Society for Human Ecology
XVth International Conference
« Local Populations and Diversity in a Changing World »

Rio de Janeiro, october 4 – 7, 2007

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Climatologists and merina farmers read the sky in Madagascar. Crossed glances.

Madagascar island

(source: http://rapidfire.sci.gsfc.nasa.gov)

Five years ago, I set out to do research work in geo-climatology in order to obtain a doctorate in geography from the University of Poitiers in France. I completed my doctoral studies in 2006. The main focus of those years of research was the climate dynamics of the central highlands of Madagascar, locally known as Imerina country.

I approached the subject from two complementary angles:

_ My first angle was that of physical geography, which included statistical data analysis, weather-type analysis and a study of radiosonde sounding data;

_ The second angle of my research work was the relationship between Merina communities and climate.

The main thrust of the work was to compare scientific knowledge with local knowledge. Hence, my presentation will focus on what has brought us here today: The relationship between climate and culture.

My presentation will include three sections:

_ First, a brief description of the geographic framework of my study. I shall touch upon such matters as landscape, climate and the communities involved;

_ Then, I shall give three examples of how perceptive the Merina farming communities are in their approach to weather and climate matters;

_ Finally, I shall show that Merina culture has incorporated specific traits related to weather which transcend ordinary factual experience and observation of climate. The farmers' attitude towards hail will illustrate this point.

1° Rice-producing highlands, between trade winds and monsoon.

Just as Asian paddy fields, the landscapes of the central and eastern Imerina highland country reward the visitor with breathtaking views. Whatever the season, Imerina is a network of permanently

cultivated hills and shallow valleys, the slopes of which have been cleared to make room for grazing and crops.

Valley-floor paddies

A hilly landscape with pastureland and plantations

During the rainy season, the countless paddies make up a patchwork of glittering green surfaces across all the valleys. Rice in Madagascar is in fact the ultimate staple food. Its cultural weight is considerable because the paddy field constitutes an invaluable link between those living today and the countless generations who moulded the landscape over the centuries. This relationship between man and rice is so intense that the locals use an anthropomorphic figure of speech to express it: When rice is in its growing phase they say it is “pregnant” and when it has come to fruition they say it has “given birth!”

During the dry season, the same paddy fields take on a new aspect as they are planted with low-season vegetables and tubers which complete the daily rice diet of the inhabitants.

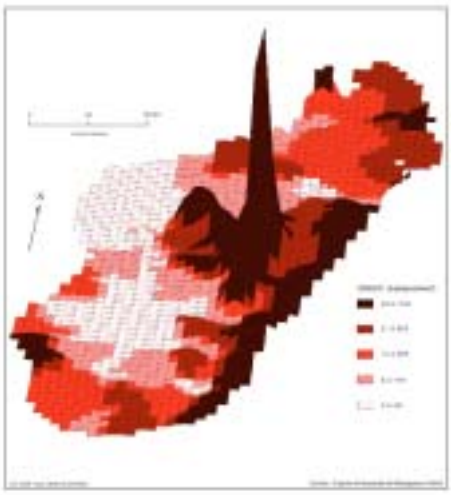
Plots planted with sweet potatoes and manioc

The grazing fields, for their part, stretch eastwards over a very wide area, particularly towards the primary forest of the eastern coast of the island.

The eastern rainforest

Thus, as elsewhere in Madagascar, where 78 per cent of the people live outside urban areas, Imerina, the land of the Merina people, one of the 18 ethnic groups of the island (**SLIDE 5**), has been shaped by an overwhelmingly rural population who have tilled and tended the countryside for centuries.

