



Synthesis of National Impact Reports for BIO-EARN Projects and Programme Activities in Phase II (2002 – 2005)

John Komen and Ivar Virgin, September 2006

1. Background and methodology

The BIO-EARN¹ mission is to promote the application of biotechnology in agriculture, industry and environmental management in order to contribute to a more productive and sustainable agricultural sector and the development of a more efficient bio-resource economy. This is done through interdisciplinary collaborative research, policy advocacy and outreach involving R&D and policy institutions in Ethiopia, Kenya, Tanzania and Uganda. The main objectives of BIO-EARN's current phase (2006-2009) are to:

- (1) Capitalize on BIO-EARN Phase I and II investments in education and training by extending support for five interdisciplinary biotechnology research programs, which contribute to sustainable development in the region.
- (2) Expand institutional and technical linkages of the Programme to augment strategic research efforts and to ensure that any prospective products of the research create added value for the region.
- (3) Address the limiting factors for technology diffusion and dissemination by building capacity and awareness for relevant policy areas (i.e. intellectual property, innovation systems and research policy).

The programme is financially supported primarily through a grant from the Government of Sweden — Sida/SAREC². Sida/SAREC requires the implementing agency — the Stockholm Environment Institute (SEI) — to submit a BIO-EARN Programme Impact Assessment Report to facilitate monitoring of the Programme's past performance and efficiency. The impact report would also be used to improve the Programme's ability to meet its strategic objectives defined for Phase III (2006-2009). This requirement was addressed in two stages: (1) an external evaluation commissioned in 2003, towards the end of Phase II (2002-2004)³, assessing the programme's overall outputs and impacts; (2) an "internally commissioned" assessment of activities, outputs and impacts per country, which is the subject of this report.

This assessment complements the earlier external evaluation in providing a detailed overview for each BIO-EARN network country following full completion of Phase II. Its methodology and main results are described in the sections below. Findings and recommendations from the external

¹ BIO-EARN: East African Regional Programme and Research Network for Biotechnology, Biosafety and Biotechnology Policy Development. URL: www.bio-earn.org

² Sida: Swedish International Development Cooperation Agency. SAREC is SIDA's Department for Research Cooperation.

³ Morris, E.J. and N.P. Louwaars. 2004. The East African Regional Programme and Research Network for Biotechnology, Biosafety and Biotechnology Policy Development (BIO-EARN). Sida Evaluation 04/09. Stockholm: Swedish International Development Cooperation Agency.

evaluation will not be repeated in this synthesis report. It is also not our intention to review or modify any of the external review's recommendations or criticisms, which were all considered relevant and were internalized in the planning process for BIO-EARN Phase III.

In order to achieve the detailed assessment for each country, SEI worked with a consultant (John Komen) and each National Focal Point (NFP) to draft detailed guidelines ([Annex 1](#)) for the country studies, and to identify competent local consultants to perform the tasks. The key question at hand is: What type of impact have BIO-EARN programme activities (e.g. research, training, capacity building and information exchange etc) had in the 4 network countries? Impact should be judged against the **mission** statement and the Programme **objectives**, and expected **outputs** defined during the Phase II development stages in 2000-2001. ([Annex 2](#), and included in the study guidelines).

Based on the study's guidelines, the National Focal Point formulated detailed terms of reference for local consultants, and subsequently commissioned the country evaluations during the period March – June 2006. Literature review and interviews with BIO-EARN stakeholders made up the main activities undertaken as part of the assessments. Various drafts of the country reports were reviewed by SEI, while the final reports are included in full as [Annex 3 to 6](#).

The methodology followed for the country assessments was based on common outcome-based programme evaluation methods, as practiced in most development organizations. Specifically, we used a modified version of a methodology used by the International Service for National Agricultural Research (ISNAR) to assess and monitor impact of training and technical assistance activities. This methodology, named the Participant Action Plan Approach (PAPA), was modified to better cover the scope of the BIO-EARN programme, which also includes biological-science R&D activities and capacity building. Thus, activities and outputs were categorized according to the main components of BIO-EARN:

- Biotechnology research and capacity building
- Biosafety research and capacity building
- Biotechnology policy research and outreach
- Research management skills development

Programme impacts were assessed for the following levels:

- Scientific impact
- Economic, environmental and social impact
- Impact on the individual
- Impact on the team, division or department
- Impact on the institute or organization
- Policy formulation and implementation

Section 2 below summarizes the main findings of the country reports, following programme components and impact levels as outlined above.

2. Outputs and Impact: Findings from the country reports

2.1 Biotechnology research and capacity building

The biotechnology research component of the BIO-EARN programme is by far the most visible and significant in terms of outputs and impact. This comes as no surprise, as around 60% of available funding was allocated to the research component. Since this component was structured as distinct

PhD projects, it is possible to attribute any outputs and impacts directly to BIO-EARN. For the 4 programme countries, the summary of outputs and impacts is as follows (further details to be found in the country reports).

