

Global Engagement in Action

Highlights from the Canada-Africa Research Exchange Grants (CAREG) pilot program (2010–2012)



“The mentorship of new researchers, fostering of new research networks, and improved research capacity helped both universities achieve excellence in maternal child health research and has led to the establishment of a longstanding partnership among all involved.”

DR. LISA AVERY
UNIVERSITY OF MANITOBA, CANADA

“Our participation in the CAREG program enabled us to share research results, to interest the greatest number of students possible in our research and to learn new methods of work that were very fruitful.”

DR. BENKHALED ABDELKADER
UNIVERSITÉ DE BISKRA, ALGERIA

The Canada-Africa Research Exchange Grants (CAREG) program is designed to strengthen international partnerships and consolidate emerging networks among academic researchers from Canada and Africa.

Managed by the Association of Universities and Colleges of Canada (AUCC), the CAREG program is made possible with the financial support of the International Development Research Centre (IDRC).

ISBN 978-0-88876-304-2

Photos courtesy of CAREG grant recipients

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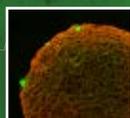
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A cocoa producer ferments cocoa beans in Ghana (see page 6).



A microscopic view of the JJY4 strain of bacteria (see page 4).



Coquerel's sifaka, a common lemur, in Madagascar (see page 8).



OVERVIEW

Dr. Carole Beaulieu, Université de Sherbrooke, instructs a class at the Université de Yaoundé.

*Fresh perspectives.
New ways of seeing.
Ideas re-imagined
rather than re-invented.*

Whether it's tackling maternal and child mortality or pursuing effective responses to emerging issues such as climate change, collaboration among researchers — both within disciplines and between countries — creates fertile ground for learning and, ultimately, influencing policy and practice.

Often the seeds of creativity are first planted through short-term exchanges that enable researchers to build professional and personal relationships. These initiatives can become the basis for larger partnerships and networks that generate and share knowledge more effectively.

It's no secret that Canadian and African universities and research institutes have relatively few opportunities to collaborate on projects of mutual interest. Consequently, in 2008, the International Development Research Centre (IDRC) circulated a concept paper among several Canadian and African institutions that proposed a pilot exchange modeled on the Canada-Latin America and the Caribbean Research Exchange Grants (LACREG) — a peer research program supported by AUCC since 1995 that has strengthened existing relationships or been the catalyst to new ventures.

Encouraged by the enthusiastic response, IDRC signed an agreement with AUCC in 2010 to manage the Canada-Africa Research Exchange Grants (CAREG) program, a two-year pilot to support short-term exchanges between Canadian and African researchers.

OBJECTIVES

The principal objective of the pilot CAREG program was to support short-term exchanges between Canadian and African universities and research institutes that address one or more of IDRC's research themes through:

- a) the development of new applied research and training collaborations or the strengthening and broadening of existing ones; and
- b) the improvement of the know-how and knowledge of African and Canadian academics.

The table below details the specific objectives and indicators of success:

OBJECTIVES	SUCCESS INDICATORS
Strengthen interaction and collaboration between Canadian and African researchers	Development and consolidation of research partnerships facilitated through the program
Strengthen research and training collaboration on development priorities of mutual interest to partner institutions and IDRC	Focus of the research and training collaboration
Increase mutual familiarity with African and Canadian research and training systems, as well as funding mechanisms	Qualitative reports by program participants
Increase corporate knowledge in IDRC and AUCC about this kind of support, particularly on its impact and lessons learned, to create and enhance a research dialogue	Distribution of this publication and summary of lessons generated and recommendations from the June 2012 workshop



CAREG project researchers during field testing in Mali.

With these objectives in mind, CAREG had two key components:

COMPONENT 1: PROJECTS

CAREG funding supported projects that strengthened research, graduate student training (e.g. curriculum development) as well as the sharing of resources (e.g. journals, data).

By the June 30, 2010 competition deadline, AUCC had received 59 proposals, of which all but five were eligible. In August 2010, the CAREG selection committee awarded eight grants ranging from \$28,920 to \$40,000.

African researchers were to spend three to six months in Canada, while Canadian participants were to spend at least six weeks at the African institution. The grant covered travel and accommodation, the cost of hiring replacement instructors and some equipment and resources for research. As part of their contract, partners contributed at least one-third of the project's total cost.