The 18 ethnic groups of Madagascar



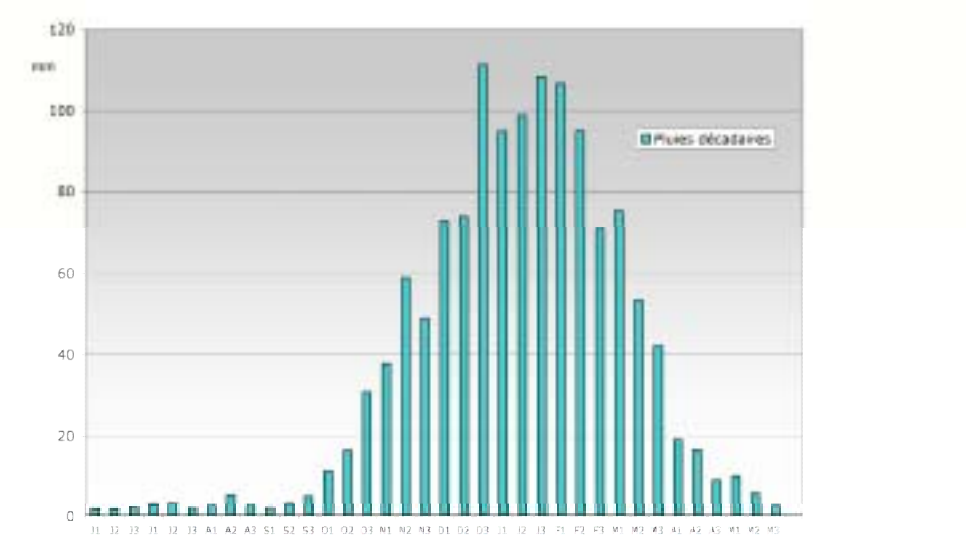
The densely populated central highlands

Population density in Imerina is rather high: It varies between 80 and 100 inhabitants per square kilometer. The standard of living is generally low and does become very low indeed in remote cut-off areas of eastern Imerina where there is no access to electricity or drinking water.

The precarious existence of the eastern pioneers

Most Merina people follow a yearly pattern of high-season paddy tending and low season vegetable production. Women work in large numbers alongside the men in the fields. Merina people also raise zebus, a breed which has considerable social importance for zebus are a sign of wealth and prestige for their owners.

Malagasy women planting the paddies



Average precipitation per 10-day period, Antananarivo (1967/2003)

We therefore have on the middle-altitude slopes of Imerina, people who live extremely close to nature and have acquired intimate knowledge of their climate.

This climate is of the tropical type with two clearly marked seasons:

_ A hot and rainy season from October to April (fahavaratra);

_ and a cool and dry season from May to September (ririnina).

On close examination, however, this basic binary structure doesn't account for two short intermediary seasons which are difficult to locate precisely in time.

The rigors of this tropical environment are somewhat attenuated by the effects of altitude. Imerina rises from about 1200 meters to 1600 meters as one moves from the west to the east: Hence,

_ summers are never scorching

_ and winter mornings may sometimes be very cool verging on crisp.

Finally, I must mention the wind, for it is an important aspect of the local weather. Indeed, it controls the entire climatic process of the area. The southeastern trade wind, a low altitude wind, blows the year round, but its intensity varies with the seasons. Its importance appears even greater when it disappears temporarily in the summer to make way for a different wind-system, the northwestern monsoon. The fight between these two predominating winds, which fluctuates in intensity, is an important ecological characteristic of Imerina. In fact, the land of the Merina people is located precisely where the two

wind-systems meet to create a subtle climatic east-west gradient.

Minimum & maximum monthly average temperatures, Antananarivo (1970/2000)

These are the main aspects of the geographic area where I undertook to study the relationship between Merina culture and a climate which defines the terms of the Merina people's way of life.

2° Detailed, accurate, folk knowledge of "*the weather's attire.*"

Winds & clouds. Daily skies wherever one may be on earth are characterized by cloud cover and air mass movement. Because they are so intimately depended on the weather, Malagasy farmers have grown extremely sensitive to their atmospheric environment. They have no academic knowledge; Indeed few of them have been to school and many cannot read nor write. However, the knowledge they have acquired is based on years of experience and observation. The words they use to describe what they see are altogether clear and poetical.

