



Global Horticultural Initiative video conference on

# **Environment and Sustainable Issues for horticultural sector**

## **Madagascar Position Paper**

**October 13, 2010**

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## List of acronyms

<b>AVRDC</b>	: Asian Vegetable Research and Development Center
<b>CBO</b>	: Community Based Organization
<b>CCAA</b>	: Climate Change Adaptation in Africa
<b>CDM</b>	Clean Development Mechanism
<b>CEFFEL</b>	: <i>Centre d'Enseignement et de Formation des Fruits et Légumes</i>
<b>CIRAD</b>	: <i>Centre de coopération International pour la Recherche Agricole pour le Développement</i> (French Agricultural Research Center for International Development)
<b>CNRE</b>	: <i>Centre National de Recherche pour l'Environnement</i> (National Environmental Research Center)
<b>CTHA</b>	: <i>Centre Technique Horticole d'Antananarivo</i> (Horticultural Technical Center of Antananarivo)
<b>CTHT</b>	: <i>Centre Technique Horticole de Toamasina</i> (Horticultural Technical Center of Toamasina)
<b>DSRP</b>	: <i>Document Stratégique pour la Réduction de la Pauvreté</i> (Strategy Document for Reducing Poverty)
<b>FIFAMANOR</b>	: <i>Fikambanana Fampandrosoana Malagasy Norveziana</i> (Norwegian development cooperation in Madagascar)
<b>FOFIFA</b>	: <i>Foibe Fikarohana ampiarina amin'ny Fampandrosoana</i> (National Center of Applied Research and Rural Development)
<b>GSDM</b>	: <i>Groupement Semis Direct Madagascar</i>
<b>IEC</b>	: Information Education and Communication
<b>IRD</b>	: <i>Institut de Recherche pour le Développement</i>
<b>LPDR</b>	: <i>Lettre de politique de développement Rural</i> (Rural Development Policy Letter)
<b>MAP</b>	: Madagascar Action Plan
<b>MDG</b>	: Millennium Development Goal
<b>ONE</b>	: <i>l'Office National de l'Environnement</i> - (National Environment Office)
<b>PADR</b>	: <i>Plan d'Action pour le Développement Rural</i> - (Action Plan for Rural Development)
<b>PANA</b>	: <i>Programme d'Action National d'Adaptation</i> - (National Adaptation Program of Action of Madagascar)
<b>PCMDI</b>	: Program for Climate Model Diagnosis and Intercomparison
<b>PNAE</b>	: <i>Plan National d'Action Environnemental</i> - (Madagascar National Environmental Program)
<b>PNDR</b>	: <i>Programme National de Développement Rural</i> - (National Rural Development Program)
<b>PSA</b>	: <i>Programme Sectoriel Agricole</i> (Agricultural Sector Program)
<b>SNS</b>	: <i>Stratégie Nationale Semencière</i> (Seed National Strategy )
<b>TFESSD</b>	: Trust Fund for Environmentally and Socially Sustainable Development
<b>WCRP</b>	: World Climate Research Program
<b>WGCM</b>	: Working Group on Coupled Modelling

## 1. Introduction

Madagascar's climate is highly diversified in agro ecological conditions, largely due to its geographical position in the Indian Ocean, its wide range of altitudes and different microclimates. Fruits, vegetables, nuts, and ornamental plants are grown year-round making Madagascar an attractive country from which have the potential to serve markets in temperate and cold climates such as the USA and Europe<sup>1</sup>. The climates variability combined with other factors like slash-and-burn activities influence the horticulture sector in Madagascar; especially in the fields of water management, soil fertility, crop varieties, cropping seasons and food security<sup>2</sup>.

