



Case Study on the Impact of Climate Change on Agriculture on an Indigenous Community in Guyana



Prepared for the UNDP by Paulette Bynoe (Ph.D.)

Copyright © United Nations Development Programme (UNDP) 2009

All rights reserved

Published in Barbados

The views expressed in this publication are those of the authors and do not necessarily represent those of the United Nations or UNDP

Table of Contents

List of figures and plates	iii
List of appendices	iv
Acronyms	v
Acknowledgements	vi
1. Introduction	1
2. Background	2
2.1. Climate of Guyana	2
2.2. Demographic and social characteristics of population	2
2.3. Economic performance and poverty	3
2.4. Characterisation of local society and economy	4
3. Case study of Surama	6
3.1. Introduction to Surama	6
3.2. Surama demographic and social characteristics of surveyed population	6
3.3. Characterisation of the Surama economy	8
3.4. Amerindians, agriculture and climate change	10
3.5. The local risk situation: past experiences	14
3.6. Adaptation and coping strategies and measures	17
4. Lessons learned and recommendations	20
4.1. Lessons learned	20
4.2. Recommendations	21
4.2.1. Recommendations from local people	21
4.3. Conclusion	24
References	25

List of figures and plates

Figure 1: Length of residence of respondents in the community	1
Figure 2: Population trends between 1970 and 2002	2
Figure 3: Map of Guyana depicting Marginality Index	3
Figure 4: Map of Iwokrama and adjacent communities	7
Figure 5: Number of persons per household	8
Figure 6: Level of education achieved by gender	8
Figure 7: Employment status by gender	9
Figure 8: Income sources by gender	9
Figure 9: Non cash sources of household income	11
Figure 10: Respondents' view of a change in climate	14
Figure 11 Perceived reasons for climate change	14
Figure 12: Impacts of rainfall and temperature changes on farming	15
Figure 13: Effects of impacts of floods on men	16
Figure 14: Effects of impacts of floods on women	17
Figure 15: Adaptation measures used in conjunction with relocation of farmlands	18
Figure 16: Recommendations of sample population	22
Figure 17: Recommendations to accompany increased production	22
Plate 1: The Rupununi Savannahs	6
Plate 2: Cassava product being cooked on wood fire	12
Plate 3: Macushi woman demonstrating how cassava is manually processed to make farine	13
Plate 4: Macushi Man showing one of the sifters used in processing cassava	13
Plate 5: Amazon Stick – a new cassava variety	18

List of appendices

Appendix I: List of Key Informants	26
Appendix II: Interview Schedule for Key Informants	27
Appendix III: Survey Questionnaire for Gender and Climate Change Adaptation	28
Appendix IV: Lethem monthly temperature and mean rainfall (1998 – 2007)	32

List of acronyms

CRMI	Caribbean Risk Management Initiative
USAID	United States Agency for International Development
APA	Amerindian Peoples Association
EPA	Environmental Protection Agency
ENSO	El Nino Southern Oscillation
ICUN	International Union for Conservation and Nature

Acknowledgements

The Consultant wishes to thank the Surama Community and all key respondents who have willingly participated in the study. Thanks to Dr. Leith Dunn and Ms. Patrice La Fleur for their encouragement and support throughout the study. Sincere gratitude is expressed to the members of the CRMI Gender Advisory Committee for their invaluable comments. Finally, heartfelt gratitude is expressed to the Honourable Ms Pauline Sukhai; Minister of Amerindian Affairs, Permanent Secretary, Mr. Emil McGarrell; and Council Members of Surama for readily granting permission for the study to be conducted in an Amerindian village.

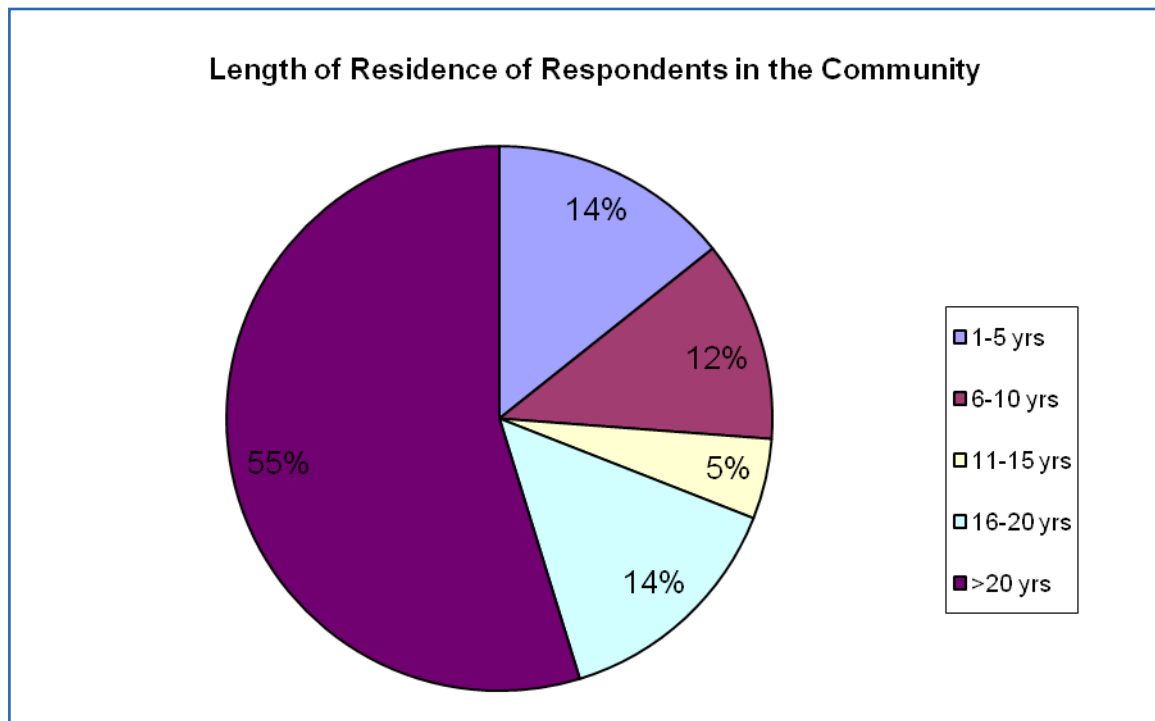
Paulette Bynoe, Ph.D.

1. Introduction

This case study on Guyana focuses on Amerindian women in agriculture and examines the impact of natural disasters and climate change on their cassava production.

A combination of research methods including desk reviews, key interviews, direct field observations, and a household survey was employed to undertake the study (See Appendices I and II). The household survey was conducted in Surama between 29 and 30 June 2008. Since the community is relatively small (52 households) the consultant aimed for a census. However, only 42 households (80.7 percent) were covered in the study since a few families left for their farms and did not return within the study period. Appendix III provides details on the survey instrument. Specific efforts were made to solicit responses from both men and women; 43 percent of the respondents were males and 57 percent were females. Further, the majority (69 percent) of the respondents had resided in the study area for more than 16 years.

Figure 1: Length of residence of respondents in the community



Source: Survey Data

2. Background

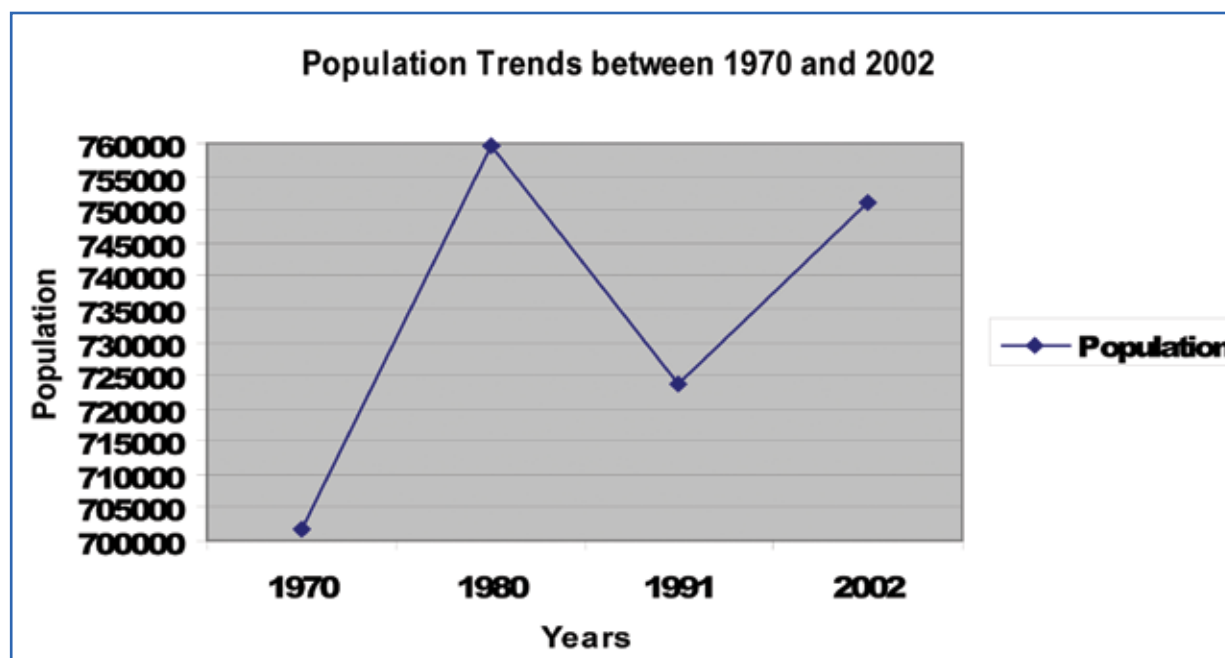
2.1. Climate of Guyana

Guyana experiences an equatorial climate characterized by two wet seasons (May to mid-August and mid-November to mid-January) and two dry seasons (January to April and mid-August to mid-November). The average daily temperature is approximately 26.7° C. Relative humidity is high with 80 percent or more on the coastal zone, approximately 70 percent in the savannah zone and 100 percent in the forested zone.

