Sida Evaluation 96/9

Building Research Capacity in Ethiopia

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Sida Evaluation 96/9
Commissioned by Sida, Department for Research Cooperation

Printed in Stockholm, Sweden
ISBN 91-586-7357-1
ISSN 1401–0402

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Acknowledgement. The Evaluation Team is grateful to both ESTC and SAREC for the opportunity to carry out a thorough evaluation of a unique and important research capacity building program. The difficult task was considerably facilitated by the efforts of numerous staff members in ESTC and SAREC as well as individuals within each project. During numerous visits to project managements and sites in both Sweden and Ethiopia, the Team members were met with hospitality, openness and willingness to enter frank discussions. The Team had to request a considerable amount of detailed project data; such information was in every case provided in the shortest possible time. A list of persons met is given in Annex II; these are all gratefully acknowledged.

1. EXECUTIVE SUMMARY

Background for the Evaluation. The present report on the SAREC sponsored research capacity building program in Ethiopia is the result of an evaluation carried out during the beginning of 1995. It follows two earlier evaluations, with somewhat different objectives, performed in 1985 and 1990. The Terms of Reference (TOR) were defined by the Ethiopian Science and Technology Commission (ESTC) and SAREC (Annex I), and the evaluation was carried out by a Team of three members: Akalu Negewo, Ethiopia, Makonnen Fekadu, the United States, and Erik W. Thulstrup, Denmark (Team Leader). The main report is based on separate background documents from each Team member; in particular, the background papers produced by two of the Team members contain much additional detail and are available to interested readers (Negewo, 1996; Fekadu, 1996).

Two Team members visited briefly SAREC and ten projects in Sweden. Later, all three members made more extensive visits to ESTC, the University of Addis Ababa (AAU) and over ten individual projects in Ethiopia. In addition, a meeting was held in Addis Ababa with officials and project participants from Alamaya University (AUA). The purpose of the evaluation is to provide guidance for ESTC and SAREC in the planning of their future cooperation. It does not include a detailed scientific evaluation of individual projects, but does attempt to assess both the backgrounds, performances, and cost efficiency for a number of individual projects, listed in the TOR.

Because of the wide range of project objectives and outputs and their interrelation, the methodology used for the evaluation is not a simple cost benefit analysis. In general, it has not been possible to assign specific costs to individual project outputs. Rather, the Team has attempted an overall evaluation of the program, based on impressions and data from individual projects. The key material has been financial input analyses (Negewo, 1996) and output in the form of scientific results and capacity building, especially training. Six individual projects were used as case studies. Finally, the working relationship between ESTC and SAREC has been assessed. The Team considers this a key part of the evaluation.

Science, Technology, and Research in the Third World. Research based Science and Technology (S&T) hold the key to development in the Third World and the global demand for capacity building within scientific research is extensive. Capacity building may take place at three different levels (Thulstrup, 1996): 1) Partial Research Capacity in a given field covers the ability to perform research in cooperation with competent partners, 2) Complete Research Capacity in a field is reached when research can be performed and disseminated independently at a good international level, while 3) National Research Capacity requires the ability to prioritize, evaluate, and support research activities, to train and attract good researchers, to create conducive research environments and incentive systems for researchers, and to apply the research results and training for the benefit of national development.

A sustainable national research capacity must be based on a comprehensive national research policy and efficient organizations to implement it. Recent government decisions have placed Ethiopia in a position, which is rare among Third World countries and which may become a major factor in the national development: The establishment of an Ethiopian national S&T policy in 1993, a

government commitment to spend up to 1.5 percent of the GDP on research, and the determination to strengthen the implementing agency, ESTC.

Experience has shown that research capacity building, even at the most basic level, is a difficult process. This is especially the case in developing countries, where research traditions tend to be weak and practical problems related to laboratory work are often overwhelming. Procurement of equipment and consumables is difficult, critical utilities tend to be unreliable, good technicians are hard to find and retain, and instrumentation services are often unavailable. The establishment of research capacity in specific fields is often hindered by a lack of national research capacity, resulting in low salaries for researchers, unsatisfactory working conditions, and lack of incentives. This situation, combined with a persistent shortage of S&T manpower in some industrialized countries, easily leads to brain drain among the best qualified researchers. Over the years, this has hurt Ethiopia very severely.

Many developing countries have considerable "natural research advantages", for example in the form of an abundance of young, talented students and unique settings for research in specific fields (tropical flora, tropical diseases, etc.). These might be used as a basis for constructive cooperation with industrialized countries, but instead they sometimes lead to brain drain; even "scientific theft" of materials or research data is not unknown. Despite these risks, developing countries have little choice, but must rely on international cooperation to create the needed capacity for research and research training.

Higher Education in Ethiopia. Ethiopian higher education has so far been characterized by low expenditures (they reached a minimum in the early 1990s, at 1.2% of the national recurrent budget) and low admission (in the early 1990s, only 0.5% of the relevant age group). The present higher education budget for the country totals Birr 92 million (USD 15 million). Although investments in higher education are increasing these years, the total number of students is still below 40,000, less than half of these are degree students, and many (about half) study part time.

The oldest and largest university, AAU, has today about 6,000 undergraduate and a few hundred graduate students within its main campus, which covers essentially all major fields of higher education. A number of satellite campuses of AAU are today gaining increased independence (see later) and the number of independent higher education institutions in Ethiopia is growing. These include AUA and a number of specialized colleges. AUA with 1700 students (70 graduate students) is located 500 kms East of Addis Ababa. It belonged from the start in 1953 under the Ministry of Agriculture and still covers primarily agriculture and forestry. AUA was for several of the early years managed by a foreign university; it became a fully independent university in 1986. Recently it has been widening its activities to include other fields, especially social sciences (e.g. accounting and management). A Sida sponsored study of AUA is presently in progress (Sida, 1996).

The drop-out rates in Ethiopian universities are very high, partly because of language problems. Staff qualifications have improved in recent years, primarily due to expanding graduate programs at AAU; presently 20% of the academic staff at AAU hold a Ph.D. As in many other Third World countries, the academic environment in Ethiopia is heavily dominated by males. Less than ten percent of the university students are female; in electrical engineering only one out of 200 students is female. This is an indication of inefficient use of talent in the country and there is an urgent need for

new initiatives which may help increase the female participation in the academic life, for example through the use of role models for female high school graduates.

At present, the Ethiopian Government is engaged in a thorough revision of the higher education institutions, including an expansion of higher education activities to more regions and an increase in institutional independence. There are many reasons for this decentralization policy, both political ones, which should not be neglected, and real needs, e.g. for exploiting all local talent and for ensuring university trained manpower for all regions. This may be achieved by providing improved educational opportunities in each region. because of the present very low enrolment, the demand for higher education opportunities is likely to increase strongly (in order to offer higher education to ten percent of the age group, higher education institutions would have to be expanded by a factor 25). In this expansion process, the role of the established universities, primarily AAU, will remain dominant for years to come; one of their main tasks will be to train staff for other higher education institutions.

Due to the present transitional state of higher education in Ethiopia, the Team has refrained from a detailed evaluation of higher education in general, but has concentrated on those aspects of higher education which are most relevant in connection with the evaluation of the SAREC program and individual SAREC sponsored projects.

SAREC Support to Ethiopia. For years, Swedish aid through SIDA and SAREC (in 1995, SIDA and SAREC were merged with other Swedish aid agencies into Sida) has been of great importance in Ethiopia. The support provided through SAREC has within the present program totalled SEK 155 million since the late 1970s; it has been a major source of funds for Ethiopian research, even in times of severe national problems. SAREC's program in Ethiopia has explicitly targeted capacity building and is rare in the sense that it has attempted to provide all components: training, cooperative partners, equipment and other physical facilities, consumables, and literature, in a coordinated fashion. There is no doubt that the program has been essential for the survival of many Ethiopian research activities.

In order to maximize the training effect of the support, Addis Ababa University (AAU) and to a smaller extent the university in Alamaya (AUA), have been targeted. The choice of ESTC as the Ethiopian partner in the program has emphasized the particular role of hard sciences, which are the main responsibility of ESTC, in the development process. Also the relatively high costs connected with laboratory and field work has led to an increasing concentration within science based fields.

Most SAREC projects in Ethiopia are cooperative research projects between an Ethiopian and a Swedish research group. They are long term projects and run typically over 10-15 years. Often, the capacity on the Ethiopian side has been very limited at first and the Swedish group has been the leading force in the cooperation. Ideally, throughout the lifetime of a successful project, this situation will change gradually and by the end of the project, the Ethiopian group will be independent, sustainable, and able to cooperate on an equal footing with the Swedish counterpart and any other international research group in the field.

Research training is a key component in essentially all projects. Some training programs have taken place exclusively in Sweden, some (to an increasing degree) in Ethiopia, while other degree

programs were carried out under a sandwich model. In this model, the students work on Ethiopian problems, whenever possible, but part of the training takes place in Sweden. Close to one third of the support was used to provide Ethiopian institutions with equipment and other research facilities. This is an essential part of the capacity building process.

The distribution between fields shows the traditional donor preference for health and agriculture, but it is interesting that also the basic sciences on which these applications are based, biology and chemistry, received substantial support. The total support for each of the four fields over the years has been between SEK 20 and 30 million. Most of the remaining support went to capacity building activities in Ethiopia, e.g. as library and research journal support.

Fees are usually paid to Swedish institutions, primarily for research training activities. They are calculated from different formulas and vary strongly among the institutions, although most are at a reasonable level compared with most fees in the international higher education market. As a result of increasing economic constraints at Swedish universities, much valuable time is today spent on negotiations between SAREC and Swedish institutions about overheads, travel, and salary costs.

The SAREC program has no efficient, built-in system for monitoring and evaluation, particularly of project output and cost effectiveness. At the moment, annual progress reports for each project are prepared independently by the counterparts in Ethiopia and Sweden and submitted to ESTC and SAREC, respectively. In several cases, Ethiopian project participants received no information about the content of the progress report from their Swedish counterpart. Such a practice provides a breeding ground for suspicion between the partners, which may be harmful for the project outcome.

General Impression of the Projects. The Team found the scientific quality of most projects commendable and noted that scientific theft and brain drain to Sweden are very rare. However, while some projects made good progress towards complete capacity building, most have only established partial capacity by concentrating on the scientific research alone without paying much attention to the wider issues which are essential for capacity building, e.g. research management, procurement, equipment maintenance and use, and dissemination. Over two thirds of all project funds are still managed by Swedish counterparts, mostly on behalf of Ethiopian institutions.

Dissemination of research results to the international research community is generally satisfactory. The SAREC-supported and ESTC managed establishment of good, national journals in key fields is of major importance for the dissemination of research results to other researchers and some potential users within the country. While projects in the basic sciences help create the crucial foundation for applied research and training, other projects produce results of direct importance for large groups of the Ethiopian population. The dissemination of such results to the end users is often unsatisfactory. This is rarely the fault of the researchers, but is mainly due to shortcomings of the national systems for implementation of research results.

Partly because most projects have started as cooperation between individual researchers, they often depend strongly on individuals. Some projects have suffered severely or even failed because the Ethiopian project leader left for an extended period. It is important that the institutionalization of the projects is strengthened. Such a process was visible in a few projects, thereby reducing the risky dependence on individuals.

A common problem for projects carried out at AAU is that the university's research policy and its implementations are weak. The central administration has not been able to create a background, conducive for active research and research training. The leadership of AAU is aware of these problems and AAU is in the process of internal reorganization, in addition to the national reforms within higher education. It is essential for the performance of the many projects carried out at AAU that these efforts lead to much improved support, monitoring, and incentive systems at the university.

The general quality of research training in all three models used, the Ethiopian, the Swedish, and the sandwich model, was found to be satisfactory. The M.Sc. programs under the Graduate School at AAU and AUA are highly cost efficient; they are around a factor five less expensive than common international costs and the costs are an order of magnitude below those in the most expensive sandwich program among those supported (see below). The cost effectiveness in other projects is less impressive than that in the Graduate School at AAU, although the expenditures must be considered acceptable compared with international market costs. The student intake is low in most projects; if the student intake were increased somewhat, many projects might achieve a better cost effectiveness.

There has been a tendency for Ethiopian students to extend the studies in Sweden longer than seems reasonable; this may be a result of the relatively good conditions offered them and a lack of incentives to complete the studies. The training strategies seem to have limited direct brain drain considerably compared with that observed in other programs. While brain drain to Sweden is very low, later brain drain to other countries (after completion of the studies) is more difficult to avoid, although the continued contact with the home institution during the studies and the establishment of functioning research environments in Ethiopia may have a positive effect.

The physical facilities provided by the projects have generally been well selected and coordinated with the training. Therefore, the utilization is good in many projects; only one project demonstrated poor utilization (see below). Maintenance and spare parts have generally not caused major problems in the projects, because the equipment supplies were coordinated with the training (sometimes also technician training), because of access to Swedish know-how, and increasingly because maintenance facilities are being established under ESTC. In general, the equipment provided under the program has been well absorbed in the individual departments in Ethiopia.

In the TOR, the Team was asked to look closer at six selected projects, although a complete scientific evaluation should not be attempted. In the following, brief descriptions of these six projects are given, together with the project specific conclusions and recommendations of the Team.

Individual Projects: Flora and Ecology. The SAREC supported Flora and Ecology Project was initiated in 1980 as a cooperation between Ethiopian botanists, primarily from the Faculty of Science at AAU, and a group of Swedish botanists from the University of Uppsala. The purpose was at least threefold: 1) a flora for Ethiopia should be produced as fast as possible - the management of this task was initially given to a secretariat in Uppsala; 2) the National Herbarium at AAU should be strengthened and expanded to include a much larger portion of the plants of Ethiopia - to manage

this task, a secretariat was established at AAU; and 3) a much strengthened botanical research capacity should be built in Ethiopia.

In the brief evaluation report from 1990, a considerable amount of credit is given to the project. The main complaint is that the flora, in spite of many valuable contributions provided at no charge from European botanists, is being produced very slowly and is far behind schedule. Today, five years later, the flora is even further behind schedule, with only one out of eight planned volumes published; the optimism expressed by the project managers about an increased productivity is not convincing since similar predictions in the past have turned out to be unrealistic. It is obvious that the incentive structure in the project (as in many other projects) is unfortunate; there is no outside reward for punctuality, while delays are rewarded with extended funding.

Other activities under the project are progressing considerably faster: The Herbarium has been expanded to include a much larger share of the relevant plants, a related library has been established at AAU, although it is not yet satisfactory, the human resource development for Ethiopia has been generally successful with the training of five Ph.D.s, one M.Sc., and six technicians. Nevertheless, institution building in Ethiopia has been weak, the employment pattern of the botanists trained under the project is unsatisfactory, the project (as well as most of the funds - 70% over the years) is still managed by Swedish researchers. Only 9% of the total expenditures have been used for establishment of physical facilities in Ethiopia.

The Team concludes that the main reasons for this outcome is weak leadership on the Ethiopian side, lack of support from AAU, and a continued reliance on foreigners, including full-time employed European taxonomists, rather than on the Ethiopians trained in the project.

It is recommended to reestablish the Ethiopian Flora Board in order to work out a plan, including an improved incentive system, for fast completion of the Ethiopian Flora and that an efficient project manager is appointed at AAU and is given considerable managerial, including financial, responsibility. The earlier decision to appoint Ethiopian liaison officers abroad should be reactivated.

The Landscape Ecology Project is carried out in close coordination with the Flora Project, and shares some strengths and weaknesses with it. Although the scientific quality is good, the local capacity building is still insufficient, although provisions of hardware to Ethiopia recently has been increasing. The Team recommends that the project seriously start preparing for "project graduation" (i.e. transfer from SAREC to national funding).

The Biomedical Research Training Program. A relatively new graduate training project at AAU, placed in the Medical Faculty outside the Graduate School, consists of sandwich-type M.Sc. programs in biomedical subjects, carried out in cooperation with a leading Swedish research institution. The cost of an M.Sc. degree under this project is presently close to USD 200,000, but this number will drop to around half if the second batch of students in the project graduate without any high drop-out. Even then, the costs will be an order of magnitude higher than in the M.Sc. programs under the Graduate School.

Although biomedical research tends to be expensive, the Evaluation Team does not find the discrepancy justified, especially in view of the apparent lack of capacity building at AAU under the

project. The Team was worried about the negligible research activity at AAU that has resulted from the extensive provision of equipment (for over five million SEK) to the Medical Faculty of AAU. This is particularly striking in view of the good research standards in the Swedish partner institution and the high travel expenditures (SEK 2.4 million) paid in connection with Swedish counterpart visits to AAU; one would expect that these visits had made a stronger impact.

Exposing young students in a developing country to expensive, but poorly utilized equipment may have a very negative impact. The Team was also concerned that the employment record of the graduates from the program was not only poor, but also unknown to the local project management at AAU.

It seems clear that the project from an early stage became supply driven and that the Faculty of Medicine at AAU has not been sufficiently prepared for it. The Team does not recommend that plans for establishment of Ph.D. programs under the project are realized at the moment. A continuation and expansion of the project would require a considerable strengthening of the management in the Medical Faculty and much improved coordination of provisions of equipment, consumables, training, and available positions in the Medical Faculty, as well as the selection procedures for candidates to be trained. Furthermore, project accountability in a wider sense (e.g. including utilization of facilities and capacity building in the Medical Faculty) would have to be strengthened. ESTC, in cooperation with SAREC, would have to take a leading role in this process.

The Butajira Rural Project. The cooperative project between the Faculty of Medicine at AAU and the University in Umeå, Sweden, includes three major research activities: 1) Development and evaluation of a baseline population and sampling frame for health related activities and a system for continuous registration of vital health events; 2) control of acute respiratory infections in Ethiopian children; and 3) community-based studies of neurological disorders in Ethiopia. The projects are carried out independently by the departments of Community Health, Paediatrics and Child Health, and Internal Medicine, respectively. They were initiated by Ethiopian researchers and represent some of the very few studies of health conditions in an Ethiopian rural population.

All three projects have produced important epidemiological data of general scientific value and of particular relevance for the understanding of how the vast amount of acute and chronic disease in an Ethiopian rural community may be reduced. In addition, a considerable amount of research training is carried out (two Ph.D.s have graduated) and the neurological project is in the process of implementing an action plan for provision of rehabilitation services to rural populations.

The three projects are all well planned and implemented; however, the neurological subprogram is implemented independently, without sufficient coordination and cooperation with the other subprograms. The Team considers a closer cooperation and correlation of research and interventions essential. Another important task is to transfer part of the computer hardware and software, which has been provided through SAREC support, to the study area. At the moment the equipment is well utilized, but it all remains at AAU.

The Programs at the AAU Graduate School. The Graduate School at AAU has received support through SAREC since 1979. Presently, the support covers M.Sc. programs in biology, chemistry, physics, geography, civil engineering, and electrical engineering, as well as Ph.D. programs in

biology and chemistry. About half of the total number of 1200 M.Sc.s produced over the years have benefitted from SAREC support. Although the latter only covers about half of the direct costs (AAU provides the rest, primarily in the form of salaries), it is essential, since it may be used for foreign currency items and other items that do not fit into the normal budget.

The M.Sc. programs are very cost effective; the cost per candidate is an order of magnitude below that of overseas programs. At the same time the quality is satisfactory, the drop-out rate low, and the graduates usually have jobs to return to after completion of their degree. The Ph.D. programs are also of good quality, but are much more expensive, in particular because they require more advanced equipment, but such equipment is likely to benefit also other students and researchers.

The programs are almost completely managed by the Graduate School on its own. Only procurement of some items (equipment, etc.) was still performed in Sweden (by SIDA). The Team is convinced that also this task may be gradually transferred to Ethiopia. The programs under the Graduate School at AAU are, on the whole, remarkably successful, and they satisfy key needs of the country, both in connection with the expansion and strengthening of the higher education system and elsewhere.

One concern, raised during discussions at AAU, was that the internationalization of the programs is weak; there are, for example, no funds for international external examiners or visiting professors. In view of the importance of the programs, additional support for such purposes may be considered. The Team recommends that the SAREC support is continued, possibly with an increasing emphasis on engineering subjects. The involvement of SAREC may even be seen as a mechanism for transfer of the successful design of the local graduate training to other countries where SAREC is active.

The Integrated Pest Management Project. The project started in 1984 with a Ph.D. program for an Ethiopian entomologist. After successful completion of the training, a research cooperation project developed between the graduate, now employed at Awassa College, and a Swedish group in Uppsala. The subject for the cooperation was the maize stalk borer, a harmful pest in large parts of southern Ethiopia. The project has been a scientific success producing solid, internationally published research results. Although most funds have been managed by the Swedish counterpart (69%), the competence established in Ethiopia is considerable. Some of the research results, especially the finding that changing the planting time for maize may completely prevent losses due to the maize stalk borer, has great potential value for poor farmers. Unfortunately, the dissemination to local users of these findings is still unsatisfactory.

In 1991, before the Maize stalk borer studies were completed, the project was widened in scope to cover "integrated pest management", and research training became a more prominent goal. It is clear that the researchers involved are highly competent and that the project is important, both scientifically and economically. The Team considers this project a candidate for "graduation", i.e. for transfer from SAREC support to national funding sources.

Any successful basic science research project may be extended in time and expanded in scope for good scientific reasons, such actions may also help delay "graduation" from SAREC support. The opportunities provided to researchers working on SAREC funded projects are much better than those for most other researchers in Ethiopia and it may seem risky for a project to "graduate".

Nevertheless, this process must take place regularly for SAREC supported projects in order to give other research fields the opportunity to develop with SAREC support.

The Photovoltaics Project. The project was initiated in 1990. It is (together with a few other projects) unique in the sense that it does not involve any Swedish scientific counterpart. The purpose of the project is to test the potential of solar energy production in rural areas. Three test sites have been established, providing information on the feasibility of solar cells as an energy source for water pumping of either ground water for drinking or surface water for irrigation.

The results of the tests are promising; service and maintenance problems are minimal and local demand at the sites for water is very high. However, there are also problems: The procurement of equipment and materials through SIDA has so far not worked well. In particular, incomplete or incorrect items have frequently been provided. The Team is convinced that this procurement might be transferred to the project in Ethiopia.