COMPONENT 2: OUTREACH AND KNOWLEDGE-SHARING

CAREG funding also supported outreach and knowledge-sharing. For example, AUCC shared information about CAREG through its various networks, the CAREG website and publications such as *UniWorld*. In spring 2011, AUCC surveyed CAREG applicants, and reported their feedback to IDRC in August 2011. In June 2012, Canadian and African grant recipients came to Ottawa for the IDRC-funded “Leaders’ symposium: New models of North-South partnerships” and the CAREG workshop “Canada-Africa research collaborations: Reflecting on the CAREG experience.”

HIGHLIGHTS

The eight projects funded through the pilot CAREG program tackled a variety of pressing issues, generating compelling and persuasive results. In so doing, they relied on and strengthened partnerships between Canadian and African researchers and their institutions. Apart from their immediate contribution to development, the results also promise to inform policy and practice.

Algeria

Fighting loss of water and sedimentation

*Fateh Chebana, Institut National de Recherche Scientifique, Canada
Abdelhakim Necir and Benkhaled Abdelkader Université de Biskra, Algeria*

Every year, Algeria loses millions of cubic metres of water due to evaporation and siltation in hydro installations. In the region of Biskra, for example, the Foum El Ghorza dam can only retain two-thirds of its capacity due to siltation. However, the sedimentation in the dam has never been measured through the standard tool of frequency analysis (FA).

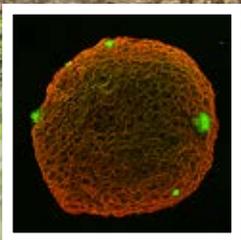
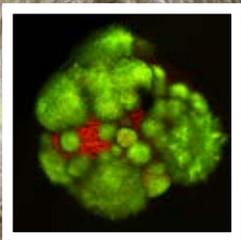
With this project, researchers sought to improve predictions of extreme hydrological events in target sites in Biskra, including the M'Chouneche station. After gathering data at this station, the team applied FA to the annual maxima of the flow and concentrations of sediments in suspension. Armed with this information, they developed models using HYFRAN and other software, determining hydrological risk.

Members of the Algerian research team at the M'Chouneche station, part of the Foum El Ghorza dam.

In the third phase, the team went beyond the initial parameters of the research, adopting recently developed additions to FA methodology. Given the lack of data, the team used FA based on the peaks over threshold (POT) method. Finally, the team initiated a literature survey on work relating to the transport of sediments.

The research has led to the submission of three articles to scholarly journals, as well as a presentation to a conference in Algiers. As of spring 2012, a fourth article was in progress and the team was being considered for conferences in Turkey and Tunisia in the fall.

Following the analysis, the team modified the model to provide a multidisciplinary tool for local decision-makers. Ultimately, the models produced by the team will help improve management of siltation, as well as better flood forecasting. Indeed, the tools will be useful for all hydrological events, not just in Algeria but throughout North Africa.



Cameroon

Microscopic views of the JJY4 strain of bacteria (foreground) which attacks brown rot and helps stimulate the growth of Cameroon's lucrative cocoa crops (background).

New biocontrols to fight brown rot in cocoa plants

Carole Beaulieu, Université de Sherbrooke, Canada

Thadée Boudjeko and Chantal Florentine Ndoye Foe, Université de Yaoundé I, Cameroon

In Cameroon, cocoa represents close to 30 percent of non-petroleum exports, generating more than \$19 billion (CAD) in annual revenue for some 600,000 producers. The cocoa plant, however, is threatened by brown rot caused by *Phytophthora megakarya*. To date, efforts to eliminate the pandemic or limit its expansion have not been fully successful.

This project sought to develop a way to counter brown rot through biocontrols, the training of researchers and African students in the field of biocontrols, and by consolidating the efforts of Canadian researchers to create and participate in an international research network.

Working with two African students, the research team broke new ground, demonstrating that the JJY4 strain of bacteria belonged to a new species. The antibiotic properties of the JJY4 strain proved effective against *Phytophthora megakarya* and in addition was found to stimulate the growth of cocoa plants, even in the absence of the pathogen. This aspect of biofertilization was unexpected and requires more exploration.

In terms of training, 60 graduate and post-graduate students at the Université de Yaoundé I and l'Université de Dschang in Cameroon took a course on biocontrols taught by Dr. Beaulieu. The average grade in the written exam was 90 percent, indicating an effective transfer of knowledge. These senior students became the foundation for a research network between Quebec and Cameroon.

