, how the risk of flooding may increase in the future.

Source: Adapted from ICT Update, <http://ictupdate.cta.int/en/Feature-Articles/A-climate-mashup>

Data Collection Using Mobile Phones (Global - private sector)

Mobile Researcher is a tiny application that can be installed on mobile phones to gather data, either by entering text numbers or by answering a series of questions designed to meet the specific needs of the project. The information can be sent instantly to the project office, which saves both money and time, as it is expensive for fieldworkers to travel regularly to every project site. Even small handheld computers or laptops can exhaust limited budgets.

Mobile Researcher can be installed on a wide variety of mobile phones from most major manufacturers. To design a survey questionnaire and analyze the data, a web browser and internet connection are required. A project team can design a survey on the web and send it to fieldworkers within minutes, almost anywhere in the world. Users of Mobile Researcher can also 'pay-as-you-go' so the cost of the system depends on how often it is used.

Source: Adapted from ICT Update, <http://ictupdate.cta.int/en/Regulars/Techtip/Data-collection-using-mobile-phones>

Using Radio TV Drama to Adapt to Climate Change (NGO - Nigeria)

A radio drama project to enhance learning and dialogue in farming communities coping with climate change takes place in northern Nigeria. The project focuses on four states in northern Nigeria. Important agricultural crops in these states include millet, sorghum, maize, cassava, rice, cowpeas, groundnuts and cotton. Animal husbandry of cattle, sheep and goats is also practiced. Small holder farmers in northern Nigeria are highly vulnerable to climate change. Many are developing coping strategies but there remains a need to provide opportunities for sharing successful adaptation strategies. Nigerian agricultural research institutions and NGOs are already collaborating with farming organizations to find adaptation strategies and the radio drama is building on this research.

Information from focus groups, literature review, and Nigerian agricultural institutions has helped to provide content for the radio drama. A workshop also helped to determine some of the key climate change messages that would be in the drama. At the end of each episode, the radio host will highlight local initiatives and provide farmers with contact information for local climate change organizations. Listeners will also be encouraged to provide feedback via text messages, phone, email, or farmer groups.

To date, much of the project has focused on developing the content for the radio drama to ensure it is relevant to the audience. Going forward, the project intends to learn more about the actual impacts of the radio drama and whether the information has been of use to the farmers.

Sources: Adapted from the African Radio Drama Association, http://ardaradio.org/whats_new_at_arda and Canada's Coalition to End Global Poverty, http://www.ccic.ca/f/docs/003_food_2009-03_case_study_nigeria.pdf

Canadian Wheat Board (CWB) Uses Wireless to Track Weather (Government, Canada)

In 2008, the CWB today launched an innovative new online weather centre for farmers to manage information from the CWB-WeatherBug network, now the most extensive weather monitoring network in Western Canada. The weather centre puts localized, instant weather updates at farmers' fingertips, along with the capability to track historic trends of factors such as temperature, precipitation and wind speed and direction. It is fed with information from a farmer's own weather stations and hundreds of others recently installed on farms, at Pioneer grain elevators and at agri-retail outlets across Western Canada.

Weather station information can also be accessed through home computers, personal handheld devices or cell phones for handy instant updates from anywhere. Current weather information is updated every few seconds, with localized forecasts updated hourly and weather warning alerts available.

From the start, CWB stated that they were struggling to keep up with demand, which is a good indicator of the need that exists. Access is available for a subscription of \$99 CND per year for farmers with a CWB weather station and \$199 a year for those without. The weather stations cost \$900 for those who wish to be put on a waiting list for CWB installation. CWB asserts that the new network is a cost-effective salutation to a longstanding problem for farmers who have been looking for this type of weather information.

Source: Adapted from the Canadian Wheat Board,

<http://www.cwb.ca/en/newsroom/releases/2008/061808.jsp>

■ Mapping examples

UNEP – Atlas of our Changing Environment

UNEP's Atlas of the Changing Environment is an interactive media that depicts humanity's past and present impact on the environment through illustrations, satellite images, ground photographs that are powered by Google Maps. For example, Africa's Atlas highlights stories of environmental change at more than 100 locations spread across every country in Africa. There are more than 300 satellite images, 300 ground photographs, and 150 maps, along with informative graphs and charts.

Sources: Adapted from UNEP, http://na.unep.net/digital_atlas2/google.php and <http://www.unep.org/dewa/africa/AfricaAtlas/>

Ushahidi – Gathering Crisis Information through Text Messaging

The Ushahidi, which means "testimony" in Swahili, is a platform that allows anyone to gather distributed data via text messaging/SMS, email or web form. Resulting data are visualized on thematic maps or timelines. Recent initiatives covered the Swine Flu epidemic and the elections

in India. The same free and open source application has been used to spatially document the Gaza war and Eastern Congo conflict.

Source: Adapted from Ushahidi, <http://www.ushahidi.com/>

Geospatial Technology Program – Mapping and Mobile Phones

Initiated in November 2008, the Geospatial Technology Program recognizes the importance of geospatial information to agriculture decision making and the inadequate access to data, tools, and analyses, especially in Africa. The program will design and develop a comprehensive program to provide smallholder farmers in sub-Saharan Africa and other agricultural stakeholders with access to geospatial data, services, tools, and methodologies to help them make more informed decisions.