Cooperation with a researcher in the UK on a planned Ph.D. program for an AAU Engineering Faculty staff member has just started, but the initial experience is mixed. The Photovoltaics Project is strongly dependent on a single researcher at AAU and it is difficult to secure an institutionalization of the project in the field of solar energy, where the number of researchers at AAU is small. Inclusion of a wind energy component, an activity which earlier was supported through SAREC, in the project has been proposed. Such expansion of the project scope would bring a larger group of AAU engineering researchers into the project and might, for this reason alone, be useful.

The solar energy project is an example of an engineering project which may have a large, positive impact, both on human health (by facilitating access to safe drinking water) and on food production (by making irrigation possible). However, in itself, it is limited in scope hardly able to have a wider effect on technology development in Ethiopia.

It is remarkable that such technology projects usually are given much lower priority by donors than traditional health or agricultural projects. As mentioned above, the profile of SAREC's support for applied sciences in Ethiopia follows this traditional pattern. As the leading donor in the field, SAREC might consider expanding the support for research capacity building in Ethiopia towards engineering. In addition to the benefits that would come from the results of such research, the support would help strengthen engineering education in the country. It is important that such a strengthening takes place before the demand for engineering manpower in Ethiopia starts growing too fast.

Recommendations: The Projects. In addition to the project specific recommendations above, a number of more general recommendations are given. The Team recommends that SAREC's support of research in Ethiopia is continued with an increased emphasis on institution building and creation of independent and sustainable, complete research capacity in each field. Dissemination of research results to users must be strengthened and ESTC is urged to actively support this process.

The increased emphasis on institution building would, among other actions, require a gradual transfer of responsibility for financial management of funds earmarked for the Ethiopian institutions

to the Ethiopian counterparts. The expediency of such transfer depends on the capacity in each individual project/institution. The transfer process, which the Team considers very important, should be carefully monitored by ESTC and SAREC together in order for both to benefit fully from the experience gained.

Target dates must be set for completion of each major activity and the present rewards for slow progress towards project "graduation" or completion of individual degree programs must be replaced by incentives for punctual performance.

Continuous monitoring and regular evaluation are key instruments for project control and must be strengthened for the program as a whole and in each project. It is essential for the cooperation that the counterparts are required to produce regular (annual) progress reports in common, providing information on outputs, including capacity building in a wider sense. This would also provide ESTC and SAREC with a common background material for their negotiations. The introduction of a report form might help ensure comprehensive and standardized information, emphasizing capacity building and project outputs. A step in this direction may have been taken in the 1994/95 agreement between ESTC and SAREC where a listing of expected results was included. It is essential that such efforts to emphasize project outputs are given a strong follow-up.

Finally, continuous, direct communication between individual researchers on the two sides is a necessary condition for productive capacity building; it is recommended that projects without convenient access to electronic mail or faximile communication establish such facilities without delay.

The Working Relationship between ESTC and SAREC. The misunderstandings, which have occurred between ESTC and SAREC, are not caused by a disagreement on the goals of the cooperation. They are primarily a result of the changing demands to the two partners resulting from the introduction of an Ethiopian national S&T policy and the efforts to implement it. The cooperation may have suffered further due to slow and inefficient communication between the partners. It is clear that considerable flexibility on both sides together with an improved communication are required to adjust to the new situation. However, the increased independence of ESTC and its more active involvement in the implementation of the research policy is an important step towards the establishment of true national research capacity in Ethiopia. Such capacity building is an essential component of the goals of SAREC's work. The Team has been given the Terms of Agreement between ESTC and SAREC of June 30, 1994 (Annex IV) and finds that these, for the time being, form a constructive foundation for present and future cooperation between the two organizations.

Recommendations: Program Management. The improved availability of national funds for research in Ethiopia is likely to reduce the dependence on SAREC. This will simplify both project graduation and the selection of projects for support, since alternative funding may be provided for projects which graduate from SAREC support or are given low priority by SAREC. The Team strongly recommends that ESTC and SAREC take full advantage of these new opportunities.

The Team considers monitoring and evaluation, both through improved annual progress reports and more thorough project evaluations every 3-5 years, important instruments for program

management. An increasingly active involvement of ESTC, together with SAREC, in regular monitoring of all project expenditures and outcomes is essential in order to improve the quality of the monitoring, to facilitate the cooperation, and as a learning process. If needed, SAREC might further expand its direct economic support for ESTC, e.g. through support for training activities for ESTC staff and other Ethiopian research managers (e.g. from AAU) within research monitoring, procurement, and other management fields. On the Swedish side, the Team recommends that SAREC makes a strong attempt to standardize compensation provided to Swedish institutions and strictly enforce a set of standard practices. This will save time for more important tasks.

It is important that SAREC, together with other relevant donors, actively support the implementation of the new S&T policy for Ethiopia. This would include actions to assist in the further development of ESTC, which still needs considerable strengthening to handle its immense task. In view of the history of continuous SAREC support over many, often difficult, years, the size of this support, the successes accomplished, and the experience gained through the cooperation, it would be a missed opportunity if SAREC did not remain the leading bilateral partner for ESTC in this new and important process.

2. BACKGROUND

2.1 ETHIOPIA: GENERAL INFORMATION

Physical Features. Ethiopia is situated between 3 and 18 degrees North, and between 33 and 48 degrees East, in the Horn of Africa. The land area is approximately 1.24 million km^2. Ethiopia's northern neighbour is Eritrea; to the west and to the south it shares borders with Sudan and Kenya, respectively; and to the east and south-east it borders the republics of Djibouti and Somalia. With the declaration of independence by Eritrea on May 24, 1993, Ethiopia has become a land-locked country without any sea ports of its own. Ethiopia is physically unique in Africa because of the large proportion of its landmass which is over 2000 meters above sea level; in these large areas the climate is more temperate than tropical.

Temperatures vary widely throughout the country, from the hottest on earth to those of the frost prone Afro-alpine zone. Rainfall also varies in both amount and distribution, ranging from a few showers per year in the semi-arid zone to more than 2000 millimeters annually in the western highlands. Soils used for agriculture are predominantly formed by volcanic materials. This, together with temperate highlands and adequate rainfall, makes the country potentially rich for agriculture. However, unfortunate climate fluctuations, inefficient, traditional farming practices and inefficient agricultural development policies of the previous government have reduced the productivity.

The Economy. Ethiopia, with a population of 55 million (World Bank, 1994) is the second most populous country in Sub-Saharan Africa. In addition to the agricultural potential, its natural resources include gold, platinum, tantalum, soda ash, and potash. Substantial gas reserves exist in its eastern region. Gold has been exploited on a large scale and there are good prospects for developing other exportable minerals. Agriculture is the backbone of the Ethiopian economy, accounting for 48 percent of the GDP, 80 percent of the employment, and 85 percent of the exports, especially coffee, which produces 60 percent of the foreign exchange earnings.

The agricultural sector depends mainly on peasant farming with little modern inputs in terms of farming techniques. Field crops account for about 40 percent of gross agricultural throughput, livestock for another 40 percent, and cash crops for the rest. The industrial sector contributes only 12 percent of the GDP and 15 percent of the export earnings. The service sector accounts for the rest of the output, largely due to the prominent role of the Ethiopian Government in the economy. Basic infrastructure is poorly developed; Ethiopia has one of the lowest road densities in Africa (84 km per million inhabitants). Nearly three-quarters of its farms are more than a half-day's walk from all-weather roads (World Bank, 1993).

Ethiopia ranks as the third poorest country in the world (World Bank, 1995), with a per capita income of US$ 110. Social indicators are consistent with the low per capita income. The infant mortality rate is high, 154 per 1,000; life expectancy is low, 48 years, and attendance at primary schools is poor, only 36 percent and much lower in some regions. The average daily calorie intake of 1750 is well below the average required for a healthy life (World Bank, 1993).

The economic performance during the last decades has been poor. Real GDP growth was only about 2 percent during 1973-90, when the population growth was 2.9 percent per year. The poor economic performance is a result of unfortunate economic policies, severe fluctuations in weather

conditions, a protracted civil war, and low levels of development assistance. The civil war, combined with the effects of the policies of the previous government and the effects of drought and environmental damage, has resulted in a large share of the population being disadvantaged and very poor. In particular, an estimated 7.4 million people in Ethiopia are vulnerable to drought (World Bank, 1993).

Economic and Political Reforms. In May 1991, the government was ousted by a coalition group headed by the Ethiopian People's Revolutionary Democratic front. Following a national conference, a transitional Government consisting of a broadly based Council of Representatives and Council of Ministers was installed, with the task to establish a democratic constitution leading to free elections. A constitution was drafted and approved by the constituent assembly elected from all nationalities in the country, and a general election was scheduled to be held in 1995.

In November 1991, the Transitional Government of Ethiopia published an economic policy statement providing a framework for restructuring and reforming the economy. The policy document emphasized a limited economic role for the state and established a basis for liberalisation of the economy. The Government has implemented several policy measures aimed at stabilizing the economy and stimulating economic growth. It devalued the currency, corrected distortions in key prices, introduced a foreign exchange auction making foreign currency exchange available to all, decontrolled most prices, simplified export licensing requirements, and introduced a new investment code.

The new government also introduced improvements in governance, such as devolution of power to the newly formed regional administrations, improved accountability, and strengthened democratic processes. It has attempted to maintain the effectiveness of the civil service and key public sector agencies. Because of these and other measures, growth in the Ethiopian economy has been revived, with the real GDP increasing by an estimated 7 to 8 percent in 1993. It is expected that with the democratization process and market-oriented economic policies, the economy will grow reasonably fast in a sustainable way. The most critical problems at the moment are how to improve agricultural production and productivity to overcome the longstanding structural food deficit of the country, and to establish food security protection against harvest failure. In all these efforts, increased support of foreign donors will be highly important.

For years, Ethiopia has not received development aid comparable to other similar countries and commensurate to its needs. The main reason has been the economic policies and hostile political environment of the previous government. It presently receives less than USD 20 per capita, including humanitarian assistance (World Bank, 1994). This is the lowest amount for all countries in Sub-Saharan Africa.

The low allocation of development assistance also plays a role for the research activities in the country; it is common in Sub-Saharan Africa that research activities to a large extent are financed by foreign sources. Nevertheless, during the years of the former government, Ethiopia did receive foreign research support in various forms, both bilateral and multilateral. The most important bilateral research support during the last, difficult decade has come from Sweden through the Swedish Agency for Research Cooperation with Developing country (SAREC). Despite ill-

conceived economic policies and poor governance by the former government, the research support through SAREC has been increasing over the period.

The Relationship between Ethiopia and Sweden. The relationship between Ethiopia and Sweden goes back to the middle of the nineteenth century when Swedish missionaries entered the country. A number of individual Swedes played a substantial role in the promotion and strengthening of the Ethio-Swedish relationship; this eventually led to the initiation of a Ethio-Swedish governmental cooperation, and Ethiopia became the first country to receive Swedish development aid (SIDA, 1989, p.1). The Swedish assistance increased progressively and has contributed in many critical areas, in particular targeting the social needs of the country, education (e.g. support for primary schools and printing facilities for educational materials), health (e.g. the establishment of the Ethio-Swedish Paediatric clinic), and agriculture.

The fundamental principle of the Swedish assistance has been to support the process of constructive change in recipient countries in order to strengthen economic growth, economic and social equity, democracy, economic and political independence, and environmental protection (SIDA, 1989, pp 7-8). One of the interesting aspects of Swedish assistance to Ethiopia has been the emphasis on institutional development as part of individual projects and programs components, as illustrated by several past and on-going projects (Negewo, 1996). Also SAREC's research capacity building support shares the Swedish tradition in which "economic and political independence" is one of the main objectives. Obviously, without institutional development, economic and political independence would be unthinkable.

Further information on the general background for the program in Ethiopia is given in Negewo, 1996.

2.2 RESEARCH CAPACITY BUILDING IN THE THIRD WORLD

The Need for Improved S&T and Research Capacity. A major difference between industrialized and developing countries is the ability of the industrialized world to create, select, and use scientific knowledge. Due to the recent fast technological development, industry, agriculture, and health in a country may benefit greatly from efficient use of scientific knowledge.

Scientific knowledge is often internationally available at no cost. The problem many developing countries face and which prevents them from taking advantage of the opportunities offered by science based technology, is a severe shortage of research trained manpower and S&T institutions, which are able to develop, select, modify, apply, and disseminate science based knowledge.

Some industrialized countries face similar problems. In particular the United States also has a shortage of S&T manpower, but has found it easy to solve this problem by importing the needed manpower. This is hardly a long-term solution for Third World countries, although both international development organizations and bilateral donors have supplied large amounts of short term technical assistance to developing countries. There is a growing consensus that such solutions

are frequently expensive and of poor quality. Import of S&T manpower does not offer a sustainable solution for the Third World.

Creating S&T Capacity in the Third World. If foreign labour is not a solution, the most obvious strategy is to train the nationals of a country in the fields of manpower needs. Since the higher education systems and the potential for research training in most developing countries are still unsatisfactory, the obvious solution has been to provide overseas study opportunities in industrialized countries for talented students from the Third World. Unfortunately, this model has not been widely successful: The costs of foreign research training have often been very high, and the students have often specialized in less relevant fields.

Brain Drain. The most damaging outcome of long-term foreign training, especially for graduate students from the poorest countries, is that they do not return home after graduation because of job offers from the industrialized countries which suffer from their own S&T manpower shortage. Particularly in the case of low income countries in Africa, brain drain has been, and still is, a very serious problem.

Higher Education and Research Policies in Ethiopia. Higher education and research are not likely to be sustainable and useful unless they are part of national policies within education, research, and S&T, and coordinated with the agricultural, environmental, health, and industrial policies in the country. In the past, Ethiopian governments did not have a clear understanding of this and no efficient national research policy was established. Nevertheless, some donors, foremost Sweden through SAREC, have continued to support Ethiopian research over the years, with the positive result that a research culture exists in the country, although it is often totally dependent on external resources. Donor directed research activities and donor tailored research projects dominate. In spite of many good qualities and intensions, the extensive research support through SAREC has not been a clear exception to this trend.

S&T Transfer to the Third World (For further details see Negewo, 1996). The transfer of science and technology to less developed countries like Ethiopia may be divided in three phases (Hayami and Ruttan, 1985) The first is hardware transfer - raw materials, machinery, laboratory and other equipments, etc. - without much local participation or adaptation. Most donors have been providing such assistance and some of SAREC's research support is of this nature. Often, technology transferred this way become inefficiently operated, underutilized, and poorly maintained. Some countries have become graveyards of such equipment.

The second type is "design transfer" where blueprints, methods, formulas, books, etc. are provided in order to encourage and facilitate domestic production. This kind of transfer is rare in the case of Ethiopia. SAREC research support has attempted it in a constructive fashion, through sandwich and twinning research training programs, focusing on domestic issues.

The third phase involves the establishment of an international status in scientific and technological knowledge and an ability to use it in the development process. It is the transfer of "scientific knowledge and capacity which enables the production of locally adaptable technology" (Hayami and Ruttan, 1985). Such capacity is very limited in Ethiopia. It may be developed primarily through long

term investments in research trained professionals and by providing satisfactory work environments for them. The research support from SAREC has been instrumental in this connection; the projects have supported research training in which domestic problems and issues have been emphasized and the build-up of research facilities in Ethiopia.

Aid for S&T Capacity Building. In view of the long-term importance of S&T know-how in a country, it is remarkable that most bilateral donors only provide a very small share of their aid to developing countries towards research and higher education. The total support for higher education is estimated to at most a couple of percent of the global development assistance (Eisemon and Kourouma, 1992). In a Canadian study, the aid provided for research is estimated to be close to two percent, this corresponds to around USD two billion annually (IDRC, 1991). However, much of the aid towards higher education and research is probably counted in both studies, so that the total for higher education and research combined may be estimated to around three percent.

Key Project Components. In spite of differences in national needs it is possible to identify some main components of good higher education and research capacity building project. If these components are not present before the start of the project, they must be provided during the project (Thulstrup, 1995):

1. Training, especially of university staff, including researchers, teachers, technicians, librarians, and managers in **all relevant aspects** of university education and research,

2. provision of buildings for teaching activities, research, libraries, administration, and possibly for housing of staff and students,

3. provision of teaching facilities, including class-rooms, teaching equipment, teaching laboratories, etc.,

4. provision of research equipment, computers and service facilities for research and teaching equipment,

5. funds for operation and maintenance - it is generally considered important that these are provided by local sources,

6. provision of textbooks, research journals, access to data bases and other communication channels - in recent years electronic communication (faximile, electronic mail) has become an extremely valuable tool for international communication among researchers,

7. on a national level, support for development of professional societies, subject specific research journals, and communication channels between universities and users of knowledge (i.e. industry, extension services, health workers, schools, etc.),

8. access for university researchers and educators to international communities in the relevant fields;

9. incentive systems at all levels (at universities, faculties, departments, and for individual administrative staff, teachers, researchers, and students) which ensure that facilities and working time are used in the most productive fashion - an important part of such incentive systems are well designed and fair promotion rules and salaries, which make full time work efforts possible, and

10. monitoring and evaluation systems, not only for the build-up phase, but more importantly for the productive situation that is supposed follow after the initial investments.

Capacity Building Through North-South Cooperation. Capacity building in research and higher education in developing countries is usually a difficult task. Successes are likely to be rare. One reason is that governments in Third World countries must satisfy many very basic needs. Research and higher education often seem less urgent. Although the economic rate of return for investments in S&T, higher education, and research may be very high, it usually appears only after many years. This makes it tempting to invest in other activities for which the outcomes are faster and more visible. This is the main reason for the low production of research outputs observed in most developing countries.

Research Publications from Ethiopia. As an illustration of the magnitude of research output at an international level in Ethiopia, Table 2.1 shows the annual number of articles published by Ethiopian organizations during two recent years, 1987 and 1992. The data have been obtained from the Corporate Science Citation Index (SCI), and are listed according to major scientific field. The division between fields is based on the organization of the author, which usually also represents the field of the research. Although the information that can be extracted from SCI does rarely tell the whole story, it is clear that the production of international papers is modest and typical for a developing country (Thulstrup, 1994). However, the progress between 1987 and 1992 is considerable (57 percent); at AAU it is over 150 percent. AAU produced well over one third of all international papers from Ethiopia in 1992.

The present global distribution of research capacity makes involvement of researchers from industrialized countries necessary for efficient research capacity building in the Third World. There has been some disagreement on their exact roles, but recently the interest for a direct cooperation between individual research groups in the North and the South has been increasing (Gaillard and Thulstrup, 1994). The initial lack of capacity in the South often leads to an asymmetry in the cooperation, with the more experienced researchers located in the North and the less experienced in the South.

Table 2.1 Number of Ethiopian Publications from 1987 to 92 in International Journals, According to Field.

Number of Papers:

	T	H	A	B	C	O	From AAU
1987	97	50	29	7	5	5	21
1992	152	64	48	18	8	14	55

Percent increase in published papers between 1987 and 1992:

T	H	A	B	C	O	From AAU
57	28	65	157	60	180	162

T: Total number of articles published
H: Health (nutrition, medicine)
A: Agriculture
B: Biology
C: Chemistry
O: Other, including physics, geophysics, architecture, etc.
From AAU: The number of articles published by AAU researchers

Source: Science Citation (Corporate) Index

The asymmetry may create serious risks for the capacity building process, if tasks are divided according to the former experience of the partners. This may prevent partners from the South from being in charge of (and acquiring experience in) essential tasks like procurement of equipment and chemicals, as well as planning and dissemination of research. It is often overlooked that the main task is capacity building, not production of research results, although the latter may be an important indicator for capacity.

Scientific Theft. In some cases the research interests of the partners from the North have been so strong that it has led to scientific theft - research results obtained on material collected by researchers in developing countries have been published by researchers from the North without giving proper credit. Other, frequently quoted examples of scientific theft include cases where rare plant species have been exported illegally from a developing country for scientific purposes (Thulstrup, 1995). The standards for good behaviour in these matters vary a great deal between different parts of the World, but seems to be high in the SAREC supported projects.

Brain Drain Resulting from North-South Cooperation. In a North-South partnership project, there are often good reasons for training activities to take place in the North. It is particularly important that this does not reduce the contact with the home base and that the training is directly related to future tasks at home (Thulstrup, 1994). This is not always done well; at the Faculty of Economics at the University of Mozambique, generous support for staff training and other opportunities led to an almost complete depopulation of the Faculty, with only one full time teacher left (Olsson, 1992).

As mentioned above, a frequent outcome of high quality research training abroad is brain drain - trained staff leaves the home institution or never returns because of job opportunities in industrialized countries. This is a particular risk when all the training takes place in industrialized countries with a shortage of S&T manpower. Brain drain imposes an enormous burden on most African countries - almost half of all their university graduates now work in other countries (Olsson, 1992). Also many Latin American and Asian countries suffer severely from brain drain.

Donor organizations, including the development banks, often seem unable to prevent this outcome of foreign training. Many still provide assistance for capacity building in research and higher education in developing countries (particularly in the case of African countries), which is dominated by support for foreign training (69% of the support for higher education in Cameroon and 72% in Nigeria, according to Eisemon and Kourouma, 1992). In view of the fact that brain drain is often an almost integral part of poorly designed overseas training programs, this kind of assistance may be of highly questionable value.

Guidelines for North-South Capacity Building Projects. Research capacity building in the Third World is likely to require support over long periods, typically 10-15 years (Danida, 1992). When well designed and implemented, cooperation with industrialized countries provides efficient guidance during a research capacity building process (Gaillard and Thulstrup, 1994). However, it is an important condition that suitable partners, with a common interest for capacity building, not only for production of research results, can be identified in both countries. SAREC is one of relatively few organizations that consistently has used the North-South cooperative model for higher education and research capacity building.

Based on the experience gained through the many years of SAREC support of higher education, research and research training in the Third World, Bhagavan (1992) lists a number of key recommendations for projects based on cooperation between institutions in developing and industrialized countries:

1. Each cooperating group should include a substantial number of researchers (the cooperation should be "institutionalized"),

2. the partners should meet regularly to review ongoing work and plan future activities,

3. transparency in all budget matters should be ensured,

4. research papers should be written jointly - e.g. names from both cooperating research groups should appear on the research publications, and

5. project managers on both sides should be senior scientists in central positions in their respective institutions.