Table 1. Summary of biotechnology research outputs and impact

Country	Type of outputs / impact			
	Scientific	Individual	Team / division	Institute / organization
Ethiopia	<ul style="list-style-type: none"> ▪ 14 peer-reviewed publications ▪ protocol for coffee genetic diversity ▪ enset micropropagation protocol ▪ RAPD markers for enset diversity ▪ transformation / regeneration protocol for <i>Hagenia abyssinica</i> ▪ molecular genetic diversity studies for <i>Hagenia abyssinica</i> ▪ denitrifying bacteria isolated for wastewater treatment 	<ul style="list-style-type: none"> ▪ 4 completed PhD programs ▪ 2 supervisors received faculty training 	3 labs upgraded	Enhanced regional and international collaboration
Kenya	<ul style="list-style-type: none"> ▪ 10 peer-reviewed publications (of which 3 <i>in press</i>) ▪ 1 regeneration protocol (sesame) ▪ 1 isolated alkaliphilic bacterium 	<ul style="list-style-type: none"> ▪ 3 PhD ▪ 1 MSc 	3 labs upgraded	Postgraduate courses and international training
Tanzania	<ul style="list-style-type: none"> ▪ 14 peer-reviewed publications (2 in conf.proc.) ▪ molecular markers for disease diagnostics (coffee, sweet potato) ▪ protocol for biogas production from agro-industrial waste 	<ul style="list-style-type: none"> ▪ 3 PhD ▪ 1 licentiate ▪ 3 trained technicians ▪ 2 supervisors received faculty training 	2 labs upgraded	<ul style="list-style-type: none"> ▪ Enhanced regional and international collaboration ▪ BSc degree program ▪ Increased funding by national government (MARI)
Uganda	<ul style="list-style-type: none"> ▪ 15 peer-reviewed publications ▪ molecular markers for disease diagnostics (maize, sweet potato) ▪ model for GM cassava with modified starch content ▪ molecular markers for cyanide and dry matter content in cassava ▪ model for wastewater treatment through wetlands 	5 PhD	3 labs upgraded	<ul style="list-style-type: none"> ▪ New undergraduate / graduate courses (Makerere) ▪ Enhanced regional and international collaboration
OVERALL	<ul style="list-style-type: none"> ▪ 54 peer-reviewed publications ▪ 16 scientific protocols / models 	<ul style="list-style-type: none"> ▪ 15 PhD ▪ 1 MSc ▪ 1 licentiate ▪ trained technicians and supervisors 	11 labs upgraded	<ul style="list-style-type: none"> ▪ Enhanced regional and international collaboration ▪ New curricula ▪ Increased funding

The data in Table 1 above confirm the successful performance of the biotechnology research component in terms of outputs. The overall actual outputs match or exceed those expected at Phase II inception (see Annex 2). The model chosen for PhD training – sandwich programs between East African and Swedish universities – has been a major contributing factor leading to a high success rate of the PhD candidates; a good number of new biotechnology applications; and, no less than 54

peer-reviewed publications. Supporting activities were designed to contribute to the objectives and outputs defined for the research component. Infrastructure (including ICT upgrading) support for network institutes provided a stimulus for PhD graduates to return to their home institutes.

As regards impact, this is confined mainly to the scientific level. All country reviews point to the fact that it's too early to assess the impact from research projects in economic or social terms. A number of promising biotechnology applications were generated that may lead to impact when used in productive processes in the not too distant future, particularly those in the field of wastewater treatment. Clearly, the research component has had a major direct impact at the team / division level through the upgrading of laboratory facilities. This has led to further impact on their respective organizations, for instance through the development of new teaching programs (reported by Tanzania, Uganda) and increased funding (Tanzania). Impact on the division or organization could have been greater if the planned short-term training of technicians had materialized fully; however, it appears this opportunity was lost in most countries due to miscommunications, as reported in, e.g., the report from Ethiopia.

Overall, the component made a strong contribution to one long-term goal defined for BIO-EARN Phase II, which is “[...] *to create a critical mass of capable individuals in biotechnology R&D in the East African region that will enable the institutions to be equal and effective partners in international R&D collaborations involving development of commercial products. It is also hoped that once adequately equipped, the East African BIO-EARN laboratories will be able to offer training to scientists from neighbouring countries in the region to a lower cost than what would be available in Europe and USA.*”

2.2 Biosafety research and capacity building

The biosafety component consists of a diverse set of activities as follows:

- A limited number of PhD research projects
- Development of botanical files
- National biosafety studies and development of a biosafety resource book
- Training courses and workshops

As a relatively small component — around 20% of the Phase II budget was allocated to biosafety capacity building including the 3 PhD projects — the biosafety component achieved a number of significant outputs. This includes 3 fresh PhDs, peer-reviewed publications and gene flow assessment models in a scientific area that is relatively uncharted in East Africa. In addition, a range of regional workshops and overseas training increased the skills and general awareness about the scientific and policy aspects of biosafety management. Unfortunately, the development of botanical files as a risk assessment tool in biosafety decision-making never left the conceptual stages as the collaboration between East African partners and the technical backstopping partner (Plant Research International) broke down.