2.2. Demographic and social characteristics of population

Guyana's population of 751,223 is diverse: the three largest groups are the Indians or Indo-Guyanese (43.5 percent in 2002), the Africans or Afro-Guyanese (30.2 percent) and those of mixed origin (16.7 percent). The Amerindians (9.2 percent) who live mainly in Guyana's interior, are divided into nine different groups: the Akawois, Arawaks, Arecunas, Caribs, Macushis, Patamonas, Wai-Wais, Wapishanans and Warrous. Several smaller groups, including Chinese, Whites and Others make up less than 1% of the population.

Figure 2: Population trends between 1970 and 2002



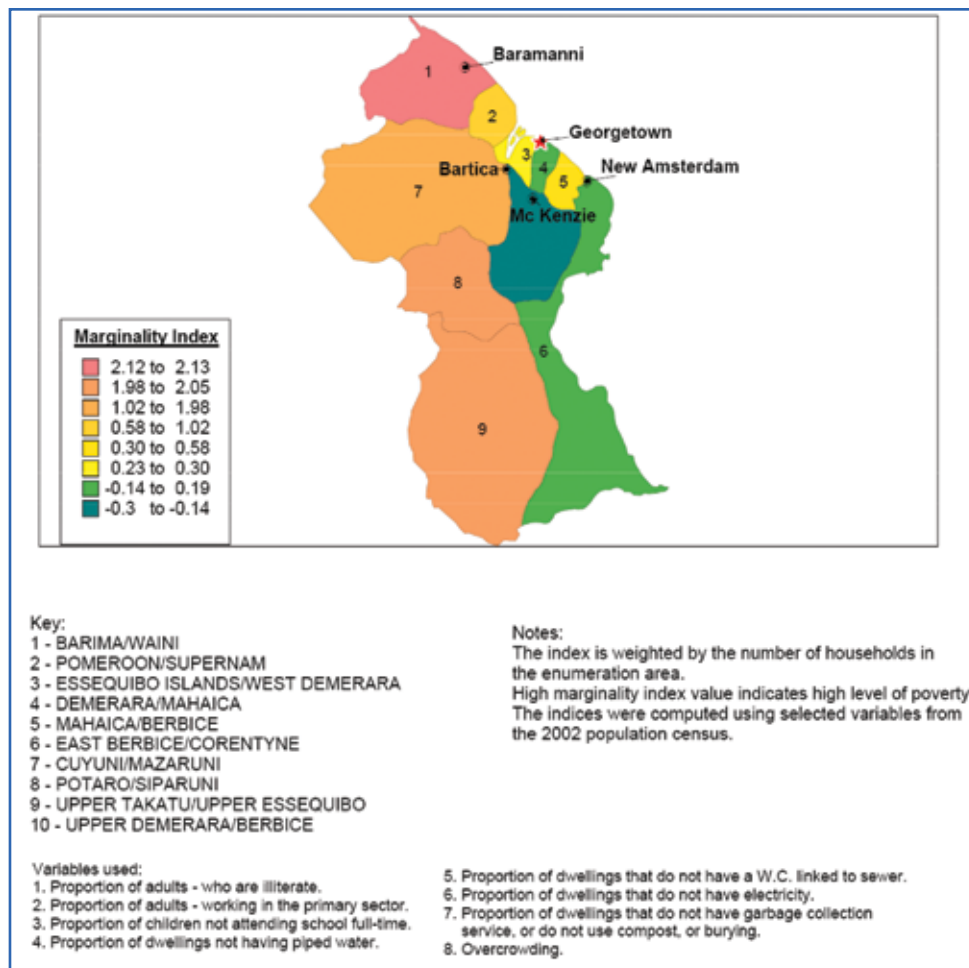
Source: Housing and Population Census, 2002

As indicated in Figure 2, Guyana's population has fluctuated very little. Between 1970 and 2002, the population rose by 7.1 percent; though there was a notable decline of 4.7 percent between 1980 and 1991. Over the period under discussion, the population figure was lowest in 1991 with 723,673 persons. According to the 2002 Housing and Population Census, this decline is best explained by high emigration flows. The estimated growth rate for 2006 is 0.25 percent and life expectancy of the total population is 65.86 years.

Guyana's working age population has increased progressively over the decades. In 2002, this group accounted for two-thirds of the total population (484,042 persons), compared with 417,770 in 1980 and approximately 467,173 in 1992.

2.3. Economic performance and poverty

Figure 3: Map of Guyana depicting Marginality Index



Source: Bureau of Statistics Population and Housing Census, 2002.

Guyana's economic performance remains dependent on a few primary commodities: sugar, rice, fish, bauxite, gold and timber. The economy showed signs of moderate economic growth in 2001-2002 because of several factors, including expansion in the agricultural and mining sectors, relatively low inflation, and the continued support of international organisations. Growth was retarded in 2003 and came back gradually in 2004, buoyed largely by increased export earnings. It slowed again in 2005.

More importantly is the marginality index shown in Figure 3. The high marginality index value indicates a high level of poverty and it is noteworthy that areas of high levels of poverty coincide with hinterland areas dominated by Amerindians. Moreover, in 1998, Guyana's poverty level was estimated at 35 percent. According to the survey, 50 percent of Guyanese women are living in poverty, and nearly 30 percent of the households headed by women are characterized by absolute poverty¹.

2.4. Characterisation of local society and economy

Guyana's working age population has grown progressively over the decades. In 2002, this group accounted for two-thirds of the total population (484,042 persons), compared with 417,770 in 1980 and approximately 467,173 in 1992. According to the Housing Population and Census Report (2002, pp.16): 'On average 88 percent of all persons of the working population who would like to work are actually working. This is an average, however, as 90 percent of the males who want to work actually do work, compared with 85 percent of the females. Persons who have no jobs comprise approximately 12 percent of the population who would like to work. Once again, this average of unemployment levels masks the male-female differential, in that 15 percent of females are out of work, compared with 10 percent of males.'

Currently, Amerindian women have ventured into income generating activities such as sewing, cash crop farming, teaching, health care, forest ranging and ecotourism. Their present roles are directly related to the economic situation in the household, coupled with their interactions with the city, Georgetown or Boa Vista. Traditionally, Amerindian women remained at home and cared for the children, and also shared the farm labour (weeding, clearing and harvesting) with the men.

Amerindian women, nevertheless, still face the challenge of making decisions regarding reproductive health. These decisions are still made mostly by men as local societies may be best described as patriarchal.² This partly explains the fact that the average household size is larger than the national average. While children can assist with farm labour, their socio-economic upkeep becomes an economic burden to many women, particularly when the men leave the communities in search of employment. The departure of males has also resulted in family disintegration.

¹DevTech Systems, Inc. (2003) Gender Assessment for United States Agency for International Development (USAID)/ Guyana

²It is noted, however, that few Amerindian Village Councils (the local decision-making body) include women leaders. Also, in August 2002, the Amerindian Peoples Association (APA) sponsored a National Indigenous Women's Conference, involving 60 women from six of the ten administrative regions of the country. For the first time, indigenous women came together to identify issues of concern to them and to propose solutions.

Information provided by the key respondents suggests that there is a problem with violence in the form of verbal and physical abuse of women by men when they are under the influence of alcohol or lack recreational opportunities. The problem of alcoholism further exacerbates the poverty condition of households since a large percentage of the men's earnings are spent on this 'social activity'. The issue of alcohol is serious since it is felt that consumption of the 'beverage' is a coping strategy to deal with hunger.

3. Case study of Surama

3.1. Introduction to Surama

Surama, a predominantly Macushi community currently comprising 55 households, was established in 1973. The village is located on five square miles of leased land on flat savannah (Plate 1) and bordered by the forested Pakaraima Mountain. It is often described as the transition between the savannahs and the mountains in the North Rupununi.

Appendix IV provides details of the rainfall and the monthly mean temperatures for the period 1998-2007 for the Lethem area that forms part of the Rupununi Savannahs. Special attention should be given to the year 1998 when local communities experienced the El Nino effect.