Identical criteria for fruitful cooperation appear to be valid in other programs (Gaillard and Thulstrup, 1994). They are, for example, also listed in the evaluation report for the Danish ENRECA program (Danida, 1992), where some further recommendations are added:

6. Capacity building must include all aspects of the work to be done (not only the research itself, but also how to invest in and manage research facilities, and disseminate research),

7. no single capacity building project is able to secure development on its own, but must be designed in coordination with related activities in the country,

8. research training is an important part of capacity building towards sustainability. In order to increase the commitment, it should, whenever possible, be part of formal degree programs,

9. the remuneration of local staff involved must be sufficient to ensure a full time commitment,

10. efficient and fast communication channels, such as faximile and electronic mail, must be available to secure efficient interaction between partners, and

11. project monitoring and evaluation are important, both as learning processes and as a way of providing guidance and incentives to project participants. Monitoring should emphasize project outputs rather than inputs.

2.3 THE ETHIOPIAN SCIENCE AND TECHNOLOGY COMMISSION AND THE NEW SCIENCE AND TECHNOLOGY POLICY IN ETHIOPIA

The Ethiopian Science and Technology Commission. ESTC was created in 1975 by the Government of Ethiopia, with the mandate to plan, encourage, guide, coordinate, choose, approve, and support research programs and projects of importance to national development. A key task was to distribute the very limited national research funds. Already in the middle and late 1970s ESTC established eight research councils within itself to be responsible for the following research sectors: 1) Food and agriculture; 2) industry and technology; 3) natural sciences; 4) natural resources; 5) health; 6) construction, housing and urban development; 7) education and manpower development; and 9) science and technology popularization. This was a functionally appropriate structure, resembling those in several other developing and in many industrial countries. However, during the first fifteen years, the structure never worked in practice as planned.

Science and Technology Policy in Ethiopia. In the early 1990s, it was clear that the prevailing conditions in research and S&T management in Ethiopia, especially the lack of a clearly articulated policy, prevented research from effectively promoting national development. In an initiative rare for African countries, the Transitional Government of Ethiopia formulated an S&T Policy for Ethiopia with the purpose of increasing the country's S&T capability, coordinating related S&T activities, and enhancing their contributions to the national economic development. The major chapters in the policy document describe the objectives of the national S&T policy, directives, strategies, and priority sectors and programs. The document also defines the national S&T organization and structure, sources for financial support and priorities for international research collaboration (Annex V).

The immediate purpose of the S&T policy is to initiate specific and detailed research policies and prioritized action programs for different economic sectors. The main areas targeted are essential for the development process. The specific goals mentioned are:

1. To build a national capability to generate, select, import, develop, disseminate, and apply appropriate technologies for the realization of the country's socio-economic objectives and to rationally conserve and utilize its natural and manpower resources,

2. to improve and develop the knowledge, culture and scientific and technological awareness of the people of Ethiopia, and to promote the development of traditional, new, and emerging technologies, and

3. to make science and technology activities in the country more efficient and development oriented.

The new policy is intended to assist governmental bodies as well as private organizations in the planning of S&T activities. In addition, it will serve as a basis for the participation of Ethiopian researchers in international scientific and technological cooperation.

2.4 HIGHER EDUCATION IN ETHIOPIA

Background. In the last decade, Ethiopia has spent very little on the educational sector, compared with other developing countries with similar birth rates. A minimum was reached in 1991, when only ten percent of the national recurrent budget was used for education (Turner, 1992). The higher education share of the national budget was 1.2 percent. Presently, the higher education budget totals Birr 92 million (USD 15 million), of which almost half goes to AAU.

As a result of the low spending, educational opportunities in many regions of the country are very poor; in some areas less that ten percent of twelve year olds complete primary education. It is estimated that around ten percent of the relevant age group receive secondary education. Even for

them, the situation is not completely satisfactory; schools are often poorly equipped and teachers poorly trained.

The percentage of the age group that attend higher education was 0.5% in 1984, but had dropped to 0.4% by 1992 (Turner, 1992). This is a very low number compared with most other developing countries. In spite of the limited provision of secondary education in Ethiopia, the number of bright young secondary school graduates who want to receive higher education vastly exceeds the present capacity of the universities; at the moment only around five percent of the applicants are accepted as university students.

Selection of Students for Higher Education. The procedures for selection of students for higher education among the secondary school graduates is based on their performance in the final examination. The tests in this examination are widely criticised for being unfair; the bias is towards male students and those from the Addis Ababa area. Much talent among secondary school graduates never gets the best educational opportunities; for most students, however, this loss of educational opportunities has already taken place much earlier in school. Students who score high in the final examination have a fairly free choice of subjects they want to study, while those with a lower score will have to accept a field of study which may be far from their interests and talents. There is little doubt that this system needs considerable improvement.

Female Participation. In order to increase female participation, the minimum score required for females is lower than for males. Nevertheless, although one third of the secondary school students is girls, only around fifteen percent of the university students are women; at AUA it is only five percent. In reality, the situation is even worse, since among the few girls who attend higher education, most prefer shorter diploma programs instead of degree programs; the top preference among girls is secretarial programs.

In the Department of Electrical Engineering at AAU, which the Team visited, only one student out of a few hundred was female. The low female participation in this and similar fields represents a severe waste of valuable S&T talent which the country can hardly afford. The low female participation is also visible in SAREC supported projects: During 15 years of support to numerous projects in Ethiopia, not a single project has had a female principal investigator on the Ethiopian side. Since successful female researchers as role models for young students might have a considerable effect on their career choice, this may be considered a wasted opportunity.

It is encouraging that a new national S&T policy directive calls for a "facilitation of the conditions for wider participation of women in S&T activities" (ESTC, 1993). Since producing an increase in the female participation is a long-term project, actions must be taken as soon as possible.

The Universities in Ethiopia: Addis Ababa University. The oldest university in Ethiopia is the University of Addis Ababa (AAU), which was founded in 1950 as the University College of Addis Ababa. In 1961 it was merged with other tertiary education institutions under its present name. It covers essentially all fields and has since 1978 established a range of graduate programs. Until recently, AAU had nine campuses and administered a number of colleges in other locations, for example the Gondar College of Medical Sciences, the Awassa College of Agriculture, and the Bahir

Dar Teachers College. Presently, these satellite institutions are in the process of increasing their independence.
The AAU is governed by a **Board of Governors** with six members appointed by the Government. Presently it includes the Chairman of ESTC. It formulates the general university policy, approves the annual budgets and progress plans, and determines the conditions for the employment of academic staff.

Another governing body is the **Senate**, which consists of the university president and the two vice-presidents (for academic and administrative affairs), the deans of the faculties, the registrar, and others. The Senate decides on academic matters, including examinations, diplomas, and degrees, and on the promotion of academic staff.

Research is part of the duties of the staff of AAU; ideally the academic staff should spend at least as much time on research as on teaching. In practice, this is not common. The **Research and Publications Office (RPO)** has the overall responsibility for supporting and coordinating research at AAU in cooperation with faculties and departments. Based on specific proposals, the RPO may provide financial support to research projects at the university. Dissemination of research results is considered an important activity; it is an important factor when academic staff promotions are decided. In order to support this process, AAU publishes over half a dozen Ethiopian journals of high quality, covering most research fields at the university.

It is a severe problem at AAU that the administrative capacity is weak and that unnecessarily complicated administrative procedures still are common. The university management is aware of this and is trying to improve matters. The university has been able to attract funding from several foreign donors, with SAREC as the most important. Attempts to efficiently monitor the supported research projects from a central office at AAU have not yet succeeded. Most donors are not attentive to the situation at AAU and do not support the AAU management, e.g. by making the projects more transparent.

The present total enrolment at the main campus of AAU is around 6,000, only a few hundred of these are in graduate programs, mostly Masters programs, within 27 disciplines. Annually, around 150 candidates, including many university staff, graduate from the M.Sc. programs (AAU, 1994). The build-up of local graduate education is considered extremely important also because the university for many years has suffered a severe loss (brain drain) among those staff members who study abroad for a research degree.

Other Universities. The Alamaya University of Agriculture, located 500 km East of Addis Ababa, is the second national higher education institution. Started in 1953 as a specialized college, placed under the Ministry of Agriculture and covering only the fields of agriculture and forestry, it was for several years managed by Oklahoma State University (USA), which even appointed the presidents of the college. It became an independent university in 1986. AUA has 1700 students (70 of them graduate). Among the teaching staff of 160, almost half have Masters degrees and one out of six a Ph.D. The university is presently expanding its activities to include accounting and management. A Sida sponsored study of AUA is in progress (Sida, 1996).

Among the other tertiary educational institutions are the Bahir Dar Polytechnic Institute, the Jimma College of Agriculture, the Kobete College of Teacher Education, and the College of Commerce. The two latter are situated in Addis Ababa.

In addition to full time diploma and degree students, the tertiary education institutions serve a large number of part time students on extension programs. In 1990/91, 11,000 out of a total of 18,000 diploma students were in extension programs, while 5,000 out of 15,000 degree students studied part time.

High Drop-Out Rates. Even with the limited participation in higher education in Ethiopia, a multitude of problems for both teachers and students, together with unsatisfactory physical facilities, have an effect on the ability of the students to complete their studies. Among engineering students at AAU, for example, the drop-out rate is around 40 percent, despite the fact that the students have been carefully selected before entering both the university and the engineering program. At AAU, engineering students spend the first year in the Science Faculty; out of 1500 students only 200 of the best are accepted for the remaining four years of engineering studies.

Many of the students who fail come from rural areas and have an insufficient high school preparation for their studies. They often lack textbooks, sometimes even paper to write on. Also language problems are often serious; English is the language of instruction in higher education, but many students are far from sufficiently prepared for it. Finally, a high drop-out rate after the first year has become a necessity, since the intake and first year capacity greatly exceeds the second year capacity in most higher education programs.

The Working Conditions for Staff at Ethiopian Universities. As in many other developing countries, the working conditions for Ethiopian university staff are not ideal. Salaries of university teachers are low and the rewards for high quality teaching are often hard to find. But there are also other problems. Buildings and laboratories are often in bad physical shape, the equipment tend to be old and sometimes out of order, and the procurement of supplies, such as chemicals for teaching and research, often create problems. Fortunately, there are also bright spots; in some institutions the equipment available is working well and moral is high. The support through SAREC has been an important factor in this connection.

The qualifications of the teaching staff of the tertiary institutions have been improved very much through the graduate programs, primarily at AAU, but also at AUA. A typical career pattern for a teaching staff in an Ethiopian university consists of a first employment as graduate assistant, after the Bachelors Degree has been obtained. Studies during this employment may later lead to a Masters Degree, which opens the possibility for obtaining a full faculty position. Relatively few proceed from their M.Sc. to a Ph.D. At the moment, around 20 percent of the academic staff at AAU have earned their Ph.D.

Weak Incentive Systems for Research. Visits to some departments at AAU and meetings with representatives from other educational institutions in Ethiopia gave the Evaluation Team a strong impression of the amount of professional competence and research interest in the country. However, the lack of a conducive research environment, unsatisfactory incentive systems, and

missing rewards for outstanding research and teaching efforts by university staff were frequently mentioned as the most serious problems, although published research results and research degrees obtained do play a role for promotion in the university system.

Human Resources in Ethiopian Universities. Nevertheless, the human resource base at Ethiopian universities must be considered above average, on a global scale, for the country's economic status. It is impressive that it has been possible to establish this situation despite severe manpower losses due to brain drain, both to Africa and Europe, but especially to North America. The credit must go, not only to the hard work and dedication of the individuals involved, but also to the institutional will to create and expand graduate training programs within Ethiopia. In this connection, the support from SAREC to graduate training programs has been essential, and the modest support for M.Sc. programs has resulted in extremely good cost/benefit ratios.

The Effect of Regionalization. For many important reasons, a policy of decentralization has been adopted in Ethiopia. It is essential that the higher education system adjust to this new situation. In particular, one might expect an increase in the demand for manpower with higher education in less developed regions. This demand may best be satisfied by an increased higher education enrolment of students from such regions, which may be hard to accomplish unless at least part of the higher education courses can be offered locally. The increasing regional pride may also lead to greater expectations to the local educational system.

The role of the established universities is crucial in this process. They must not only provide the academic staff for new tertiary institutions, they must also act as tutor, research partner, quality controller, etc. in connection with the expansion of new institutions. This will require an incentive system for providing such services and a further expansion of the graduate programs.

Future Expansion of Ethiopian Higher Education Institutions. It should not be overlooked that for demographic reasons alone, a huge expansion of the higher education system in Ethiopia is necessary. In several developing countries, 10% or more of the relevant age group attend institutions of higher education. In order to make this possible in Ethiopia an expansion of these institutions by a factor 25 would be required, in addition to a three percent annual increase due to population growth alone. A common problem in developing countries with high participation rates in higher education is low quality standards; a considerable strengthening and widening of the research base in Ethiopia will be needed in order to allow a higher education expansion at an acceptable quality level.

2.5 SAREC AND ITS PROJECTS IN ETHIOPIA

The Mandate of SAREC. SAREC was established in 1975 (reconstituted as a Government Authority in 1979) in order to provide support for relevant, problem solving research activities, focused specifically on developing countries (in 1995, SAREC was merged with SIDA and other Swedish aid organizations into Sida). The rationale behind the establishment of SAREC was a clear vision that research may be essential for the promotion of development; in order for this to happen,

the research should be managed and prioritized by the developing countries themselves, conducted by their own researchers, and high priority given to research capacity building. At the same time, Swedish institutions were encouraged to increase their capability to deal with development problems through research cooperation. Finally, it was intended that the research support given through SAREC should support the general cooperative development objectives of Sweden.

The research support provided through SAREC has been tailored to this philosophy. The key activities are:

1. Assistance to developing countries in the build-up of their own research capacity enabling them to perform the research needed to identify and solve important national problems,

2. production of and transfer to developing countries of relevant research results in key problem areas, and

3. promotion of scientific contacts and research cooperation for developing country researchers with researchers in Sweden and other countries.

To implement these ambitious objectives, SAREC has a relatively small secretariat. In spite of the limited size, it has demonstrated an ability to effectively coordinate research activities and capacity building in a large number of developing countries and regions, involving numerous international and Swedish research institutions. In the process, a considerable capacity for research planning, management, monitoring, follow-up, and evaluation has been developed and accumulated in SAREC.

Transfer of Managerial Experience. If properly transferred, several aspects of the organizational design and capacity of SAREC might be useful in the build-up of institutions, responsible for local research management in developing countries. Although SAREC does not engage in such activities to any great extent, it might occasionally be a worthwhile exercise. For example, in the case of Ethiopia, it might be possible to transfer essential institutional elements of SAREC, as well as of other Swedish institutions involved in the projects, to ESTC and the university managements in Ethiopia.

The SAREC Strategy. With its clearly defined objectives and efficient secretariat, SAREC has followed a three-pronged strategy to implement its mandate. First, it contributes to a strengthening of research capacity at the national level. Second, SAREC actively encourages international research programs to work more closely with national systems in developing countries. Third, it promotes the involvement of scientists from developing countries, not only in the direct research work, but also in policy formulation, project design and research management.

SAREC Programs. SAREC has established four interrelated research cooperation programs, all intended to promote, develop and assist research capacity building and utilization in developing countries. **The bilateral research cooperation program** is targeted to very poor countries. Funds are allocated for basic training of researchers, provision of research infrastructure such as

laboratories, equipment, vehicles, books and periodicals, etc., dissemination of research results, and establishment of contacts between institutions and researchers in the developing countries and Sweden. Ethiopia has benefitted much from this program.

The second program, **the regional research program**, deals with regional institutions and issues. It encourages and facilitates regional research cooperation, and supports special projects in a regional context. The third cooperative program provides **support to international institutions and organizations** engaged in fields relevant for developing countries. In this connection, Ethiopia has benefitted from the research activities of, for example, FAO, other international agricultural organizations, WHO, ILO, and the International Foundation for Science (IFS). The fourth and last of SAREC's programs provides **support to development research projects at Swedish institutions**, in order to enable Swedish researchers to work on problems of importance for developing countries. A common risk in connection with a program of this type is that the responsibility remains in the industrialized country, in this case Sweden. Some Ethiopian research groups, which have received SAREC support over a long period, have developed not only the needed close links with their Swedish counterparts, but also a high degree of dependency.

Amount of Support. Over the years, SAREC has seen an almost continuous increase in the financial allocations to bilateral and regional projects. Ethiopia has received support through SAREC for fifteen years and the allocations have steadily increased, in particular since 1986/87. By 1995 the total was SEK 155 million.

Initially, the support went to a few projects in biology, medicine, energy, and development studies, but it soon grew to cover more than thirty research projects. Most projects were placed in different faculties and colleges of AAU. The distribution between fields shows the traditional donor preference for health (liver disease, health related information, mental health) and agriculture (crops, pests and livestock), but it is interesting that also the basic sciences on which these applications are based, biology and chemistry, received substantial support. The total support for each of the four fields over the years has been between SEK 20 and 30 million. Most of the remaining support went to capacity building activities in Ethiopia, e.g. as library and research journal support. The lion's share of the funding presently goes to biological and health research. As discussed later, the distribution of the financial management duties is a key issue in connection with the projects. In most projects, the funds contributed from SAREC are expended both for local and foreign use, and may categorized in three groups:

1. Funds for local use in Ethiopia and disbursed through ESTC,

2. costs expended by the Swedish counterpart on behalf of the Ethiopian partner for local and foreign use, and

3. costs in Sweden managed by Swedish institutions for project services.

The funds categorized under the former group, managed by the Ethiopian counterpart, are on the average very modest in size - under 25% - as illustrated by Table 2.2 below, which also shows the average distribution of expenditures on items.

Table 2.2 SAREC Projects 1984 to 1995.

Summary of Expenditures by Management and Item (in SEK, see Negewo, 1996).

Item	Ethiopian Inst.	Swed. Inst. for Eth.Inst.	Swed. Inst. for Swed.Ins.	Total Costs	%
Salaries	7,234,584	1,489,713	17,223,163	25,947,459	18.83%
Consumables	8,747,991	6,546,051	2,467,955	17,761,997	12.89%
Literature	576,464	6,959,874	249,771	7,786,110	5.65%
Overhead	47,579	427,354	3,610,235	4,085,168	2.96%
Equipment	2,897,520	32,126,867	1,553,185	36,577,573	26.55%
Travel	4,317,011	8,138,492	7,706,270	20,161,774	14.63%
Subsist. Grants	645,205	13,180,937	588,331	14,414,473	10.46%
Support to ESTC	5,495,000	0	0	5,495,000	3.99%
Field Allowance	630,000	75,000	0	705,000	0.51%
Workshop	30,000	0	20,000	50,000	0.04%
Unforseen	1,464,139	2,240,167	1,092,850	4,797,163	3.48%
Grand Total	32,085,493	71,184,455	34,511,760	137,781,708	100.00%
Percentage share	23.29%	51.66%	25.05%	100.00%	

2.6 THE PRESENT EVALUATION

Earlier Evaluations. The activities in Ethiopia have been evaluated twice since the research cooperation between Sweden and Ethiopia was initiated in 1979/80. The first evaluation took place in 1985, as part of a SAREC performance evaluation, while the second evaluation, in 1990, concentrated on technical aspects of individual projects and did not deal much with overall issues in the cooperation. Both earlier evaluations were performed under the different economic and political conditions of the previous government of Ethiopia. With the important developments since then, especially the reorganization of ESTC, its more extensive responsibilities, the new national policy, and the increased governmental commitment to research, the need for a new evaluation was clearly felt in both ESTC and SAREC. The need was further emphasized by the appearance of a number of problems in the cooperative climate between the two partners.

The 1995 Evaluation. Thus, there were good reasons to perform both a general assessment of the cooperation and a review of some individual research activities. In addition, the assessment should contribute to a strengthening of the working relationship between ESTC and SAREC under the new operational modalities of ESTC. ESTC and SAREC agreed on the main conditions for the evaluation and on the composition of the Evaluation Team. It is illustrative for the cooperative

climate between ESTC and SAREC that the present Evaluation Team was provided with two (almost, but not quite identical) sets of terms of reference (TOR, Annexes V and VI). The two TORs both emphasize assessments of research management, cost effectiveness and accountability, capacity building and sustainability, research impacts, and the working relationship between SAREC and ESTC.

The Evaluation Team consists of Akalu Negewo, Ethiopia, Makonnen Fekadu, USA, and Erik W. Thulstrup, Denmark (Team Leader). The two latter members visited SAREC and project activities in Stockholm and Uppsala, before all three members met in Addis Ababa for discussions with ESTC staff and Ethiopian project leaders and visits to institutions. A list of persons met is given in Annex II. In all cases, the Team was well received and was given ample opportunities to understand the key issues in connection with the evaluation, during frank and stimulating discussions.

Methodological Framework for the Evaluation. Since SAREC's research support to Ethiopia has covered a wide range of projects with very diverse objectives and outcomes, it would be both difficult and inappropriate to employ a simple, quantitative cost-benefit methodology. The calculation of a cost/benefit ratio for a training activity would require that the tuition fees, travel costs, subsistence costs and field research costs in connection with the training of a single student could be separated from costs of other project activities and that the quality of the training could be measured.

Fortunately, according to the TOR (Annex 1) the main questions deal less with quantifiable costs and benefits and more with policies, priorities, management, and cooperation. This does not mean that quantitative data and costs will be ignored in the evaluation. On the contrary, attempts will be made to incorporate quantifiable data whenever reasonable.

The approach followed by the Evaluation Team is thus based on studies of quantifiable data combined with intuitive, judgemental and analytical assessments. Personal observations are supported by both qualitative and quantitative information. An attempt has been made to look at both micro and macro aspects of the SAREC supported research projects. The evaluation targets six key issues (Elzinda, 1981):

1. The modalities (the research council activities, training of researchers, infrastructure development, and quantifiable research results) of SAREC's research support and the receptiveness of the participating Ethiopian institutions and researchers,

2. the project objectives and the anticipated time frame in fulfilling the established targets,

3. the strategies used to realize the objectives for individual research activities, possible strategy changes made during the implementation, the reasons for the changes, and their resource implications,

4. the gradual development of organizational frameworks in support of the research activities,

5. the internal and external factors affecting the overall working environment in which the research activities take place, and

6. the project outcomes in relation to the objectives.