Thus, the southeastern trade wind is described as a cold wind which comes with rather unpleasant wet weather called "erika," which literally means drizzle. The wind itself is called "rivo panala" which

means “wind that brings frost.” I have been able to identify it precisely while I was in the field.

The local farmers have identified another wind, this one coming from the west or north-west during the rainy season. It does not blow as consistently as the trade wind. It is weak when it comes from the west and carries rain but can grow very strong when it is associated with thunderstorms. In that case the wind is called “rambon-danitra,” which means “tale of the sky.” This brings us to tornadoes, the spectacular twisters which are triggered by the most severe thunderstorms and are accompanied by torrential rain.

In the accounts made by local farmers, winds are usually associated with clouds. Cloud-types are well identified and, though their Latin labels are totally unknown, the locals have their own pragmatic and poetical appelations for them. Thus, to quote only one example, the storm cloud cumulonimbus is called “orana mitohatra mandrahoana miakatra,” which means “escalating rains whose clouds move upwards.” The meteorologist notes in the local lore the systematic association of precipitation, extensive vertical cloud profile and ascending air mass movement. Better still: this cloud-type is sometimes described as the “udder cloud.” By discussing the matter with local farmers, I was able to convince myself that they did indeed mean the cumulonimbus mammatus, the cloud which is typical of the most powerful thunderstorms.

Cumulonimbus threatening Antananarivo

Cumulonimbus mammatus "udder cloud"

The analogy drawn from animal life underlines the importance of cattle raising in Madagascar. Thus the study of clouds points to important aspects of Malagasy cultural life.

A subtle climatic gradient. Another aspect of Merina lore which shows how well country folk understand the regional weather conditions is their knowledge of the local climatic gradient. To this day there are hardly any meteorological data on the subject and the gradient itself is very gentle, which makes its identification all the more difficult.

This gradient is due to both a foehn effect and the position of Imerina in relation to the general dynamics of the trade wind and the monsoon. Indeed, in the dry season, the trade wind holds sway over the entire central highlands, but, in the summer, it must give in, at times, to the northwestern monsoon, Imerina being located precisely where the two flows meet.

Local lore helps to understand better these climatic conditions. Merina farmers are used to moving back and forth between the capital Antananarivo and the highest areas of Eastern Imerina. They therefore know the country extremely well and they all describe a double gradient, one for heat and the other for rainfall. The existence of this double gradient is consistent with a series of scientific presumptions which have pointed to a decrease in summer heat and an increase in dry season or winter coolness as one moves from the west to the east.

Similarly, spells of wet weather, which we associate with low layers, are systematically associated by

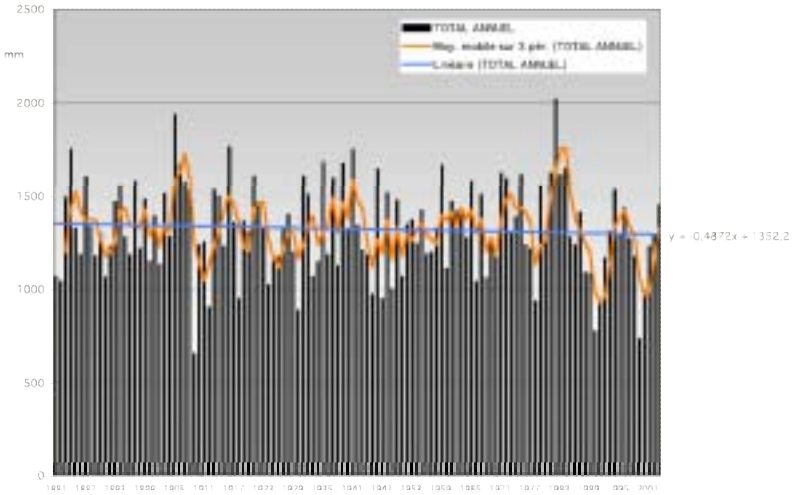
the locals with the dry season (ririnina). They have noticed that during the winter season, when "erika-weather" sets in, they have more clouds, more drizzle and more wind than the people who live in Antananarivo.