Plate 1: The Rupununi Savannahs



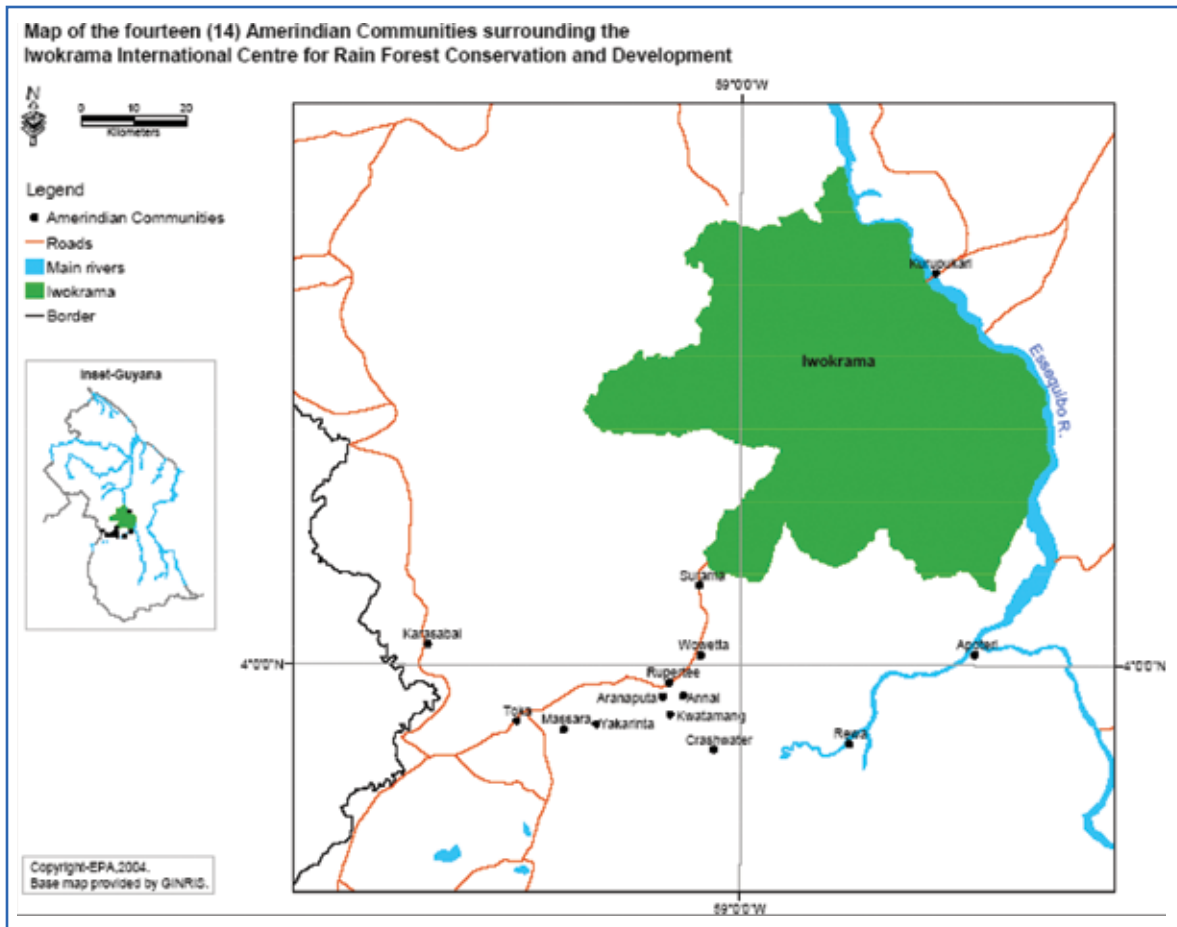
Source: Graphic courtesy of the Iwokrama Centre

3.2. Surama demographic and social characteristics of surveyed population

Almost 50 percent of the surveyed households comprise four to six persons, as shown in Figure 5. The average household size tends to be larger than the national average of 4.15 persons (Population and Housing Census, 2002). In fact the local population has shown signs of growth. Between 2003 and 2008, the Surama population has grown by approximately 33.7 percent.

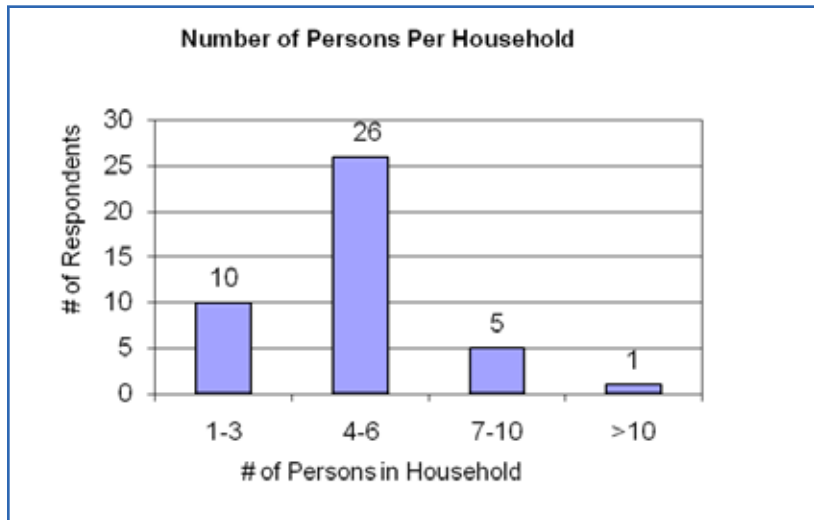
Figure 4 shows that Surama is one of fourteen communities that are adjacent to Iwokrama Forests.

Figure 4: Map of Iwokrama and adjacent communities



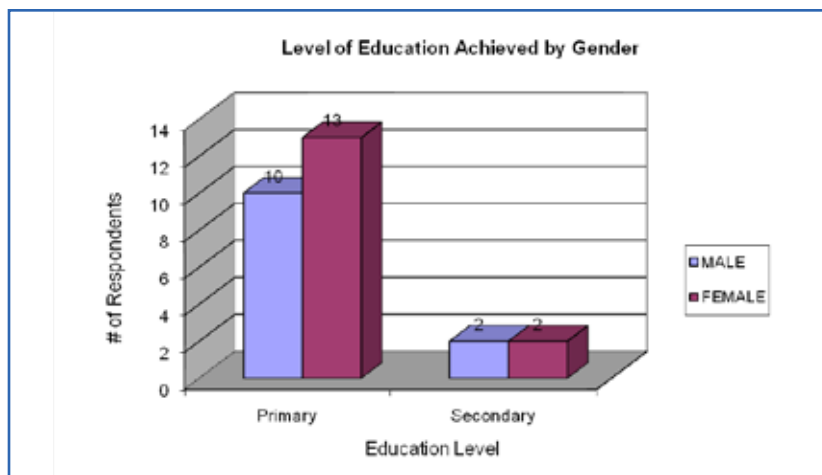
Source: Graphic Courtesy of the Guyana Environmental Protection Agency (EPA).

Figure 5: Number of persons per household



Source: Survey Data

Figure 6: Level of education achieved by gender



Source: Survey Data

More than 50 percent of the respondents have received primary school education (Figure 6).

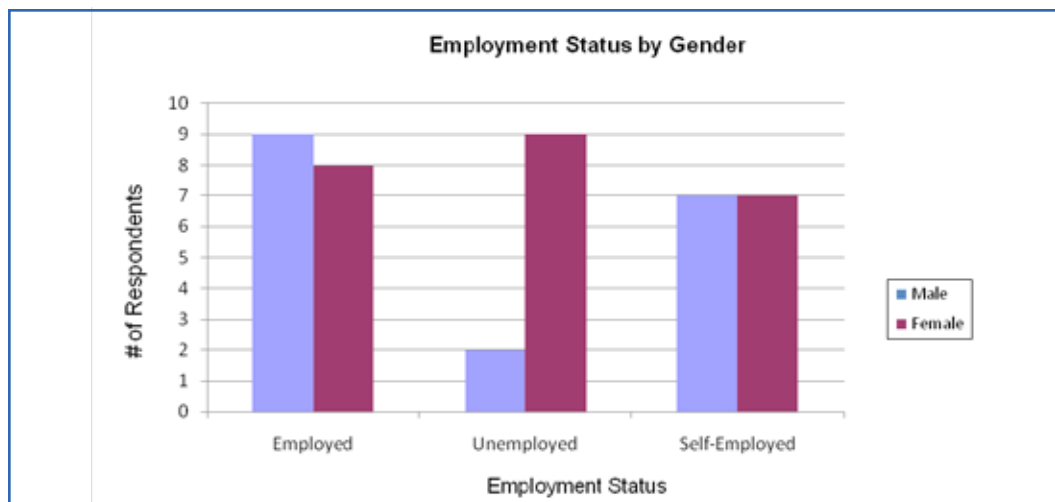
3.3. Characterisation of the Surama economy

Figure 7 clearly indicates that approximately 89 percent of the men are employed (including self-employed), compared to 75 percent of women. Undoubtedly, more women are currently employed compared to a decade or so ago. In fact, many women have become the single supporters of family. This is because young Amerindian men often leave their communities in search of work in mining and forestry areas, or migrate to neighbouring Brazil, and this leaves a heavy burden on the women since they must still tend to their farms, do the household chores and provide for their families. A serious outcome of

this situation is the phenomenon of a rise in the number of female-headed households which has implications for the stability of the family unit and may result in the neglect of children and/or excessive burdens on women.