A summary overview of outputs and impact is provided in Table 2 below.

Table 2. Summary of biosafety outputs and impact

Country	Type of outputs / impact			
	Scientific	Individual	Institute / organization	National policy
Ethiopia	<ul style="list-style-type: none"> ▪ 2 peer-reviewed publications ▪ technique for assessing gene transfer through pollination ▪ botanical files on crop plants initiated 	1 PhD	Regional / international collaboration	<ul style="list-style-type: none"> ▪ 1 national biosafety policy workshop ▪ contribution to national biosafety framework (NBF)
Kenya	<ul style="list-style-type: none"> ▪ 1 peer-reviewed publication ▪ botanical files on crop plants initiated 	<ul style="list-style-type: none"> ▪ 1 PhD ▪ 1 MSc 		<ul style="list-style-type: none"> ▪ 1 national biosafety study ▪ contribution to NBF
Tanzania	<ul style="list-style-type: none"> ▪ 1 peer-reviewed publication ▪ gene flow assessment model ▪ botanical files on crop plants initiated 	1 PhD		<ul style="list-style-type: none"> ▪ contribution to NBF
Uganda	botanical files on crop plants initiated			<ul style="list-style-type: none"> ▪ 1 national biosafety study ▪ contribution to NBF
Regional		72 persons received biosafety training in Phase II (regional, international)		biosafety resource book published
OVERALL	<ul style="list-style-type: none"> ▪ 4 peer-reviewed publications ▪ 2 scientific models ▪ botanical files developed 	<ul style="list-style-type: none"> ▪ 3 PhD ▪ 1 MSc ▪ 72 trained individuals 	Enhanced regional / international collaboration	<ul style="list-style-type: none"> ▪ 2 national biosafety studies ▪ 1 resource book ▪ 1 national policy workshop ▪ 4 NBFs

As with the biotechnology research component, the impact of the biosafety component is largely confined to the scientific and individual levels. This is generally consistent with the type of expected outputs defined for this component (Annex 2). As a result, it is not entirely clear if and how the various workshops have contributed to biosafety capacity development in the region; and, if BIO-EARN has made a direct contribution to biosafety policy and regulatory development in the programme countries. The country assessment reports provide a number of positive indications in that direction but no solid data.

This is also due to the fact that the “biosafety landscape” in East Africa rapidly changed during the Phase II period, with major new initiatives such as the UNEP-GEF supported biosafety implementation projects (active in Kenya and Uganda) and biosafety development projects (Ethiopia, Tanzania); and, the USAID supported Program for Biosafety Systems (PBS) with activities in Kenya, Tanzania and Uganda. Collectively, these programs contributed with BIO-EARN to the development of biosafety regulatory structures and risk assessment capacity. BIO-

EARN national focal points — based at the national science councils — all play a leading role in the UNEP projects and PBS.

2.3 Biotechnology policy research and outreach

The policy component of BIO-EARN (around 10% of the total Phase II budget) covered a wide range of activities, including policy studies and a series of regional and national workshops. The Phase II proposal recognizes the tight link between developing research capacity and creating an enabling policy environment: *“Apart from [research capacity] [policy makers] must also develop a policy framework that links biotechnology capacity building with development of biosafety oversight mechanisms and suitable biotechnology policies (e.g. IPR regulations, cost-benefit & impact analysis etc). It is our strong belief that such an enabling environment can only be built when countries simultaneously develop a capacity in biotechnology R&D, biosafety and biotechnology policy.”*

BIO-EARN’s role would be *“[...] to act as a catalyst in the broad biotechnology policy-making process, whether at the level of individual scientists, participating institutions (e.g., institutional biosafety committees), participating countries or the region. This will be done through training courses, providing policy development capacity and workshops providing opportunities for various stakeholders.”*

Technical backstopping for this component in Phase I was arranged through the African Center for Technology Studies (ACTS), and in Phase II provided by the International Service for National Agricultural Research (ISNAR). The main topics covered under this component were:

- National policies and strategies
- Intellectual Property (IP) and genetic resources management
- Product development and public-private partnerships

Based on the broad expectations above, outputs and impacts were accomplished as summarized in Table 3 below.

The policy component shows satisfactory performance in terms of relevant outputs, but as yet little direct “measurable” impact on national policy development in programme countries. BIO-EARN is certainly instrumental in stimulating policy analysis and dialogue, resulting in the current strong role of the national focal points (NFPs – based at the national science councils) in national policy development and as “policy think-tanks”. This may lead to more tangible policy impact (i.e., adopted policies) in the near future, taking into account the fact that there are many exogenous factors influencing the adoption of biotechnology policies. As reported in the Tanzania assessment, BIO-EARN “initiated and speeded up the process of developing national biotechnology policy and to some extent in the formulation of bio-safety guidelines.”