Although the TOR stress that a thorough scientific evaluation of individual projects should not be performed, a number of projects have been used as case studies, in accordance with the TOR.

The information and data used for the analyses were obtained from a number of key sources:

1. A highly structured, short questionnaire designed by the evaluation team and given to the principal investigators in Ethiopia (Annex III),

2. discussions with officials from ESTC and SAREC, university administrators, principal investigators in Ethiopia and counterparts in Sweden, students and graduates from the projects, field workers and farmers in the field (Annex II),

3. field visits to research institutions, laboratories, etc., and

4. background material provided by SAREC and ESTC, financial data and files of some projects obtained from the ESTC office, annual and other progress reports, policy documents and proclamations from ESTC, and other documents (for a more complete list of documents available in Ethiopia, see Negewo, 1996).

Based on the information gathered and on an agreed plan for the preparation of the final report, the Team members each produced individual reports. The present report has been compiled from these individual contributions, two of which are available separately (Negewo, 1996; Fekadu, 1996). They contain a considerable amount of additional information and references.

3. INDIVIDUAL PROJECTS: CASE STUDIES

3.1 THE ETHIOPIAN FLORA AND ECOLOGY

3.1.1 The Flora Project

Historical Background. The early history of the Ethiopian Flora Project is described in the Ethiopian Flora File, available at ESTC; the following survey is based on the information contained in this file - see Negewo (1996) for further information. The work on the Flora was proposed in 1967 by a group of Ethiopians, including representatives from the Faculty of Science at AAU. The idea was followed up by a group of foreign botanists attending a meeting in Munich.

They established an advisory and a working committee and circulated a proposal which finally reached Addis Ababa University and the Institute of Agricultural Research (IAR). As a result, an ad-hoc working committee consisting of concerned Ethiopian government institutions was created to "modify the proposal so as to safeguard Ethiopia's interest". The proposal was submitted to SAREC, and in July, 1980, the project was initiated. Before it was dissolved, the committee made two additional recommendations: The project should be located in the Faculty of Science at AAU and should have a board consisting of representatives from concerned institutions.

The project proposal states that the principal objective of the project is "to write up an Ethiopian Flora within the shortest time". The complete flora would consist of eight volumes. As subsidiary objectives are mentioned: The establishment of a National Herbarium and related library and the promotion of scientific activities in taxonomic botany, economic botany, plant ecology, etc. It was planned that five young researchers would be trained to the Ph.D. level under the project. The project would last about 15 years and be managed by an editorial board in charge of the overall activities under the project and the Director of the National Herbarium. The Department of Biology at AAU would be in charge of the secretariat, with a counterpart secretariat at the Institute of Systematic Botany at Uppsala University in Sweden.

The original project proposal states that the editorial board would consist of three members - one from Addis Ababa, one from Uppsala, and one from The Royal Botanical Garden, Kew (UK). It was planned that the office should be placed in Uppsala for the first two years, and then move to Addis Ababa. Although it was expected that project implementation at first would largely depend on the counterpart secretariat at Uppsala University, the intention was to transfer responsibility as fast as possible to Addis Ababa.

Project Implementation. In addition to SAREC financing, AAU contributed with about half of the local costs in Addis Ababa. Early project documents report that substantial progress was made during the first years with essential inputs from Uppsala University. Two full-time, European taxonomists were employed at the Herbarium of the Royal Botanic Garden, to work through and write up a number of families for the Flora. In order to facilitate sample collection, three vehicles were purchased and placed at AAU.

The brief scientific evaluation report from March 1990 is appreciative (except for worries about the slow pace of the production of the Flora) of the results obtained and in a recent proposal submitted to SAREC for "An Ethiopian Plant Biodiversity Program" it is mentioned that the Flora Project has: "Achieved international scientific recognition, trained five core researchers, established a tradition of botanical research in Ethiopia, and developed (although not satisfactorily) a reference library". It is added, however, that "the publication of the Flora is not on target owing to problems with completion of manuscripts and editing, associated with disruptions caused by the long civil war...".

Project Costs. Over the years, SAREC's support for the project has totalled about SEK 19 million (Table 3.1). From the available information, the AAU contribution to the project is estimated to about 30 percent of that of SAREC, or SEK 5½ million, in terms of salaries to researchers and administrative and facility costs. Thus, in nominal value, the total cost of the project during the last 15 years has been approximately SEK 24 million (USD 3 million).

Table 3.1. The Ethiopian Flora Project.

Summary of SAREC Support 1979 to 95 (in SEK, see Negewo, 1996).

Item	Ethiopian Institutions	Swedish Institutions for Eth.Inst.	Service Charges Swe.Inst.	Total Project Costs	%
Salaries	3,043,907	1,079,254	4,859,033	8,982,193	47.39%
Consumables	1,692,754	444,093	268,655	2,405,502	12.69%
Literature	228,814	282,674	93,771	605,260	3.19%
Overhead	47,579	34,291	654,395	736,265	3.88%
Equipment	604,720	1,014,712	170,185	1,789,618	9.44%
Travel	291,291	1,129,053	1,233,773	2,654,117	14.00%
Subs. Grants	140,125	765,334	462,331	1,367,790	7.22%
Field Allowance	70,000	0	0	70,000	0.37%
Workshop	0	0	0	0	0.00%
Unforeseen	103,790	88,146	151,505	343,440	1.81%
Grand Total	6,222,980	4,837,557	7,893,648	18,954,185	100.00%
Percentage	32.83%	25.52%	41.65%	100.00%	

The distribution between the three categories listed in Section 2.5 over a fifteen year period is shown in Table 3.1. It has not changed much during the 15 years. More than two thirds of the funds have been managed in Uppsala. The managerial role of ESTC, AAU, as well as the Herbarium in

Addis Ababa has throughout the project been marginal and the Ethiopian institutions received very limited amounts of financial and other managerial information. Almost half the project costs have been for salaries; about one third for Ethiopians and two thirds for British and Swedish researchers. One seventh of the total expenditures have been for consumables and a similar amount for travel. Less than ten percent have been used for equipment. Although one might argue that the project by nature is not hardware-intensive and that the high operational expenditures are used to accumulate capacity (the Ethiopian Flora, the Herbarium collection, trained researchers, etc.), the limited provision of equipment is striking.

As discussed earlier, it is not possible to determine a reliable cost effectiveness of each activity in projects like the present. However, in some, the relation between input and output is clear. For example, the low expenditures for books and periodicals are obviously the main cause for an unsatisfactory library build-up at AAU, contrary to the original intentions.

Project Impact. The main objective, production of the Flora, has progressed slowly, in spite of dedicated efforts from the Uppsala secretariat, two full-time employed taxonomists at Kew, numerous unpaid contributions from mainly European botanists, generous financial support from SAREC, and some support form AAU. The first of the eight planned Flora volumes, for systematical reasons labelled Volume 3, was expected to appear in 1984/85. It was actually published in February 1990, five years after the manuscript was reported to be ready for printing.

The completion of Volume 2 has been announced during the last four years, but it has not yet been printed. It has recently been indicated that also Volume 7 and Volume 6 are near completion. Based on the experience of the last fifteen years, it will take drastic measures to ensure that the last volume will be published by the end of this century. Thus, one must conclude that the progress towards the main objective of the project has been disappointing.

Other Project Outputs. Contrary to the pace with which the Flora has appeared, the number of publications under the project with Ethiopian (co)authorship in refereed journals is high, over 70. One of the researchers trained under the project was recently given an award as outstanding researcher by ESTC.

The Herbarium collection in Addis Ababa has been increased from 14,000 to around 60,000 specimens (in spite of some inconsistencies in the figures provided in recent progress reports); the Herbarium is providing services to many different institutions and individuals. Unfortunately, the establishment of a reference library has not been accomplished, as discussed above.

Five Ph.D.s and one M.Sc. have completed their degrees (one additional Ph.D. student is still to graduate), six technicians, all placed in Addis Ababa, have been trained, and eight Ethiopian researchers and many researchers from other herbaria have been involved in the project. However, none of the graduates have obtained full-time employment as researchers; most of them have been engaged in undergraduate and graduate teaching and have had to use their summer holidays to conduct research, in contrast to the British taxonomists who were employed full-time under the project.

Institution Building at AAU. The original proposal also emphasized institution building at AAU with the participation of other departments, which were to be represented on a board for the project. The establishment of such a board was never realized. During meetings with officials and researchers from other departments, the Team noted that most were not aware of the existence of the flora project. The planned composition of the Editorial Board (with three members - one from AAU, one from Uppsala, and one from Kew) has developed into a five member Board, of which four are expatriates. Together with the long delay in the transfer of managerial leadership from Uppsala to Addis Ababa, this demonstrates that the role of Ethiopians in the project management is peripheral.

Project Constraints. The most critical problem in the project may have been the lack of leadership on the Ethiopian side. In late 1983, the Ethiopian initiator of the project was appointed to a government position which reduced his involvement in project management, administration and research. Already in the 1982 progress report, the project leader indicated that "teaching and other commitments arising both from within the AAU and from other institutions has taken much of his time", as also mentioned in the 1985 progress report. It is clear that when the Ethiopian Flora Project lost its full-time leader at a critical time, the responsibilities were never transferred to another, even after qualified Ethiopian botanists had become available in Addis Ababa. Although individuals in both Uppsala and Addis Ababa have made huge contributions to the project, Ethiopia still lacks a botanical institution that can act as a fully independent, international center for Ethiopian plant biodiversity.

Lack of Local Support. Several factors on the Ethiopian side, such as inefficiency in the AAU administration, poor monitoring by the AAU Research and Publication Office (RPO), and lack of involvement of the Faculty of Science at AAU, have contributed to the problems. A similar inefficiency prevailed for years in ESTC. The Commission noted the delay of the Ethiopian Flora Project in 1987 and inquired in writing to RPO, but did not get any response. After five years of silence on the matter, ESTC again sought an explanation for the delay; again to no avail; thus, monitoring and follow-up of the project from ESTC has been equally insufficient.

A major obstacle to many Ethiopian projects has been the lack of a conducive research environment at AAU. In the case of the Flora Project, opportunities were missed because AAU did not employ at least one of the returning Ph.D.s in a full time research position. While the project from the start employed European, full-time taxonomists, it was not until 1993/94, that one of the Ethiopian researchers, trained under the project, was named liaison officer at Kew. Unfortunately, "due to problems in getting timely and adequate financial support", he has left Kew for employment in the United States.

Foreign Involvement. One of the ultimate goals of almost any research capacity building project is to make it possible for local researchers to carry out research in cooperation with others at home or abroad on an equal footing. Extensive involvement of expatriates and external financial resources may be needed for a period to create this capacity. In the Flora Project, the foreign involvement, both in managerial and research matters, has remained at a very high level throughout the project life, and an attempt was never made to develop an institution controlled and managed by Ethiopian researchers. Ethiopian researchers have only been employed in part-time jobs in the project; this has

not been sufficient for the creation of a sustainable domestic research capacity at an international level.

In spite of the considerable international interest in the vegetation of Ethiopia, the Project has not been able to generate any significant alternative resources. If the support from SAREC were withdrawn, the project would most likely collapse.

Recommendations. The most important task at hand is to complete the publication of the Ethiopian flora in accordance with the original plan. At the same time it must be ensured that both research and managerial capacity in the field at the Faculty of Science at AAU is strengthened until it becomes sustainable. The Evaluation Team recommends that the following concrete actions are taken:

1. The Ethiopian Flora Board is reestablished, with participation from the Ministry of Natural Resource Development and Environmental Protection, the Ministry of Agriculture, the Institute of Agricultural Research, the Ethiopian Plant Genetic Resource Center, Addis Ababa University, the AAU Faculty of Science, Alemaya University, the Natural Science Research Council, and the Department of Traditional Medicine under the Ministry of Health. The Board works out a new design for the Ethiopian Plant Biodiversity Program,

2. the Board prepares a plan of action to speed up the Flora Project. This plan should contain a cost sharing mechanism between SAREC, ESTC and AAU. The detailed plan should be drafted by a task force with a strong representation of Ethiopian researchers trained under the project, although others, in particular the Uppsala secretariat, would have to be involved,

3. a full-time Ethiopian project leader is appointed (preferably among those trained under the project) as responsible for the institutional development at AAU in close cooperation with the Uppsala secretariat. The project leader chairs the editorial board and is accountable for all funds allocated for the project, and

4. the earlier assignment of Ethiopian liaison officers abroad (at Kew and Uppsala) should be reactivated in order to speed up completion of the Flora and to improve the institutional management base in Ethiopia. The inclusion of two additional Ph.D. training fellowships may also be considered.

3.1.2 Landscape Ecology and Ecological Restoration Studies.

Background. The Landscape Ecology Project is the continuation of a SAREC supported Ph.D. program, started in 1982 and completed in 1985. The Project formally started in 1986 with the objective of studying "the process of natural and manipulated regeneration of degraded areas in Wollo". The project is based in the Biology Department of the Faculty of Science at AAU in close cooperation with the Flora Project and ecologists at Uppsala University. In 1992, the project was

formally merged with the Ethiopian Flora project as " Floristic and Ecological Research in Ethiopia", which in 1994 changed the name to "An Ethiopian Plant Biodiversity Programme". Five Ethiopians and three Swedes are presently involved in the ecology subproject.

Project Inputs. The total SAREC support for the project since 1986 has amounted to SEK 4.8 million. In recent years it has received about SEK one million annually. Vehicles, laboratory equipment, greenhouses and computing facilities have been procured under the project. The distribution of expenditures is similar to that of the Ethiopian Flora project, although the share of salaries in the total is only around 30 percent. The expenditures for travel and consumables are about one fifth each of the total project costs, while only seven percent has been used for equipment. In recent years, the percentage spent for equipment has been higher. The Swedish counterpart has been responsible for the management of 72 percent of the total funds (Negewo, 1996).

Project Outputs. The project has produced several publications in refereed international and Ethiopian journals and attempts have been made to disseminate useful information to end users. So far, one Ph.D. has completed the training under the project, while two Ph.D. students are presently enrolled. There have been occasional delays in the research outputs and efforts to make the project independent of foreign support have been insufficient. Individuals rather than institutions are responsible for the project; when the principal investigator was on sabbatical leave, nobody took his place, as already noted in the 1990 evaluation.

Recommendations. After nine years, no plan has yet been developed for "graduation": Transfer from SAREC support to national funding. The Evaluation Team recommends that the project starts preparing for this situation and attempts to finance research activities with outside funds. However, given satisfactory progress by the Ph.D. students enrolled, it is important that SAREC funding is provided for completion of the studies.

3.2. THE BIOMEDICAL RESEARCH TRAINING PROJECT

Background. The main objectives of the Biomedical Research Training Project (BRTP), carried out in cooperation between the Faculty of Medicine at AAU (AAU-FM) and the Karolinska Institute (KI) in Stockholm, are to strengthen the preclinical departments at AAU-FM and to promote clinical and epidemiological research activities. The BRTP agreement between AAU-FM and KI was signed in Stockholm in November, 1988, and the project started in 1989. The main task was to provide medical research training to Ethiopian students at the M.Sc. and Ph.D. levels, as well as facilitating post-doctoral research activities for young Ethiopian researchers. During the first project phase, a maximum of twenty M.Sc. candidates would be trained at KI in two batches of ten each.

Project Inputs. This project is one of the most expensive in terms of annual costs. The total project support from SAREC since the start of the project amounts to over SEK 17½ million (Table 3.2). The Ethiopian contributions (primarily salaries) are much smaller. The by far largest item is equipment, for which the expenditures over the years have been close to SEK five million (28

percent). Most of the equipment is placed in AAU-FM; only minor amounts of equipment remains at KI, where it is used for training of Ethiopian students.

Other large items are travel, with close to 20 percent of the total; mainly covering Swedish counterpart visits to Ethiopia (SEK 2.4 million total). Consumables with 14 percent (most spent for research in AAU-MF), salaries with 13.5 percent, and subsistence for Ethiopian students in Sweden with 12.8 percent are also large items. 14 percent (SEK 2.4 million) were paid in salaries to the staff at KI; this is a slightly larger amount than the total paid in subsistence grants to the Ethiopian students. The overhead charged by KI is about seven percent.

Project Outputs: Research Training. The first batch of students, consisting of eight M.Sc. and three diploma students, the latter all in pathology, entered the program in January 1990. In 1992, five of these defended their M.Sc. theses at AAU (one in biochemistry, one physiology, and three in microbiology) and the three pathology students acquired their diplomas. The second batch of students consisted originally of fourteen M.Sc. students and three pathology diploma students, but some have dropped out. The remaining are currently being trained under the project. Eight of the M.Sc. students and all the diploma students were expected to graduate in 1995 while the remaining were scheduled to graduate in 1996.

Table 3.2 The Biomedical Research Training Project.

Summary of SAREC Support 1988 to 95 (in SEK, see Negewo, 1996)

Item	Ethiopian Institutions	Services to Eth. Inst.	Service Charges Swed. Inst.	Total	%
Salaries	0	0	2,390,000	2,390,000	13.54%
Consumables	545,000	1,165,000	785,000	2,495,000	14.14%
Literature	35,000	345,000	0	380,000	2.15%
Overhead	0	98,000	1,124,700	1,222,700	6.93%
Equipment	610,000	3,067,300	1,200,000	4,877,300	27.64%
Travel	200,000	840,000	2,373,500	3,413,500	19.34%
Sub. Grant	0	2,250,000	0	2,250,000	12.75%
Field Work Allowance	0	0	0	0	0.00%
Workshops	0	0	0	0	0.00%
Unforeseen	120,000	145,000	352,000	617,000	3.50%
Grand Total	1,510,000	7,910,300	8,225,200	17,645,500	100.00%
Percentage	8.56%	44.83%	46.61%	100.00%	

Large amounts of physical facilities have been provided under the project. During the first year of the collaborative program laboratory facilities were established at AAU-FM, primarily a core laboratory containing equipment for basic training in preclinical subjects. In addition, specialized equipment has been provided to the departmental specialty laboratories.

Assessment of the Research Training Program. The research and research training produced seem fully acceptable, except for the high costs. If the planned training programs are completed, AAU-FM might have a total of eighteen M.Sc.s and six diploma holders in pathology available by 1996. The scientific quality of all the M.Sc. theses and five published articles is good, and nine so far unpublished manuscripts are expected to meet international peer-reviewed journal requirements.

A severe weakness in the project is the limited progress towards a solid biomedical research environment at AAU-FM. In the project, research priorities were not defined by Ethiopian institutions, but by individuals, both Ethiopian and, especially, Swedish. Despite its general goal of national capacity building, the project seems to benefit mainly individual researchers. The biomedical project is to a large extent supply driven, with KI defining the priorities, and a very limited demand for upgrading from AAU-MF.

Some individual research subprojects under BRTP, e.g. the Liver Disease Project, have produced long awaited and badly needed epidemiological data, representing important scientific progress. These results are of considerable importance since they contribute to an improved understanding of which measures must be taken to reduce the vast amount of acute and chronic liver disease in Ethiopia. However, the sustainability of this subproject is in serious danger due to the departure of the project leader from AAU-FM without an institutional research management ready to take over.

The Physical Facilities. Through the project, the core laboratory and a number of specialty laboratories at AAU-MF have been equipped to a high standard with essential, modern equipment. Some of the special laboratories are so well equipped that they might serve as reference centers for the country. The Evaluation Team was informed that some equipment intended for the core laboratory had been transferred to the specialty laboratories, with limited access to other users and against the planned function of the core laboratory. The justification may be a weak utilization of the equipment placed in the core laboratory. The Team observed during a short visit and through interviews with researchers and BRTP graduates that the core facility is only rarely used. No full time technician is assigned to look after the equipment on a daily basis or to supervise graduate students in the use of the equipment.

Utilization of Human Resources. During the visit in Stockholm, the Team was informed by the Swedish project leader that three of M.Sc. graduates from 1992 were still unemployed. During the subsequent visit to AAU-FM in Addis Ababa, where the Ethiopian project leader stated that two of the graduates were employed and that a third was in the process of being employed. After collecting further information from researchers and recent BRTP graduates in Addis Ababa, the Team concluded that one of the M.Sc. graduates became employed shortly after the return from Sweden and that a second graduate was employed by AAU-MF after a substantial delay. The remaining three graduates are still unemployed in their field of expertise. One of them left the country in despair after he failed to find employment in his field during the two years following his return. The

Team must conclude that AAU-FM was unaware of the fate of three of the first five graduates from the project.

The second batch of M.Sc. students are ready to graduate within a year. It seems doubtful that AAU-FM is ready to employ a substantial number of them. In the original plans, the M.Sc. programs were to be gradually replaced by Ph.D. programs. This year, ten qualified M.Sc. graduates were to be selected for Ph.D. training. Under the present conditions at AAU-FM, this plan does not seem realistic, although project leaders in both institutions are eager to launch the Ph.D. programs.

A Critical Phase for the Project. The Team considers the BRTP project to be in a critical phase. While KI has fulfilled its commitments with respect to research training activities in a narrow sense, the capacity building in a broader sense in Ethiopia remains highly unsatisfactory, even after SEK 17½ million in expenditures. Among several weaknesses, it demonstrates those characteristic of unprofessional management. It was distressing for the Team to observe the lack of leadership and interest in research training demonstrated by AAU-MF. Contributing to the problems may be the failure of the central management of AAU to allocate funds to sustain projects and to keep qualified researchers in the Faculty.

Disappointments at KI. It has not improved matters that the Swedish counterparts at KI seem to have been unaware of the full extent of their task in Ethiopia. Teaching bright research students at a high level with full financing provided by SAREC is attractive for essentially any researcher or research institution. This aspect has been performed well by KI. However, the second and possibly less pleasant task, a transfer of the documented high standards and high activity levels of research at KI to AAU-FM, has not been accomplished. It is surprising that the conditions at AAU-FM have been seemingly unaffected by the expensive (SEK 2.4 million) visits by KI researchers in Ethiopia.