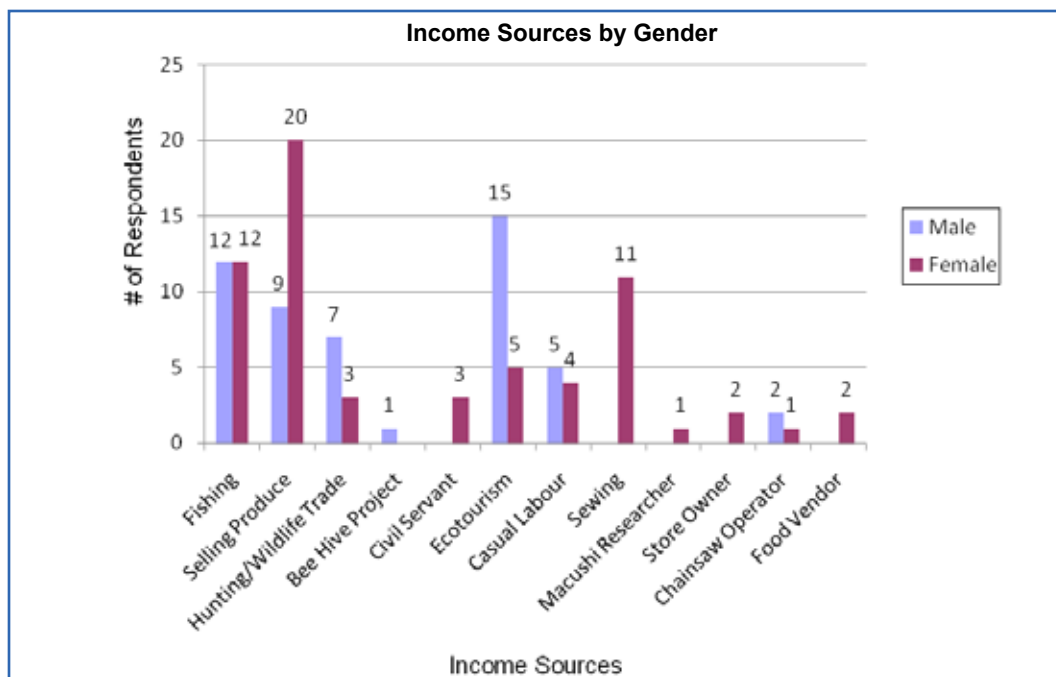
Figure 7 also highlights the fact that unemployment is still higher among women (37.5 percent for females compared with 11.1 percent for males.)

Figure 7: Employment status by gender



Source: Survey Data

Figure 8: Income sources by gender



Source: Survey Data

According to Figure 8 both men and women are engaged in fishing activities, casual labour, chainsaw operation, ecotourism related activities, hunting and selling of surplus agricultural produce. While men dominate fishing, hunting, beehive project, ecotourism and casual labour. More women are employed in areas such as public service (teachers and health workers), selling produce (predominantly cassava products), sewing, and food vending.

Amerindians were formerly generally involved only in subsistence activities which were mostly associated with agriculture (See Figure 9). The women's role as housekeepers and child-bearers was reinforced by their culture and religion. However all Amerindian economies are rapidly being transformed from subsistence and bartering to cash economies. This trend was noted by Forte (1998) in the following statement:

“People no longer farm, fish, hunt and gather only for subsistence use, but also for sale within as well as outside communities in order to earn some cash income”

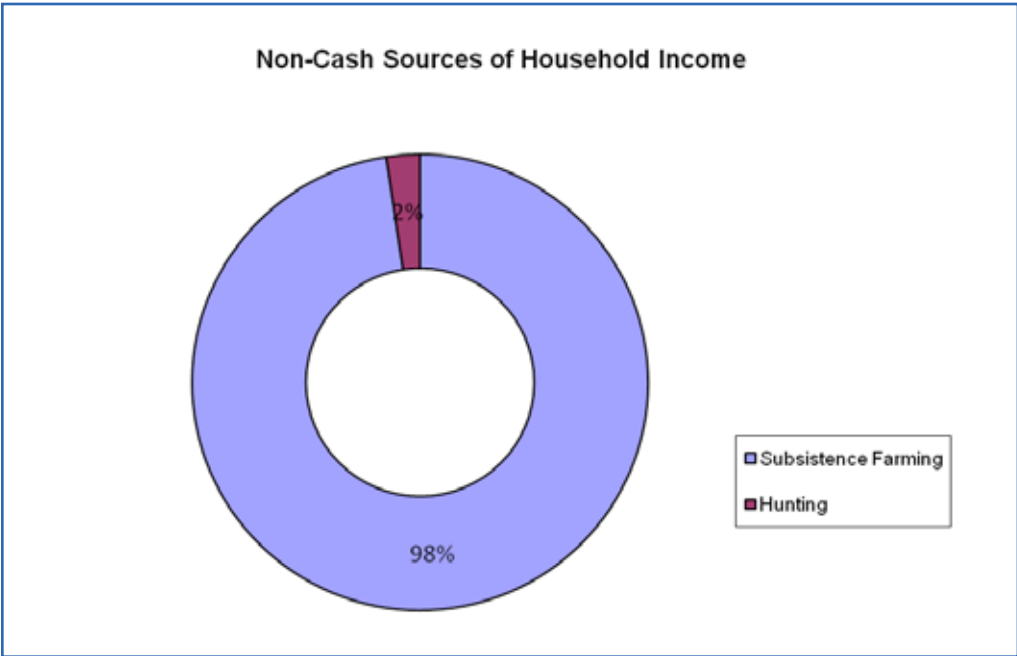
More importantly, many women in Surama indicated their willingness to work since they 'can put better use to the wages' received. Other reasons cited for the change in division of labour by gender are: (a) increased awareness of the need for development, coupled with changing aspirations; (b) poverty/economic situation and the need for money to purchase basic consumables (for example, salt, rice, milk, soap) not produced locally; (c) interactions with persons from the city (Georgetown)/socialisation process; (d) influx of foreigners, mainly Brazilians; (e) modernisation and integration; (f) improved education; (g) increased employment opportunities; and (h) need to support children at school (for example, purchase school books and uniforms).

Arnold, Bynoe, Gomes, Holden, and Solomon (2002) draw attention to a number of constraints that need to be addressed to enhance the livelihoods of Amerindians. Chief among those constraints are lack of employment, problems relating to enterprise development, risk of exploitation, institutional barriers to accessing natural resources, unregulated and overexploited common resources, limited delivery of public services and, more often than not, an unresponsive local government. These issues obviously have implications for livelihood opportunities for men and women, as well as for their efforts to build their resilience to environmental, social and economic shocks, and to pursue a better quality of life

3.4. Amerindians, agriculture and climate change

Agriculture is the mainstay of all Amerindian communities; Surama is no exception. As Figure 9 indicates, 98 percent of the households are involved in agriculture as a subsistence activity. Thus their current livelihood systems are supported by their subsistence farming activities. A mere two percent still practise hunting.

Figure 9: Non cash sources of household income



Source: Survey Data

Cassava production is the major farming activity. Cassava³ is crucial for food security, bartering and income generation, however, it should be noted that the crop is produced mostly for household consumption.

Amerindians practise subsistence farming throughout the year, but confine hunting and fishing to specific seasons. ‘Slash and burn’ agriculture, a common farming practice among Amerindian households in the North Rupununi, occurs mainly in the rainforests and is characterised by clearing of the land, burning of the cleared vegetation to fertilise the soil and to eradicate the pests, followed by planting of cassava sticks, corn, bananas, watermelons, pineapples, papaws, greens, cotton and peanuts.

³Cassava is the staple food, but yams, fruits, and cash-crops are also grown. While the men clear and plant the fields, the women and children are responsible for the maintenance.

Some of the products derived from cassava are farine, cassava bread (See Plate 2), tapioca, cassareep, and fermented drinks such as parakari. Cassava is so important to Surama that the community agreed to establish a Cassava Project on 27 February 1995. The project began with two groups, each having five women and two men. Generally, the men are responsible for choosing the soil (near to creeks or at the foot of hills or mountains since these locations yield fertile soils) and site preparation, while the women are responsible for keeping the farms clear of weeds, monitoring the crops and harvest the produce. Normally, the cassava crop will take about eight months to ripen. Both sweet and bitter cassava are cultivated and used for different purposes.

Plate 2: Cassava product being cooked on wood fire



Photograph taken by Consultant

Plate 3: Macushi woman demonstrating how cassava is manually processed to make farine