Policy activities have had a distinct impact at the institutional level, through the development of IP management guidelines (Ethiopia) and adoption of IP management policies at 6 network institutes. This is a direct result of hands-on regional and national IP management workshops — that also review major international and national policy developments in this field — and continued involvement of international resource persons in the development and review of (draft) institutional policies.

Table 3. Summary of BIO-EARN policy outputs and impact

Country	Type of outputs / impact		
	Individual	Institute / organization	National policy
Ethiopia	enhanced awareness on selected policy topics	guidelines for institutional IP policy	<ul style="list-style-type: none"> ▪ 2 policy reports ▪ 2 national workshops ▪ BIO-EARN NFP lead agency for policy development
Kenya	enhanced awareness on selected policy topics	IP policies at 2 network institutes	<ul style="list-style-type: none"> ▪ 2 policy reports ▪ 2 national workshops ▪ BIO-EARN NFP lead agency for policy development
Tanzania	enhanced awareness on selected policy topics	IP policies at 2 network institutes	<ul style="list-style-type: none"> ▪ 2 policy reports ▪ 2 national workshops ▪ 3 IP awareness workshops ▪ BIO-EARN NFP lead agency for policy development ▪ draft national biotech policy
Uganda	enhanced awareness on selected policy topics	IP policies at 2 network institutes	<ul style="list-style-type: none"> ▪ 2 policy reports ▪ 3 national workshops ▪ BIO-EARN NFP lead agency for policy development ▪ draft national biotech policy
Regional	98 persons received policy training in Phase II (regional, international workshops)		<ul style="list-style-type: none"> ▪ 2 policy reports (synthesis of country reports) ▪ 3 regional workshops ▪ compilation of policy reports on CD-ROM
OVERALL	<ul style="list-style-type: none"> ▪ enhanced awareness on selected policy topics ▪ 98 trained individuals 	IP policies at 6 network institutes	<ul style="list-style-type: none"> ▪ 8 policy reports ▪ 2 synthesis reports ▪ 10 national workshops ▪ 3 regional workshops ▪ policy CD-ROM ▪ NFPs lead agency for policy development ▪ 2 draft national policies

2.4 Research management skills

While not a distinct component of the BIO-EARN programme, a small number of planned activities focused on improving the research management skills of faculty members from network institutes.

A proposal writing workshop for all BIO-EARN PhD students was held in Stockholm in April 2004. The ability to write convincing and well structured research proposals is a crucial skill for all researchers. Therefore, a BIO-EARN proposal writing course was developed to facilitate the integration of BIO-EARN PhD Students into their research environment in East Africa and increase their competitiveness to attract future funding. SEI commissioned the International Foundation for Science (IFS) to develop and implement a course curriculum with the aim to:

- Train BIO-EARN PhD students to write high quality research proposals.
- Develop ideas and further strengthen BIO-EARN concept notes for a potential Phase III of the BIO-EARN Programme.
- Familiarise BIO-EARN PhD students with IFS and increase their chances of getting funded by IFS or other research funding organisations.

Judging from the evaluation by the BIO-EARN students, the course was highly appreciated.

A research management course planned to be held during Phase II was postponed until 2006 and now planned to be conducted in conjunction with the start of the new BIO-EARN Phase III. This would have been useful to have during beginning of Phase II. Research management skills development therefore only occurred through “exposure”: for instance, of students and faculty to Swedish universities. A more concrete output here is the development and adoption of a BIO-EARN *Material Transfer Agreement* (MTA), governing the exchange of biological and genetic materials among Swedish and East African institutes. Based on the country reviews, the MTA appears to be widely adopted by the network institutes.

3. Key findings and recommendations

The overall objectives defined for BIO-EARN Phase II were to:

- Enable the countries in the region to develop biotechnologies and policies according to their own needs, abilities and opportunities;
- Promote collaboration in biotechnology, biosafety and biotechnology policy development to address key challenges and opportunities in the region;
- Foster communication between scientists, policy makers, biosafety regulatory officials and private sector nationally and regionally.

The main finding that becomes apparent from the country assessments is that BIO-EARN strongly contributed towards these objectives. A summary of outputs and impacts by programme component substantiates this conclusion (see Table 4 below), and is further supported by the more detailed country assessments (Annex 3 to 6). The reports also show that BIO-EARN supported activities and outputs were evenly distributed across the 4 countries, for which the regional coordinators and national focal points should be commended.

In conclusion, the BIO-EARN Programme has through human capacity building, infrastructure support, policy and networking support been able to greatly strengthen eleven East African R&D institutions. As a result, these institutions are now better able to carry out advanced biotechnology R&D relevant to national needs. They are also, through the development of a regional interdisciplinary BIO-EARN R&D platform, better able to engage in regional and international research collaboration, which will be increasingly important to ensure sustainability, relevance, quality and impact of research efforts in the region.