Recommendations. The cost efficiency of the project is low compared with other SAREC supported projects in Ethiopia and on an international scale (see Chapter 5). At the moment, the Team does not recommend that training at the Ph.D. level is introduced. Although bright Ethiopian candidates for such training are available and KI is eager to start, there is no indication that the graduates will find a conducive research environment and satisfactory employment at AAU-FM. A careful examination of the possibilities for correcting the obvious weaknesses of the project is badly needed. In this respect, a key to future actions will be the willingness of KI to carry out the difficult and possibly even frustrating actions that will be needed in order to help AAU-FM create a strong biomedical research environment. If this is not done, most investments will be lost. For further details see Fekadu (1996).

3.3 THE BUTAJIRA RURAL HEALTH PROJECT

Background. The project is based on a rural health surveillance system, initiated in 1980. In 1986, this developed into a collaborative research project between the Department of Community Health, AAU-FM, and the Department of Epidemiology and Public Health at the University of Umeå in Sweden, and AAU-FM selected the Butajira area for a continuous rural health attachment teaching

program for its senior year medical students. Butajira is located in the central part of Ethiopia, 130 km south of Addis Ababa on the eastern side of the Gurage mountains. The altitude ranges from 1500 to 2000 meters above sea level. The area has geographic features between highland and lowland, and harmoniously living multiple ethnic sub-groups, representative of the two common religions in the country.

The objectives of the Butajira Rural Health Project are to establish a demographic study base for research on essential health problems in rural areas and to develop and strengthen research capacity and infrastructure for this purpose. In the project, a system for continuous registration of vital health related events is developed and evaluated, thus providing a baseline population and sampling source for a range of health research activities.

The Team carried out a useful telephone conference with the Swedish counterpart in Umeå and was later given a comprehensive briefing on relevant activities in Addis Ababa by the research coordinator and the staff of the Department of Community Health, AAU. The activities include the Borana Health and Nutrition Study (BHNS), a project carried out in collaboration with the Department of Community Health in Ethiopia and the Center for International Health at the University of Bergen, Norway. In addition, the project leaders of "Control of Acute Respiratory Infections in Ethiopian Children" (ARI) and "Community-Based Study of Neurological Disorders in Ethiopia" (Neuro-project) described their projects.

Two members of the Team visited the Butajira project area and were impressed by the dedication and integrity of the project leaders and their commitment to and interaction with the local community. The Butajira Rural Health project is a highly useful and pertinent project for the country. It has already contributed important methods used by the Ministry of Health for improved decision-making in disease prevention and control.

Project Inputs. Up to 1995, the projects had received SEK 5.1 million in support through SAREC. Close to half of this amount was spent in Ethiopia by the Ethiopian counterpart, while a little over one third was spent in Sweden for the Swedish counterpart in connection with research training activities. A summary of the Neuro Project expenditures is given in Table 3.3.

Project Outputs: ARI. The three subprojects within the Butajira rural health project are demand driven and conceived by Ethiopian researchers, and have produced epidemiological data of considerable scientific value. They are of particular relevance to Ethiopia since they may improve the understanding of what measures may reduce the vast amount of acute and chronic disease in a rural community. SAREC's contribution has been substantial, but local leadership has also been essential for the success. The sustainability of the projects is secured through farsighted planning by the project leaders and the early involvement of the local community, health agencies, and the Ministry of Health. In particular, the latter is committed to take over financing of the project within five years.

Table 3.3 Butajira Neurological Project.

Summary of SAREC Support 1984 to 95 (in SEK, see Negewo, 1996)

Item	Ethiopian for Eth.	Services to Eth. Inst.	Service Charges by Swed. Inst.	Total Costs	%
Salaries	842,000	0	324,000	1,166,000	32.22%
Consumables	319,000	219,000	120,000	658,000	18.18%
Literature	10,000	28,500	0	38,500	1.06%
Overhead	0	0	89,500	89,500	2.47%
Equipment	95,000	310,000	0	405,000	11.19%
Travel	352,000	330,000	85,000	767,000	21.19%
Sub. Grant	125,000	280,000	0	405,000	11.19%
Field Allowance	0	0	0	0	0.00%
Workshops	0	0	0	0	0.00%
Unforeseen	40,000	20,000	30,000	90,000	2.49%
Grand Total	1,783,000	1,187,500	648,500	3,619,000	100.00%
Percentage	49.27%	32.81%	17.92%	100.00%	

The project has already developed important methods which may improve the decision-making by the Ministry of Health within disease prevention and control. The study of the demographic setting and mortality pattern of a representative rural population is one of very few of its kind. The epidemiological control of acute respiratory infection in Ethiopian children have produced some important findings on prevalence, mortality patterns, and causes of mortality in children below five years of age as well as factors on public health and behavioral determinants of ARI mortality. The study has shown a crude birth rate of 40.3/1000, a crude death rate of 16.4/1000, a life expectancy at birth of 48 years, an infant mortality of 114/1000, a 1-4 year specific mortality of 36/1000 and an under five mortality of 210/1000. Furthermore, methods to evaluate the efficiency of an intervention package using community health agents as well as the feasibility and effectiveness of community based ARI case management using community health agents have been demonstrated. .

The Butajira Neurological Study Project. The SAREC supported project on community-based studies of neurological disorders in Ethiopia has performed a survey of neurological disorders in a rural population in Butajira, as the first of its kind in the country. The survey revealed that epilepsy, mental retardation, and post poliomyelitis paralysis were the most common neurological disorders. Blindness due to cataract and trachoma was also found to be a serious problem. With the motto "No Survey without Service", the Butajira neurological project is now extending rehabilitation

services to the rural population of the Meskan and Mareko districts through a project named "Grarbet Ledekuman", in collaboration with a Swedish philanthropic donor organization and the Ministry of Health.

Capacity Building. Two Doctor of Medical Sciences degrees (D.M.Sc., equivalent to Ph.D.s) have been conferred under the project by the University of Umeå in 1993 and 1994. Two Ph.D. and three M.Sc. students are expected to graduate from the University of Umeå and AAU, respectively, in the near future. Two other graduate students have been accepted for a Ph.D. program in health statistics at a university in Australia, and five researchers have attended short courses in Sweden in epidemiologic study design, collection and analysis of data.

A considerable amount of computer hardware and software has been supplied to the departments of Community Health and Paediatrics and Child Health. Essential communication devices (faximile) and office hardware have also been provided to the departments. But all computers are still in Addis Ababa; none have yet been placed at the study area, where they will be needed for data entry.

Recommendations. In spite of the successes, some improvements are possible. Several university departments (those of Internal Medicine, of Paediatrics and Child Health, and of Community Health), together with the Ministry of Health and local health agencies are involved in the Butajira projects. The neurological subprogram, in particular, needs to improve the coordination of present and future research activities and intervention programs with the activities taking place in other subprograms in order to reduce duplication and waste of resources. Concerted efforts may lead to new techniques for dealing with major health problems in developing countries. The project is nearing graduation, but proper plans for this situation are in place. Further information on the project is available in Fekadu (1996).

3.4 THE PROGRAMS UNDER THE GRADUATE SCHOOL AT AAU

M.Sc. Programs: Background. SAREC started supporting the Graduate School at AAU in 1979 in connection with training activities towards Masters degrees in a variety of disciplines. The M.Sc. program in agricultural science was moved to AUA in 1985. By 1988, a total of 370 students had obtained their Masters degrees at AUA in 27 different disciplines with a total SAREC support of close to five million SEK. This corresponds to less than SEK 15,000 per degree; the local support is estimated to be roughly the same.

Most students have employment before they start on their Masters program, often in a public, mostly educational, institution. They usually receive a salary during their studies and are committed to return to their former position after having completed the degree. The drop-out rate is very low, less than 5%. The duration of the studies is two years or more; earlier, four years were common, but a tightening of the rules, with tuition fees being charged after the second year, has reduced average length of the studies. During the first two years of the studies towards a Masters degree, Ethiopian students pay no tuition fees. AAU has requested permission to charge fees from students employed outside the university, but the Government has not yet decided on this matter. A numbers of foreign students are enrolled; they typically pay a total fee of around Birr 50,000.The programs,

including the Ph.D. programs (see later), are placed under the Council of Graduate Studies at AAU, which establishes regulations and approves programs. The Council is responsible to the AAU Senate. The Graduate School is headed by a Dean,. who manages the graduate studies in cooperation with the relevant university faculties (with faculty graduate commissions) and departments (each with a graduate committee).

After more general support in the first years, SAREC's support for training at the M.Sc. level was in 1988 limited to six programs at AAU, mainly those with hardware (and therefore foreign currency) needs, namely biology, chemistry, physics, geography, civil engineering, and electrical engineering:

1. **Biology.** The M.Sc. program in biology was initiated in 1978/79. It has trained 106 M.Sc.s, primarily staff at the Biology Department and other departments at AAU, but also students employed at other public institutions. All have returned to their sponsoring institutions and are in active service. The program has covered a wide range of fields, bordering on other subjects, e.g. livestock and dairy production, fisheries and aquatic resources utilization, forestry, nature conservation, traditional medicine, water supply development planning, and other. The scientific quality of the work is judged adequate, with around half of the Masters projects resulting in publications in refereed scientific journals. A streamlining of the program with redefined streams targeting specific biological manpower needs of the country has recently been approved.

2. **Chemistry.** Also the M.Sc. program in chemistry was initiated in 1978/79. A total of 102 students have so far graduated under the program. One third of the students came from the Department of Chemistry at AAU, most of the rest came from other educational institutions and ministries. Except for a few interinstitutional transfers, all graduates returned to their sponsoring institution, but some are now pursuing further studies abroad. The four streams of specialization are: Analytical chemistry, inorganic chemistry, organic chemistry, and physical chemistry. Most thesis work has concentrated on analytical or organic chemistry (natural products). As an indication of the quality, around half of all masters projects result in publications in scientific journals.

3. **Physics.** The M.Sc. program in physics was launched in 1981/82. So far, 58 have graduated under the program, half of these were staff from the Physics Department at AAU and the rest primarily from other educational institutions. The program provides a broad foundation in the physical disciplines. Many specialize in solid state and materials science fields, but also other specializations, e.g. in statistical mechanics and molecular physics, have been selected.

4. **Geography.** The graduate program in geography started in 1979/80. So far, 46 have graduated under the program; they are employees of a numbers of public institutions including universities, primarily AAU. The program has two streams, covering physical geography and cultural/economic geography. Some courses are shared between the two streams.

5. **Civil Engineering.** The graduate program in civil engineering was launched in 1979/80, with the training of the staff of the Faculty of Engineering as the main purpose. Until 1995, 20 have graduated from the program, primarily employees of AAU. Some have come from other public institutions as well as from the construction industry. The program now contains four main disciplines: Structural engineering, soil mechanics, hydraulic engineering, and construction technology and management.

6. **Electrical Engineering**. The graduate program in electrical engineering started in 1986/87. So far, 12 have graduated from the program. Most have been employees of AAU or the Ethiopian Light and Power and Telecommunications Authorities. All students share a first year course program; later they specialize in one of four streams, namely: Communication, power, control, and electronic and materials technology.

Project Inputs. SAREC's support since 1988 has been around three million SEK, which is similar to the amount provided in direct, local support through AAU, primarily in the form of salaries. Since SAREC funds are more flexible than university funds and may be used for foreign currency costs and for other items which would not fit into the normal budget, they are of a particular importance for the M.Sc. research projects. Presently, SAREC's support typically goes to laboratory equipment, office equipment, especially computers, field equipment, including vehicles, chemicals and other supplies, and literature. A summary of inputs by item from SAREC since 1984 is given in Table 3.4.

M.Sc. Programs: Conclusions. The SAREC supported Masters programs in the Graduate School at AAU were evaluated in 1989 and were given excellent grades. The combined graduate programs have so far produced around 1200 candidates; among these, SAREC supported programs outside the field of medicine have produced close to half. The programs have been an invaluable source of research trained manpower, the impact of which hardly can be overestimated in Ethiopia; in particular, many graduates are employed in educational institutions so that their improved qualifications may have an impact on the training of thousands of students. Despite the good scientific quality of the M.Sc. programs, the direct costs have been extremely modest, below SEK 30,000 per graduate.

It is remarkable how well the programs are managed by the Graduate School in cooperation with the relevant departments at AAU. Only procurement of certain items are presently carried out overseas, by SIDA. This is presently done to the satisfaction of the Graduate School. Still, the Team has no doubt that these duties successfully may be gradually transferred to Ethiopia.

Table 3.4 The M.Sc. Programs at AAU and AUA.

Summary of SAREC Support by Item and Year (in SEK, see Negewo, 1996)

Item	1984/86	1986/88	1988/90	1990/92	1992/94	1994/95	Total	%
Salaries	0	0	0	0	0	0	0	0.00%
Consum.	288,000	80,000	160,000	250,450	720,000	280,000	1,778,450	29.33%
Literature	0	0	60,000	96,750	60,000	30,000	246,750	4.07%
Overhead	0	0	0	52,000	0	0	52,000	0.86%
Equipm.	385,000	620,000	580,000	946,800	790,000	370,000	3,691,800	60.88%
Travel	91,000	0	0	30,000	0	0	121,000	2.00%
Sub. Grant	0	0	0	0	0	0	0	0.00%
Field Work	0	0	0	0	0	75,000	75,000	1.24%
Workshops	0	0	0	0	0	0	0	0.00%
Unforeseen	0	0	0	24,000	30,000	45,000	99,000	1.63%
Total	764,000	700,000	800,000	1,400,000	1,600,000	800,000	6,064,000	100%
Percentage	12.60%	11.54%	13.19%	23.09%	26.39%	13.19%	100.00%	

The fact that the training is carried out in Ethiopia instead of abroad not only reduces the costs and promotes research subjects of national relevance, it also limits the risk for brain-drain, which in Ethiopia tends to be equivalent to a total loss of the investment in research training. Moreover, interaction with bright research students at a high level is an essential element in the creation of strong a research environment as well as in the further upgrading and work satisfaction of the best trained faculty members. It is remarkable that a model like the present is so rarely used in the Third World.

Recommendations. It is therefore strongly recommended that the modest SAREC support to M.Sc. programs at AAU is continued. In view of the extremely good cost/benefit ratio, it would be proper to occasionally provide more expensive items, when they are needed by a sufficiently large student population. All procurement should be gradually transferred to Ethiopia.

Other initiatives may also be considered; although extensive dependence on technical assistance should be avoided, it might be valuable to provide additional intellectual input from carefully selected visiting lecturers in specific fields. In this connection, the huge number of well trained, research active Ethiopians abroad (as a result of brain-drain) may be one of the most important sources to tap. In order to perform quality control at an international level, the Graduate School also would like to bring in more foreign external examiners, who may also help promote international research cooperation. It is recommended that ESTC and SAREC, together with the

Graduate School, consider how foreign visiting lecturers and external examiners, possibly limited to Ethiopians abroad and Swedes, might be financed.

Ph.D. Programs. As a natural extension of the best established M.Sc. programs, Ph.D. programs in biology and chemistry were started in 1986:

1. **Biology.** The Ph.D. program in biology includes three research areas: Biomedicine/biotechnology, in close cooperation with the National Research Institute of Health and the Armauer Hansen Research Institute, systematic/ecological botany, including studies of economic use of indigenous plants (oil bearing plants, traditional medicine plants), and fisheries/aquaculture, including studies of the age and growth of fish. So far, two students have graduated with Ph.D.s in biology.

2. **Chemistry.** The Ph.D. program in chemistry includes two main fields: Analytical/physical chemistry, concentrating on electrochemistry, water and soil analyses, etc., and organic chemistry, primarily dealing with natural products, including essential oils and bioactive chemicals in medicinal plants. So far, four students have graduated with a Ph.D. in chemistry.

There is an urgent need in Ethiopia to improve the research background from the M.Sc. to the Ph.D. level, especially for university staff. Although the number of students enrolled (presently seven) and so far graduated (six) are very limited, the Ph.D. programs have a considerable impact on AAU. A total of 39 university researchers have been involved in the training and 34 papers have been published in international journals as a result of research in connection with the Ph.D. programs.

So far, all Ph.D. studies have been carried out as sandwich programs with Swedish universities. For this reason, and since the need for specialized and expensive instrumentation is much greater than in connection with the M.Sc. programs, the costs are relatively higher, although the physical facilities acquired for the Ph.D. programs are likely to benefit many outside these programs, for example M.Sc. students.

Project Inputs. Since 1986, SAREC has allocated close to SEK eleven million to the Ph.D. programs; over half of this amount went to equipment and other physical facilities. Some minor support is also received from other foreign sources, e.g. DAAD, Germany, and the local support, primarily from the university, has been around Birr four million, including salary costs. The budget breakdown for 1992/94 shows that AAU only administered 10% of the total SAREC support of SEK three million. Over 70% was administered by the Swedish institutions involved in the sandwich programs, but used for equipment and student subsistence and travel, etc., on behalf of AAU. Less than 20 % was used by the Swedish counterparts; in particular, the overheads in these programs were very low, only one percent of the total grant.

Ph.D. Programs: Conclusions and Recommendations. The existence of good quality Ph.D. programs at AAU is in itself of the highest importance; they contribute to a feeling of self-reliance in

Ethiopia and may serve as role models for other fields. The programs also have a considerable impact on the intellectual climate and research productivity at AAU. It is important that university staff may be offered training at this level; the fact that the studies are based in Ethiopia is likely to increase the national relevance and reduce brain drain, which might be severe if the studies were carried out completely at a foreign university. In view of the efficient management, demonstrated by the Graduate School and the involved departments, it seems reasonable to gradually transfer managements of funds to AAU. This will be part of the learning process, a part without which the Ph.D. programs at AAU will never become sufficiently self-reliant and sustainable.

Any university needs foreign interaction to ensure a high quality in its Ph.D. training. In this sense, the involvement of Swedish institutions in the AAU Ph.D. programs has been very constructive; at the same time, the costs have been modest. Today, internationalization is an important aspect of research training and industrialized countries make today large efforts, e.g. through the European Union, to internationalize their Ph.D. programs. Furthermore, the research training cooperation with Sweden seems, in contrast to programs in other countries, to have very modest direct costs in the form of brain drain.

The two Ph.D. programs are still strongly dependent on SAREC support. Although the costs per student are much higher than in the M.Sc. programs, they are reasonable on an international scale. Their order of magnitude may be estimated to below SEK 1.5 million per Ph.D., but this includes provision of a considerable amount of equipment to AAU. Continued support is therefore strongly recommended. There seems to be no obvious reason for the present low enrolment, especially in chemistry; it would serve the needs of Ethiopia well if the student intake were increased.

3.5 INTEGRATED PEST MANAGEMENT (IPM)

Background. The project started as a Ph.D. program in 1984, entitled "Biology and Ecology of Maize Stalk Borer in Ethiopia", with emphasis on the Awassa area. In 1987, an extension of the support was granted and in 1991, the project was widened in scope to "Integrated Pest Management (IPM) on Major Crops". The objectives were to develop sound pest management techniques and to provide related research training. The Ethiopian principal investigator, the former Ph.D. student who graduated in 1988, is now employed at Awassa Agricultural College. He is presently combining his research with teaching obligations at the undergraduate, M.Sc. and Ph.D. levels (also at other institutions) and has been Dean of the College. Two Swedish entomologists are active in the project.

Project Input and Implementation. The total amount of SAREC support since 1984 amounts to almost SEK 4.7 million (Table 3.5). 75 percent of this amount went to the Ethiopian institutions involved, although most of these funds were managed by the Swedish counterpart. The main expenditures have been salaries (24 percent of the total expenses), paid both in Ethiopia and in Sweden with roughly the same amounts. Almost 21 percent was spent on consumables, half in Sweden, half in Ethiopia. 18 percent was used for travel and 14 percent for subsistence grants. The overhead charged by the Swedish institutions was low, only 3.5 percent of the total.

In spite of relatively low expenditures for equipment (12 percent of the total), considerable facilities have been established in Ethiopia. Both vehicles, other field equipment, computer facilities, and a small greenhouse have been procured.

Ongoing Research Training. Presently the project supports one Ph.D. and one M.Sc. student, the former dealing with agricultural entomology (population dynamics of insect pest), the latter with plant protection, in particular virus vector relationship.

Table 3.5 The IPM Project.

Summary of SAREC Support (in SEK, see Negewo, 1996)

Item	Ethiopian Institutions	Swed. Inst. for Eth. Inst.	Swed. Inst. for Swed.	Total Costs	%
Salaries	467,000	0	657,000	1,124,000	24.11%
Consumables	689,000	215,000	60,000	964,000	20.68%
Literature	0	125,000	0	125,000	2.68%
Overhead	0	52,000	111,600	163,600	3.51%
Equipment	29,000	542,000	0	571,000	12.25%
Travel	90,000	445,000	284,000	819,000	17.57%
Subsist. Grants	0	644,400	20,000	664,400	14.25%
Field Allowance	80,000	0	0	80,000	1.72%
Workshops	0	0	20,000	20,000	0.43%
Unforseen	40,000	45,000	45,000	130,000	2.79%
Grand Total	1,395,000	2,068,400	1,197,600	4,661,000	100.00%
Percentage Share	29.93%	44.38%	25.69%	100.00%	

Project Outputs: Important Research Results. The project has produced several important research results, including:

1. Three generations of maize stalk borers, which cause considerable agricultural damage in parts of Ethiopia, have been identified. The second generation larvae was found to cause significant damage on late planted maize,

2. the role that rain plays on the timely pupation of the larvae in the post-diapause period has been determined, and

3. the relationship between the planting time and the damage on maize has been established. Planting within a specific time window was found to result in a high yield and a low infestation.

The last finding has a potential significance for small farmers, but proper dissemination methods are yet to be identified. The scientific quality and productivity is good at an international level; eight publications with Ethiopian (co)authorship have been published in refereed international and Ethiopian journals.