Photograph taken by Consultant

Plate 4: Macushi Man showing one of the sifters used in processing cassava

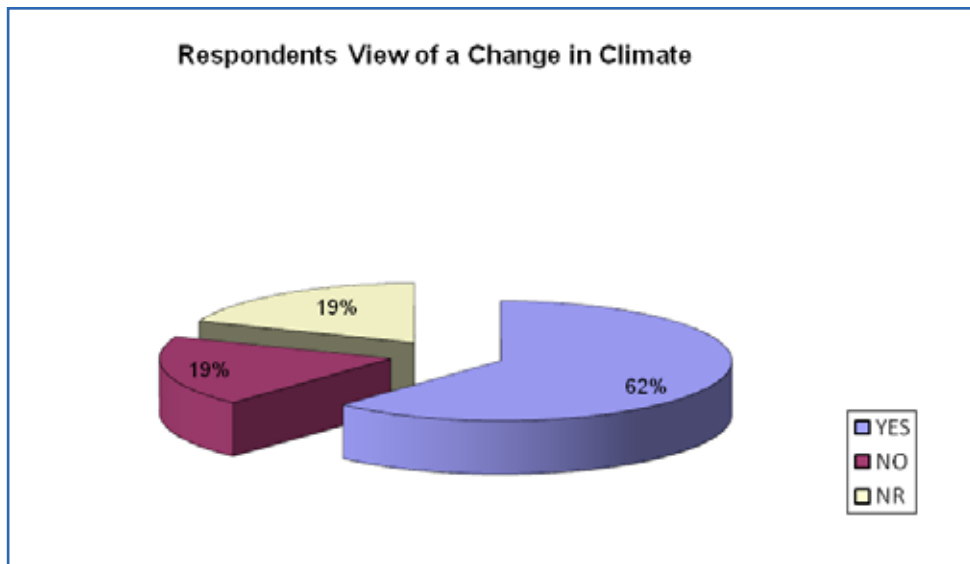


Photograph taken by Consultant

3.5. The local risk situation: past experiences

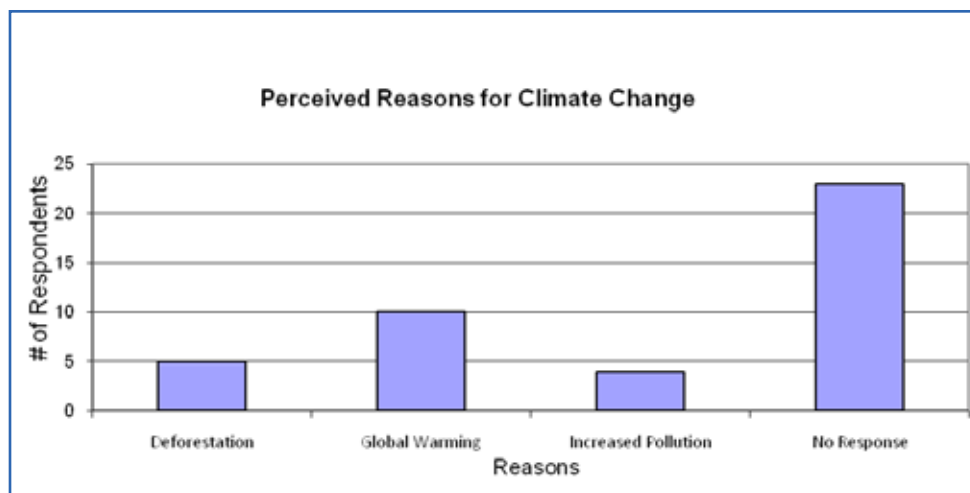
Surveyed respondents were asked whether they thought that the climate was changing and what they thought might be the reason/s for the change. As indicated by Figure 10, more than half (62 percent) of the respondents said “Yes” but more than one-third of the respondents were unable to give possible reasons for the observed change. The 45 percent who provided responses cited: (i) global warming; (ii) deforestation; and (iii) increased pollution (See Figure 11). Interviews with community representatives suggest that there is an urgent need for a community awareness programme on climate change.

Figure 10: Respondents' view of a change in climate



Source: Survey Data

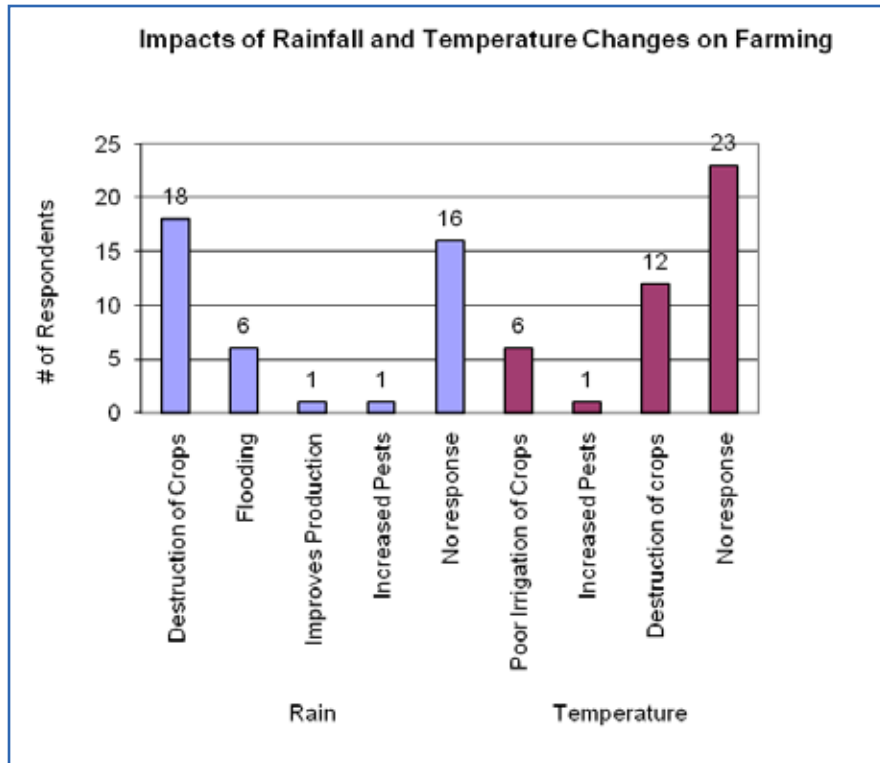
Figure 11: Perceived reasons for climate change



Source: Survey Data

Sadly, climate change poses threats and risks to the survival of Amerindians in Surama and other parts of Guyana’s hinterland, even though their traditional lifestyles contribute very little to greenhouse gas emissions. Respondents in both the survey and interviews were requested to identify past experiences and to describe the impacts associated with weather patterns. Most respondents recalled the droughts and intense floods in the North Rupununi in 1996, and El Nino Southern Oscillation (ENSO) phenomenon (drought) of 1998. Scientists have predicted more frequent, intense and extended droughts. Figure 12 summarises the impacts.

Figure 12: Impacts of rainfall and temperature changes on farming



Source: Survey Data

In-depth interviews have revealed that the main impacts associated with the droughts were:

- cassava crops were withered and root sizes were reduced significantly;
- there was an infestation of caterpillars and this damaged the cassava crops;
- there was a reduction in water levels, as there was no substantial rainfall for more than one month.;
- food prices skyrocketed;
- there was an increase in diarrhoea and vomiting; coupled with an outbreak of skin rashes in Surama where 35 households were affected;

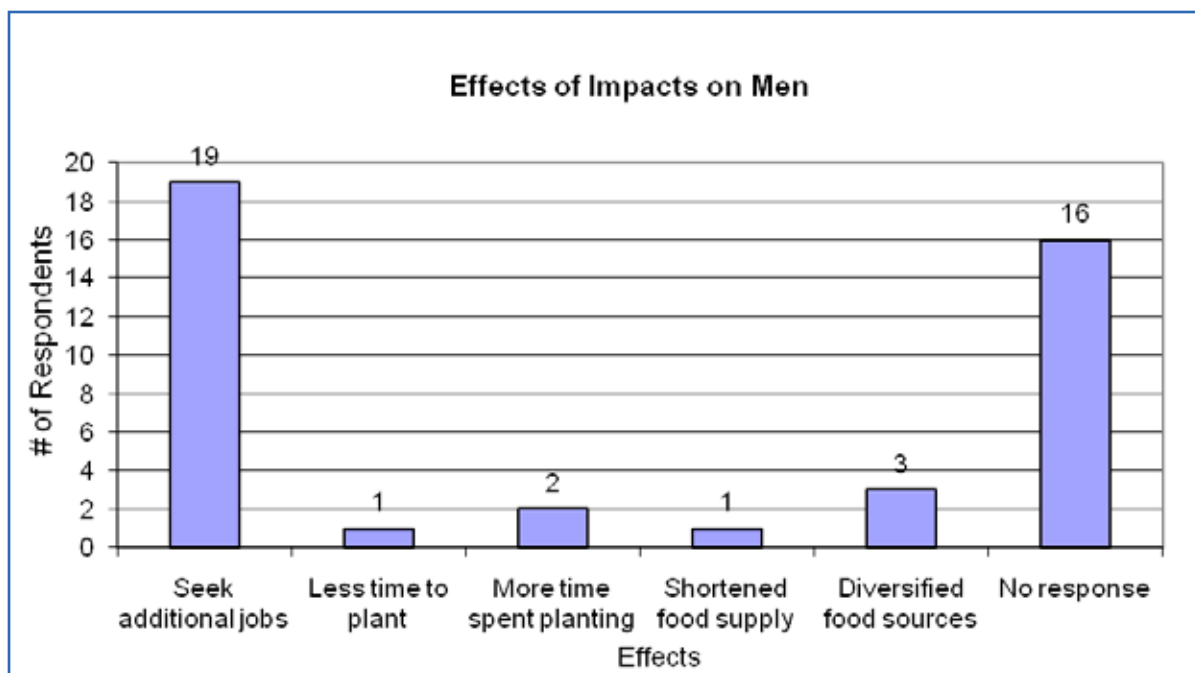
- food security was threatened as cassava is the main staple;
- forest fires destroyed several farms.

With respect to the 1996 floods, the following impacts were particularly noted:

- cassava rotted;
- farmlands, especially near creeks, were inundated;
- the long and heavy rainfall prevented the drying of cassava bread; and
- food security was threatened.

According to Figure 13, the men were forced to seek additional jobs, including casual labour or logging or mining, which necessitated leaving their families for long periods. Additionally, the men in Surama were required to spend more time planting and diversifying their crops.