In particular, the project promoted the participation of women in scientific research. In addition to co-directing a course on women and science, Dr. Beaulieu facilitated a conference on "Scientific objectivity and the role of women in the sciences." The conference, which attracted 40 participants, included a stimulating discussion on similarities between women researchers in North America and male researchers in Africa.

Since so little new research exists on antibiotics made from African microorganisms, the new molecule may well interest not only the agriculture community but the pharmaceutical industry as well. Not surprisingly, the team plans to patent its discovery once the structure of the molecule has stabilized.

No doubt these discoveries will also interest policy and decision-makers in Cameroon. Indeed, government representatives from the Ministry of Agriculture and Rural Development and the Ministry of Scientific Research and Innovation took part in one of the five conferences led by Dr. Beaulieu in Cameroon. Dr. Boudjeko plans to follow up with the two departments.



Project partners, Dr. Yanful and Dr. Mensah, discuss their findings in Ottawa.

Ghana

Exploring biodiesels for sustainable socio-economic development

Ernest K. Yanful, Western University, Canada

Ebenezer Mensah, Kwame Nkrumah University of Science & Technology (KNUST), Ghana

Over the next two decades, global energy demand is expected to double, leading to higher fuel costs. At the same time, the production of more environmentally friendly fuels is still prohibitively expensive. Indeed, many fear that biofuel production from plant food such as corn may lead to high grain prices.

With this in mind, researchers sought to produce biodiesel fuel from waste cooking oil and jatropha, a non-edible plant. Recycling waste oil would not only take advantage of a readily available resource, it would close the loop between farming, food production and waste generation. And since jatropha thrives in non-arable environments, harvesting oil from this plant would mean less competition for arable land, resulting in a lower impact on food prices.

The team achieved promising results. It was the first time the two-step esterification-transesterification of jatropha oil, as well as the novel catalyst potassium carbonate, were used together to demonstrate a biodiesel yield of 94.8 percent. Similarly, it was the first time this novel catalyst was used in transesterification of waste vegetable oils to produce biodiesel with a yield of 95 percent.

While the team did not have sufficient time to evaluate biodiesel in engine performance, it did compare biofuel quality to fossil-based diesel and biodiesel-fossil diesel blend. It also began designing a biodiesel pilot plant in Ghana and exploring the feasibility of full-scale production. If a biodiesel plant proves feasible, the project may also generate jobs for low-income women to plant, harvest and process jatropha.

Building on a prior working relationship, the lead researchers harnessed the talents of three Ghanaian graduate students — Patrick Boakye, Arnold Painsil and Maame Addai — who each developed theses around the work. The team has submitted two papers stemming from the project to academic journals. Furthermore, Mr. Boakye plans to pursue a PhD.

Working with the Faculty of Renewable Resources at KNUST, the team intends to share project results with the Government of Ghana. Armed with their convincing evidence, the researchers hope to convince the government to integrate biodiesel production into the national energy policy.



Cocoa farmers in Ghana.

Ghana

Agrarian resilience in a changing climate

Marney Isaac, University of Toronto, Canada

Luke Anglaaere, Forestry Research Institute of Ghana, Ghana

Nutrient depletion and unpredictable rainfall have led to declining crop yields in Ghana, where 55 percent of labourers in the southern, central and western regions are connected to the cocoa industry. In recent years, farmers in the drought-prone north have been migrating to the cocoa-growing districts in the southern regions. Many of these farmers bring practical information on the effects of climate change with them, but little is known about how they share that knowledge and its impact on management.

With this project, researchers worked with Ghanaian producers to understand the transfer of knowledge on climate change between farmers and the development of social networks. Through social surveys and interviews, the team showed that migrant farmers play a key bridging role in transferring knowledge between previously isolated social networks. Researchers identified drought-resistant practices such as planting shade trees, and used innovative geo-imaging technologies to determine the impact of these adopted practices on crop production. Ultimately, they demonstrated

that root zones are more dispersed in systems with more than one species and presumably more effective at using water resources efficiently.

Even as the project pursued this groundbreaking research, it held two training workshops to expose researchers to the field of social network analysis. The first, held in Ghana, attracted 65 technicians, graduate students and faculty from the partner organization and three other institutions. The second workshop in Toronto, which focused on data analysis, led Dr. Isaac to successfully secure a SSHRC Insight Development grant.