Recommendations. The project has been active for more than ten years; it is scientifically strong and produces useful results. In spite of the recent widening of the scope into "Integrated Pest Management" (IPM), it still mainly deals with two stalk borer species, relatively abundant in southern Ethiopia. The work has so far only covered phenology, efficiency of trapping, and sowing dates, and more research is still needed on the stalk borer. This raises some questions related to the future of the project:

1. Is it worthwhile to move into other pests?

2. Is the change of strategy based on national priorities, interests of the Ethiopian or Swedish researchers involved, or the wishes of SAREC or ESTC?

3. Is the new IPM project strategy cost effective?

Integrated pest management is an important field within agricultural research in the Third World and will for years to come be of considerable importance to Ethiopia. A stronger coordination with other Ethiopian researchers in the field (IAR) is recommended, also with respect to dissemination to users and other applications of the research results.

IPM is an example of a project in which the lack of deadlines and a project graduation date give cause for concern. Good researchers involved in a productive project will always be able to find strong reasons to keep it alive, typically by expanding the scope and moving into neighbouring fields. However, with the very limited access in Ethiopia to resources of the kind provided through SAREC, and with an abundance of societal problems, which require a research effort, research priorities in Ethiopia must be considered very carefully.

The Team expects that the result for the present project of such an evaluation may be that its SAREC support should be phased out; if this is the case, it is highly important that the Ph.D. and M.Sc. programs are continued to graduation. The Team considers it an important condition for successful conclusion of SAREC support to strong projects like the present that other (local) research funds are made accessible, primarily through a strengthened national research council function.

Further details on the IPM project are available in Negewo (1996).

3.6 THE PHOTOVOLTAICS PROJECT

Background. The project "Performance Evaluation of a Photovoltaic System Applied for Water Pumping" is based in the Technology Faculty of AAU and has no Swedish counterpart. It is so far very small both in terms of funding and number of people involved. The project was started in 1990, and presently only one Ph.D. student is enrolled, while three Engineering Faculty members are involved. As the detailed title indicates, the main goal of the project is to investigate the feasibility of using solar energy for water pumping; in the process it is hoped that some staff development and formalized research training can take place.

The purpose of water pumping is at least twofold. On the one hand, because of the climate and geography of Ethiopia, there is a widespread need for transporting irrigation water over long distances, typically from rivers to agricultural areas. On the other hand, the need for safe drinking water is huge; pumping ground water to the surface in populated areas will improve health conditions and the general quality of life for many.

The alternative to solar energy driven pumps is diesel driven pumps; they are demanding in terms of service and require expensive fuel. Since the Ethiopian climate is well suited for solar energy production, the project may help provide affordable and reliable power for water pumps, and at the same time help save traditional energy sources for other purposes.

Project Inputs. Almost half of the total SAREC funding up to 1994/95 of SEK 1.7 million was used for equipment. Some smaller amounts of support have come from local sources, particularly the university and ESTC. Procurement of equipment (and to a smaller extent also literature) has been carried out by SIDA. This has not been without problems. In particular, specifications of hardware have not been followed accurately. Typically, small, essential parts have been left out of the order, with the result that the equipment could be put to use only after long delays and considerable efforts by the local staff. A summary of expenditures is given in Table 3.6.

Research Results. So far, a photovoltaic system laboratory has been built and a small number of test sites, provided with solar panels and pumps, have been established in different locations in Ethiopia; presently these test sites and the reactions of the local population in each area are being monitored. The initial conclusions are very positive. At a cost of USD 7,000 per unit, the voltaic systems satisfy the power needs for several farms, they are almost maintenance free (except for simple cleaning of the solar panels, which may be performed by local farmers), their expected lifetime is 20-30 years, and the local populations have shown great interest in using the water. As an important aspect, undergraduate engineering students at AAU have been involved in the work and now regularly carry out student projects on solar energy.

In connection with the Ph.D. program, which deals with the interphase between a photovoltaic system and a pump, a research group and an expatriate advisor has been selected in the UK with support through the SAREC grant. The experience of this partnership during the first six months is not satisfactory; in particular, communication with the advisor has been difficult.

Table 3.6 The Photovoltaics Project.

Summary of SAREC Support 1990 to 95 (in SEK, see Negewo, 1996)

Item	Ethiopian Institutions	Swed. Inst. for Eth. Inst.	Service Charge by Swed. Inst.	Total	%
Salaries	120,000	0	0	120,000	6.86%
Consumables	20,000	20,000	20,000	60,000	3.43%
Literature	10,000	70,000	0	80,000	4.57%
Overhead	0	33,085	0	33,085	1.89%
Equipment	0	698,500	0	698,500	39.91%
Travel	30,000	155,000	30,000	215,000	12.29%
Sub. Grants	0	320,000	0	320,000	18.29%
Field Allowance	30,000	0	0	30,000	1.71%
Workshop	0	0	0	0	0.00%
Unforseen	10,000	173,415	10,000	193,415	11.05%
Grand Total	220,000	1,470,000	60,000	1,750,000	100.00%
Percentage share	12.57%	84.00%	3.43%	100.00%	

Conclusions and Recommendations. Photovoltaic systems are of high potential relevance to Ethiopia and might provide very direct support to poor farming areas in the country. However, a number of problems are apparent in the project.

First of all, the project is so far very small. Institution building, which should be an important part of a SAREC supported research project, is difficult to accomplish when only three Ethiopian staff members are involved. The limited scope also makes the potential impact on technology development in the country minimal. It has been proposed to solve this limitation by combining the Photovoltaics Project with other renewable energy activities at AAU. One specific candidate for such a merger is a wind energy project, a research activity which earlier received SAREC support. Although the Evaluation Team did not meet the wind energy group at AAU, it believes that the need for a broader project base in the Engineering Faculty at AAU is so urgent that, for this reason alone, the possibility of an expansion may be worth further exploration.

The dissatisfaction with the procurement services provided by SIDA is in contrast to the experiences of the Graduate School at AAU. The Photovoltaic Project has very specific needs for equipment and parts. Since the present arrangement is not working well, there seems to be no reason to delay the transfer of procurement duties to Ethiopia, especially if ESTC is willing to assist in this task. If the outcome of the project is that a larger number of photovoltaic systems will be not

only established, but also partly produced (assembled) in Ethiopia, a local experience in procurement will be badly needed.

Communication. Finally, it is important that the performance of the foreign Ph.D. advisor is closely monitored from the start and that his duties are made clear to him. Communication is a major problem in this connection; it is important that modern, low-cost, technical communication facilities, such as faximile or electronic mail, are made available to the project. At the moment there are no faximile machines or electronic mail facilities in the Technology Faculty.

Emerging Needs in Engineering. Within the field of research support for Third World countries, there is an obvious global donor preference for fields like agriculture and health. Support for engineering research is surprisingly rare, in spite of the widespread need for increased industrialization and improved use of modern technologies in many Third World countries. The activities of SAREC follows this pattern; the Photovoltaics Project represents the relatively rare case of a SAREC supported activity in engineering.

The project combines good research with a potential for providing very direct satisfaction of basic human needs (related to food production and safe drinking water) in the poorest part of the Ethiopian population. In Ethiopia today, the very limited involvement of SAREC in the field of engineering does not seem optimal. A UNDP study (UNDP, 1991) estimates that the higher education system in the country, mainly through AAU, was able to provide less than half of the technical manpower demand during the slow growth in the 1980s. In the coming years, the need for well trained engineers is likely to grow fast in Ethiopia, both in connection with the build-up of infrastructure and for the badly needed establishment of (at first, low technology) export industries in the country.

4. CAPACITY BUILDING AND IMPACT

Partial Research Capacity in a Field. For the following discussion, it will be useful to view the creation of research capacity as a process in three stages (Thulstrup, 1996). A researcher or research group has established a partial research capacity in a given field when they are able to perform research at an international level in that field, based on a situation where they are provided with the necessary facilities and are able to rely on proper cooperative opportunities.

Complete Research Capacity in a Field. A more demanding aspiration is the creation of a complete research capacity in the given field; this stage is reached when the researchers are able to independently perform all aspects of the research in the field, including managerial aspects, at a good, international standard. It is important that a country reaches this latter stage in fields of significance to the national development. However, this is often not enough. Lack of a national research capacity at a more general level may prohibit the exploitation of the research capacities created in specific fields.

National Research Capacity. The establishment of a true national research capacity requires much more than the combined establishment of research capacity in fields of interest in the country. It also includes the capability to prioritize research activities, to efficiently provide support for the selected research activities, to monitor and evaluate these activities, to train, attract, and keep good researchers in the country, to create conducive research environments, including incentive systems, for them, and to apply the research outcomes (both in the form of research results and research training) to the benefit of national development.

According to this definition, the demands for the establishment of a national research capacity are clearly very comprehensive. Essentially all developing countries, including Ethiopia, and many industrialized countries as well, still have a long way to go before they can claim success in this respect. It is of particular interest in connection with the SAREC activities that some small North European countries, such as Sweden, seem to be the most advanced in the world with respect to efficient, national research management. For example, their research outputs, when measured in scientific papers or citations, are higher relative to their populations or research expenditures than those in other industrialized countries (Thulstrup, 1992). One may therefore expect that research cooperation with Sweden might provide a developing country with particularly good opportunities for making progress towards a true national research capacity.

Progress Towards Partial Research Capacity. In the cooperative research projects in Ethiopia, which are supported by SAREC, it is clear that efficient partial research capacity building has taken place in many individual fields. In such fields, Ethiopian researchers have been trained individually to the highest international level and essential equipment has been supplied which allow research at a good international standard to be performed within the country in cooperation with qualified partners in Sweden. This is an important result, which must not be underestimated.

Complete Research Capacity in Specific Fields. Often the progress towards a more complete research capacity in each given field has been much slower. Today, it is still insufficient in many fields that have received SAREC support over long periods. There are encouraging exceptions to this among individual projects; for example, the Natural Product Chemistry Project. This project, which aims at strengthening the important field of natural product chemistry at AAU, has for more than ten years received an average annual support of close to SEK 700,000 - for further details, see Negewo (1996). The project is now completely managed by Ethiopian researchers. Even earlier, the Swedish contributions were modest (although clearly of a high quality); the total fees charged by Swedish institutions, mainly in connection with training programs, have amounted to only 2½ percent of the grants. Based on the indicators available, the scientific standard is excellent.

Despite of successes like this, many solid research activities, which have been initiated under SAREC sponsored projects, are not yet sustainable in Ethiopia without continued foreign assistance, both in the form of hardware supplies and management support. The projects have never reached a stage of complete research capacity in their field. The most common reason for this is that essential managerial duties, such as procurement, have consistently been performed in Sweden on behalf of the Ethiopian researcher.

Insufficient National Research Capacity. The reason that the progress from partial to complete research capacity in specific fields often has been slow in Ethiopia may be a result of the earlier failure to establish a sufficient degree of national research capacity. This has made it extremely difficult to take advantage of research capacities created in specific fields. In the absence of competent national (even institutional) research management, the creation of complete research capacities in individual fields was considered unsustainable and many Ethiopian researchers never took the necessary steps. In the absence of local support, they found it more convenient and efficient to rely on foreign management and research support.

The lack of a national research capacity in Ethiopia, as in most other developing countries, is apparent in many ways. In particular, the lack of efficient and reliable national financial support for and national recognition of important research activities, is a serious problem. Also the weak incentive structure, inefficient administrations (especially in universities), difficulties with procurement of both equipment and basic supplies, which require foreign currency, and lack of opportunities for efficient international communication, are characteristic weaknesses. These conditions have often discouraged well qualified Ethiopian researchers, who might otherwise have created research groups able to independently make significant contributions to the national development.

The New National S&T Policy. Therefore it is an important development, which may greatly improve the research productivity in the country, that the Government of Ethiopia has defined a national S&T policy (Annex V), that it is willing to provide substantial economic support to important, qualified research activities, and that it is in the process of strengthening the policy implementing institution, ESTC. The support of SAREC in this process is likely to be essential.

SAREC Support for National Research Capacity Building. Already in the former, more difficult climate, SAREC projects have made direct and determined contributions towards national

research capacity beyond the direct production of research results and research training. Among such projects are the support for national research journals, which so far has contributed SEK 4.3 million towards the establishment or strengthening of subject specific research journals in key fields, managed through ESTC. Such journals improve the communication among the researchers within the country. They may, with the help of constructive editors and reviewers, shape the habits of young researchers and improve their access to quality control and dissemination channels for their results. National research journals may also be essential for public and private users of research which may keep track on the national ability in each field. Partly due to the journal support through SAREC, scientific communication in Ethiopia is in a better shape than in most other developing countries.

Graduate Programs in Ethiopia. Another important contribution to national capacity building from SAREC sponsored projects is the assistance for graduate training in Ethiopia. Especially the M.Sc. programs at AAU, described in Chapter 3, have demonstrated an extremely good cost-efficiency. The graduate programs have mainly been managed by the two universities involved, AAU and AUA, on their own. In addition, the Graduate School at AAU, in cooperation with the involved departments, has established a capacity for research training management that exceeds the specific research and course activities included in the training.

Procurement in connection with the M.Sc. programs is mainly done by the Ethiopian side. Only procurement of a minor amount of equipment and other items are still performed in Sweden (by SIDA); although this works in well, there seems to be no reason to avoid taking the full step towards complete managerial independence (Chapter 3). The Ph.D. programs at AAU are still sandwich programs, but they are by nature Ethiopian programs, managed by the Graduate School and the departments involved. The Team finds the foreign involvement through the sandwich model valuable at this level; international experience is essential at the Ph.D. level, and it is important for the students to establish their own international profile.

Shortcomings: Priorities of the Swedish Partners. Contrary to the examples of support for a national research capacity building, most SAREC projects concentrate on research and research training in a much more narrow sense. Swedish partners are generally satisfied if their research training supply the Ethiopian students with a solid scientific knowledge about their subject, if the students, in cooperation with their advisors, produce valuable results in their research projects, and if the right equipment and consumables are provided in an efficient and economical fashion to the partners in Ethiopia. Training of young researchers in a wider sense, for example in research management, is rarely given much attention.

There are several reasons for this. The Swedish partners may be unaware of the need for a wider research capacity building in Ethiopia. Even if this is not the case, they may consider such activities as outside their responsibilities, according to the agreement with SAREC. The Swedish partner may feel that a success in wider capacity building will not be recognized and rewarded, while inefficiency and waste, which initially may result from a transfer of managerial duties to less experienced Ethiopian partners, will be considered failures.

For active researchers in a competitive research environment, such as the Swedish, fast progress in the production of research results is essential. One should not expect voluntary capacity building efforts in a direction which, at least for a while, might slow down the research, unless such efforts are specifically required as part of an agreement or demanded by the individual Ethiopian counterpart.

The View of the Ethiopian Partners. While it is clear that the Swedish partners and graduate advisors, with the best intentions, have missed opportunities for extending the capacity building to a wider range of issues, the problem exists as much on the Ethiopian side as on the Swedish, as mentioned above. Until a few years ago, there were few demands for greater Ethiopian involvement in project management. Most researchers (as well as ESTC at the time) seemed satisfied with the distribution of tasks. The priorities of the Swedish counterpart were shared by most individual researchers in Ethiopia: Fast progress within the individual research project was considered the main goal; the partner who most efficiently was able to procure and manage (usually the Swedish) should be given these tasks.

New Opportunities in Ethiopia. As discussed above, the lack of an official research policy together with the weak management of research at both the national and institutional levels have made a wider capacity building in most fields doomed from the start. With the new S&T policy and the strengthening of ESTC, the climate has changed and new opportunities have appeared. It is important that they are used efficiently, and not wasted. The difficulties in the cooperation between ESTC and SAREC, which was a result of the climate change (see Chapter 6), is a risk in this connection. Together, ESTC and SAREC must take the lead on both the project and national and institutional levels, to secure that capacity building is emphasized.

In connection with the design of individual projects, it is important that ESTC and SAREC together with the Ethiopian and Swedish partners place high emphasis on the wider capacity building efforts beyond the project research itself. Typical examples of concrete demands to the projects would include institutionalization of the projects in Ethiopia and gradual transfer of the management of funds for Ethiopian expenditures to the Ethiopian partners. This does not reduce the importance of excellence in the research and research training; they will still be very important goals, but no longer the only ones. As part of such a widening of the goals for individual projects, it must be made very clear to the participants that project monitoring and evaluation will consider a wider capacity building major criterion for success.

Direct Support for ESTC. In addition to the proposed expansion of the capacity building tasks in individual projects, SAREC may consider new activities (see Chapter 6). ESTC is still far from having developed its full potential, a potential which will be needed to handle the implementation of the national S&T policy. SAREC may be able to provide essential support for this process, partly based on the strengths of Swedish traditions within national research management, for example the important research council functions, research evaluations, etc.

University Management. Similarly, SAREC may consider assistance in the strengthening of the weak university administrations, which are often unable to provide conducive or even tolerable research environments for good and active researchers among the staff. An improvement of

university management remains a task of the highest importance in Ethiopia, especially at AAU, which for years to come will serve as a model for other universities.

It is likely that, within the coming year, the ongoing higher education reorganizations, both on a national level and at AAU, will either have been completed or will have produced a clearer picture of the future situation in Ethiopian tertiary education. The Sida sponsored study on AUA will further contribute to this clarification (Sida, 1996). It would therefore seem a highly worthwhile task for SAREC, in cooperation with ESTC, to actively contribute towards the strengthening of the research management ability in Ethiopian universities; such a strengthening must reach well beyond traditional financial management and must include subjects like incentive structures, quality issues, monitoring, and evaluation.

5. COST EFFECTIVENESS AND ACCOUNTABILITY

5.1 COST EFFECTIVENESS

Since a quantitative definition of wanted outputs from the SAREC financed projects in Ethiopia does not exist and since most investments produce outputs of several types, an accurate determination of cost effectiveness in the form of cost per output unit is not possible. Nevertheless, some rough, but still useful, estimates will be attempted in the following, especially with regard to research training.

Project Inputs. By 1994/95, the total monetary input from SAREC over the years in over 30 different projects had reached a total of SEK 155.8 million, or around USD 20 million. A considerable additional input in the projects, but one which is hard to quantify, has come from the Ethiopian side (for example in the form of staff salaries and working space). A detailed analysis of monetary inputs has been given by Negewo (1996).

Input by Project. In spite of the large number of projects that have received support (at one time over 30), most of the support went to a very limited number of projects. The projects which have received the largest share of the funding are the long-lasting Ethiopian flora project with 14 percent of all funds, the relatively new biomedical research project with 13 percent, and the natural product chemistry project with 8 percent of the grants. Ethiopian managed activities, the research training programs at AAU and the library and professional journal support projects received a total of close to 20 percent of the funds. The remaining over 25 projects shared the last 45 percent of the SAREC support.

Input by Item. Close to one third of all funds over the years have been used for laboratory equipment, vehicles, and other physical facilities. Most hardware went to Ethiopia, but in some cases equipment has been provided to Swedish institutions for use in the training of Ethiopian students. 19 percent of the total funds were used for travel, mostly between Ethiopia and Sweden, 14 percent for consumables, both in Ethiopia and for Ethiopian students in Sweden, and 13 percent for salaries, mainly to Swedish advisors. Another 13 percent was spent on subsistence, primarily for Ethiopian graduate students in Sweden.

Project Outputs. The outputs from the investments are harder to quantify. They have appeared in many different forms:

1. As trained manpower (returning to and remaining in Ethiopia), at levels from technicians to Ph.D.s; the benefits from this output include not only the improved research capability but often also - as an added advantage of university staff upgrading - a strengthening of undergraduate training,

2. as equipment, vehicles, and other physical research facilities, kept in working condition and placed in Ethiopian institutions,

3. as foreign books and journals, placed in university libraries and other institutions where they are available for Ethiopian researchers and students, or as strengthened Ethiopian research journals, facilitating scientific communication within the country,

4. as published research results with an impact on the development process in the country and contributing to the international recognition of, as well as cooperative opportunities for, Ethiopian scientists,

5. as institutional capability at many levels in Ethiopia (from capability within individual projects to that within faculties, universities, and the whole nation),

6. as an increased knowledge abroad about Ethiopian conditions and problems and increased foreign contributions to the international knowledge base concerning Ethiopia, and

7. as a strengthening of the Swedish research groups involved in research of interest to Ethiopia.

Research Training: Quality. Most graduate students trained in the projects work on research activities of direct relevance for Ethiopia. Even when the studies have taken place abroad, it has been possible for the graduates to continue their research after the return to Ethiopia. It is a very important aspect that most projects include a build-up of facilities in Ethiopia for this purpose. This quality is often missing in other foreign research training programs.

Based on all available evidence, including discussions with graduate students, researchers who have graduated from the projects and other experts in both Sweden and Ethiopia, the scientific production from degree programs, especially in the form of research papers, and the general high level of science based fields in Swedish universities, the Evaluation Team must conclude that the general scientific quality of the research training in the projects is good.

Brain Drain. Contrary to the experience over many years, that the risk of brain drain is very high in connection with foreign research training of Ethiopians, immediate brain drain in connection with the SAREC supported projects, and brain drain to Sweden in general, is very low. The reason may be partly a less severe shortage of research trained manpower in Sweden than in some other countries, but it is also an essential factor that the contact with the home institution in Ethiopia is kept alive during the studies in SAREC supported projects and that a relevant research environment is usually created in Ethiopia. However, the risk of brain drain to other countries remains after the training has been completed, especially since the graduates have been trained at a high international level.

Slow Progress Towards Graduation. A small flaw exists in the sandwich research training programs: Ethiopian students frequently exceed the planned period for completion of their degree work in Sweden. There are many reasons; it is difficult to time research work accurately, generous time limits for research and for the production of a thesis will usually improve the result, and both

economic and working conditions for the graduate student may be better during their studies in Sweden than after their return to Ethiopia. On the Swedish side, advisors often benefit from having experienced graduate students around longer. Incentives for an early completion of degree work in Sweden seem to be lacking.

Research Training: Cost Effectiveness. From other projects, for example large scale research training programs for staff from public institutions, financed by World Bank loans, it may be estimated that the present market costs of foreign training (in industrialized countries) of a graduate student up to the M.Sc. level are around USD 60,000 or SEK 450,000, covering tuition fees, living costs, and various overheads. Further foreign training of a student up to the Ph.D. level is likely to cost about twice as much, or close to SEK one million.