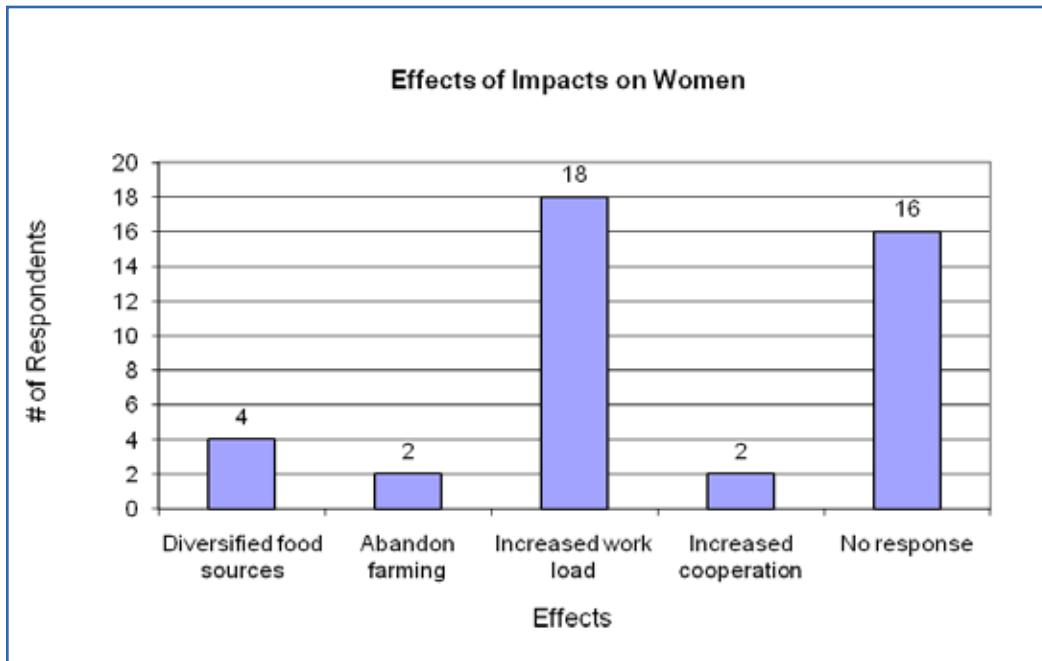
Figure 13: Effects of impacts of floods on men



Source: Survey Data

Figure 14 indicates that the work load of women increased since they were forced to find food for their families. Increasing cooperation and diversifying food crops can be considered adaptation strategies.

Figure 14: Effects of impacts of floods on women



Source: Survey Data

3.6. Adaptation and coping strategies and measures

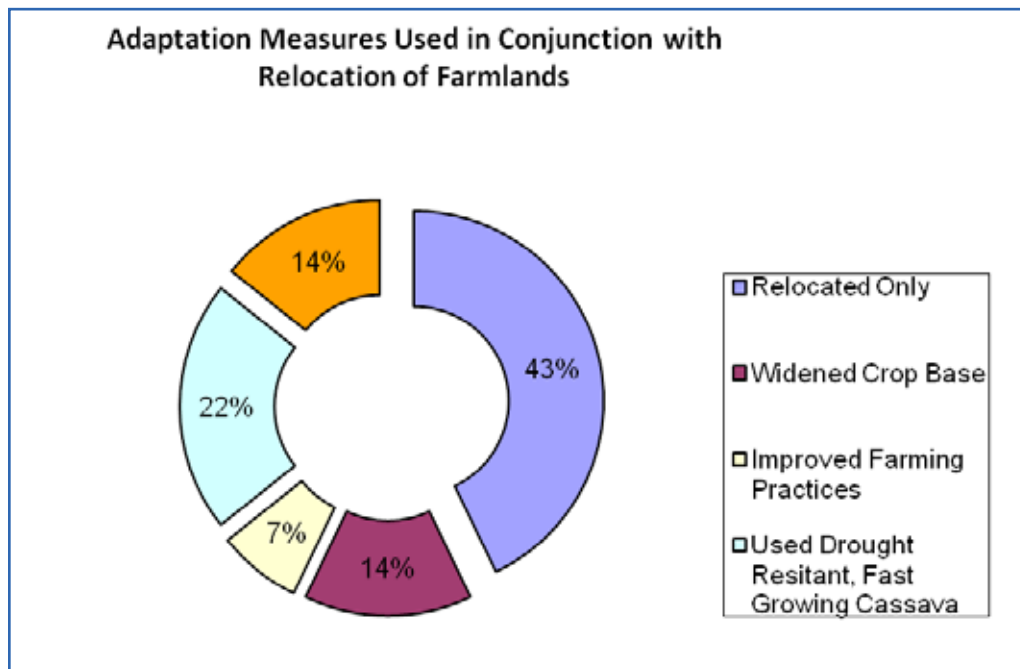
Oviedo *et al* notes that:

‘Traditional societies in many cases have built up knowledge over long periods about changes in the environment and have developed elaborated strategies to cope with these changes. However, traditional knowledge systems in mitigation and adaptation have for a long time been neglected in climate change policy formulation and implementation and have only recently been taken up into the climate change discourse. Traditional and indigenous peoples, who have survived over long periods to many kinds of environmental changes, including climate change, may have valuable lessons to offer about successful and unsuccessful adaptations which could be vital in the context of climate change.’⁴

A combination of the results of the household survey and the key informants’ interviews has revealed several local adaptation strategies and measures, as highlighted in Figure 15. The main measures cited by respondents were not gender sensitive and may be summarized as: relocation to higher ground; diversifying or widening crop base (planting other crops such as vegetables and hill rice); improved farming practices by practising intercropping to resist pest infestation; and the planting of a new variety of cassava, known as Amazon stick. This particular strain ripens in approximately 4 months. See Plate 5 for photograph of the specific variety.

⁴Oviedo, Gotheil, Cross, Boedihartono, Wolfangel, and Howell (2008) Indigenous and Traditional Peoples and Climate Change, Issue Paper, March 2008, Gland: International Union for Conservation of Nature (IUCN).

Figure 15: Adaptation measures used in conjunction with relocation of farmlands



Source: Survey Data

Plate 5: Amazon Stick - a new cassava variety



Photograph taken by consultant

Coping strategies of men to deal with changes in the environment were cited as:

- Decreased food consumption;
- Seeking of additional jobs in Brazil, and in mining and logging areas;
- Improved farm management; and
- Increased labour input.

Women's coping strategies were identified as:

- Diversification of food sources/change of family diet, for example the cockrit from the forest was used to make porridge;
- Women worked as domestic help, and got involved in other income generating activities, such as weeding, craft, embroidery and sewing until men returned ;
- Government gave a GYD\$25,000 relief;
- Alternative income sources (for example, casual labour as maids) were sought; and
- Sharing of resources.

4. Lessons learned and recommendations

4.1. Lessons learned

The Surama Case Study offers valuable lessons for the Caribbean. These are:

- Human beings must treat the environment (particularly forest resources) with respect. Poverty is not a license for wanton destruction of resources. The forest is a source of food, medicines, and materials. The Amerindian households' dependence on resources from ecosystems other than forests during an environmental shock underscores the need for all communities to understand the inter-relatedness between resource management and self-sustenance. If forest resources had been destroyed, then Surama households could not have secured their food source.
- Sustainable livelihood practices must be supported at all levels. The institutions (policy, legislation and organisations) should provide the enabling framework within which livelihoods can be ecologically, socio-culturally and economically sustainable. For example, local farms in Surama were once located in areas vulnerable to floods; hence there was the persistent threat posed by heavy rainfall and overflowing of water bodies. Proper land use planning and zoning at both the macro and micro levels should help reduce climatic risks.
- Women are key agents in the livelihood adaptation process which is essential for sustainable human development. This requires the establishment of conditions that will promote and facilitate diverse livelihood portfolios that take into account the roles and responsibilities of women in society. Further, the coping capacities of Caribbean societies require the appropriate institutional support to ensure success.
- Community organisation (allowing for sharing of resources) is critical to resilience of local people during environmental stress and shocks. Local groups/organisations comprising both men and women should be promoted and facilitated through capacity building to ensure cooperation. This is vital since community mobilisation and networking/organisation can reduce risks and vulnerability. Sharing of resources in times of stress and shock is imperative. Communities should be encouraged to build up their social networks/capital, particularly in urban communities that are more often likely to be very impersonal.
- Women should be consulted when strategies and action plans are formulated to respond to the growing concern about food security in the wake of climate change. For example, the local food preservation methods (e.g.: smoking and drying) practised by Amerindian women will ensure food security during a disaster. The lack of food security is a common threat during environmental disasters (particularly hurricanes and floods) in the Caribbean. Households can adopt new methods of food storage during disaster preparedness processes. Of course this requires early warning and effective communication systems. The traditional knowledge and experiences of Amerindian women should be documented and disseminated.