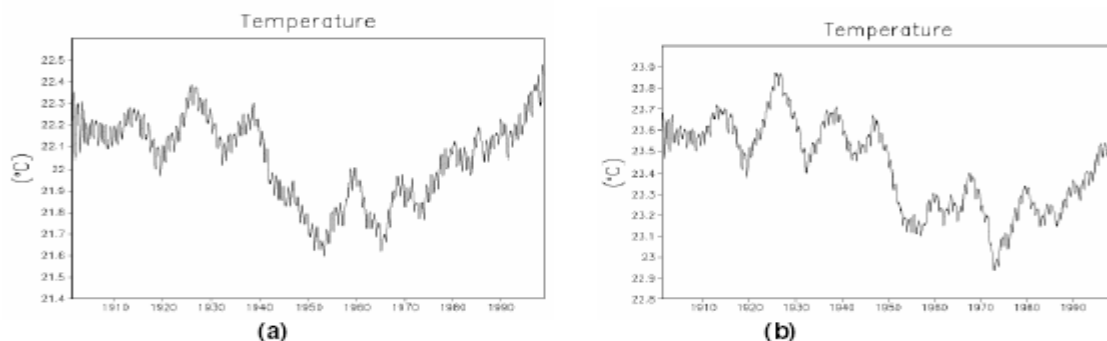
Rainfall patterns follow a mono modal curve and most rain falls during summer (November – April) while “heavy drizzle” occurs during June July in eastern coastal zones. Average annual temperatures are greatest along the dry west coast and coolest over the central upland area. Temperature variations depend on location and altitude with minimum on average less than 5 °C during June and July in the highlands (though some days reach below freezing). Maximum temperatures are highest in early summer (October and November) over the west coast, on average greater than 36°C in some regions, though some days are significantly hotter<sup>3</sup>.

The aims of Environment and Sustainability in horticulture sector are to contribute in decreasing negatives impacts of climates changes and using the climate as opportunities for a sustainable agriculture<sup>2</sup>.

## 2. Present status on Environment impact and Sustainability measurements for horticultural production

### 2.1. Temperature

Surface air temperature were observed over southern (figure 1a) and northern (figure 1b) Madagascar. Over southern Madagascar temperature has been steadily climbing since the 1950's and though it was also significantly warmer in the early part of the century, temperatures in the year 2000 are approximately 0.2 °C warmer. Over northern Madagascar temperatures started rising since the early 1970's, but have yet to reach temperatures seen in the first half of the century, being approximately 0.1 °C colder at the end of the century<sup>3</sup>.



**Figure 1:** Mean (6-year average) surface air temperature (°C) measurements 1901-2000: a) southern Madagascar (43-51°E, 27-20°S); b) northern Madagascar (43-51°E, 20-11°S). *Source: Climate Research Unit (Mitchell et al., 2004).*

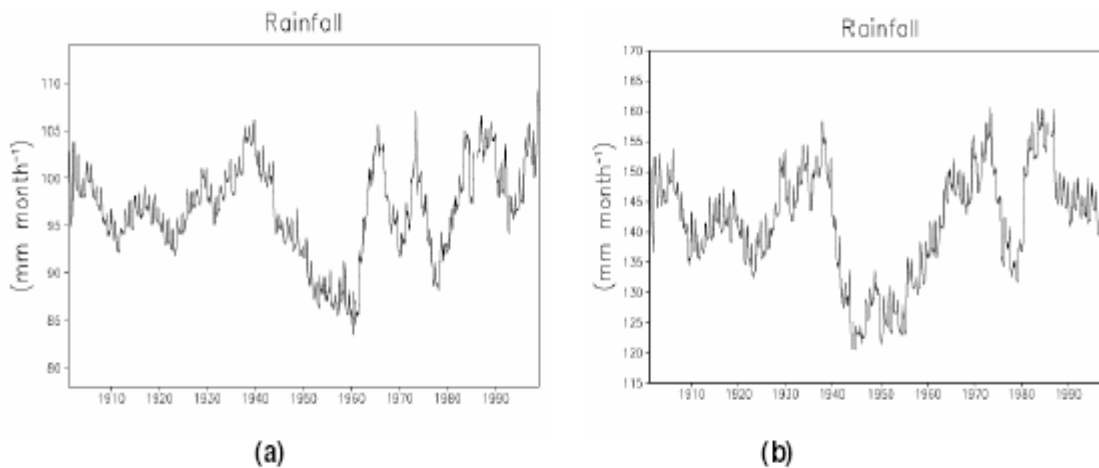
<sup>1</sup> World Bank Group/MIGA Snapshot Africa-Madagascar, January 2007

<sup>2</sup> Stratégie d'adaptation et d'atténuation aux changements climatiques du Ministère de l'agriculture (DRAFT), Août 2010