It is intended that farmers will have access to higher-quality, location-specific information to make better decisions. They can use this information to decide which crops to raise and when to harvest; receive pest and disease information via cell phone; and apply changing technologies to boost productivity. They will also be able to help other farmers by reporting pest and disease conditions. Developing countries will benefit from collection and dissemination of agricultural data; analysis and communication of geospatial information; and monitoring and evaluation of agricultural development efforts.

Source: Adapted from AGCommons, <http://www.agcommons.com/?q=node/40>

GIS Techniques and Rainfall Patterns

International Crops Research Institute for Semi-Arid Tropics (ICRISAT) is a non-profit and non-political research organization that serves the poorest of the poor in the semi-arid areas of the developing world. ICRISAT's integrated climate risk assessment and management system uses remote sensing and GIS techniques to study rainfall patterns and accordingly prepare advisories for poor farmers in drylands of Asia and Sub-Saharan Africa.

Sources: Adapted from ICRISAT, <http://www.icrisat.org/> and Global Knowledge Partnership, <http://www.globalknowledgepartnership.org/gkp/index.cfm/elementid/8205/GKP-and-OWSA-publish-Fixing-the-Climate-with-ICT-guide>

Case study of Addakkal Region, Andhra Pradesh:

Remote sensing and GIS tools and techniques were employed to assess the water tanks in the Adakkal region to suggest a plan for combating drought. The study assessed individual (62) tanks, their degradation status, feasibility of restoration, and benefit of restoration. Maps were created to indicate degradation status, as measured by surface area, silt thickness, encroachments on the reservoir bed and blockage of channels. Restoration benefit was calculated based on the quantity of silt to be removed from the lake bed and length of channels to be restored. This information formed the basis for micro level planning to combat drought and provided a range of vulnerability scenarios for different rainfall regimes that were developed as colour-coded maps.

The usefulness of such maps has been discussed with the communities to assess their response to the interpretation of experts. Initial responses have been positive, and the testing process continues. In the mean time, a group of researchers of the Indian National Remote Sensing Agency (NRSA), an institute having mandate to apply space technology and remote sensing information for natural resource management, has come forward to join such a study.

Sources: Adapted from ICRISAT, <http://www.icrisat.org/vasat/research/gis.htm> and I4D, <http://www.i4donline.net/articles/current-article.asp?Title=Improving%20microlevel%20drought%20preparedness%20using%20GIS&articleid=2258&typ=Features>

- **Networking and knowledge sharing for climate change**

Rural Community Carbon Network

In the fall of 2006, Ruralnet.uk teamed up with the Carnegie Rural Community Development Programme to raise awareness, promote and support collective approaches to reducing energy use and increasing energy production from renewable sources, or in shorthand, reducing the carbon footprint of communities.

Source: Adapted from Rural Community Carbon Network, <http://rccn.communitycarbon.net/>

Gendercc <http://www.gendercc.net/metanavigation/home.html> This is an internet knowledge portal providing access to research, case studies, activities, campaigns and tools to integrate gender into climate change. It has a literature data base, a series of case studies, gender tools, and a network called 'Gendercc – women for climate justice'. It does not have a major focus on communication but does contain a number of resources on gender related adaptation issues.

Adaptation Learning Mechanism <http://www.adaptationlearning.net/about.php>

While still in its beta phase, this initiative supported by the GEF, SDC, IEPF, UNDP, The World Bank and UNEP is designed to be a collaborative knowledge sharing platform that provides stakeholders with a common platform for sharing and learning and seeks to complement other adaptation networks. It will focus on developing tools and resources on adaptation practises, integrating climate change into development policy and capacity building. It does not have a specific ComDev focus.

we ADAPT <http://www.weadapt.org/> This internet based knowledge portal provides guidance by pooling expertise using web based tools, methods, methods, data sets and experience. It contains analysis tools, links to resources and an overview of major climate change networks. It also utilizes a wiki to promote adaptation collaboration through a section called wikiADAPT http://wikiadapt.org/index.php?title=Overview_of_major_climate_adaptation There is no major focus on communication for change and this site is still in beta format.

World Bank Environment Department - Vulnerability and Climate Change

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTCC/0,,contentMDK:21510771~menuPK:4274476~pagePK:210058~piPK:210062~theSitePK:407864,00.html>

This multilateral agency portal provides research, analysis and planning tools. Some of the features are still under development such as the climate change portal and the climate screening tool.



Demonstration: Organic Pineapple Cooperative, Guyana

9. An urgent need for capacity building

In the context of climate change, women need to find those individuals within government bodies and institutions who understand and champion small holder farm interests. These institutions often function at a policy making level, not at the grass roots level and do not involve or engage farmers. These institutions include those responsible for solid waste management, national security forces, national water commission, forestry, meteorological office, climate risk insurance bodies, tourism, aqua and fisheries development, coastal lands management, local and national media, and environmental legislature. In other words, the policy context, while still evolving, needs the strong and vocal advocacy from and for women farmers.