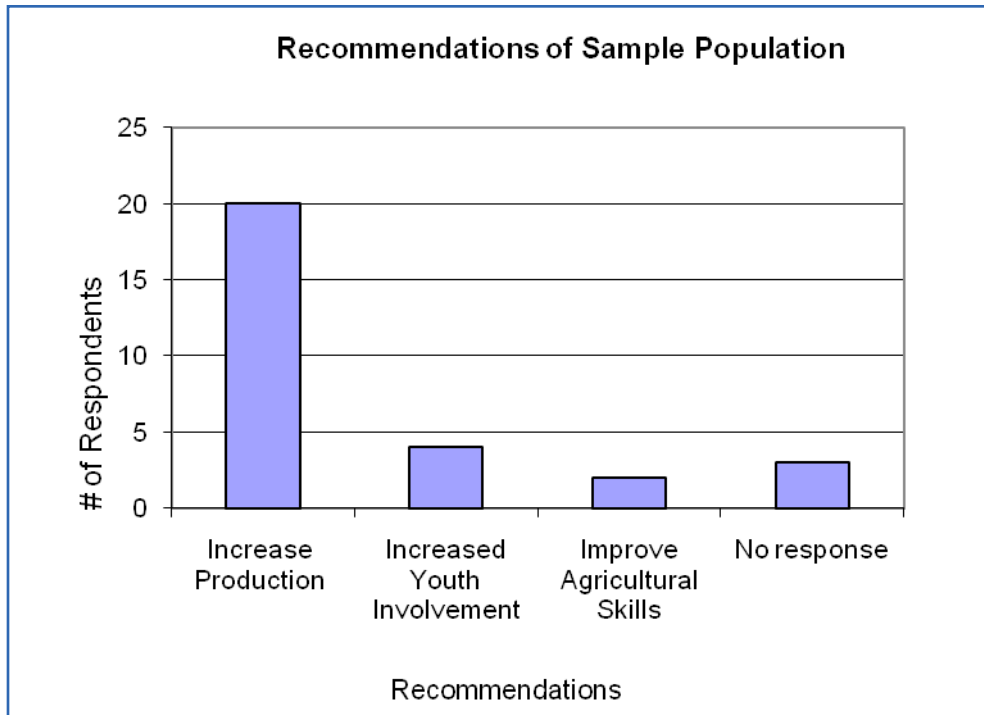
- Local communities need support such as new irrigation systems to sustain agricultural activities during harsh weather conditions. This, in turn, requires resources for research and development in appropriate technologies as a precautionary/proactive measure, instead of the reactive measures, which are characteristic of most Caribbean countries. Climate change is a reality so research on and development of new technologies must be a priority.
- Relocation must be embraced by all as a viable option. People's feelings or attachments to a geographic space or 'place' become obstacles to the adoption of safety measures, including possible relocation from areas that are low lying and susceptible to floods and other meteorological disasters. Relocation should therefore be a phased process.
- Product substitution is a necessity for survival. Children and youth especially must be introduced to new food products to decrease their vulnerability to food insecurity as a potential impact of climate change.
- Crop diversification must be practised to minimise the risk of harvest failure. Research on and development of biotechnology must be promoted and tangibly supported by national budgets. Experiments on new varieties with high resistance to environmental shocks must be a priority of Caribbean governments. Additionally, seed banks must be increased. These measures are necessary and should be factored into national food security policies.
- Investments must be directed appropriately since climate change has dire consequences for coastal and hinterland regions. Much focus has been given to the coast but climate change requires a national policy and plan with supporting budgetary allocations to reduce associated risks and vulnerabilities.

4.2. Recommendations

4.2.1. Recommendations from local people

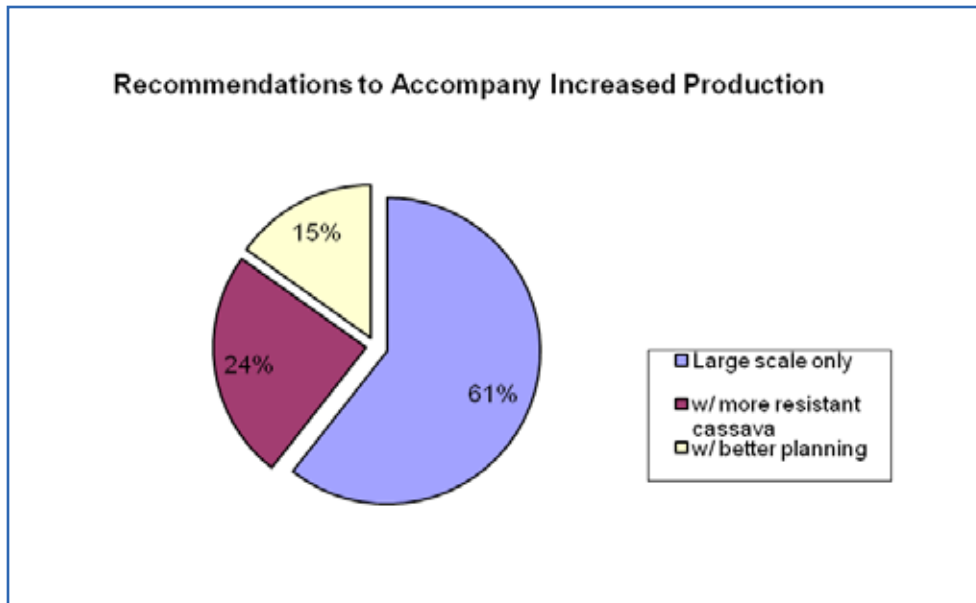
Recommendations were solicited from the local population as well as the key respondents. As Figures 16 and 17 show, almost 50 percent felt that cassava production should be increased. A few respondents also cited involvement of youth and improved agricultural skills as important changes needed. Further, those respondents who cited increased production as an option specifically mentioned three key issues for consideration, namely: large scale production, more resistant cassava strains and better planning.

Figure 16: Recommendations of sample population



Source: Survey Data

Figure 17: Recommendations to accompany increased production



Source: Survey Data

Other recommendations based on lessons learned include:

1. Develop and implement a comprehensive public awareness programme on the inter-dependence between society and ecology, utilising both formal and non formal communication channels. Water conservation techniques should also feature in such a programme.
2. Create an enabling environment that will ensure the sustainable livelihoods of both men and women. Special measures should be taken to remove the barriers that prevent women from participating meaningfully in the labour force.
3. Disseminate information on 'old' and 'new' methods of preserving foods as a means of reducing household vulnerability.
4. Create and introduce early warning systems to ensure preparedness.
5. Allocate adequate resources for research and development in appropriate technologies to improve agriculture productivity and to develop new crop varieties to strains that are more resistant to environmental shocks.
6. Implement community awareness programmes on climate change issues. This is critical to the preparedness process.
7. Develop and implement a phased relocation programme starting at the community level.
8. Diversify food products and launching of promotion campaigns to encourage the public's gradual acceptance of other types of food that are produced locally or regionally.
9. Establish Community Conservation Sites and introduction of remuneration system to ensure prudent resource management. This can be linked to ecotourism initiatives.
10. Emphasise capacity building as necessary to implement any long term strategy in Amerindian areas.
11. Create and maintain special cassava cultivars, and other agricultural crops to ensure food security during harsh climatic conditions. Gene banks should be established.
12. Significantly improve technical support to women in agriculture in the communities in relation to terms of access to credits and extension workers.
13. The regional allocation of funds and other support must be re-considered since climate change is not a phenomenon peculiar to Guyana's coastland. There is need for a policy on climate change since this affects all of Guyana.
14. Create a special fund for interior/hinterland communities to finance projects aimed at building sustainable livelihoods and resilient communities.

4.3. Conclusion

The Surama case study provides a very rich and detailed account of how gender roles in an Amerindian setting have changed gradually over the years in response to socio and economic pressures at the household level, as well as the change in individual aspirations associated with development objectives. However, the resourcefulness of the local population and particularly women is threatened by global environmental changes, including climate change.

The case study also illustrates how local populations have learnt to adjust to climatic changes which have been accepted as normal natural processes. This adaptation is based on a deep understanding of, and harmonious existence with their environment. Their level of poverty does not give them a licence to plunder the forest resources. In fact the forest is their 'supermarket' and has for many centuries provided materials to ensure their survival. This level of dependence has encouraged sustainable utilization that is also urgently needed at the regional level, given the unprecedented rate of resource depletion and the increasing global environmental risks posed by climate change.

More importantly, the past experiences in weather conditions and climate change have not weakened the resilience of the inhabitants but rather has provided opportunities for their creativity. This situation draws attention to the need for Caribbean people to demonstrate an indomitable attitude in times of environmental stress or crisis. Such an attitude is fostered by willingness to adapt to new situations and to use substitutes provided by the environment. In all of this the role of women must be carefully documented given the vital role they play at the household level in ensuring the very survival of their families.

The adaptation and coping strategies employed are lessons for the entire Caribbean. Relocation, using other crop varieties that are more resistant, and diversifying the agricultural base are particularly relevant to Small Island Developing States that are low lying and therefore vulnerable to consequences of climate change, for example, sea level rise. Moreover, the narrow resource base and undue specialization make these economies particularly vulnerable to meteorological and other shocks; thus the need for diversification cannot be over-emphasised.

Climate change is real. It has the potential to cause catastrophic damage and therefore requires timely policy interventions with supporting financial resources to ensure implementation.

References

1. Arnold, C, M. Bynoe, P.I. Gomes, S. Holden, & J. Solomon, (2002). *An Analysis of Livelihoods in the Hinterland of Guyana: Implications for the PRSP and the Guyana Forestry Commission*. Report, July.
2. Brenman, J., Johnson, C., and Aggarwal, S. (2003) *Biodiversity, Tropical Forest Conservation, Protection and Management in Guyana*. USAID/Guyana Report.
3. Bynoe, P. (2005) *Ecotourism, Institutions and Livelihoods: A Study of North Rupununi, Guyana*, PhD Thesis. Unpublished. University of Sussex, England.
4. Bynoe, P. (2007) *Women, Environment and Sustainable Development. Issue Paper 1. Reviewed and Updated*. National Commission on Women, Georgetown.
5. DevTech Systems, Inc.(2003) *Gender Assessment for USAID/Guyana*.
6. Forte, J., 1996. (ed). *Macushi Lifestyles and Biodiversity Use. Report of a research project commissioned for Iwokrama International Rain Forest Programme*. 1996.
7. Government of Guyana (2002) *Population and Housing Census*, Bureau of Statistics, Georgetown.
8. Khan, M. (2001) *National Climate Change Adaptation Policy and Implementation Plan for Guyana*. Prepared for National Ozone Unit of Guyana Hydrometeorological Office.
9. Oviedo, Gotheil, Cross, Boedhihartono, Wolfangel, and Howell (2008) *Indigenous and Traditional Peoples and Climate Change*, Issue Paper, March 2008, IUCN, Gland.
10. Vereecke, J. (1994) *National Report on Indigenous People*. United Nations Development Programme Local Office, Georgetown.