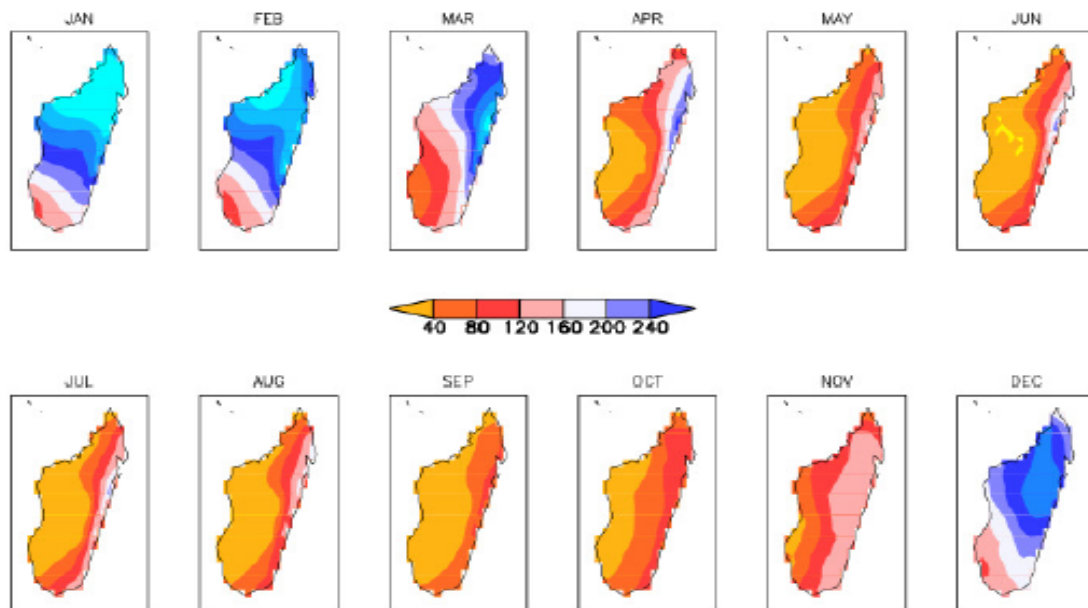
<sup>3</sup> DGM : Le Changement Climatique à Madagascar, Mars 2008

## 2.2. Rainfall

Rainfall has varied between 1901 and 2000 in both southern (figure 2a) and northern (figure 2b) Madagascar. During the 100-year period there are no obvious trends in either region, though comparison with the temperatures since 1950 suggests that over northern Madagascar the temperature record goes up when the rainfall record goes down, and vice versa<sup>4</sup>.



**Figure 2:** Mean (6-year average) rainfall (mm month<sup>-1</sup>) measurements 1901-2000: a) southern Madagascar (43-51°E, 27-20°S); b) northern Madagascar (43-51°E, 20-11°S). *Source : Climate Research Unit (Mitchell et al., 2004).*



**Figure 3:** Monthly mean rainfall distribution (mm month<sup>-1</sup>) 1901-2000. *Source : Climate Research Unit (Mitchell et al., 2004).*

The figure 3 indicates the average monthly rainfall distribution between 1901 and 2000, demonstrating that most of the western regions are dry (less than 40mm of rainfall) between May and October, with the onset of rainfall in the north typically occurring in November, spreading southward through December and peaking in January/February. During March and

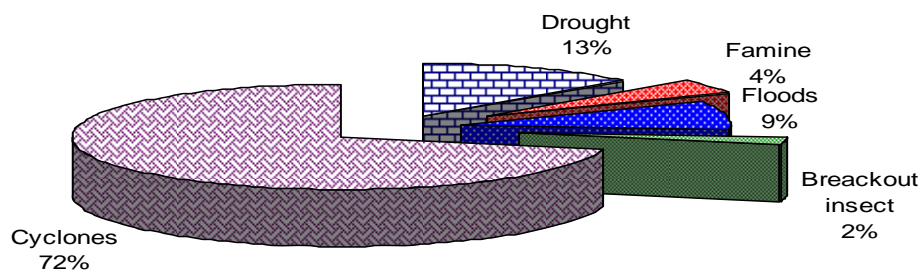
<sup>4</sup> DGM : Le Changement Climatique à Madagascar, Mars 2008

April average rainfall retreats northward, with the east coast receiving moderate amounts (> 80 mm month<sup>-1</sup>) of rain during the winter months.

### 2.3. Natural disasters

Tropical cyclones are a prominent feature of the Madagascar climate often leading to heavy rainfall and strong winds causing significant floods. The cyclone season is generally from November to May, with the peak of the season in January and February often extending into May. 46 major natural disasters occurred during 36 years from 1968 to 2005<sup>5</sup> as shown in figure 6. These disasters affected not only the crops but also the population.

**Figure 4 : Natural disaster Events**



Studies of recent historical changes in climate within Madagascar are limited and complicated by the significant regional variations in climate mentioned earlier, as well as natural variability on time scales of 10 years or longer. However, there is clear evidence that temperatures have increased, following the global trend and that the character of rainfall has changed significantly.