Indeed, the project leveraged several other funding sources to broaden its scope. Dr. Isaac obtained a Teaching Enhancement grant from the University of Toronto to help develop videos of lectures on socio-ecological systems for graduate students at both partner institutions. She also secured a Canada Foundation for Innovation grant, enabling the project to add a training session on ground-penetrating radar systems, as well as the intensive training of one technician at the African partner institution.

Results from this project shed light on best practices for enhancing resilience in a changing and uncertain climate.



Canadian researchers from the University of Manitoba pose with Kenyan counterparts during a symposium on maternal child health in Nairobi.

Kenya

Enhancing maternal child health

Lisa Avery and Maryanne Crockett, University of Manitoba, Canada

Anne Kihara, Florence Murila and Peter Njoroge, University of Nairobi, Kenya

Children whose mothers die in childbirth are up to 10 times more likely to die within the first three years of life. Those who survive are more likely to be malnourished, receive less education, live in poverty and experience adverse health outcomes. Yet investment in women and children also yields the highest return of any development expenditure, leading to improved household incomes and health, as well as greater economic growth for society at large.

These trends speak volumes in Kenya, a country with a maternal mortality ratio of 560 deaths per 100,000 live births and an infant mortality rate of 80.5 per 1,000 live births. This project sought to develop research capacity in maternal child health (MCH) and eventually establish a core multidisciplinary MCH research team at the two universities. In this way, the exchange could improve MCH outcomes in Kenya.

Over their three months in Manitoba, the three Kenyan researchers — all new faculty members — took courses to improve skills in epidemiology, research design, statistics and analysis and grantsmanship. The two Canadian researchers also spent three months in Nairobi, where they took part

in a maternal, neonatal and child health (MNCH) research symposium and helped develop a study to evaluate maternal and newborn outcomes at Kenyatta National Hospital (KNH).

While the two universities have collaborated for more than three decades, this exchange represented their first MNCH research partnership from a broad public health perspective. In addition to evaluating maternal and newborn outcomes at KNH, the team undertook a participatory qualitative assessment of the health status and concerns of an isolated Masai community in southeastern Kenya.

The researchers quickly coalesced into a multidisciplinary team, receiving grants for two major MNCH projects through CIDA's Muskoka Initiative Partnership Program and the AUCC/CIDA Students for Development program. In addition, several other activities ensued, including the creation of an undergraduate medical elective at the University of Nairobi for students from the University of Manitoba.

Armed with strengthened research capacity, the team plans to complete its Muskoka MCNH project, as well as the maternal and newborn outcomes project at KNH. It may also pursue additional research with the Masai community. Not only is their work likely to generate useful data that can affect the health and nutrition of mothers and children in one county, it can serve as a focal point to scale-up related research across Kenya.



Lemurs, an endangered primate species, are unique to the island of Madagascar.

Madagascar

Protecting biodiversity against climate change

Damase P. Khasa, Université Laval, Canada
Vololomboahangy Randrianjafy Rasoloarisoa, Université de Majahanga, Madagascar

Madagascar's rich biodiversity faces a myriad of threats from climate change to the conversion of forests into arable land. In response to these challenges, this project strengthened the capacity to research biodiversity and climate change adaptation.

Dr. Randrianjafy Rasoloarisoa spent three months in Quebec, leading seminars on the theme of managing integrated rural development in a tropical environment. She also took part in several courses, including those on tropical diseases and sanitation and challenges pertaining to national parks in biosphere reserves. On his part of the exchange, Dr. Khasa pursued research and delivered graduate-level courses in the management of endangered species.

Using archival climate data from 26 stations, the researchers analyzed the evolution of climate change in six different provinces, each with distinct climate patterns. They reported their findings in a jointly authored paper that explored options for adaptation. They also co-wrote a paper on forest governance in Madagascar and collaborated with others on a

study of community management of natural resources in a Malagasy national park.

Finally, during the exchange Dr. Khasa co-organized an international workshop on community forestry in the context of Reducing Emissions from Deforestation and Forest Degradation, as well as understanding the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in this process (REDD +). Since the workshop at Université Laval, he has been directing a publication on REDD + in developing countries.

In light of the project's goal to enhance partnerships between Canadian and African institutions, Dr. Khasa also met with several other institutions of higher learning and research, both in Madagascar and South Africa. These contacts expressed strong interest in developing a regional project on agrobiodiversity, food security and climate change.