Appendix I - List of Key Informants

Name	Designation	Institution
Anthony Andries	Village Councillor	Village Council
Carolyn Rodrigues	Honourable Minister of Foreign Affairs and Former Minister of Amerindian Affairs	Ministry of Foreign Affairs and International Trade
Claris Milton	Group Member of Cassava project	Community
Denise De Souza	Consultant	
Donna Hastings	Programme Assistant	UNFPA
Elizabeth Roland	Group Member of Cassava project	Community
Emily Allicock	Business Woman	Community
Jacqueline Allicock	Senior Village Councillor	Village Council
Jean La Rose	Administrator	Amerindian Peoples Association
Joseph Singh	Major General Rtd. and Former Executive Director of Conservation International	NGO
Ovid Williams	Principal Development Officer	Ministry of Amerindian Affairs
Patrice La Fleur	Programme Officer	UNFPA
Patsy Ross	Programme Analyst	UNDP
Paulette Allicock	Former Village Councillor and Macushi Researcher	Community
Pauline Sukhai	Honourable Minister of Amerindian Affairs	Ministry of Amerindian Affairs
Veronica Allicock	Former Cassava Project Group Leader	Community
Yvonne Pearson	Village Captain	Village Council

Appendix II - Interview Schedule for Key Informants

1. How is the Amerindians' local economy (paid and unpaid activities) organised in terms of gender?
2. Can you give reasons your response to question #1.
3. Describe specifically the role of agriculture in Amerindians' local economy.
4. Do women and men take on different roles and activities, due to socially conditioned expectation and the resulting division of labour? Kindly provide details.
5. In what ways have the following factors structured the gender system in Amerindian communities?
 - traditions
 - culture
 - practices (e.g. gender based violence)
6. What are the risks posed to local populations?
7. What connections do you think these risk situations have with climate change? For example, the risks posed to local agriculture (refer to cassava production).
8. What vulnerabilities (insecurities, exposure to risks, shock and stress related to climate change) do you think are specific to men in Surama?
9. What vulnerabilities (insecurities, exposure to risks, shock and stress related to climate change) do you think are specific to women in Surama?
10. Kindly comment on the capacities (land, money, skills, knowledge, beliefs, community organisation etc.) specific to men in Surama as effects of this gender system?
11. Kindly comment on the capacities (land, money, skills, knowledge, beliefs, community organisation etc.) specific to women in Surama as effects of this gender system.
12. Kindly describe any adaptation strategies or measures employed by men to deal with climate change, either spontaneously or in a planned fashion (traditional practices or recent innovations).
13. Kindly describe any adaptation strategies or measures employed by women to deal with climate change, either spontaneously or in a planned fashion (traditional practices or recent innovations).
14. What lessons can be learned from these adaptation strategies/measures undertaken by men and women, which could be applicable in similar contexts throughout the Caribbean?

Appendix III Survey Questionnaire for Gender and Climate Change Adaptation

Surama Community

his survey is being undertaken on behalf of the Gender Unit of the University of the West Indies, Mona Campus. All information shared with the respondent will only be used for academic purposes. Thank you.

Section A: Respondent Variables

- | | | |
|------------------------------------------------|-----------------------------------|-----|
| Q1. Gender Information: | 01 Male | () |
| | 02 Female | () |
| Q2. Age Range of respondent: | 01 18-25 | () |
| | 02 26 -33 | () |
| | 03 34 - 41 | () |
| | 04 42 – 49 | () |
| | 05 Above 49 | () |
| Q3. Length of residence in Community in years: | 01 < 1 year | () |
| | 02 1- 5 years | () |
| | 03 6-10 year | () |
| | 04 11-15 years | () |
| | 05 16- 20years | () |
| | 06 > 20 years | () |
| Q4. No. of persons in household: | 01 1-3 persons | () |
| | 02 4-6 persons | () |
| | 03 7-10 persons | () |
| | 04 above 10 persons | () |
| Q5. No. of dependants: | 01 1-3 persons | () |
| | 02 4-6 persons | () |
| | 03 Above 6 persons | () |
| Q6. Education of Respondent: | 01 Primary | () |
| | 02 Secondary | () |
| | 03 Technical/Vocational | () |
| | 04 Tertiary (college, university) | () |
| | 05 Other..... | () |

Q.10. Non- cash sources to support livelihood.

- 01 subsistence farming ()
- 02 hunting ()
- 03 fishing ()
- 04 bartering ()
- 04 other (please specify).....

Q. 11(a). Could you tell me what is your main staple?

- 01 Rice and Rice Products ()
- 02 Wheat and Wheat Products ()
- 03 Ground provisions and their products ()
- 04 Others (please specify).....

Q. 11 (b) What is your main food supplement?

- 01 Meats ()
- 02 Fish ()
- 03 Vegetables ()
- 04 Fruits ()
- 05 Others (please specify).....

Q.12 Kindly provide information on seasonal variations with regards to agricultural activities (particularly, farming and fishing)

Section B: Climate Change Issues

Q.13. Have you ever experienced any significant change in your weather patterns over a long period of time?

- 01 Yes
- 02 No
- 03 No response

Q.14. If, yes, kindly identify the year or period and describe this change (e.g. rainfall duration and intensity or temperature increase).

Q. 15. If yes, what do you think is responsible for this observed change?

Q.16. What were the impacts of these climatic changes on your local cassava production:

- a) impacts of observed change in rainfall patterns cassava production.
- b) impacts of observed change in temperature on cassava production.

Q.17. Kindly explain any differences in effects of 15 a and b on men and women.

a) Effects on men-----

b) Effects on women -----

Q.18 Kindly explain the coping strategies of :

Men -----

Women-----

Q. 19. What measures (related to agricultural production, for example, relocation to higher ground, use of different crop varieties, change in timing of production activities) have to put in place to adapt to the changes in climate?

Q.20. What are some other measures you wish to see implemented to ensure the continued production of cassava in your community?

Appendix IV - Lethem monthly rainfall and mean temperature (1998 - 2007)

Lethem Total Monthly Rainfall (mm)												
YEAR	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1998	0.7	2.0	11.1	172.2	463.9	417.0	176.8	35.3	56.2	39.7	3.8	33.9
1999	6.4	47.0	25.2	146.9	249.4	246.9	321.5	228.5	159.5	147.8	94.4	6.7
2000	12.2	11.3	22.6	170.6	314.9	269.6	148.2	137.9	100.7	32.4	106.8	83.5
2001	6.0	8.4	24.2	44.0	286.3	232.5	289.4	169.2	58.6	44.2	0.0	0.4
2002			18.8	158.8	230.7		247.3	169.2	76.6	3.2	11.3	34.8
2003	3.2	4.1	0.5	82.8	387.6	327.6	215.4	123.0	133.9	121.8	87.2	44.8
2004	9.1	36.2	31.6	94.5	465.4	275.5	278.6	226.5	99.1	56.4	0.2	24.7
2005	38.3	61.6	18.5	190.9	284.1	228.6	292.8	244.6	150.7	162.8	4.8	16.3
2006	41.4	3.8		24.4	369.5	433.1	370.8	97.1	115.7	39.1	35.8	5.9
2007	27.6	0.0	114.1	188.0	357.9	381.0	411.8	312.7	49.3	49.2	3.0	73.0

Lethem Monthly Mean Temperature (°C)												
YEAR	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1998	29.1	30.0		29.1	28.3	27.6	27.8	28.8	29.5	29.8	29.7	29.4
1999	28.3	28.2	28.9	27.9	27.7	27.1	26.6	27.3	28.5	28.2	29.0	29.0
2000	28.1	27.9	28.5	27.5	27.0	27.4	27.1	28.0	29.0	29.6	29.0	27.4
2001	27.1	27.7	28.6	28.8	27.0	26.5	27.0	27.0	28.7	29.4	29.8	29.2
2002	28.8	28.5	29.2	28.5	27.9	27.0	27.8	26.9	29.2	30.0	29.7	28.2
2003	28.3	28.7	29.4	29.1	27.5	27.6	26.9	28.2	28.5	29.5	29.3	29.1
2004	28.8	28.9	28.7	29.1	27.3	27.5	27.3	28.0	28.7	29.6	30.2	30.2
2005	29.2	28.8	29.3	28.4	27.8	28.0	27.0	28.0	28.9	29.1	29.8	29.1
2006	28.4	28.6	29.0	29.1	27.2	27.0	27.2	28.4	28.7	29.9	29.0	28.9
2007	28.4	28.8	28.7	28.3	27.8	27.1	27.5	27.5	28.6	29.2		

Source: Guyana Meteorological Office



www.undp.org.cu/crmi

Knowledge network promoting best practices in risk management
and climate change adaptation throughout the Caribbean.

Project Manager

Ian King
UNDP Barbados & OECS
Tel.: (246) 467-6032
Fax: (246) 429-2448
ian.king@undp.org

Programme Manager

Jacinda Fairholm
UNDP Cuba
Tel.: (537) 204-1512
Fax: (537) 204-1516
jacinda.fairholm@undp.org