This research paper, while still a work in progress, identifies capacity building as a key priority for the region. Capacity building has to take place simultaneously at the grassroots and the policy levels:

- Climate change adaptation needs to be incorporated and 'mainstreamed' into national budgets and broader development efforts.
- This can only be successful done if there is sufficient understanding of local livelihood realities and contexts, and how these relate to local climate variability and change.
- Decentralized knowledge networks are fundamental for promoting diversity in livelihood strategies in the context of variable and changing climate conditions.
- There is also much to be gained South-South learning and from the activities of farmers worldwide and the organic food movement.

In this context, capacity building for Caribbean women farmers is urgent.

Priority Area I - Climate Change Literacy: farmers can only do something about climate change if they understand what it is.

The development of local audio-visual training tools specifically for farmers and public campaign materials for the general population, go hand-in-hand with the sensitization and briefing required for policy makers and champions of a robust and viable food economy in the region. We have found that taking laptops and short videos into the farm has an immediate and positive impact on farm learning.

Climate change literacy will require sustained and comprehensive activities in:

- Basic climate change literacy, awareness and understanding of global and local climate change issues among farmers and consumers;

- Further development of digital networking and electronic access to climate-change information and networks;
- Inspiration and affirmation from what farmers have been able to do to mitigate and adapt to climate change and what can be done locally in the Caribbean, women's voices need to be promoted too;
- A range of technical knowhow encompassing permaculture, organic farming and 'beyond organic' needs to be made readily available to counter mainstream agro-industry (such as easily available GMOs, fertilizers and pesticides);
- An awareness of issues that farmers do not often get to hear about, such as access to information about on farm and processing energy use and options; maximising carbon sequestration on farm and minimising carbon emissions; trends in biofuel production; practical actions to collect weather data; and future plans for climate risk insurance and reduction in the region;
- Understanding their farming roles in reducing carbon emissions and the farm's role in carbon sequestration;
- Understanding the key aspects of water systems management for the farm and beyond;
- Understanding linkages with forestry departments and possible partnerships there. A systemic shift away from current single-species monoculture model¹⁴ (whether in crops, livestock, aquaculture or forestry) towards a more integrated closed-cycle polyculture system; and
- Beginnings of an understanding of traditional means of farm protection in hurricanes.

Warschauer proposes that a better model for understanding access to ICTs is provided by the concept of literacy. The world has considerable experience in literacy acquisition that can also be brought to bear on ICT for development. Referring to the work of Brazilian social activist and educator Paulo Freire, Warschauer argues that "literacy instruction is most effective when it involves content that speaks to the needs and social conditions of the learners. As with ICT-related material, this content is often best developed by the learners themselves"¹⁵. This has a particular resonance with women, who are usually intimately knowledgeable about their local contexts, issues and solutions, and can use ICTs to share, consolidate and represent their interests and perspectives. They will also benefit by accessing information that can provide them with the information to better serve themselves, their families, and their communities.

Priority Area II - Policy briefings for policy makers in the Caribbean - stepping away from conventional agriculture and making organic the default solution

- Development of a policy brief on organic farming and climate change for policy makers in preparation for Copenhagen Conference on Climate Change in December 2009;
- Development of Press releases and organization of Press conferences;
- Lobbying key policy makers in the lead-up to the Copenhagen Climate Change Conference for the inclusion of agriculture (particularly organic) onto the Copenhagen CC agenda. Opportunities are the upcoming UNFCCC technical discussions in Bonn in August and in the Fall in Bangkok;

- Formulating policy recommendations and tabling them with the UNFCCC Secretariat and selected member delegations, COSs, and informal and formal groupings (G8, G5 and G77/China etc);
- Organizing organic-farming/ICT side events (workshops, seminars, exhibitions) in both the lead-up meetings and at the COP 15 in Copenhagen in December.

10. Research literature review results

The literature review is limited to publications and research papers published after 2005. Over 120 sources were explored, using keyword searches for gender, agriculture and climate change; climate change, agriculture and ICTs; and organic farming and climate change.

The review selected 69 publications that together present a combination of materials that are:

- a) most pertinent to the Caribbean region
- b) addressing climate change from an agrarian perspective - and where possible, from an organic farming priority
- c) showcasing potential uses of ICTs to track, research and present data on climate change
- d) a combination of the above three issues analyzed from a gender perspective.

There is a distinct gap in both (a) and (d). NID was able to access some timely materials that are just being made available - such as the World Bank's "Assessing the potential consequences of climate destabilization in Latin America." Walter Vergara (ed.) Latin America and Caribbean Region Sustainable Development Working Paper 32. The conference proceedings of the high-level conference "ICTs, the Environment and Climate Change" held 27-28 May 2009 will likely include useful and relevant information, but it is not yet available to the public. An International Conference of Slobiom which is focusing on Organic Agriculture and Healthy Food, Renewable Energy and Raw Materials for a Low Carbon Future took place in Slovenia - June 12-13 2009 - an indication of the slow but steady growth in this movement and its linkages to addressing climate change. Research in Africa and Asia could lend themselves to south-south comparative research, but again, a combination of organic farming, ICTs, climate change and women's priorities is very thin.

A thorough review of current research and documentation shows that there are no comprehensive materials that look at women's use of and access to ICTs in the context of farming and climate change. A monograph or publication on our research findings and policy recommendations would be timely and would fill an important research gap in the literature.