"Erika" weather in eastern Imerina

Climate change? One of my research subjects was the evolution of the generating factors of perceptible weather which is indeed a recurrent theme of contemporary climatology. My hypothesis was that since Merina farmers pay so much attention to climate, they might have noticed, over time, changes in the occurrence and unfolding of the seasons. The sedentary lifestyle of the Merina population might have given them enough hindsight to assess climate transformation. Indeed, such an assessment ought to be possible within the space of a single generation.

In this matter, I was able to draw three some important conclusions from my conversations with Merina farmers. For instance:

1. Merina farmers have noticed that the showers of the warm rainy season occur later in the year. This of course is a serious matter to them because, as we know, rain is vital for anyone involved in the production of rice. My study of the earliest of these showers between 1953 and 2003 has shown that they occurred within a 40 day window between 1953 and 1970 and within a 60 day window between 1967 and 2003. Hence their perception of change and my study tend to agree.
2. Most people insist that average yearly rainfall has decreased over time. This seems to be

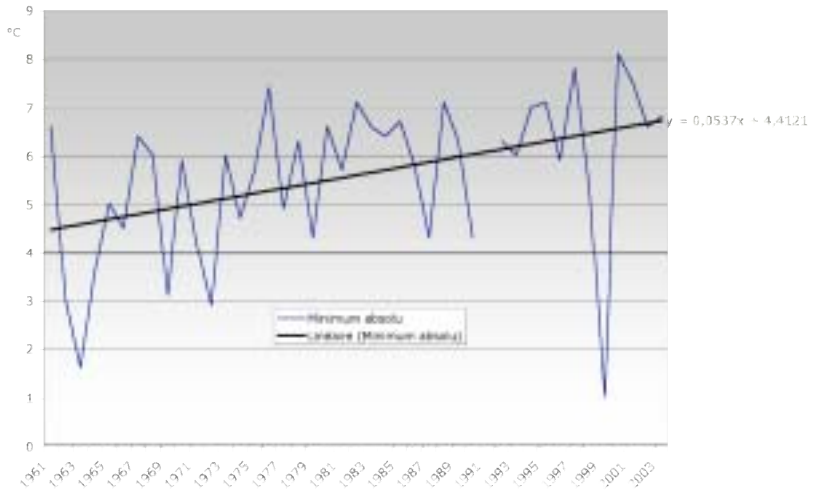


Annual rainfall 1881/2003, Antananarivo

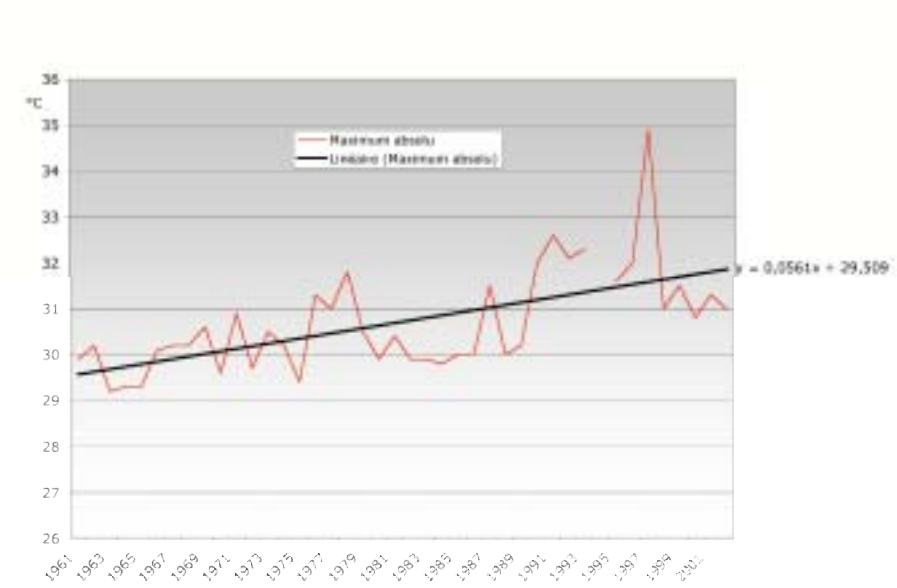
confirmed by rainfall data for Antananarivo over the last century; It is particularly apparent in the data for the most recent decades, which are, of course, best remembered by the local inhabitants!