Based on these rates, the total SAREC support over the years, if it had been spent on research training alone, without the many other related outputs, might have produced 150-200 foreign trained Ph.D.s or about 3-400 M.Sc.s. However, the support from SAREC covers much more than training towards degrees. If it is assumed that one fourth of all SAREC funds had been spent at international market rates for research training towards Ph.D.s and one fourth for training towards M.Sc.s, the program would have produced 40-50 Ph.D.s and 80-100 M.Sc.s.

The total number of Ph.D.s produced until 1995 from the SAREC supported projects at Swedish universities is sixteen (Negewo, 1996), six Ph.D.s in Chemistry and Biology have been produced from AAU (Section 3.4) and more than ten students are on their way towards completion of a Ph.D. This corresponds to only half of the hypothetical number of Ph.D.s mentioned above. On the other hand, the number of M.Sc.s produced under SAREC projects is several times higher than the "expected" number, primarily due to the efficient production of M.Sc.s in the Graduate School at AAU. This project alone had produced 547 M.Sc.s by 1994 (although it must be kept in mind that the graduate programs at AAU received considerable direct, local support in the form of staff salaries and facilities). Based on the information available to the Team, the cost of training per graduate at the AAU Graduate School is only around USD 10,000.

Within the SAREC program, the highest costs of producing an M.Sc. overseas were observed in the Biomedical Research Training Project (Section 3.2), in which seven M.Sc.s and three diploma students had graduated by early 1995. This corresponds to an average cost close to SEK 1.7 million per graduate; assuming a low drop-out rate, the number will decline to about SEK 800,000 (USD 100,000) when the next batch graduate. This would bring the costs for this expensive field into a range below twice the average international market costs. Again, one must keep in mind that research training is not the only activity. Among other outputs, the amount of equipment placed at AAU under the project is very considerable (a value close to SEK four million). Thus even this project, which the Team considers one of the least cost effective, may eventually become able to compete on the price with international costs.

Equipment and other Research Facilities. Equipment utilization and maintenance are frequently problem areas in Third World research. As mentioned earlier, close to one third (32%) of the total SAREC funds over the years have been used for equipment and other physical facilities (Negewo, 1996), although some projects have provided remarkably small amounts. Most equipment is placed

in Ethiopian institutions, but in some cases it is provided to the Swedish counterpart in order to be used for training of Ethiopian students in Sweden. Because of the coordination of equipment supplies with other activities, in particular the training, the investments have generally been successful.

In general, the equipment utilization in SAREC supported projects is good and much above what is common in Third World countries. In most projects, the equipment provided has been well absorbed in the respective Ethiopian departments - the main exception noted by the Evaluation Team was in the Biomedical Research Training Project, where expensive equipment placed in the Medical Faculty of AAU seemed to be poorly managed and utilized (Section 3.2). In most projects, availability of foreign currency and close contacts with Swedish experts within each kind of equipment also helped keep the instrumentation well serviced and in a good state of repair.

Books, Journals, Publications, etc. The support from SAREC for the upgrading of specialized and more general research libraries has in several projects been significant for the creation of conducive research environments in Ethiopia. Also, the SAREC support for strengthening of national research journals in key fields is essential; such journals help improve communication between researchers and users of research, as well as within the national research community in each field (Chapter 4).

Production of Research Results. A number of research results emerging from the projects have the potential of contributing very directly to the development process, often in a way that is relevant to the poorest part of the Ethiopian population. The work on the maize stalk borer, for example, has shown that by changing the planting time, the harmful effect of this pest may, to a large extent, be avoided (Section 3.5). Similarly, the Photovoltaics Project has demonstrated a new and efficient source of energy for water pumping which may be useful for remote villages (Section 3.6).

Difficult Dissemination within the Country. In order to be useful, such research results must be disseminated to the potential users. This is rarely the direct responsibility of the researchers involved; others, e.g. extension services, should take over. However, in Ethiopia, weak extension services and other problems often make efficient dissemination very difficult. This is a problem which a strengthened ESTC may help solve.

International Contacts. An important advantage in connection with the production and international dissemination of research results is that they give Ethiopian researchers access to the informal, international research networks which exist in most science based fields. Without such access, Ethiopian research activities are not likely to be sustainable. As mentioned above, the Team found considerable evidence that the production of internationally published research results is satisfactory in most projects, including the Ethiopian managed graduate programs. However, modern communication channels, e.g. faximile and electronic mail, are still unavailable or inefficient in many projects, and funds for foreign visits and visitors, e.g. for external examiners for the graduate programs at AAU are very limited.

The vast majority of Ethiopian researchers outside SAREC projects have extremely limited opportunities for visits to relevant research environments abroad, including those in Sweden.

Among several negative consequences of this, it is also an obstacle in the creation of new SAREC projects. Access to travel grants for visits in Sweden might not only be essential for the work of individual Ethiopian researchers, but would also facilitate the establishment of new cooperative projects.

Institutional Capacity Building. As discussed in Chapter 4, the contribution of most projects towards institutional capacity building has not been satisfactory. There are important exceptions, first of all the Ethiopian graduate programs (Section 3.4), but the emphasis on institutional capacity building has been weak in most projects. A higher degree of awareness about this problem in individual projects is needed as well as a requirement that progress reports include an account of institutional capacity building efforts in the project. An essential contribution to institution building in Ethiopia might come from a gradual, systematic transfer of managerial tasks, especially procurement duties, from Swedish to Ethiopian counterparts. Over the years, 22 percent of the total funds have been managed by the Ethiopian partners, while 78 percent have been managed by Swedish counterparts, mostly on behalf of Ethiopian institutions (Negewo, 1996).

Inefficient University Administrations. Research activities both in SAREC supported and in other projects are frequently delayed and incentives for researchers are weakened because of inefficient university administrations. This is especially the case at AAU, which for years to come is likely to influence managerial procedures at other universities. Although SAREC supported projects have provided most of the total funding to projects at AAU, they have had little impact. In view of the fact that the AAU top management is fully aware of the problem and is willing to try to solve it, the time may be right for ESTC and SAREC together with AAU to consider possible actions. In view of the extensive impact of AAU management activities, investments in a strengthening may be very cost efficient.

ESTC and the Research Councils. The direct contributions to national capacity building by SAREC funded activities have been limited, with few exceptions as discussed above. It might be considered a further implicit contribution that the cooperation with ESTC over the years helped keep the organization alive. At any time, it gave ESTC a role to play, although this opportunity was not used to any great extent. At the moment, a strengthening of the capacity of ESTC is a national priority, including an improved research council function. The latter, combined with access to Ethiopian Government funds for research, would make it possible for the country to benefit from graduating SAREC projects, after the necessary capacity in the field has been achieved through SAREC funding.

International Exposure of Ethiopian Research Problems. As long as scientific thefts and brain drain are avoided, a foreign interest in Ethiopian research problems may have a very positive effect. International cooperation may bring considerable benefits to Ethiopian research groups and specific national problems may be solved through the efforts of foreign researchers. It is therefore important that specific Ethiopian problems are exposed internationally. In this regard, the good publication habits established in many of the SAREC funded projects have been essential. The Ethiopian Flora Project in particular, has demonstrated a considerable ability to actively involve foreign botanists in studies of the plants of Ethiopia. This benefit will grow when more flora volumes are in print.

5.2 ACCOUNTABILITY

Levels of Accountability. There are several important levels of accountability which must be considered:

1. The simplest form of accountability is the economic input accountability, demonstrating that funds in individual projects are spent as agreed upon,

2. another important kind of accountability is the output accountability in individual projects which demonstrates to what extent the project goals are realized, and

3. finally there is the overall program accountability, demonstrating that the whole program over many years is able to provide a cost-effective contribution to research based development of Ethiopia.

Project Monitoring. In monitoring and evaluation of activities, there is a widespread tendency to emphasize the first kind of accountability - input accountability - although it often would be more efficient to view outputs as the focal point in individual projects. For example, when a piece of research equipment is purchased, great emphasis tend to be placed on the price paid and the condition it arrives in. Waste at this stage is usually unacceptable. The monitoring of the utilization of the equipment, the production of research results or research training, and the contributions towards national development, is usually much weaker or even nonexistent. Waste at the later stages (after procurement) is frequently unnoticed. It is also often overlooked that output monitoring and evaluation is likely to provide a highly efficient tool for guiding projects in the wanted direction.

Systematic and Comprehensive Annual Progress Reports. Both input and output accountability reflect core elements of institutional capability. As a guiding tool for projects, output accountability is particularly important. The SAREC supported projects do not use this opportunity in a systematical way. It might have a highly positive effect if individual projects were required to produce annual progress reports specifically listing project outputs, including indicators like equipment utilization. In this connection, it may be considered an important decision that ESTC and SAREC included a list of expected results in their 1994/95 agreement. It is essential that such lists are used in later evaluations.

Overheads to Swedish Institutions. Several questions have been raised to the Evaluation Team about the overheads charged by Swedish institutions. These vary greatly in size (Negewo, 1996) and are calculated according to very different formulas. Negotiations between SAREC staff and individual Swedish project managers and institutions about these rates, travel costs, and similar expenditures, take time away from more constructive activities, although the financial background for involvement of Swedish institutions is simple:

1. The present financial situation in Swedish universities does not allow any extensive generosity; thus fees are generally necessary,

2. most, but far from all, present fees seem reasonable or low on an international scale, and

3. most Swedish project participants have sufficient freedom from the central university administrations to accept any reasonable agreement,

Therefore, much time would be saved if SAREC defined a set of standard rates for compensation of Swedish project participants, depending on the services involved. If these rates were not satisfactory to a potential Swedish partner, an attempt should be made to locate another partner. In this, as well as in other connections, it is an underlying problem that the interest in a cooperation with Ethiopian researchers depends strongly on the field; while Swedish researchers in tropical subjects (e.g. tropical biology, agriculture, and health) often would find a cooperation with Ethiopian partners highly attractive, this is often not the case in other fields, for example physics and computer science (Danida, 1992).

Accountability between Partners. Another important aspect of accountability is the accountability between partners. Presently, progress reports for cooperative projects, with accounts of inputs and often also outputs, are prepared by the Ethiopian partner for ESTC and by the Swedish partner for SAREC. The Evaluation Team was surprised to learn that the Ethiopian partners often were not informed about the content of the report from their Swedish counterparts. This provides a breeding ground for suspicion and does not promote efficient cooperation. Nor does it promote efficient cooperation between ESRC and SAREC that they receive different background material on the projects.

Common Progress Reports. If the cooperative partners produced a common report, accounting for both inputs and outputs and signed by both, these problems would be solved. In addition, it might be a learning (capacity building) process, especially for the Ethiopian partner. In case the partners did not agree on the report, the process would expose this disagreement (which would be helpful) and would bring it to the attention of ESTC and SAREC. The most important accounts of input and output to be included in annual progress reports are:

1. Information on expenditures in Ethiopia and Sweden and on how decisions were made on these expenditures,

2. information on major project activities, including their distribution between Ethiopia and Sweden, utilization of facilities, etc., and comparison with plans presented in the previous annual report,

3. information on project outputs, research results, dissemination, training provided, and capacity building, and a comparison with the expected outputs listed in the previous progress report, and

4. an account of the agreed plans for activities in the coming project year and of the expected outputs.

Standard Forms. In order for ESTC and SAREC to receive project information in a systematical format, the use of standard report forms might be very convenient. The forms should emphasize output information. In addition to the standardized information required, partners should have an opportunity to provide further project information, also on possible differences in opinion among them. The introduction of standard report forms in the Danish ENRECA program (Danida, 1992), which in many ways is similar to SAREC's cooperative program, has simplified the administrative tasks in Danida and given new opportunities for both project comparisons, evaluations, and improved policy decisions.

6. WORKING RELATIONS BETWEEN ESTC AND SAREC

Recent Problems Between ESTC and SAREC. During the last two years, the working relations between the two major partners in the Swedish support for Ethiopian research, ESTC and SAREC, have changed considerably. For years, ESTC functioned as a helpful, but not very active partner for SAREC in Ethiopia - in return, SAREC supported projects played an essential role for the preservation of a certain competence within ESTC, although such competence was not used much. Without sufficiently active and efficient institutions in Ethiopia, i.e. with a passive ESTC and an inefficient management at AAU, both Swedish and Ethiopian project partners were tempted to deal directly with SAREC, rather than with Ethiopian institutions. Similarly, SAREC often found it more convenient to communicate directly with the researchers involved on both sides, thereby bypassing ESTC and university managements. This practice was recommended by the 1985 evaluation team, which found that the Ethiopian Government lacked genuine interest in research capacity building.

The New S&T Policy. The situation was changed completely with the recent introduction of a science and technology policy in Ethiopia. The role that ESTC was supposed to play became greatly enhanced and its possibilities for concrete actions became much improved, especially since the Government declared its willingness to commit up to 1.5% of the gross national product for research, a drastic change from a situation where the national research support outside salaries and modest facilities were negligible. As a result, SAREC suddenly found itself dealing with a partner that had strong views and strong commitments to national S&T policy issues. It is not surprising that a sudden change of this kind and magnitude would require an adjustment period for the two partners.

Basic Areas of Agreement between ESTC and SAREC. It is important to stress that ESTC and SAREC by their mandates share important obligations and still are in perfect agreement on the main goal of their cooperation: To build sustainable research capacity in support of the development of Ethiopia. They also agree that such capacity building includes a wide range of activities; not only the research itself or the availability of research facilities, but also the ability to plan, manage, and disseminate research, both on the project, institutional, and national levels, and to carry out high quality research training. Both consider it important that the capacity building includes the national level and both consider the final goal for each individual project a situation in which the Ethiopian research groups on their own can sustain all essential activities.

Reasons for Disagreements. Thus, it seems that there are no fundamental reasons for the recent disagreements between ESTC and SAREC. The disagreements have been related to issues like the division between the Swedish and Ethiopian counterparts of the responsibility for management of project funds, the new decentralization efforts, and the magnitudes of project costs in Sweden. ESTC has occasionally felt that SAREC's response to the new situation "has been one of disinterest and active undermining" (Negewo, 1996). This lack of constructive cooperative climate is to a large extent a result of the sudden increase in the competence of and expectations to ESTC, but there may also be other reasons.

The Donor-Recipient Syndrome. One possible explanation may be the traditional donor-recipient syndrome. The different roles of the two parties easily create a situation in which the donor dictates all important decisions and the recipient accepts a passive role, like ESTC did earlier. This situation is contrary to what ESTC and SAREC want; the policy of SAREC is - probably more clearly than for many other foreign donors - strongly in favour of strengthening the local influence and managerial capability.

Management of Funds. While restrictions due to government regulations and lack of competitive markets in Ethiopia earlier limited the possibilities for implementing several aspects of research capacity building in the country, for example with respect to procurement of equipment and materials and exchange of foreign currency, this situation is now improving fast. With the increased possibilities, e.g. for procuring needed items in Ethiopia, it has become clear to ESTC that many projects leave too little responsibility for financial management to the Ethiopian counterparts and that this creates a severe flaw in the capacity building activities.

The point of view held by ESTC, and widely shared by the Evaluation Team as well as by SAREC, is that although the research and research training activities in many projects are performed well, key aspects of the capacity building process have been neglected - for example, when most procurement of equipment and materials for use in Ethiopia is done by Swedish counterparts and when air tickets for travel out of Ethiopia are purchased in Sweden (Chapter 4). Although the situation differs from one project to another, these views reflect the feelings of many, although not all, Ethiopian counterparts. In some projects, a sizeable share of the financial responsibility has been given to the Ethiopian partner, while in other projects, the Ethiopian side has been pleased with the freedom from boring managerial tasks and has found no reason for complaint over the services provided by the Swedish counterpart.

Nevertheless, the Evaluation Team is convinced that a gradual transfer of responsibility for all aspects of the research, including a considerable share of the procurement tasks, must take place in order to build a sustainable research capacity in Ethiopia, both in individual projects as well as on the institutional and national levels. It is also clear that the expedience of such a transfer must depend on individual project needs and capabilities, and that it is important that both ESTC and the Swedish partners are willing to provide advisory services for Ethiopian counterparts during this process.

Research Priorities. Both ESTC and SAREC have through their respective governments been provided with general priorities for which kinds of research they should support. The two sets of priorities are not identical, but they clearly overlap a great deal. Minor differences might create problems in the situation that existed earlier, where SAREC was the dominant source of "free" research funding in the country. With the increased government commitment to research it should become possible for ESTC to secure funding for activities, which it finds important, even if these are not given equal priority by SAREC. If needed, ESTC, in cooperation with the research councils and other relevant institutions, might simply prepare a list of research projects for funding, from which SAREC would select the projects which were in best agreement with the general Swedish development policies.

Open, Frank, and Fast Communication. The Evaluation Team noticed that, despite occasional very frank statements about the cooperation, the dialogue between ESTC and SAREC was generally not open, fast, and efficient. It often had the character of idle discussions between opponents rather than that of consultations between partners. Slow mail services have been used, when a telephone call or a fax might have solved misunderstandings or disagreements within minutes. The level of mutual information and consultation has often been unsatisfactory. The use of electronic mail might greatly facilitate the communication.

Sharing Information on Individual Projects. As noted in Chapter 5, monitoring and evaluation of research projects provide unique opportunities for influencing their direction. So far, progress reports prepared by Ethiopian project participants have been collected by ESTC, which in turn have sent them to SAREC without comments from either the home institution of the project (such as AAU) or ESTC itself. SAREC has had to perform progress analyses for each individual project solely based on this report together with the report received from the Swedish counterpart.

Joint Project Monitoring. The Evaluation Team found that the project monitoring procedures so far has been an area of missed opportunities. Clearly, input from the Ethiopian host institution might be needed as part of an efficient monitoring process. Similarly, comments by ESTC, for example on the placement of individual projects in a national setting, would be important. Most of all, the overall quality of the monitoring of any project would be enhanced considerably if ESTC took part together with SAREC and was provided full access to all information from the Swedish partner. In this connection, it must be added that the preparation of a list of expected results for the 1994/95 agreement between ESTC and SAREC is an important step towards efficient, common output evaluation.

Development of Monitoring and Evaluation Capability. A joint monitoring of projects might also function as an important learning process, for both ESTC and SAREC. In the future, the demands to the monitoring capability of ESTC are likely to increase greatly with its increased mandate. Together, ESTC and SAREC might be able to define improved indicators (especially on outputs) for project success. Such indicators have so far been less specific; improved definitions will be needed, not only for the management of SAREC funded projects, but also for a general strengthening of the national research management capability.

Regular Project and Program Evaluations. In addition to the annual monitoring of individual projects, it might be valuable for ESTC and SAREC to join in regular (e.g. every three to five years) evaluations of the program in general, including evaluations of selected individual projects, which either demonstrate unsatisfactory performance in the annual progress analysis, or which might be considered near graduation. The participation of ESTC would be particularly important in the latter case, since an estimate of available national research funds for graduating projects would have to be made.

The June 30, 1994 Agreement between ESTC and SAREC. In June, 1994, a meeting was held in Addis Ababa between the Swedish Ambassador to Ethiopia, the Commissioner of ESTC, the Director General of SAREC, and other high level staff from ESTC and SAREC. The minutes from this meeting contain several of the recommendations given above and define a division of duties

between ESTC (together with the national research councils) and SAREC, which the Evaluation Team finds commendable. The text of the approved minutes is given in Annex IV. The Team considers it essential that ESTC and SAREC, at least for the time being, closely follows the procedures agreed on in this document.

7. MAIN CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS: THE PROJECTS

Capacity Building. Creation of sustainable research capacity in key fields in the Third World is not an easy task. Numerous attempts have failed, also in countries with a much better economic background than Ethiopia. The research support provided through SAREC is unique both because of its design, its size, and its 15 year long history. Most projects, which have been supported through SAREC, have provided contributions to research capacity building in Ethiopia at a high academic level (partial research capacity), but insufficient with regard to wider issues (complete research capacity). The cost efficiency has been acceptable, although not outstanding, in most projects. In one case, the M.Sc. programs at AAU and AUA, it has been excellent. Dissemination of research results is good in a traditional, academic sense, but due to weaknesses elsewhere in Ethiopia, dissemination to local users needs major improvement.

The projects target primarily direct research ability within each specific field, while most have not seriously attempted wider capacity building, which would include research management aspects and institution building in Ethiopia. Many projects are still dependent on one or a few individuals. A particular issue is the management of project funds, of which still two thirds are managed by the Swedish counterparts in the projects, although responsibility for procurement and financial management must be considered an essential part of the capacity building process.

Institutional Capacity. There are several reasons for this situation. Individual researchers on both sides consider a fast production of quality research results the main goal. A major additional priority for most Swedish advisors of graduate students is the quality of the training in a narrow sense. A further priority is the build-up of physical facilities in Ethiopia. However, the concerns have rarely been extended to true institution building. The projects have often targeted the needs of individual researchers, but less those of institutions.

Project Monitoring. Contributing to this situation may be that the wider capacity building issues have not been sufficiently emphasized in the agreements with Swedish counterparts and in the communication between Ethiopian and Swedish partners on the one hand and ESTC and SAREC on the other. In particular, the project monitoring mechanisms have not covered these issues with sufficient clarity. Systematical output monitoring has not been performed, nor have standardized progress report forms been used; such forms have helped secure essential output information elsewhere (Section 5.2).

Coordination. A very strong quality in the projects is the coordination between different kinds of inputs: Research training, physical facilities, provision of consumables and literature, travel, etc. Ethiopians, trained in Sweden under the projects, rarely return to a scientifically empty environment. Throughout the studies, contact has been preserved with the home base; in addition, local conditions have usually been prepared for a continuation of the research after the return, e.g.

through provision of physical facilities. This is a rare quality among capacity building projects in the Third World.

Priorities. A problem which is particularly obvious in Ethiopia, where the need for research support in the development process is widespread, is the definition of priorities. Support for research at the level provided through SAREC is rare in Ethiopia; a major question is how long each particular project should benefit from this kind of support. Even for individual research training programs one might ask how long Ethiopian students should be allowed to extend their studies in Sweden under good conditions, but at high costs (Chapter 5), when other qualified candidates for research training have to wait because of lack of funds. The fact that slow progress towards goals is often rewarded, both in individual study programs and at the project level, is a serious problem.