The literature review indicates the following main points:

- Despite the lack of dependable data on the impact of climate change on agriculture and small-scale farmers in the Caribbean and Latin America, the issue is gaining more attention as climate issues attract more urgency.

- At the same time, it is clear that the treatment of climate change and agriculture needs to be localized in order for it to be of any value to farmers and policy makers alike, particularly with the micro-climates presented by the small island geographies.
- Economies of scale mean that innovative initiatives in either agriculture or in ICT applications tend to be limited to the large-scale, so for instance the Guyana mapping initiative had not considered its potential value with small holder farmers, and climate-related risk insurance schemes are limited in Jamaica to coffee and cotton cash crop producers.
- Mainstream agricultural research and analysis tends to disregard organic farming methods altogether or to refer to it only indirectly. At the same time, there are a number of recent research publications that highlight the range of advantages of organic farming as both a mitigating and adaptation measure for climate change.
- Comprehensive studies on ICTs and climate change - by specialist institutions such as the International Telecommunication Union (ITU), appear to continue to omit consideration of small -scale user groups, farmers and women.
- A few key collections of best practices and project summaries have been compiled recently that offer some insights into the implementation of relevant gender sensitive policies and programs. Foremost among them are:
 - Gender and ICTs for Development: a Global Sourcebook: A Collection of case studies on how ICT has influenced women in developing countries by KIT Royal Tropical Institute, Netherlands and Oxfam (UK) 2005. The case studies present comprehensive portraits of experiences in gender and ICTs for development in Bhutan, China, Ghana, Sierra Leone and the Caribbean. (Highly recommended and very current);
 - ICT for Development Success Stories by the Global Knowledge Partnership <http://www.apdip.net/resources/case/misc/gkp01032004.pdf/view>); and
 - Profiles and Experiences in ICT Innovation for Poverty Reduction by UNESCO 2004.

The list of 69 publications or research documents is listed below, following an illustrative table that shows only one publication addressing all four sector areas: Sara Ahmed and Elizabeth Fajber. 2009. "Engendering adaption to climate variability in Gujarat, India." Gender and Development, 17(1) 33-50.

Table 1. Topics covered for papers published in or after 2005

Reference	Climate change	Agriculture	ICTs	Gender issues
Acharya 2009	X	X		X
ActionAid International 2006	X			X
Admassie et al. 2008	X	X		
Ahmed and Fajber 2009	X	X	X	X
Alber and Roehr 2006	X			X
Ashton n.d.		X		X
Atthill et al. 2007		X		X
Aymone Gbetibouo 2008.	X	X		
Bellarby et al. 2008	X	X		
Brody et al. 2008	X	X		X
Bryan et al. 2008	X	X		
Buechler 2009	X	X		X
Bueno et al. 2008	X	X		
Climate-L.org 2009	X		X	
Climate Alliance 2005	X			X
Deressa et al. 2008a	X	X		
Deressa et al. 2008b	X	X		
Farnworth & Hutchings 2009		X		X
FSPG 2008	X	X		
Genanet 2005	X			X
Genanet 2006	X			X
Hambly Odame 2005			X	X
Hemmati 2005	X			X
IICD 2009			X	X
International Trade Centre 2007	X	X		
IPCC 2007	X	X		
IRIN 2009	X	X		
ITU 2009	X		X	
Jarvis et al. 2006	X	X		
Johnsson-Latham 2007	X			X
Knabe and Nkoyok 2006		X		X
Lambrou and Piana 2006	X	X		X
MacLean 2008	X		X	
Mitchell, Tanner & Lussier 2007	X			X
Muller 2009	X	X		
Mutri 2005	X	X	X	X
Nelson 2009	X	X		
Nelson and Stathers 2009	X	X		X
Nhemachena and Hassan 2008	X	X		
Odero 2009	X			X
Piepenstock et al. 2006		X	X	X
Prowse and Brauholtz 2007	X	X		

Ringler 2008	X	X		
Roehr 2005	X			X
Roehr 2006a	X			X
Roehr 2006b	X			X
Roehr and Hemmati 2005	X			X
Rowan-Campbell and Tandon 2008		X	X	X
SCBD 2007	X	X		
Schalatek 2009	X			X
Scherr and Sthapit 2009	X	X		
Shewmake 2008	X			X
Slater et al. 2007	X	X		
Specht 2007		X		X
Tandon 2009	X	X		X
Thas et al. 2007			X	
Ulsrud et al. 2008	X	X		X
UNDP 2009a	X	X		X
UNDP 2009b	X	X	X	X
USC Canada 2008	X	X		
Wan Ho and Li Ching. 2008	X	X		
Women's Major Group 2005	X			X
Women's Climate Caucus 2005	X			X
World Bank 2005	X	X		
World Bank 2008			X	X
World Bank 2009a	X	X		
World Bank 2009b			X	X
Yesuf and Bluffstone 2008	X	X		
Yesuf et al. 2008	X	X		

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12. A final word of caution

In focusing on hardware, software and integrated systems, we risk ignoring participation and engagement of end-users. Advanced ICT systems are already being used to streamline the measurement and enforcement of carbon offsets, financial flows and carbon credits for international investors. General Intelligence Service (GIS) mapping systems and climate simulation software are also developing rapidly to keep up with scientific research and analysis of climate change.