As in many complex programmes such as BIO-EARN, covering a broad range of actors and activities, areas for improvement are easily identified and have been reported in the external evaluation by Morris and Louwaars (2004). Some of them are reiterated in the country assessments, including:

- Unclear procedure for programme priority setting and research project selection;
- Limited ownership of the programme at high political levels;
- Key stakeholders not always involved;

- No or partial implementation of planned activities.

Table 4. Summary of BIO-EARN Phase II outputs and impact

Programme component	Type of outputs / impact				
	Scientific	Individual	Team / division	Institute / organization	National policy
Biotechnology research and capacity building	<ul style="list-style-type: none"> ▪ 54 peer-reviewed publications ▪ 16 scientific protocols / models 	<ul style="list-style-type: none"> ▪ 15 PhD ▪ 1 MSc ▪ 1 licentiate ▪ trained technicians and supervisors 	11 labs upgraded	<ul style="list-style-type: none"> ▪ Enhanced regional and international collaboration ▪ New curricula ▪ Increased funding 	
Biosafety research and capacity building	<ul style="list-style-type: none"> ▪ 4 peer-reviewed publications ▪ 2 scientific models ▪ botanical files developed 	<ul style="list-style-type: none"> ▪ 3 PhD ▪ 1 MSc ▪ 72 trained individuals 		Enhanced regional / international collaboration	<ul style="list-style-type: none"> ▪ 2 national biosafety studies ▪ 1 resource book ▪ 1 national policy workshop ▪ 4 NBFs
Policy research and outreach		<ul style="list-style-type: none"> ▪ enhanced awareness on selected policy topics ▪ 98 trained individuals 		IP policies at 6 network institutes	<ul style="list-style-type: none"> ▪ 8 policy reports ▪ 2 synthesis reports ▪ 10 national workshops ▪ 3 regional workshops ▪ policy CD-ROM ▪ NFPs lead agency for policy development ▪ 2 draft national policies
Research management skills		20 trained individuals (PhDs) in proposal writing		Material Transfer Agreement	

A full discussion on these issues falls outside the scope of this paper. It is important to note, however, that the above weak spots have been addressed in the planning and implementation stages of BIO-EARN Phase III (2006-2009) and that the recommendations from the earlier external evaluation were accepted and used to change the way in which the programme is structured and managed. For example, research projects were awarded after a process of competitive bidding involving external peer review of concept notes and full proposals based on objective criteria. It is crucial that a long-term investment such as the BIO-EARN programme is not only regularly evaluated but that programme management also acts upon recommendations from evaluations.

As a result of the above, BIO-EARN is now organized around 5 regional projects, of which 4 are scientific and 1 focuses on policy development. Each project has clearly defined objectives and associated outputs, organized in a Logical Framework matrix. This will go a long way in addressing a major issue identified in the Phase II assessment: The difficulty to assess and/or attribute impact

from activities and outputs generated by BIO-EARN. In the case of scientific outputs (e.g., trained PhDs, publications) it may be simply too early to assess, as noted in most country reports. For the biosafety and policy components, BIO-EARN is one among many players and its unique contribution cannot be easily identified. Especially for policy activities, BIO-EARN must define what is expected in terms of outputs and desired impact.

BIO-EARN's current project-based structure is an important but partial solution to further improving the programme's performance. Another essential measure will be to implement a more rigorous system for monitoring the implementation of programme activities, outputs and impact across all 5 projects. Regular (quarterly) progress reports and annual impact reports would be the logical starting point for this, and a means for the programme managers to keep better centralized records on progress and outputs. Workshops and training events supported by BIO-EARN should be routinely evaluated in terms of their usefulness and impact. Regular citation analysis of scientific articles (from Phase II and III) could be conducted to evaluate the scientific impact of BIO-EARN supported research.

An improved monitoring system will greatly facilitate evaluating the programme's impact towards the end of Phase III. In addition, it should also be used to keep track of important achievements made in Phase II but no longer supported in Phase III. For example, several protocols developed in Phase II are not applied in Phase III projects. Still it would be important to monitor their adoption and use in programme countries (and beyond). The same applies to the BIO-EARN supported PhDs who are not involved in Phase III projects, and to keep track of their science careers back home.

ANNEX 1. Guidelines for Impact Reports for BIO-EARN Projects and Programme Activities in Phase II (2002-2005)

John Komen and Ivar Virgin, January 2006

1. Background

Sida/SAREC requires SEI to submit a BIO-EARN Programme Impact Assessment Report to facilitate monitoring of Programme's past performance and efficiency. The impact report will also be used to improve the Programme's ability to meet its strategic objectives defined for Phase III (2006-2009).