### 2.4. Horticulture and climate change

Madagascar's increasingly variable climate poses challenges for horticulture, given the sector's dependency on natural resources, especially water for irrigation. This makes horticulture inherently vulnerable to the impacts of both short-term climate variability and long-term climate change. The horticulture sector is still vulnerable to predicted changes to rainfall and temperature that will impact on, plant growth, pest and disease risk breakout, product quality... The extent of these physical impacts affects horticultural products, and businesses will be further shaped by the<sup>6</sup>:

- Growing global demand for food,
- Impacts of climate change policy,
- Increasing demands for productivity growth,
- Increasing competition for natural resources, and
- Requirements for ever more efficient and sustainable production practices.

<sup>5</sup> EM-DAT: Données Internationales sur les Cataclysmes OFDA/CRED, Université Catholique de Louvain, Bruxelles, Belgique

<sup>6</sup> Climate Change Research Strategy for Primary Industries (CCRSPI), Australia, August 2009

The combined impact of the predicted changes to rainfall and temperature affects horticultural commodities and regions in a number of ways.

- Changes on cropping system, growing conditions which have impacts on the suitability and adaptability of current cultivars, including the need to match crop breeding with optimum growing times.
- Changes on irrigation management, with increased irrigation demand despite the reduction of water availability which will impact on social relation in rural area.
- Impacts on soil management practices, more intense and irregular rainfall events (coupled with warmer temperatures) may result in the increased risk of erosions, risk of diseases and pest breakout and soil borne diseases proliferation.
- Increased incidence of physiological disorders and associated impacts on product quality and yields, tip burn, blossom end rot, and hail damage could, with all above, increase with higher incidences and severity of extreme events.
- Increased public and political pressure on the use of resources, increased competition, reduced reliability and rising costs will all increase pressures to improve on-farm efficient use of natural resources.

Eastern of Madagascar (Antsinanana, Vatovavy Fitovinany, and Analanjirofo) is an area which produces the most part of litchi in the island, some studies in September 2009 showed that the flower-time was late because the winter was longer than before<sup>7</sup>.

## **2.5. Policy and National Program**

Madagascar is one of the countries which accepted the Kyoto Protocol, with commitment to promote a sustainable development through policies and national programs. One of the ways in Kyoto protocol is promoting sustainable agriculture considering the climate change<sup>8</sup>.

The national programs and policy related on this topic are<sup>9</sup>:

- Strategy Document for Reducing Poverty (DSRP, 2003), a National Program development policy and strategy;
- Vision Madagascar Naturally, the pathway of Madagascar Action Plan (MAP, 2006): strategy document developed by the Government of Madagascar to guide development planning in the country and within regional action plans in coherence with MDG (Millennium Development Goal) with the commitment 7 related to Environment and the related green revolution breakthrough.
- Madagascar National Environnemental Program (PNAE) ;
- National Strategy for Risk and Disasters Management (2003): identified and managed disasters in Madagascar.
- National Adaptation Program of Action of Madagascar (PANA): in order to identify the primary activities for the adaptations to climate variability, elaborated on 2006 and expecting a financial support to start the 5 related sectors program (Agriculture, Health,

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<sup>7</sup> CTHT, Prospection litchi 01-09-09

<sup>8</sup> Protocole de Kyoto, 1990

<sup>9</sup> Stratégie d'adaptation et d'atténuation aux changements climatiques du Ministère de l'agriculture (DRAFT), Août 2010

water resources, forestry and coastal zone). For the agricultural sector the programs priorities are:

- Restore and/or construct irrigation system
  - Create and/or enhance CBO (Community Based Organization) for water management
  - Intensify agricultural and livestock production by farm machine, agriculture input and promote the driving sectors in the area
  - Develop drought tolerant varieties
  - Promote mulching, ground cover cropping system, drip irrigation
  - Protect and conserve soil structure by using more bio fertilizer such as manure.
- Action Plan for Rural Development (PADR): the final goals are to contribute on the national strategy for reducing poverty in rural area and to improve the economic result of agriculture sector. Decreasing the vulnerability of the poorest through strengthen the climate variability adaptation capacity.
  - Rural Development Policy Letter (LPDR)
  - National Rural Development Program (PNDR, 2005): up date of PADR
  - Seed National Strategy (SNS, 2008): promote the use of improved varieties
  - Agricultural Sector Program (PSA, 2008): modernization of Malagasy agriculture

Concerning the agriculture sector, including the horticulture sector, the policy will focus on 4 points<sup>10</sup>:

1. Information Education and Communication (IEC); inform the farmers about the climate change impacts
2. Research focused on vulnerabilities and the impacts of climate changes
3. Safety for the stakeholders on agriculture product
4. Management
  - ✓ Natural resources
  - ✓ Impacts of natural disasters

## **2.6. University, research institute with specialists dedicated to the topic**

Environment and Sustainability are one of the topics which teaching and studying in several university and research institute in Madagascar.