Examples where similar ICTs systems are placed in the hands of small-scale farm holdings or vulnerable sections of society, however, are few and far between. This is where information bottlenecks can have calamitous results for the general public.

Accurate climate-related flooding simulations for New Orleans, for instance, had been presented to the United States Government one full year before Hurricane Katrina struck the city, but no action was taken by the authorities to prepare for this likelihood, with fatal consequences for many of the local, and poorer sections of the city's populations. The Tsunami

warnings in January 2007 also did not reach people in time, (see Box 5) due to lack of coordination and action among the participating governments. All the sophistication of early warning systems, climate simulation software and forecasting models are lost if neither state nor citizen are able to see it, discuss it and plan for it.

The relaying of instant messages during emergencies as well as the process of longer term planning will require that 'networked information' can no longer be limited to governments or to institutions but **must** be made available to the public domain through multi-levels of access and distribution points with farmers as active actors and farms as active spaces.

Tsunami information did not get to people in time

A good example of the use of ICTs for disaster relief is the establishment of a tsunami early-warning and mitigation system for the Indian Ocean, following the tsunami of 26 December 2004, operating under the aegis of the United Nations Educational Scientific and Cultural Organization's (UNESCO) International Oceanographic Commission.

A similar system has existed in the Pacific Ocean since 1965 and the Indian Ocean system is based on 25 seismic stations, 26 national tsunami centres and three deep ocean sensors, with messages sent by satellite phone. It became operational in June 2006.

However, when it was needed for real the following month as a result of the Java earthquake, no message was relayed to coastal areas of Indonesia and hundreds of people were killed by the ensuing tidal wave. In a test conducted on 24 January 2007, the average delay between a message being sent (by SMS and email) and a response received back ranged between a minimum of two minutes (seven countries) and 31 hours (Indonesia), with three countries failing to respond at all. UNESCO has admitted that more coordination among governments is needed.

Sources: Adapted from IOC/UNESCO, <http://ioc3.unesco.org/indotsunami/>, and BBC, <http://news.bbc.co.uk/2/hi/asia-pacific/5191190.stm>

Annexes

Annex 1. Internet Connectivity on the Rise in Caribbean Nations

(Source: <http://globaladvances.com/blog/2009/03/04/internet-connectivity-on-the-rise-in-caribbean-nations/>)

New initiatives across the Caribbean will increase broadband internet access to facilitate the social and economic development of the region.

Last November, the Caribbean Internet Forum (CIF) in conjunction with the Caribbean Telecommunications Union (CTU) addressed broadband connectivity for small island states in the Caribbean. Participants investigated the best practices and strategies in internet connectivity such as community wireless access, capacity building, and the technological challenges and opportunities for the private sector. One interesting idea was to implement **community technology centers** designed to enhance equal access to computers/internet and the technological skills of community residents. A particularly noteworthy topic during the forum was to increase support for **innovations in mobile internet**. As the number of mobile cellular subscribers is exceptionally high throughout the Caribbean, the forum placed a strong emphasis on the opportunities offered by mobile technologies and the promotion of an enabling environment for innovative mobile applications.

Countries in the Caribbean Community and Common Market (CARICOM) will see a number of initiatives that aim to increase connectivity throughout the region. A new multi-million dollar Caribbean fibre network will span out of Florida to Puerto Rico, the Dominican Republic, and Jamaica. The 10G undersea fiber network will make use of the existing 9000 Carrier Ethernet Switch Router (CESR) family and XDM Multi-Service Provisioning Platform (MSPP) and support up to 40G per channel. Last year, Alvarion Ltd., a leading provider of WiMAX and wireless broadband technologies announced the signing of a master supply agreement with Digicel Group, the largest mobile operator in the Caribbean. The companies will deploy a WiMAX network throughout the Caribbean region in a major initiative to increase wireless internet access over the next few years.

The State of the Caribbean Internet

According to Internet World Stats, the 26 countries and territories of the Caribbean that form the CARICOM Single Market and Economy (CSME) has a population estimate of **40,371,917**, of which there are **6,956,500** Internet users and an overall **17.3%** internet penetration rate (December 2008 estimate). The nations of **Antigua & Barbuda**, **Barbados**, and **Saint Lucia** have the highest penetration rates of 85.9%, 63.8%, and 63.6%, respectively. **Haiti**, although still only having reached an 11.2% penetration rate, had the fastest growth rate between the years 2000-2008 at **16,566.7%**.