In order to achieve the above, detailed information from Network partners is needed. We therefore request our East African BIO-EARN partners to send us information on what type of impact the programme activities (e.g. research, training, capacity building and information exchange etc) have had in the region. The impact should be judged against the **mission** statement and the Programme **objectives** (see below), and expected **outputs** defined during the Phase II development stages (Annex I).

We propose that the national focal points commission an impact evaluation following the attached guidelines, be responsible for consulting with national BIO-EARN partners and report a summary of impacts (from all national BIO-EARN activities) to SEI. SEI will in turn report overall Programme impact to Sida/SAREC. A final draft report, covering activities implemented in 2002-2005, should be submitted to SEI by **April 1, 2006**.

2. BIO-EARN Phase II mission statement

The mission of the BIO-EARN Programme is to build capacity in biotechnology in Ethiopia, Kenya, Tanzania and Uganda and promote appropriate research and related policies. The Programme aims to use biotechnology in a sustainable manner in order to help improve livelihoods, ensure food security, and safeguard the environment.

3. Overall Phase II Programme objectives

The overall objectives of the BIO-EARN Programme are to:

- **Enable** the countries in the region to develop biotechnologies and policies according to their own needs, abilities and opportunities;
- **Promote** regional collaboration in biotechnology, biosafety and biopolicy development to address key challenges and opportunities in the region;
- **Foster** communication between scientists, policy makers, biosafety regulatory officials and private sector nationally and regionally.

Please also visit the BIO-EARN webpage for more project information www.bio-earn.org

Impact Report Content and Structure

The impact report shall be structured as outlined below.

A. COUNTRY

B. PERIOD

Period during which activities described under C. took place.

C. SUMMARY OF RESEARCH AND CAPACITY BUILDING ACTIVITIES

A *brief account* of the main completed research, capacity building, training and outreach activities relevant to each country for the following categories:

- (1) **Biotechnology research:** Title and short description of
 - (a) completed PhD / MSc projects;
 - (b) support for R&D infrastructure development and equipment at network institutes, including IT infrastructure.
- (2) **Biosafety research and capacity building:** Title and short description of completed projects and activities, involving
 - (a) PhD / MSc projects;
 - (b) biosafety research and Botanical Files projects;
 - (c) development of biosafety resource book;
 - (d) biosafety systems studies (Kenya, Uganda);
 - (e) biosafety training courses and policy workshops.
- (3) **Biotechnology policy research and outreach:** Title and short description of completed activities, including
 - (a) policy background studies and analysis;
 - (b) policy awareness and outreach activities (national and regional).
- (4) **Research management skills development:** Title and short description of completed training and supporting activities aimed at enhancing research management skills at network institutes.

D. OUTPUTS FROM COMPLETED ACTIVITIES

In order to better assess the impact from BIO-EARN supported activities described in section C above, a detailed description of *outputs from each activity listed* is requested from each country. As much as possible, results should be *quantified* in terms of:

- Published outputs (e.g., scientific (peer-reviewed) publications; reports; proceedings), press coverage and other popular media
- R&D outputs (e.g., new plant varieties, environmental applications, industrial processes)
- Laboratory facilities upgraded and equipment procured
- Training and outreach events organized
- People trained in-country and overseas (divided by male / female trainees)
- Research management tools or practices implemented (e.g., MTAs)
- Policy planning processes and mechanisms supported (e.g., policy documents, advisory bodies)

- Collaborative agreements at national and regional level
- Other categories of results as considered relevant.

E. ASSESSING IMPACT

The next, and most important part of the report will involve an *analysis of impact* from Programme outputs as described under section D. “Impact” can be loosely defined as the effect of one phenomenon on another. In the context of research and capacity building, it often refers to the intended and unintended social, economic, environmental, institutional or other changes that result from research and capacity building activities. Within this context, the key question is **if** and **how** Programme outputs have produced tangible impact. Through a qualitative assessment — structured interviews, case studies, literature research — impact analysis will be completed for each country. For a comprehensive Programme such as BIO-EARN, impacts will be observed at different levels. To the extent possible, impacts should be differentiated as follows:

- ⇒ Scientific impact — E.g., adoption of research results elsewhere; citation of scientific articles
- ⇒ Economic, environmental or social impacts resulting from adoption and diffusion of BIO-EARN supported R&D, for different stakeholder groups (farmers, consumers)
- ⇒ Impact on the individual scientist, research manager or policy maker — E.g., improved performance and skills
- ⇒ Impact on the team, division or department — E.g., adoption of planning or management practices leading to improved performance
- ⇒ Impact on the R&D institute or organization — E.g., regional and international collaboration, or the implementation of institutional strategies or policies leading to improved performance
- ⇒ Impact on policy formulation and implementation — E.g., adoption of national policies or laws providing an enabling environment for biotechnology R&D
- ⇒ Other relevant Programme impacts

Based on information and data provided under section E., the BIO-EARN national focal points are requested to complete the *summary table* in section F. (next page).

