5. MADAGASCAR

Simone Esau (CREST)

**MADAGASCAR**

**Political Facts**
- Madagascar regained independence in 1960
- Marc Ravalomanana is the current president of Madagascar

**Economic Facts**
- Growth in GDP for 2005 was 4.6%
- Madagascar is one of the world’s poorest countries (ranked 146 out of 177 in the UN Development Programme’s 2006 Human Development Report. Some of the reasons are a lack of local savings, outdated economic and social infrastructure and unequal and arbitrary application of rules nationwide

**Demographic Facts**
- Estimated population is 19.1 million (2006).

**Education Facts**
- Adult literacy rate 70.7% in 2000

**ICT Facts**
- In 2005 there were 7 telephone main lines per 1000 people and 5 internet users per 1000 people

**Areas of specialization in R&D**

**Local Research institutions**
The French influence in Madagascar science and technology remains significant. Research in Madagascar receives to a great extent French aid with respect to technical and scientific assistance. There are still a number of French research institutes in Madagascar where research is conducted and where one can study subjects like hydrology, tropical forestry, geology, medicine etc. The most important and well known of the research institutes of Madagascar is the National Centre of Applied Research in Rural Development. The centre is located in the capital city of Antananarivo. The research institute deals with research in agriculture, zoology, forestry, veterinary studies and fisheries.

The Pasteur Institute of Madagascar (IPM) is an important Biomedical Research centre. Its spheres of activity are primarily medical biology, microbiology and the epidemiology applied to the transmissible infectious diseases. The Pasteur Institute in Madagascar was founded in 1898 and as of June 2007 had 220 staff. (Pasteur Institute, 2007: 8). Amongst other things the Institute conducts research in the areas of malaria, plague, tuberculosis, viral diseases, schistosomiasis and cysticercosis and resistance to anti-infectious agents

The Bibikely Biodiversity Institute is the primary research and training organization for arthropods in Madagascar. Since its inception in 1992, the Institute’s activities have involved one of the most important projects for the advancement of arthropod
training and research across Madagascar. The Institute was founded in 1992 by Dr Brian Fisher, preeminent field biologist, and the curator and chairman of the entomology department of the California Academy of Sciences.

Significant research is also undertaken at the University of Antananarivo which comprises various departments including a science department, polytechnics, health sciences and agriculture. The University also has an Institute and Geophysical Observatory. The other universities that have departments for carrying out research work are the University of Fianarantsoa and the University of Mahajanga.

Research output
In 1998 Madagascar’s scientific output in terms of journals publications numbered 50. A more recent study shows that 87 articles were published in major refereed journals in 2004 and 121 in 2005 (Hayward & Rasoanampozina, 2007:1). Our analysis of the latest ISI-tables shows a significant increase in annual output (Figure 7 below) with a steady increase especially over the past three years. Table 45 list the journals in which most of these output appeared and gives an indication of the main areas of strength and priority for scientists in the country.

Figure 7: Number of number of ISI papers: 2002-2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>71</td>
</tr>
<tr>
<td>2003</td>
<td>110</td>
</tr>
<tr>
<td>2004</td>
<td>90</td>
</tr>
<tr>
<td>2005</td>
<td>121</td>
</tr>
<tr>
<td>2006</td>
<td>155</td>
</tr>
<tr>
<td>2007</td>
<td>130</td>
</tr>
</tbody>
</table>
Table 45: Papers by Top Source Title (6 and more)

<table>
<thead>
<tr>
<th>Source Title</th>
<th>Record Count</th>
<th>% of 624</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal of Natural Products</td>
<td>18</td>
<td>2.9%</td>
</tr>
<tr>
<td>International Journal of Primatology</td>
<td>12</td>
<td>1.9%</td>
</tr>
<tr>
<td>Oryx</td>
<td>12</td>
<td>1.9%</td>
</tr>
<tr>
<td>Parasite-Journal de la Société Française de Parasitologie</td>
<td>11</td>
<td>1.8%</td>
</tr>
<tr>
<td>Phytochemistry</td>
<td>11</td>
<td>1.8%</td>
</tr>
<tr>
<td>American Journal of Tropical Medicine and Hygiene</td>
<td>10</td>
<td>1.6%</td>
</tr>
<tr>
<td>Malaria Journal</td>
<td>10</td>
<td>1.6%</td>
</tr>
<tr>
<td>American Journal of Physical Anthropology</td>
<td>9</td>
<td>1.4%</td>
</tr>
<tr>
<td>Ostrich</td>
<td>9</td>
<td>1.4%</td>
</tr>
<tr>
<td>Acta Chiropterologica</td>
<td>7</td>
<td>1.1%</td>
</tr>
<tr>
<td>Archives de Pediatrie</td>
<td>7</td>
<td>1.1%</td>
</tr>
<tr>
<td>Zootaxa</td>
<td>7</td>
<td>1.1%</td>
</tr>
<tr>
<td>Biodiversity and Conservation</td>
<td>6</td>
<td>1.0%</td>
</tr>
<tr>
<td>Emerging Infectious Diseases</td>
<td>6</td>
<td>1.0%</td>
</tr>
<tr>
<td>Molecular Ecology</td>
<td>6</td>
<td>1.0%</td>
</tr>
<tr>
<td>Revue d’Ecologie-La Terre et la Vie</td>
<td>6</td>
<td>1.0%</td>
</tr>
<tr>
<td>Sexually Transmitted Diseases</td>
<td>6</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Size of the R&D work force