Annex 2. Survey Sample Data and base line responses

Countries represented	
Belize	3
Grenada	2
Guyana	1
Jamaica	9
St Kitts	2
St Lucia	2
Trinidad	4

Age Range	
21-30	4
31-40	3
41-50	4
51-60	8
61+	1
unknown	1

Gender	
Men	2
Women	21

Household size range: 2-5

Household size median: 3

Household size average: 2.75

Occupations:

agricultural assistant, farmer, farm manager, consultant, extension officer, film production, trainer, researcher

Elements in definitions of climate change:

changes in daylight length/ rainfall/ weather/ environment/biodiversity that occur over a period of time

influence of air and water pollution

influence of heat and cold in the ocean

greater intensity of storms and natural disasters

causes can be either human or nature-induced

it has an impact on agriculture: insect and pest prevalence, rainfall patterns (water cycle), crop failure, drying up of water sources, natural disasters, availability of food

coping strategies include paying attention to trenches, landfall clearing
 impact on poor countries will be greater than on rich countries (i.e. regional differences will matter)

Observed changes

Frequency of responses in each category

	Not at all	Few times a year	Ongoing challenge
Flooding or water-related changes	3	9	8
Hurricane or wind damage	1	11	5
Soil erosion or land degradation	5	4	8
Destruction of crops or buildings	1	7	6
Unpredictably of seasons		6	11
Economic costs (such as price increases)		4	13
Other (explain)	1	1	2

Current crops grown: vegetables, fruit trees, lumber trees, hot pepper, sweet pepper, yellow yam, salad greens, herbs, Irish potatoes, corn, tomatoes, pumpkin, okra, broccoli, cauliflower, pineapple, banana, plantain, cherry, naseberry, plum, gingons, heliconias, macadamia nuts, pimento, lettuce, calaloo, pakchoi, celery, cabbage, peas, carrot, watermelon, strawberry, mulberry, coffee, asparagus, sweet potato, cocoa, medicinal herbs, orange, grapefruit, lime, papaya, mango, bilimbi, starfruit, allspice, ginger, turmeric, coconut, cocoplum, avocado, soursop, memmey sapote, custard apple, Suriman cherry

Current livestock and poultry raised: cattle, chickens, pigs, goats, fowl, small ruminants, rabbits

Future crops to grow: expand product range, hot pepper, lychee, black pepper, annatto, tomricon, hydroponic, fruit orchard, nutmeg

Future livestock and poultry to raise: donkey, rabbits, guinea pigs, birds, chickens, aquaculture

Annex 3 Some key regional resources and institutions

The **Caribbean Community Climate Change Centre**¹⁶ has been coordinating the region's response to climate change, since 2005 (CCCCC, 2009). It is the official repository and clearing house for regional climate change data and change-related policy advice for the Caribbean Community (CARICOM) Member States through the CARICOM Secretariat. The CARICOM Secretariat has two relevant initiatives for this research.

Firstly, the importance of ICTs for development has been recognized and the Secretariat has mandated a CARICOM ICT strategy, by participatory process (CARICOM, 2009a). The focus of the strategy is on ICTs as an instrument for strengthened connectivity and development to foster greater prosperity and social transformation between and among member states, as well as globally. More information on CARICOM's Information and Communication Technology for Development (ICT4D) strategy is expected to be posted in July 2009 (Refer to <http://www.caricomict4d.org/>).

Furthermore, the CARICOM Secretariat has setup the Mainstreaming Adaptation to Climate Change (MACC) project, which was scheduled for 2004-2007 (CARICOM, 2009b). Currently, no update or recent information has been provided online. Broadly, the project's main objective is to mainstream climate change adaptation strategies into sustainable development agendas of the region. The MACC project aims to build capacity to identify climate change risks, reduce vulnerability, and to effectively access and utilize resources to minimize the costs of climate change. It also aims to increase public education and outreach.

The Jamaica Organic Agriculture Movement Limited (JOAM) (<http://www.joamltd.org>) is a non-profit, non-governmental organization created to foster an organic agriculture industry in Jamaica. The mission of JOAM is to facilitate the development of a sustainable and economically viable organic agriculture sector in Jamaica while maintaining organic integrity, promoting health, environmental consciousness, and social responsibility.

JOAM was established in May 2001 and has been a key partner organization working with NID since 2003. JOAM has made significant strides in the development of the local organic industry and is considered the leading organic agriculture organization in the Caribbean region. The main objectives of JOAM are to:

- Lobby for and assist in the development of an effective local organic agriculture industry;
- Assist local producers who are interested in the conversion to and certification in organic agriculture;
- Promote and facilitate the production, distribution and consumption of all types of organic agriculture products; and
- Advance and promote better environmental and human health through the acceptance and practice of organic farming techniques.

The focus of JOAM over the last two years has been in strengthening the organization, increasing organic production and certification, and laying a framework to build and strengthen the local industry. JOAM continues to be the source of knowledge on organic agriculture and has been involved in the training of farmers, extension officers and technocrats in the principles and techniques of organic agriculture.

FAO and the Italian Ministry of the Environment and Territory have launched a joint project called **Communication for Sustainable Development Initiative** (CSDI), to support the application of communication strategies and approaches to Climate Change Adaptation and Food Security. CSDI aims at strengthening and up scaling communication services in selected countries, and to make available suitable methods and tools at the international level through knowledge networks and partnerships. Activities are being launched in Africa, Asia, Latin America, the Caribbean, and the Near East. The project seeks partnerships in communication with international and national development programmes, NGOs and local organizations, to address Climate Change Adaptation and Food Security.

The **Caribbean Agricultural Research and Development Institute** (CARDI) is the only regional agricultural institution identified in the Revised Treaty of Chaguaramas that has a critical role to play in the implementation and co-ordination of key Technology and Information Systems (TIS). During the past three years CARDI has intensified its research and development efforts in *Trinidad and Tobago* and *Jamaica* to develop, and demonstrate and transfer organic agriculture production technologies.