In Madagascar, to earn the coveted "HDR" designation (known as "accreditation to supervise research"), academics require individual research, teaching and publications, as well as experience leading the scientific research of local students. With guidance from Dr. Khasa, and bolstered by the project's publications, Dr. Randrianjafy Rasoloarisoa was able to complete the ensemble of work necessary for the HDR. Her defence is expected to take place in July 2012, and Dr. Khasa is invited to attend this special event.



Oil samples derived from the jatropha plant.

Mali

Pursuing jatropha oil as a sustainable biofuel

Mamadou Lamine Doumbia and James Tonyi Agbèbavi, Université du Québec à Trois-Rivières (UQTR), Canada

Arona Coulibaly and Souleymane Karamoko Traoré, École Nationale d'Ingénieurs-Abderhamane Baba Touré (ENI-ABT), Mali

As a land-locked country that does not produce petroleum and as one of the poorest countries in the world, Mali's fuel bills are staggering, totaling \$600 million (CAD) in 2007. Consequently, the Government of Mali is keen to draw on its natural resources to develop made-at-home alternatives that are both environmentally sustainable and economically viable.

Advancing the use of biofuels — particularly from jatropha oil — is a priority of Mali's energy policy, which aims to reduce dependence on huge petroleum imports, encourage more consumption of sustainable energy in rural areas and create jobs and income-generating activities in rural communities. The strategy pays particular attention to low-income women, who can earn income through the production, commercialization and consumption of value-added products such as soap and pesticide.

Within this context, a national agency for the development of biofuels (ANADEB) has several demonstration pilot projects underway, including testing the viability of biofuels in vehicles such as the Toyota Hilux. More research is needed, however, to validate and build on preliminary results, particularly around standards and criteria for sustainability. The CAREG project thus provided an opportunity for Mali to significantly advance its research on biofuels.

Working together in both Mali and Quebec, the researchers tested varieties of jatropha oil from different regions of Mali, identifying flash point, viscosity, acid levels and other properties. They also developed an experimental protocol for evaluating the stability of a biodiesel-diesel blend in internal combustion engines, including on-road tests in the Toyota Hilux. Through a partnership with ANADEB, two students with ENI-ABT studied the use of biofuels in generators on two different sites. Finally, they prepared technical documentation for ENI-ABT on the use of jatropha oil in engines and generators, strengthening the capacity of the laboratories and the senior students who use them.

These results were disseminated in several ways, including a press conference in Bamako and a conference on biofuels at UQTR led by the two African researchers. Ultimately, through all these achievements, the project contributed to building a national strategy to develop a biofuels industry in Mali.



Dr. Belfkira holds up a Moroccan plant from which they extract lignocellulose materials.

Morocco

Transforming lignocellulose materials into biodegradable packaging

*François Brouillette, Université du Québec à Trois-Rivières, Canada
Moha Taourirte and Ahmed Belfkira, Université Cadi Ayyad, Morocco*

The Centre for Research in Lignocellulose Materials (CRLM) at l'Université du Québec à Trois-Rivières (UQTR) has become a magnet for graduate students and researchers around the world, including from l'Université Cadi Ayyad (UCA) in Marrakech, Morocco. It was a natural fit, then, for these two institutions to pursue a scientific partnership through CAREG — especially given the additional support of UCA's Laboratory for Bioorganic and Macromolecular Chemistry (LCBM).

With contributions from three Moroccan post-graduate students interning at UQTR, the researchers pursued technologies that could generate value-added in Morocco's food processing industry. Specifically, they sought to produce biodegradable packaging by transforming lignocellulose materials, known colloquially as woody species. To that end, they analyzed fabrication techniques and the properties of papers and cardboard. They also observed the operations of a pilot paper-making machine at a specialized institute within UCA. Drawing on the resources of CRLM's laboratories for six weeks, the three students produced a prototype using Moroccan fibres. Of all the species tested, agave held the most promise, and demands more study.

The Quebec end of the exchange had several unexpected spin-offs. The team leaders signed an agreement to co-supervise the doctoral theses of the three interns from UCA, as well as a Chinese doctoral candidate studying at UQTR. In addition, building on Dr. Brouillette's contacts with researchers from Gabon, the project added Gabonese fibres into its laboratory trials. Not only did this provide the Gabon team with a preliminary assessment of its fibre, it also provided the CAREG team with a useful point of comparison.