Universities R&D workforce

The tertiary education sector is insufficiently developed in Madagascar. The rate of tertiary education enrolment is 3% (compared with 8% for sub-Saharan African countries) with 260 students per 100,000 inhabitants. There is a very weak match between the programmes offered and the needs of employers. Recently there has been an increase in the number of private technical institutes; however, the quality and the organization of the programmes provided require improvement. While the universities have begun to modify aspects of their structure and curricula, for the most part the changes are insufficient for the demands of a high growth economy. (GoM, 2006:58) A major reform of the education system is currently happening through the Ministry of Education and the “groupe de reflection” who were appointed to work on an overall strategy for the transformation of postsecondary education (Hayward & Rasoanampoizina, 2007:2).
When considering the university workforce it is found that only 64% (2006) of the faculty have PhDs or their equivalent and few are involved in research or publishing. University faculty is aging. The system also suffers from a hiring freeze of more than a decade. As a result, the average age of faculty members is 56 years, with only 15 faculty members in all six universities under the age of 40.

Gender equality among students is less of a problem in Madagascar than in many other developing countries, with 46% of students being women. On the other hand, only 29% of the teaching faculty are women in public institutions and only 18% in private tertiary institutions (Hayward & Rasoanampozina, 2007:1).

Public Sector R&D workforce

Table 46 below provides a breakdown of the IRD survey on researchers in Africa which was conducted in 1999. At that time there were no full time researchers operating in the private sector. Research activities were mainly concentrated in the public sector and research activities were low at only 23 FTE researchers per million inhabitants.

Table 46: Results of the IRD Survey on Researchers in Africa, 1999

<table>
<thead>
<tr>
<th>Staff in higher education</th>
<th>Researchers full time in the public sector</th>
<th>Researchers full time in the private sector</th>
<th>FTE Researchers</th>
<th>Researchers per million inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madagascar</td>
<td>900</td>
<td>260</td>
<td>0</td>
<td>440</td>
</tr>
</tbody>
</table>

Source: UNESCO Science Report, 2005 and own calculation

Trends in masters and doctoral enrolments

No information is available

Key R&D Initiatives and Networks

Key Initiatives & Networks

Plans for a laboratory network within RIIP focusing on African viral haemorrhagic fevers (VHF)
The main objective of this regional project is to establish a VHF diagnosis and research network platform in Africa with six RIIP institutes (Bangui, Cameroon, Côte d’Ivoire, Dakar, Madagascar and CERMES), in collaboration with Institut Pasteur in Paris (Leptospirosis NRC, Quality Department, Arboviruses NRC, Arbovirus VHF NRC, WHOCC on arboviruses and viral hemorrhagic fevers, Lyons BSL-4 laboratory, CIBU) and AMP (Pasteur Institute, 2007:7). The specific goals of the project are capacity-building in the areas of diagnosis, research and action by RIIP laboratories and institutes during outbreaks of haemorrhagic fevers, and to promote multi-centre research projects for VHF viruses (Pasteur Institute, 2007: 8)

Malaria

A project on the genomics approach to changes in vector-borne and parasitic populations following malaria control operations brings together several RIIP institutes (Paris, Niger, Madagascar and Cambodia). (Pasteur Institute, 2007: 12)

Tuberculosis and other mycobacterium (Buruli Ulcer, M. Leprae, etc.):

Several RIIP institutes are involved in this research: Cambodia, Cameroon, Central Africa, Guadeloupe, French Guiana and Madagascar. (Pasteur Institute, 2007: 13)

Network membership

The Natural Products Research Network of Eastern and Central Africa (NAPRECA) has the mandate to mobilize scientists in the relevant fields in the East and Central African sub-region to contribute effectively to the development of the science of
Natural Products. The need for NAPRECA was borne from the realization that Africa was rich in biodiversity but poor in research and development in Natural Products. (www.napreca.net). So far NAPRECA branches have been formed in 11 East and Central African countries. The countries are: Botswana, Cameroon, DRC, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania, Uganda and Zimbabwe. NAPRECA became affiliated to UNESCO as part of its Network programmes in November 1987 with its activities starting in 1988. (CREST & High Impact Innovation, 2007).