A vegetable cropping system for sweet pepper, tomato and sorrel was established at the Goldsberg Demonstration and Training Centre (GDTC), Tobago, as a pilot organic farm. This was a demonstration plot that highlighted organic propagation techniques on a commercial scale. The value of this initiative is being assessed jointly by CARDI and the Tobago House of Assembly.

In a second assessment of commercial biorganic manure in Jamaica during the latter part of 2007, the biorganic material again showed superior effects on the growth and yield of both callaloo and hot pepper compared to vermi-compost and cow manure.

The **Inter-American Institute for Cooperation on Agriculture** (IICA) (www.iica.int) is a specialized agency of the Inter-American System, and its purposes are to encourage and support the efforts of its Member States to achieve agricultural development and well-being for rural populations. With more than six decades of institutional life, the Institute is responding to new mandates issued by the Heads of State and Government of the Americas, the General Assembly of the Organization of American States (OAS) and the ministers of agriculture of the Americas, to reposition itself so that it can meet both the new challenges facing agriculture and the requests for support it receives from its member countries.

As it pursues its vision and carries out its mission, the Institute has competitive advantages it can draw on to carry out its new role. It has accumulated a wealth of knowledge regarding agriculture, rural territories, the diversity of peoples and cultures, and the agro-ecological diversity of the hemisphere, all of which are important for crafting creative solutions to a wide variety of problems and challenges.

Its presence in all of the Member States gives the Institute the flexibility it needs to move resources between countries and regions in order to promote and adapt cooperation initiatives intended to address national and regional priorities, facilitate the flow of information and improve the dissemination of best practices.

The Institute has its headquarters in Costa Rica, and offices in 34 countries of the Americas, an office in Miami, which is responsible for the Inter-American Program for the Promotion of Agricultural Trade, Agribusiness and Food Safety, as well as an office for Europe, located in Madrid, Spain. The Directorate for Strategic Partnerships works out of the IICA Office in Washington, D.C.

IICA is the specialized agency for agriculture and the rural milieu of the Inter-American System, whose purpose is to provide innovative technical cooperation to the Member States, with a view to achieving their sustainable development in aid of the peoples of the Americas.

Annex 4 : Information and Communication Technology tools and services for Organic Farmers in the Caribbean : A Climate Change Survey

Thank you for taking the time to participate in our study. This survey will help us to assess the information needs of organic farmers in the context of climate change in the Caribbean region with a particular focus on tools and services offered by ICTs (Information and Communication Technologies).

Who Should Participate

Small-scale farmers; individuals who manage land or who are involved with farmers in the Caribbean region; including activists, retail and service providers, government officials and academics.

How It Works

This survey has three parts. We would appreciate responses to all three parts. The three parts of this survey can be done in any order. As a survey participant, your contact details will be retained for future invitations to related training workshops but will not be published without your permission.

The three parts of the survey are:

Climate change – on the impact that climate change has had or will have on your farming activities, plans and decisions;

Information and communication tools – on your access to timely and relevant information and ability to reach others before, during and after climatic disasters;

Organic Farming –on how organic farming might help you to prepare for and manage climate change.

Where the results will go

The survey results will help NID and local partners to better understand and address the needs of farmers in the region. This study is being supported by the IDRC Canada and the survey results will be made available on line for public use.

PERSONAL DATA (This information will not be published without your permission)

Full name & email:
Business / organization name & mailing address:
Responsibilities or main activities:
Number of immediate household members whom you support:
Age range of family members:
Your age:

PART I: CLIMATE CHANGE

1. What does the term Climate Change mean to you?
2. What changes have you seen on your farm or around your community that are a result of climate change?

	Not at all	Few times a year	Ongoing challenge
Flooding or water-related changes			
Hurricane or wind damage			
Soil erosion or land degradation			
Destruction of crops or buildings			
Unpredictably of seasons			
Economic costs (such as price increases)			
Other (explain)			

3. Do you know of any measure, program or strategy that your local or national government has adapted in order to prepare for climate change?
4. Have you been involved in local meetings to address climate change issues? If yes describe how.
5. How have you managed the effects of climate change in your farm or around your community up to now?
6. What are the top three measures or services you need to help cope with climate change?

PART II: INFORMATION AND CONNECTIVITY

7. Please tick all those which apply to indicate your current use of:

	Every Day	Weekly	Monthly	Rarely	Never
Cell phone					
Satellite phone					
Land line phone					
Computer (without Internet)					
Computer (with Internet)					

Video, film or DVD					
Television or community radio					
E-conferences or on-line debates					
Blogging & social networking					

8. What are your main sources of information on climate change and local weather warnings?
9. What would make your access to information more effective, efficient or timely?
10. Are there special issues/concerns of particular interest to you in regards to climate change? (As a woman, are there issues that are different from men?)
11. Have you come across materials or information (on-line or off-line) that are especially useful to women farmers in the region? If so, describe them.
12. What materials or information (on-line or off-line) would be especially useful to you in order to better prepare for climate change, but you have difficulty finding?
13. How did you find out about this survey? (tick all that apply)

Communication from the Knowing & Growing Network

Direct email from NID

Through a membership organization (state which)

Through a government Ministry (state which ministry)

Other means (explain)

PART III: ORGANIC FARMING AND CLIMATE CHANGE

14. What is your involvement with or links to organic farming?
15. What is your level of knowledge of organic agriculture? (Tick all that apply and year)

	2008/2009	2005 - 2008	1995 - 2005
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I want to shift to organic methods			
I practice organic methods on a farm			
I have attended organic training courses			
I am an organic farm inspector			
I work a certified organic farm			
Other - please explain			

16. What crops do you grow, what animals do you rear. Which crops or animals would you like to grow or rear in the future?