3. Finally, elderly Merinas of sound mind will tell you that summers are hotter and winters less cool. Without touching upon the much debated issues of global warming, allow me to compare these simple observations with my study of extreme temperatures registered at Antananarivo. The data show that both minimum and maximum absolute temperatures have quite clearly increased between 1961 and 2003. I do not wish to draw hasty conclusions from this observation, I just want to underline the fact that here again local lore and scientific knowledge converge.

Thus, these three elements show how relevant and legitimate the results of such a comparison between scientific knowledge and local lore can be, though the former is limited to the Imerina climate and the latter is indeed qualitative but sufficiently consistent.



Minimum absolute temperatures 1961/2003, Antananarivo



Maximum absolute temperatures 1961/2003, Antananarivo

3° “Ody andro” and “fady”: when the past reaches over to the future.

Little studied in Madagascar both across time and across space, for want of scientific data, hail is second only to insufficient rain water among the meteorological incidents Highland Merina people fear the most.

Hailstorm setting in, eastern Imerina

The local farming population feels so strongly about hail that it has developed specific collective and individual attitudes designed to protect their rice paddies from it. These attitudes consist of three core cultural traits:

- First there is the belief that some of the members of Merina communities, the “mpanao ody havandra,” literally the “makers of charms against hail,” have the power to prepare “weather medicine” (ody andro) and to use it to protect the areas in their charge, generally two or three terraced slopes. In effect, when a powerful storm is in the offing and people expect hail, the charm-maker comes out, yells words he alone knows, and points the charm in the direction of the cumulonimbus. If, despite this, hail still falls upon the paddies, no one holds it against the charm-maker for everyone knows that without his help the damage would have been even more extensive. Such is Malagasy wisdom.

A merina maker of medecine against hail

_ Another form of weather-induced traditional collective attitude is the performance of animal sacrifices. Sheep, roosters or zebus are immolated at the summit of a sacred mountain such as Mount Iharamalaza by the charm-keeper. Villagers may then collect some of the earth which has been reddened by the victims' blood and sprinkle it across the paddies.

Mount Iharamalaza, place of sacrificial ceremony

_ Finally, there are prohibitions known locally as “fady,” which are implemented to various degrees by community members. Such taboos include the prohibition of stone breaking while rice is still standing. For example, stone tombs are never built in the summer and children are

forbidden to play stone-rolling in that season because the stones used in the game resemble hail.

Here again, local lore is a precious source of information on the type of relationship the local population entertain with the climate as well as a treasure-trove of clues which may lead to solid scientific knowledge of the local climate.

Conclusion

To conclude, the fieldwork I have undertaken in the eastern Imerina highlands of Madagascar shows that the local rural population, like many similar communities around the world, have developed a solid meteoro-climatic culture of their own. This body of knowledge is based on the precise observation of nature, from clouds and temperature to birds and animals, and has accumulated in various literary forms such as sayings and poems. The comparison of local lore with scientific knowledge shows how well they may complement each other.

This body of knowledge deserves to be considered seriously by all those who, in government, deal with development, the preservation of the environment and adaptation to changing weather circumstances.

Recognizing the value of local beliefs, attitudes and knowledge, is an important and necessary step in policy making, particularly in less developed countries, where promoting sustainable development and reducing poverty must be chief objectives.

Allow me to end this presentation with an African saying which is something of a warning against the backdrop of this sunset over the Malagasy capital: “A dying elderly person is a library on fire.”

Sunset over Antananarivo

Thank you for your attention.

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