Madagascar is part of the Regional Potato and Sweet potato Improvement Network (PRAPACE) and is one of the pioneer networks of ASARECA. The three original member countries are Burundi, Rwanda and the Democratic Republic of Congo which were later joined by Uganda, Ethiopia, Kenya, Eritrea, Tanzania, Madagascar and Sudan. Since its formation, PRAPACE has operated as an independent network with close affiliation to the International Potato Centre (CIP). In 2003, PRAPACE was integrated in the ASARECA arrangement. The United States Agency for International Development (USAID) funds the network. (CREST & High Impact Innovation, 2007)

The ASARECA Animal Agricultural Research Network (A-AARNET) was established in 1997 to strengthen NARS capacity in livestock research in East and Central Africa. As a regional network, A-AARNET caters for the needs, interests and expectations of stakeholders in the 10 member countries of ASARECA which are: Burundi, D.R. Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda. These stakeholders include NARS scientists, NGOs, farmers and other public and private sector organisations. (CREST & High Impact Innovation, 2007).

The Eastern Africa Plant Genetic Resources Network (EAPGREN) was initiated by a Stakeholders Meeting held in Kampala 3-5 November 1997. EAPGREN is a regional joint project of National Agricultural Research Systems (NARS) of the ASARECA member countries, viz Burundi, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan and Uganda. Within these countries, there are national focal points for the networks. SIDA provides the funding.

Sorghum is the third most important crop among the commodities and ASARECA established to this effect the Eastern and Central Africa Regional Sorghum and Millet Network (ECARSAM), which became operational in October, 2003. ECARSAM strives to create synergy and effectiveness of national agricultural research systems (NARS) and all stakeholders through networking. It further aims to remove some of the bottlenecks to increased productivity of sorghum and millet, and their use in processing at farm and village levels by generating and adopting appropriate technologies, knowledge and information. The ASERCA member countries all form part of this network: Burundi, D.R. Congo, Eritrea, Ethiopia, Kenya , Madagascar, Rwanda, Sudan, Tanzania and Uganda. (CREST & High Impact Innovation, 2007).

RAIN (Regional Agricultural Information Network) is a network of agricultural information organizations and professionals operating in 10 countries in eastern and central Africa – Burundi, D.R. Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda. RAIN's mission is to promote the provision and sustainable management of client-orientated agricultural information throughout the ECA region. Its particular emphasis is on the strengthening of regional capacities to access, generate, exchange, package, disseminate and use this information to further economic growth. (CREST & High Impact Innovation, 2007).

**Priority areas**

No information on priority areas is available

**Facts and Figures on brain drain**

No information is available

**International and foreign funding of S&T**

Madagascar benefits from substantial bilateral and multilateral donor support, although the number of donors is limited. For example, over 50% of the overall 2004 budget was financed by external resources, and this ratio is over 70% for the investment budget. IDA and European Union (EU) are the main donors accounting for over 70% of the aid flows to the country. Chief among bilateral donors are the United States and France, though other bilateral donors, such as Japan, Germany, Norway, and Switzerland, also play key roles in certain areas, such as governance, environment, and the rural sector. (World Bank, 2006:12)
Operations of the Donor Agencies by Sector

**Macro-Economic Thrust:**
The IMF extended the PRGF agreement in December 2002, for a total amount of SDR 79.43 million (approved in March 2001, the PRGF was suspended during the first half of 2002 as a result of the crisis). The World Bank (IDA) (i) disbursed in August 2002 the last tranche of the structural adjustment credit of an amount of US$42.20 million, and (ii) granted in November 2002, an emergency economic recovery credit of an amount of US$50 million. The European Union, France and Mauritius granted emergency subsidies of 70 million euros (November 2002), 5.6 million euros (November 2002) and 1 million dollars (August 2002), respectively. The Bank (ADF) (i) disbursed the last tranche of the SAP III loan in an amount of UA 4 million and (ii) intends to support the economic reforms. (African Development Bank, 2003:19)

**Agriculture/Rural Development:**
All the donor agencies are involved, particularly IDA, FAO, UNDP, the European Union, France and Germany. The ADF has three ongoing projects in this sector namely: Rehabilitation of the Bas-Mangoky Irrigated Rice Field, the Project for Young Rural Entrepreneurs and the Project for Preventative Acridian Control. (African Development Bank, 2003:19)

**Transport:**
IDA, the European Union and France are involved. The ADF has (i) three ongoing projects in the sector on the rehabilitation and repair of damage caused by cyclones, and (ii) it proposes to finance a road rehabilitation programme, the studies of which are currently underway. (African Development Bank, 2003:19)

**Education:**
All the donor agencies are involved, especially the IDA, the European Union, UNICEF and Japan. The ADF has an ongoing project in the sector (Education III) (African Development Bank, 2003:19)

**Health and Nutrition:**
All the donor agencies are involved, especially the IDA, WHO, UNICEF, UNFPA, the European Union, USAID, CARE, France, Germany and Switzerland. The ADF is financing the Health II Project. (African Development Bank, 2003:19)

**Electricity, Drinking Water Supply and Sanitation:**
UNICEF and USAID are involved. The ADF is financing the DWSS Project in the “Grand Sud”. (African Development Bank, 2003:19)

**Banking, Industry & the Private Sector:**
IMF, IDA, USAID and France are involved (France has also contributed to the creation of the guarantee fund). (African Development Bank, 2003:19)

**Crosscutting Sectors:**
Governance: UNDP. IDA is considering a project. The ADF is also considering a project. (African Development Bank, 2003:19)