The Moroccan component of the exchange was equally rewarding. Indeed, the Quebec students were taken aback by the quality of UCA's facilities, which suggested Moroccan researchers could bring knowledge to bear on certain CRLM projects. In fact, after meeting Dr. Belfkira in Trois-Rivières, a UQTR professor went to Morocco in search of a PhD student for one of his own research projects.

Ultimately, the two universities signed an accord for scientific cooperation and exchange. In October 2012, the team will present a paper at an international conference in Marrakech and plan to submit it to a journal. A second paper is also in the works.



RESULTS AND LESSONS

On June 14, 2012, AUCC and IDRC held a CAREG workshop in Ottawa to share results, generate lessons and look ahead to a potential new phase of the program. All told, 21 participants including nine from Africa, took part, either in person or through Skype. Their discussions identified several themes for the results, as well as lessons and recommendations that could be incorporated into a subsequent phase.

Collaboration

Like its counterpart program in Latin America and the Caribbean, CAREG offers a two-way exchange for Canadian and African researchers. Each partner contributes a particular expertise, knowledge or facility that is vital for the success of the project. But the partnership extends far beyond the named leaders from Canada and Africa. Graduate students play a crucial role in supporting the research and often developed theses around the work or leveraged their experience into grants. An institution provides laboratories and other facilities that both enhance, and are enhanced themselves, by the work. Often, researchers in other departments, as well as administrators, will benefit, both directly and indirectly, from the exchange. Finally, the exchanges welcome the participation of other stakeholders

Dr. Belfkira, UCA, shares his project results and lessons learned with CAREG workshop participants.



Dr. Doumbia, UQTR, and Dr. Coulibaly, ENI-ABT, provide their recommendations at the workshop.

— from other academic institutions and industry leaders to policy and decision-makers in government and people who will benefit most directly from the results. Whether they were working together for the first time, or were long-time colleagues, all partners in the pilot program embraced the spirit of collaboration.



Participants at the CAREG workshop in Ottawa.

Research

In their own unique ways, the eight projects strengthened research for development. The results, such as those noted below, were presented both to internal audiences in the institutions, at national and international conferences and within the community. In addition, many articles found a home in scholarly journals.

Notable results include:

- Improved predictability of extreme hydrological events
- Discovery of a new antibiotic that reduces brown rot in cocoa pods and stimulates growth
- Proven viability of the jatropha plant and vegetable waste oils as fuels
- Demonstrated impact of migrant farmers on the adoption of drought-adapted knowledge to address climate change
- Creation of a research program and curriculum on biodiversity conservation and climate adaptation
- Use of local lignocellulose fibres to develop biodegradable food packaging
- Initial evaluations of maternal and neonatal outcomes at Kenyatta National Hospital and evaluation of health issues among an isolated community of Masai

Training

Whether the research used time-tested methodologies or groundbreaking techniques, it often required training. Through informal settings and formal workshops, both faculty and graduate students alike were exposed to new approaches, including information and communication technologies (ICTs). These could range from UNICET for social network analysis to HYFRAN software for frequency analysis. Researchers also lectured or gave courses at their counterpart's institution, developed curriculum and joint graduate programs, and co-supervised doctoral students.

Capacity

CAREG grants not only strengthened the knowledge of diverse faculty and students, they also developed the capacity of the institutions themselves. Many developed and expanded their research networks both within and between Canada and Africa. Some exchanges even broadened beyond their original scope, engaging researchers and institutions from a third country in the research. In many cases, the partners formalized arrangements by developing joint programs and creating mobility agreements. These efforts often attracted new funding to expand research, which in turn built additional capacity.

Lessons and recommendations

Discussions at the June 14, 2012 workshop were rich and compelling. Building on these results, AUCC plans to prepare a report highlighting lessons and recommendations for a potential future phase of the CAREG program.



CAREG INSTITUTIONS 2010-2012

ALGERIA

Université de Biskra

CAMEROON

Université de Yaoundé I

CANADA

Institut National
de Recherche Scientifique
Université Laval
Université de Sherbrooke
Université du Québec à Trois-Rivières
University of Manitoba
University of Toronto
Western University

GHANA

Forestry Research Institute of Ghana
Kwame Nkrumah University
of Science and Technology

KENYA

University of Nairobi

MADAGASCAR

Université de Majahanga

MALI

École Nationale d'Ingénieurs-
Abderhamane Baba Touré

MOROCCO

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