A number of guiding questions are listed below (section G.). *These questions are only meant to guide the response and impact report.* Please be as specific as possible, using type of products, names of policy or regulations, and names of persons, institutions, authorities (e.g. activity X contributed to output Y resulting in impact Z). Negative or unintended impacts of the BIO-EARN Programme should also be listed, as well as constraints encountered in achieving Programme impact.

F. SUMMARY TABLE

Type of Impact	Examples			
	Biotechnology research	Biosafety research and capacity building	Biotechnology policy research and outreach	Research management skills
Science				
Economic, environmental or social				
Impact on the individual				
Impact on the team, division, department				
Impact on the institute or organization				
Policy formulation and implementation				
Other relevant Programme impact				

G. ILLUSTRATIVE GUIDING QUESTIONS

(1) Biotechnology research

- **Science.** What type of scientific impact have the BIO-EARN projects had? (e.g., citation of publications, key scientific results, conference presentations, etc).
- **Capacity building.** What type of capacity building impact has the Programme resulted in at the various BIO-EARN institutions? How has this helped these institutions to enhance their performance? This

includes improved research infrastructure and human capacity (e.g., improved research infrastructure, and abilities to use molecular diagnostics, improved methods to isolate and characterise biomolecules).

- **Regional collaboration/networking.** To what extent has the Programme facilitated regional and international networking? (e.g., collaborative research started with other institutions or network, contacts/discussion with the private sector regarding collaboration).
- **Development.** To what extent have BIO-EARN research projects contributed to development in the region? Has the research, so far, lead to any significant result that may lead to a product? e.g. characterization of specific genes/traits/organisms (such as disease resistant traits, establishment of a potential useful bioprocesses) that would be of potential interest to the country/institutions and would contribute to development.
- **Visibility.** To what extent has the Programme resulted in an increased visibility of BIO-EARN institutions, nationally, regionally and internationally? How?

(2) Biosafety research and capacity building

- **Science.** What type of scientific impact have the BIO-EARN biosafety projects had? (e.g., citation of publications, key scientific results, conference presentations, etc).
- **Policy awareness/implementation.** To what extent have the BIO-EARN research projects had an impact on biosafety policy awareness? To what extent and how has the programme improved understanding among scientists on biosafety issues? To what extent have the biosafety information and capacity generated through the Programme helped national biosafety assessments or policy recommendations?
- **Regional collaboration/networking.** To what extent has BIO-EARN Programme facilitated regional and international networking on biosafety? (e.g. sharing of policy information, experience, models, etc. Has the BIO-EARN Programme facilitated national, and/or regional/international networking between biosafety/policy regulatory authorities (e.g. information channels between specific regulatory authorities improved, information on biosafety assessment practices exchanged, agreement to collaborate with information exchange etc.).
- **Visibility.** To what extent has the Programme resulted in an increased visibility of BIO-EARN institutions, nationally, regionally and internationally? How?

(3) Biotechnology policy research and outreach

- **Policy awareness/implementation.** To what extent has the Programme improved the quality of policy awareness/implementation in the countries?, e.g. new, or additions to, development of improved national policies/ regulations, biosafety regulations, biosafety committees and management structures, development of national biotechnology policy, national or institutional priority setting documents, strategy documents, IPR policies, biotechnology policies.
- **Capacity building.** What type of capacity building impact has the Programme resulted in at the various BIO-EARN institutions and national policy-making bodies? Has the Programme improved the foundation for policy making (e.g. trained policy makers, better infrastructure for communication)? Have trainees being part of the BIO-EARN policy training courses participated in the development of national biotechnology policy formulation and in development of action plans. If so, in what way.

- **Regional collaboration/networking.** To what extent has BIO-EARN Programme facilitated regional and international networking on biotechnology policy? On what topics, and how? Has the BIO-EARN Programme improved communication between scientists and policy makers?
- **Visibility.** To what extent has the Programme resulted in an increased visibility of BIO-EARN institutions, nationally, regionally and internationally? How?

(4) Research management skills development

- **Regional collaboration/networking.** To what extent has BIO-EARN Programme facilitated regional and international networking? (e.g. collaborative research ideas discussed, information exchanged, research collaboration started with other institutions or network, contacts/discussion with the private sector regarding collaboration). Has the BIO-EARN Programme improved communication between scientists and policy makers? Please describe briefly.
- **Development.** To what extent have BIO-EARN policy projects contributed to development in the region? Has material produced in the BIO-EARN Programme (e.g. model MTAs, biosafety manual, country background studies being used in national biotechnology policy development). Has the activities so far, lead to any significant result that may lead facilitate product development and technology diffusion.. e.g. revised police improving incentives for product development, institutional IPR polices & technology transfer structures. Have any patents been filed?
- **Visibility.** To what extent has the Programme resulted in an increased visibility of BIO-EARN institutions, nationally, regionally and internationally? Please describe briefly.