17. At the moment how do you get your information about farming methods, markets, prices and other business networks?

18. Do you think there could be a link between organic farming and climate change? Explain why.

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS SURVEY.

Notes and References

¹ See www.idrc.ca for further information

² James Gustave Speth, March 2009 **The Bridge at the Edge of the World: Capitalism, the Environment, and Crossing from Crisis to Sustainability**


³ What makes our food system really unsustainable is the predominance of the globalised commodity trade that has resulted in the integration of the food supply chain and its concentration in the hands of a few transnational corporations. This in turn has greatly increased the carbon footprint and energy intensity of food production and consumption.

⁴ Climate Change 2007: impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK, pp. 173-210

⁵ As codified in the FAO/WHO *Codex Alimentarius*, Organic Agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. An organic production system is designed to a) enhance biological diversity within the whole system; b) increase soil biological activity; c) maintain long-term soil fertility; d) recycle wastes of plant and animal origin in order to return nutrients to the land, thus minimizing the use of non-renewable resources; e) rely on renewable resources in locally organized agricultural systems; f) promote the healthy use of soil, water and air as well as minimize all forms of pollution thereto that many result from agricultural practices; (Codex Alimentarius 1999)

⁶ International Trade Centre UNCTAD/WTO and FiBL - Organic Farming and Climate Change 2007. In two long term comparison experiments in Switzerland, the global warming potential of all crops was reduced by 18% in the organic plots.

⁷ International Trade Centre UNCTAD/WTO and FiBL - Organic Farming and Climate Change 2007. In two long term comparison experiments in Switzerland, the global warming potential of all crops was reduced by 18% in the organic plots.

⁸ Kellermann, J.L., M.D. Johnson, A.M. Stercho, and S. Hackett. Ecological and economic services provided by birds on Jamaican Blue Mountain coffee farms. **Conservation Biology** 22:1177-1185  [reprint](#)

⁹ NID workshop reports are available on request

¹⁰ Keya Acharya, Women Farmers Ready to Beat Climate Change, www.ispnews.net, accessed June 08 2009 and reproduced in Annex

¹¹ Like electrical power before it, ICTs have been recognized as a “*General Purpose Technology*” (GPT) that transforms economic relations, enhances productivity and creates new services and markets. GPTs have the following three characteristics:

Pervasiveness: GPTs spread to most sectors. This suggests that impacts should be measured at a higher level than the firm or disaggregated sectors. Higher levels of aggregation internalise the externalities or spill-over impacts that arise at low levels of aggregation.

Improvement: GPTs get better over time and, hence, should keep lowering the costs of its users. In fact, one of the problems associated with the study of ICTs is that it is constantly evolving. Apart from making quality adjustments for improvements in current technology, new technologies will emerge. ICTs are a moving target.

Innovation spawning: GPTs make it easier to invent and produce new products or processes. That is, they allow us not only to do things better but to do better things. New possibilities are created and specialization raises productivity. *Source: ITU adapted from Bresnahan T. and Trajtenberg M. 1995, ITU report 2006*

¹² The Knowing and Growing network is a small growing virtual network of women farmers based in the Caribbean who have participated in at least one of the NID ICTs and Organic Farming workshops. The members keep in touch via email and some are members of the Knowing and Growing Facebook group. The network was first established in 2004.

¹³ In this context, networking is the building of strategic alliances and partnerships with a wide range of stakeholders – community interests; suppliers; customers; markets and policy makers - to pool together a shared asset base and to achieve mutual goals and objectives. Networks may be formal or informal, and range from a local community to a virtual international organization. The small business network forms the core of an ecosystem of networks upon which small businesses must depend for their sustainability.

¹⁴ Most of the islands are virtually mono-crop economies that have relied on preferential trade agreements which face phased dismantling as a result of recent WTO rulings.

¹⁵ Mark Warschauer, 2002, Reconceptualizing the Digital Divide, http://www.firstmonday.dk/issues/issue7_7/warschauer/ accessed June 29th 2008

¹⁶ Information from: Caribbean Community (CARICOM) Secretariat. 2009a. Information and Communication Technology for Development. Available at http://www.caricom.org/jsp/projects/ict_4_development.jsp?menu=projects

Caribbean Community (CARICOM) Secretariat. 2009b. Mainstreaming Adaptation to Climate (MACC) Project. Available at <http://www.caricom.org/jsp/projects/macc%20project/macc.jsp?menu=projects>

Caribbean Community Climate Change Centre (CCCCC). 2009. CCCCC Mission Statement. Available at <http://caribbeanclimate.bz/news.php>