- Universities of Antananarivo
  - College of Sciences: Biochemistry, Biology, Entomology, Geology...
  - College of Economy, Sociology, Management and Law
  - College of Agronomy: Agriculture, Livestock, Forestry and Waters, Agro-Management, Food Technology
  - College of Polytechnic
  - Laboratory of Radio-isotope
- University of Toamasina
  - GRENE (*Gestion de Ressources Naturelles & Environnement*)
- Research institutions

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<sup>10</sup> Stratégie d'adaptation et d'atténuation aux changements climatiques du Ministère de l'agriculture (DRAFT), Août 2010



- **CIRAD** (*French Agricultural Research Center for International Development*): working with the main institutions, universities, research for development program to manage biodiversity and develop upland rice cropping systems suited to the highlands.
- **IRD** : International Research and Development
- **FOFIFA** (*National Center of Applied Research and Rural Development*): it's Madagascar's principal agricultural research and development agency and it holds a broad mandate covering crop, livestock, forestry, postharvest, and socioeconomic research.
- **CNRE** (National Environmental Research Center) concentrated in environmental issues
- **FIFAMANOR** (*Norwegian development cooperation in Madagascar*) working on root and fodder crops research, seed production and dissemination.
- **AVRDC** – The World Vegetable Center focusing on Vegetable breeding and seed systems
- **GSDM** : Direct Sowing Group Madagascar working on cover crop systems
- **CTHT** (Horticultural Technical Center of Toamasina) covers the value chain of fruits and vegetables
  - **CTHA** (*Horticultural Technical Center of Antananarivo*) promoting horticultural products: fruits, vegetables, ornamental plants.
- **CEFFEL**: Fruits and Vegetable Training and Experimentation Center exploring and adapting farmers' knowledge and practice.

### 3. Present management of climate change impact on horticulture

- The awareness about climate change influenced the Ministry of agriculture to debate around this topic.

On 26 August 2010, the Ministry of agriculture organized a seminar focus on “Climate changes adaptations” in order to:

- Inform the stakeholders of agriculture about climate change
- Review the “Adaptation Strategy in Agriculture Sector” document
- Integrate this strategy in the Action Program for National Adaptation in Madagascar (PANA)

The participants on this seminar were:

- Ministry of Agriculture; Environment and Forestry;
- National Meteorological Office; National Environment Office; Conservation International
- On March 2008 the National Meteorological Office wrote a report about “Climate Change in Madagascar” in order to help the related Monitoring and Evaluation to climate change in the country.

This report is a guide related to climate change in Madagascar and show at the same time the level of partnership between the National Meteorological Office and the international institutions.

#### **4. On going strategy**

- Launching fruit trees plantation by Ministry of Agriculture
- Extend improved vegetable seeds
- Promote Fruits and vegetable diets
- Bio products by using organic inputs (Guanomad, Biochem)
- Increase efforts in the implementation of the Second Green Revolution.
- Increase agro-meteorological stations; Establish and/or improve the research-action platform; Establish climate change observatories.
- Promote farmer-to-farmer learning.
- Promote (via production, multiplication, and dissemination) adapted/climate resilient seed varieties.
- Develop a rural development policy around areas most vulnerable to climate change, in particular through updating the Rural Development Policy Letter (LPDR)
- Take advantage of the opportunities presented by a variety of different financing mechanisms like the CDM (under the Kyoto Protocol), Adaptation Fund, etc. The government should develop a national vision to utilize these mechanisms and tools to finance and promote rural development
- Promote Land tenure program
- Support the on going carbon network

#### **5. Conclusions and recommendations**

Malagasy agriculture is dependency on natural resources and climate change effect should be considered seriously. Climate change will impact on horticulture, with different outcomes depending on location, industry, supply chain, and timeframe. However, producers can respond to these challenges, especially by focusing on climate change as being another business issue, associated with investment planning, financial planning, process and operational management, product positioning and branding, and pricing strategy.