ANNEX 2. BIO-EARN Phase II expected outcomes and impact

Source: BIO-EARN Phase II proposal, August 2001

4.6 Expected Programme outcomes during Phase II

4.6.1 Overview

At the end of Phase II, it is expected that the Programme will have resulted in a significant capacity building in biotechnology, biosafety and biotechnology policy in the region. By 2004, some 18-19⁴ PhD students in the fields of agricultural, environmental and industrial biotechnology as well as biosafety assessment will have graduated. This will contribute to the creation of a critical mass of scientists, who are competent to carry out research independently. The Programme will significantly strengthen the biosafety regulatory framework within the region, as well as the competence of the National Biosafety Committee members. The Programme will strengthen human capacity to address identified biotechnology policy needs including the generation of policy options to address major challenges. Finally, the Programme will stimulate the dialogue between the policy makers and scientists and enhance collaboration between the countries to address key problems, challenges and opportunities in the region. A detailed Logical Framework Analysis is provided in **Annex VII**.

4.6.2 Expected outputs in Biotechnology Research

- A large number of already established East African scientists have been able to visit Swedish research institutions and vice versa.
- 13-15 Ph.D. students in agricultural biotechnology and environmental biotechnology have completed their Ph.D. education programmes.
- About 30 publications in peer reviewed scientific journals have been published. In addition, some 30 articles in conference proceedings have also been published.
- Several genetic markers and genes for important agricultural traits have been identified, characterised and cloned.
- Several transgenic crops with modified agricultural traits will be under development.
- Several fungal and viral pathogens devastating important crops in the region have been characterized for genetic variability.
- Improved diagnostic methods and resistance breeding schemes developed.
- Several novel useful microbial strains and enzymes have been identified and characterised.
- Different types of waste water cleaning processes are developed and tested on laboratory scale.

4.6.3 Expected outputs in Biosafety Capacity Building

- Three PhD students have completed their studies in the area of biosafety.
- The compilation of baseline data and biosafety information to assist the decision making process in the region has started (e.g. data on the probability of geneflow between various species, basic evaluation of ecological impacts, introduction of some transgenic crops).
- A number of national biosafety training workshops carried out.
- Three regional biosafety training workshops for regulatory scientists and policy makers have been carried out resulting in a critical mass of roughly 25 persons/country with basic skills and a good overview in general and practical biosafety risk assessment and management.
- A biosafety manual for national biosafety workshops and developing country authorities has been developed and has stimulated national capacity building activities and has created a platform for meaningful biosafety information updating.
- Specific training workshop(s) on ecological risk assessment for key scientists from the region and sandwich Ph.D. students have been held.
- Tanzania and Ethiopia have been assisted in their development of biosafety guidelines and both countries have produced draft guidelines and a basic regulatory structure.

⁴ Currently there are 20 Ph.D. students in the Programme. Realistically, one can not expect all student to reach a Ph.D status in 2004.

4.6.4 Expected outputs in Biotechnology Policy Development

- Increased understanding among government policy-makers, BIO-EARN scientists and practitioners of a wide range of biotechnology policy issues of relevance to the countries.
- Development and improvement of policies to cover such areas as biotechnology R&D, biotechnology transfer and technology evaluation, intellectual property protection, and access to genetic resources.
- Material transfer agreements established between BIO-EARN institutions and Swedish counterparts.
- 48 persons from the BIO-EARN countries trained in biotechnology policy, and biotechnology policy analysis.
- Knowledge and information generated has been disseminated through publications and position papers.
- At least 12 students, researchers and policy-makers from BIO-EARN countries exposed through internships to new and emerging biotechnology policy issues.

4.7 Long Term Impacts

The expected impacts in 7-10 years are provided below.

Biotechnology and biosafety research

- A critical mass of (20-25) well-trained and active scientists has been developed in the region. A number of BIO-EARN institutes are now able to carry out reasonably advanced biotechnology research independently.
- A number of local crops and breeding systems have been significantly improved with the aid of biotechnology.
- A number of functional wastewater treatment and industrial biotechnology processes have been fully developed and are ready to be commercialised.
- Extensive biological data for local biosafety assessment are being generated.
- East African scientists are able to generate local biosafety data

Policy capacity

- All countries have a well functioning biosafety regulatory system and are able to evaluate most types of transgenic organisms.
- The Biosafety National Committees in the region are able to make risk assessment and management evaluations of locally produced transgenic crops. The Committees are also able to address more complex biosafety issues relevant to the region (such as gene transfer in centres of origin etc.).
- The biosafety regulatory instruments in the region are now fully harmonised.
- All the countries in the region have well-developed policies facilitating technology development and transfer of sustainable technologies.
- All the countries in the region have a critical mass of scientists and policy makers who can address emerging policy issues.
- All the countries in the region can make informed decisions on what type of biotechnology they want to invest in.