Communication between Partners. A weakness of another kind in the projects is the insufficient communication between the partners with regard to monitoring and evaluation. Progress reports are produced separately, and some project participants are unaware of the content of the report from their counterparts. This is part of a more general weakness in the communication between institutional partners, which is sometimes increased by a lack of easy access to fast communication facilities (facsimile, electronic mail).

For conclusions regarding individual projects, see Chapter 3.

7.2 RECOMMENDATIONS: THE PROJECTS

Capacity Building. The Evaluation Team recommends that the SAREC sponsored support of individual projects is continued with an increased emphasis on complete research capacity building - i.e. institution building and research project management in Ethiopia. One important action to be taken is a gradual transfer of the responsibility for financial management to the Ethiopian counterparts. The expediency with which this transfer should take place depends on the situation in each project. It is important that both ESTC and the Swedish counterparts are supportive when the new duties are taken over by the Ethiopian research groups, and that ESTC and SAREC accept that some initial waste may occur in the process.

Monitoring and Evaluation. Both regular monitoring and specific evaluations must be strengthened within each project and used more efficiently as steering instruments. Annual progress reports, emphasizing project outputs, progress towards project targets, and capacity building efforts, should be produced in close cooperation between the partners. The Team recommends that each project evaluates the cost efficiency within research training activities and attempts to improve it, for example by making sure that study programs follow a reasonable time schedule and possibly by increasing the number of students involved. In this connection, particular emphasis should be placed on the recruitment of a larger number of female candidates.

Target dates. Tentative target dates for "graduation" must be provided for each project, as well as for students in individual study programs. The annual progress reports must demonstrate suitable

advance towards final project objectives and improved incentives for progress towards project goals must be developed.

Communication. If efficient cooperation between institutional partners in a project is limited by a lack of fast communication facilities (faximile, electronic mail), such facilities should be provided by the project.

Dissemination. Project participants must, with support from ESTC, actively facilitate the dissemination of relevant research results to local users. Such dissemination efforts must be described in the annual progress report.

Specific recommendations for individual projects are given in Chapter 3.

7.3 RELATIONS BETWEEN ESTC AND SAREC

Adjustment to the New S&T Policy. The new science and technology policy in Ethiopia, the government commitment to provide up to 1.5 percent of the GDP for research, and the strengthening of ESTC has in several ways changed the background for the program. ESTC is now committed and willing to play a much more active role; it is important that these new opportunities are used constructively in the cooperation between ESTC and SAREC. So far, the main result has been difficulties, but these are not based on differences in goals or general strategies, but are mainly a result of a slow adjustments to the changed situation and of inefficient communication between the two parties. Many cooperative problems might be solved instantly through consultations by phone, fax, or electronic mail. Instead, slow mail services have often been used; the resulting delays alone have made it possible for problems to accumulate.

Project Selection. Minor disagreements on project selection should no longer be a cause of cooperative problems, especially when the Ethiopian dependence on SAREC funding for research decreases through improved government funding and a strengthened research council function. This will also simplify the graduation of SAREC supported projects when sufficient capacity has been built, since the financing of strong research activities may be taken over by the new sources.

Monitoring and Evaluation. Project monitoring and evaluation is presently weak, and is not used as an efficient steering instrument for the projects. The background material for monitoring of individual projects, which is provided to ESTC and SAREC, differs, thereby making their cooperation less efficient and more difficult.

The Need for a Strengthening of ESTC. Even with improved government support, ESTC has an extremely difficult task. Many Ethiopian research environments, particularly at AAU, are not conducive for efficient research. The incentive systems are weak and salaries very low. Much equipment is outdated, funds for consumables and travel are very limited, the university managements are still inefficient, and the effects of an improved national research policy are not yet clearly felt by most individual researchers. ESTC will need substantial support in order to cope with this situation. The SAREC funded activities may be an important factor in this process.

7.4 RECOMMENDATIONS: PROGRAM MANAGEMENT

Project Selection. The new opportunities for provision of national research support may facilitate the project selection procedure, since it will make research policy implementation by ESTC less dependent on Swedish support. The Team recommends that, in case of disagreement, ESTC may prepare a list of projects it finds suitable for SAREC funding, and that SAREC after proper consultations selects those projects from the list which are in best agreement with the general Swedish development policy. Other projects are referred to national support.

Project Graduation. The Team recommends that ESTC and SAREC from the start of each project discuss realistic target dates for transfer of the project from Swedish to national support. In this context procedures which give rewards for fast rather than for slow progress towards project goals must be developed. Also in connection with individual research training programs in Sweden, the present (unintended) financial rewards for slow progress should be abolished.

Monitoring and Evaluation. The Team considers monitoring and evaluation, e.g. through the annual progress reports and more thorough project evaluations every 3-4 years, important instruments for program control. An increasingly active involvement of ESTC, together with SAREC, in regular monitoring of all project expenditures and outcomes is essential in order to improve the quality of monitoring, to facilitate cooperation, and as a learning process. If needed, SAREC might support training activities for ESTC staff and other Ethiopian research managers (e.g. from AAU), especially in research monitoring, evaluation, procurement, and management.

Institutional Compensation. The Team recommends that SAREC makes a strong attempt to standardize compensation to Swedish institutions. This will save time for more important tasks.

The Future Role of SAREC in Ethiopia: As a dominant source of research support in Ethiopia, SAREC should play a stronger role in the national research capacity building process, particularly in the strengthening of key organizations responsible for research management, including ESTC itself and university administrations. The cost efficiency of such actions may be very high. The activities would include training of staff, demonstration of efficient research management systems in Sweden, and possibly financing of both hardware and relevant pilot projects in research management.

8. REFERENCES

Addis Ababa University. 1994. Information material. Addis Ababa.

Bhagavan, M.R. 1992. "The SAREC Model: Institutional Cooperation and the Strengthening of National Research Capacity in Developing Countries." SAREC. Stockholm.

Danida. 1992. "Evaluation Report: The Bilateral Programme for Enhancement of Research Capacity in Developing Countries." Danish Ministry of Foreign Affairs. Copenhagen.

Eisemon, T. and Kourouma, M. 1992. "Foreign Assistance for University Development in Sub-Saharan Africa and Asia." World Bank, Education and Social Policy Department. Washington, D.C.

Elzinda, Aant. 1981. Evaluating the Evaluation Game: On the Methodology of Project Evaluation, with Special Reference to Development Cooperation. SAREC Report. Stockholm.

ESTC. 1993. The National Science and Technology Policy; Policy Directive no.4. Addis Ababa.

Fekadu, M. 1996. "Trip Report: Evaluation of Ethio-Swedish Research Cooperation." Sida. Stockholm.

Gaillard, J. and Thulstrup, E.W. 1994. "Research Capacity Building through North-South Cooperation: A Possible Strategy for World Bank Projects." World Bank. Education and Social Policy Department. Washington, D.C.

Hayami, Y. and Ruttan, V.W. "Agricultural Development, An International Perspective." pp. 260-262. John Hopkins University Press, Baltimore.

IDRC. 1991. "Empowerment through Knowledge. The Strategy of the International Development Research Center." Ottawa.

Negewo, A. 1996. "Evaluation of Ethio-Swedish Research Cooperation." Sida. Stockholm.

Olsson, B. 1992. "The Ownership and Cultivation of Knowledge." Draft (original in Swedish). SAREC. Stockholm.

SIDA, 1989. "Why are we in Ethiopia? 100 Years of Ethio-Swedish Development Cooperation." SIDA. Stockholm.

Sida, 1996. Report from the ongoing study of Alamaya University (AUA). In preparation. Sida. Stockholm.

Thulstrup, E.W. 1992. "Improving the Quality of University Research in Developing Countries." World Bank. PHREE Background Paper No. 52. Washington, D.C.

Thulstrup, E.W. 1994. "Scientific Research for Development." World Bank. Human Resources Development and Operations Policy Working Paper Series HROWP 25. Washington, D.C.

Thulstrup, E.W. 1995. "Strengthening Science Based Fields in Third World Universities." in "Research for Development. SAREC 20 Years." Ed. K. von Schlebrügge. SAREC. Stockholm.

Thulstrup, E.W. 1996. "Strategies for Research Capacity Building through Research Training." in "Research Training for Development." Ed. E.W. Thulstrup. Roskilde University Press. Copenhagen.

Turner, J.D. 1992. "Higher Education in Ethiopia. A Preliminary Review." Ethiopian Ministry of Education. Addis Ababa.

UNDP, 1991. Evaluation of Assistance to Addis Ababa University. Report of an In-depth Evaluation Mission. Addis Ababa.

World Bank, 1993. "Trends in Developing Countries." Volume 3, Sub-Saharan Africa, pp 62-7. Washington, D.C.

World Bank, 1994. World Development Report, Washington, D.C.

Further references may be found in Fekadu (1996) and Negewo (1996).

9. ANNEXES I - V

I. Terms of Reference

II. Persons Met during the Missions

III. Questionnaire to Project Participants

IV. Agreement of June 30, 1994

V. The Ethiopian S&T Policy

ANNEX I: TERMS OF REFERENCE

TERMS OF REFERENCE FOR A STUDY OF THE ETHIO-SWEDISH RESEARCH COOPERATION

BACKGROUND

SAREC initiated in 1979/80 a bilateral research cooperation with Ethiopia. The total support up to and including 1993/94 amounts to SEK 150,4 million, out of which SEK 18 million for 1993/94. SAREC's counterpart in the cooperation is the Ethiopian Science and Technology Commission (ESTC).

Almost the entire support is allocated to the Addis Ababa University (AAU) and to the Alemaya University of Agriculture (Alemaya).

In the agreement covering 1992/93-1993/94, some 25 projects were included.

Strengthening of research capacity in the form of support to PhD-training, mainly in institutional collaborations according to the "sandwich" model, is an important component of the cooperation.

SAREC and ESTC have agreed to extend the research cooperation with one year only, 1994/95, and to nominate a team of scientists to give a report as a background for a decision on a longterm agreement as from 1 July 1995.

TERMS OF REFERENCE

In accordance with the minutes of understanding made by and between the Ethiopian Science and Technology Commission and SAREC of Sweden, an agreement was reached to have an evaluation report made on the projects that are being financed through the bilateral ESTC/SAREC cooperation. The Consultant(s) shall study the general new setting for the overall cooperation. The environment and the new thrust in the Ethiopian economy is free-market oriented. Various new sectoral policies and strategies have been officially adopted. As part and parcel of this, the new National Science and Technology Policy has also been adopted. Having taken this and the very recent agreements between the ESTC and SAREC into account, the Team of consultants shall carry out the following:

- assess the results and the efficiency of the Ethio-Swedish bilateral research cooperation and the working relationship between SAREC and ESTC, and

- as background information, give a presentation of research in Ethiopia and the Ethiopian universities and of the new national policies and the implications of these policies on externally and nationally funded research.

The comments and recommendations of the Team need not necessarily be shared by neither SAREC nor ESTC.

When studying the research cooperation, the Team shall focus on the overall cooperation and the individual projects will be seen in a general manner. However, projects where capacity building and cost effectiveness have been discussed in particular may be studied more in detail. These include Flora and ecology, Biomedical research training program, Butajira rural project, the Graduate program at AAU, Integrated pest management, Photovoltaics etc. The Team shall not undertake a scientific evaluation of any of the individual projects included in the cooperation.

1. General

1.1. A general description of the research structure in Ethiopia: ministries, ESTC, universities, institutes etc. at both central and sectoral levels, in charge of research policy, planning, implementation and follow-up.

1.2. A brief description of the Addis Ababa University and the Alemaya University of Agriculture.

1.3. A general description of the Ethiopian Science and Technology Commission.

2. Research in Ethiopia, research policies and research funding

2.1. A brief and broad discussion on the role of research in the country and a review of strengths and weaknesses in different areas of science in Ethiopia (including areas not covered by the current bilateral research cooperation).

2.2. A general presentation of national policies related to higher

education and research, i.e. mainly Science & Technology Policy, Plant enetic Resources Policy, Educational Policy and Health Policy. A brief discussion on the mechanisms for establishing these national policies, and comments on the implementation of the policies and effects on relations with external donors.

2.3. A discussion of possible financing strategies for research activities, availability of national budget resources (including open national research funds) as well as external funds.

2.4. A presentation of international bodies and external donors supporting research activities in Ethiopia, and their relationship with national research structures.

2.5. A study of mechanisms of access and dissemination of research results (publication, specialized journals, libraries, data banks etc.)

3. Ethiopian universities

3.1. University and faculty planning. A description of ongoing activities on central university as well as on faculty level in relation to research priority setting. The team will discuss the interaction between national policies and research policy and priority setting within the universities.

3.2. Post-graduate training. An analysis of post-graduate programmes at the universities, including means and mechanisms for training abroad, with comments on the potential capacity of the system to meet the country s research priorities and requirements.

3.3. Financial situation. A description of the present financial situation of the universities (national budget resources as well as external donor support), and a prognosis for the future.

3.4. Administration. A description of the administrative capacity of the universities, in particular the administration of financial resources including convertible currency. Internal university systems of accountability, reporting, and transparency will be documented. Any differences referring to external donor support, and relation to external donors, as compared to regular national budget resources will be subject to analysis.

3.5. Research infrastructure. The team will comment on

- organisation and procedures for procurement of equipment.

- organisation and procedures for repair and maintenance of expensive scientific equipment.

4. The bilateral research cooperation

In light of their findings, the team will discuss the Ethio-Swedish bilateral research cooperation and the use of SAREC funds for support to research and for strengthening of research capacity in Ethiopia and specifically comment on:

4.1. Capacity building. The team shall elaborate on research capacity building and human resource development, scholarships and the development of critical capacity in the MSc/PhD dissertation programmes as well as in the other projects. Focus and concentration on certain research institutions or research areas will be discussed. Furthermore, comment on research administration capacity building; procurement of goods and services, scheduling and planning of activities, supervision and monitoring etc.

4.2. Cost effectiveness. The cost effectiveness of various elements in the cooperation will be analyzed; research training and supervision according to the "sandwich model" (length of stay in Sweden), travel by students and supervisors (frequencies and administrative arrangements), research administration and overhead charges.

4.3. Sustainability. An opinion will be given on the viability of the research areas presently supported by SAREC, longterm sustainability as well as institutional impact. Open endedness of certain projects, support as a function of a specified time should be raised.

4.4. Impact Analysis - An overall impact analysis shall be conducted on set versus accomplished objectives. Open endedness of certain projects shall be looked into.

4.5. Research infrastructure. The team will assess if the necessary facilities (equipment etc.) have been acquired within the projects, and if the capacities to operate and maintain scientific equipment are adequate.

4.6. Convertible currency. The overall handling of foreign exchange in the cooperation should be assessed.

4.7. Future cooperation. The team shall make recommendations for future improvements in the Ethio-Swedish research collaboration.

5. SAREC/ESTC working relationship

5.1. The team will comment on the working conditions between SAREC and ESTC, with special respect to:

- Project administration
- Priority setting and selection of projects
- Monitoring of projects
- Disbursement of funds
- Evaluation of projects
- Flexibility of alternation of project lines from originally proposed and approved
- Information flow and decision making

6. Duration and reporting

6.1. The report will be given by a team of three persons, each person expected to devote 4-5 weeks to the mission.

6.2. The team will be briefed by SAREC in Stockholm before departing for Ethiopia, and also meet a selected number of Swedish university institutions involved in the cooperation.

6.3. The team will meet ESTC in Addis Ababa. Furthermore, the team will meet the university leadership of AAU and Alemaya, and a selected number of Ethiopian project leaders.

6.4. The team will contact other external donors supporting higher education and research in Ethiopia.

6.2. The team will present a draft report in English to SAREC not later than 15 February 1995. A final report will be presented no later than 4 weeks after the consultants have received SAREC s comments on the draft report. The final report will be delivered on paper as well as on diskette (Word Perfect 5.1 or 5.2).

ANNEX II: PERSONS MET DURING THE MISSIONS

IN SWEDEN

SAREC:

Mr. Ronny Duell
Dr. Johan Holmberg
Dr. Claes Kjellstrom
Ms. Hellen Ohlin
Ms. Karin v Schlebrügge

UMEÅ UNIVERSITY:

Prof. Stig Wall - contacted by telephone

KAROLINSKA INSTITUTET - Biomedical Research Training Program:

Prof. Magnus Ingelman-Sunberg, Chairman KIRT-Committee
Dr. Bengt Hojer, Vice Chairman KIRT-Committee
Dr. Mikael Holst, BRTP-Coordinator
Dr. Johan Carlson, Programme Manager, KIRT-Comm.
Dr. Stefan Eriksson, Supervisor in Physiology
Dr. Sven Hoffner, Supervisor in Microbiology
Graduate students

SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES (SUAS), UPPSALA:

Department of Animal Breeding and Genetics

Dr. Birgitta Malmfors
Prof. Jan Philipsson

Department of Plant Breeding

Prof. Arnulf Merker
Graduate student

Department of Entomology

Prof. Jan Pettersson
Dr. Ronald Sigvald

ROYAL INSTITUTE OF TECHNOLOGY, Stockholm:

Geophysics Program

Prof. Lars Sjöberg

Multipurpose Water Development

Prof. Klas Cederwall

UPPSALA UNIVERSITY:

Flora of Ethiopia

Prof. Olov Hedberg
Dr. Inga Hedberg, Project counterpart

Department of Limnology

Dr. Ingmar Ahlgren

Geophysics Program

Dr. Rutger Wahlström
Graduate students

IN ETHIOPIA:

ESTC:

Dr. Kebede Tadesse, Commissioner ESTC
Ato Asrat Bulbula, D/Commissioner, ESTC
Dr. Beyene Kebede, Head, Agriculture and Environment Protection Department
Dr. Yemane Teklai, Head, Health Department
Ato Muhammed Umer, Head, Administration and Finance Service

Ato Mulugeta Amha, Head, Mines, Energy, and Water Resources Department
Ato Shumu Teffera, Head, Industry, Transport and Communication Department
Ato Gezachew Woldeyes, Head, Information and Popularization Department
Ato Getaneh Yimene, Head, Policy, Plan and Project Service
Ato Mulugeta Libse, Director, National Information and Computer Service
Ato Eshetu Alemu, Deputy Director, National Information and Computer Service

ADDIS ABABA UNIVERSITY (AAU)

Ato Daniel Gemechu, Vice President for Academic Affairs
Ato Haile Selassie W. Gerima, Official
Ato Haimanot Alem, Official

Biomedical Research Training Program:

Dr. Berhane Habte, Dean, Faculty of Medicine, AAU
Dr. Yoseph A. Mengesha
Dr. Yeshak Worku
Dr. Leykun Jemaneh, BRTP-Coordinator
Dr. Legesse Zerihun
Dr. Hakan Moiner, AHRI

Butajira Rural Health Project:

Dr. Dereje Kebede, Head, Community Health Department
Dr. Yemane Berhane
Dr. Mesfin Kassay

Control of Acute Respiratory Infection in Ethiopian Children

Dr. Lulu Muhe

Community-Based Study of Neurological Disorder in Ethiopia

Prof. Redda T. Haimanot

Ethiopian Flora Project:

Dr. Tewelde Berhan G. Egziabher, Project Leader
Dr. Sebsebe Demissew, Plant Taxonomist
Dr. Ensermu Kelbessa, Plant Taxonomist
Ato Damtew Teffera, Botanical Illustrator
Ms. Sue Edwards, Botanist (Editor)

The Ecology Project:

Dr. Masresha Fetene, Ecophysiologist
Ato Kebrom Tekle, Ph.D. student, Bio-geographer
Ato Tesfaye, Ph.D. student, Plant Ecology

The Chemistry Department:

Ermias Dagne, Project Leader

ETHIO-SWEDISH PEDIATRIC HOSPITAL:

Prof. Hagos Beyene, Director

ALEMAYA UNIVERSITY OF AGRICULTURE (AUA):

Dr. Desta Hamito, President
Dr. Ephrem Bechere, Vice President for Research
Dr. Mekonnen Hailemariam, Animal Breeding
Ato Shimelis W/Hawariat, Planning Officer

AWASSA COLLEGE OF AGRICULTURE:

The Integrated Pest Management Project (IPM)

Dr. Assefa Gebre Amlak, Dean, IPM Project Leader

AHRI:

Dr. Hakan Moiner, Director

ANNEX III: QUESTIONNAIRE COMPLETED BY SAREC SUPPORTED PROJECTS

PROJECT NAME:

_____

I. Quantitative data (state monetary figures in 1000 Birr/SEK):

A. Year project started_____

B. 1. No. of graduate students enrolled in 94/95: Ph.D._____ M.Sc._____.

2. Total number of degrees awarded in the project: Ph.D._____ M.Sc._____.

3. No. of technicians trained _____.

4. No. of investigators involved in the project_____.

C. 1. No. of publications with Ethiopian (co)authorship in refereed international journals_____, Ethiopian journals_____, proceedings_____, others_____.

2. Involvement in and support of relevant local activities in the form of training courses no._____, seminars no._____, written material no._____ and other_____.

D. 1. Establishment of facilities for laboratory and or field work (incl. vehicles), amount spent_____.

2. Provision of literature: books, journals etc. amount spent_____.

E. 1. Project funding: 94/95_____,92/94_____, 90/92_____, 88/90_____.

2. Funding from local sources including project related salaries;
University _____; ESTC _____; other _____.

3. Total funding for the last 5 years:

Outside sources:_____ Local sources: _____

II. Qualitative information. Describe briefly:

A. The project and its goal (specific target(s), timeframe, etc.).

B. Achievements including capacity building (institutions, human resources, infrastructure - buildings, equipment and other facilities).

C. Research cooperation with other Ethiopian and foreign researchers (including Swedish).

D. Dissemination of research results to local users.

E. How often the project is evaluated.

F. Degree of utilization and maintenance of equipment.

G. Major constraints in the project.

H. Alternative funding sources in case SAREC withdraws.

I. Incentives for participating in the project.

ANNEX IV: THE JUNE 30, 1994 AGREEMENT BETWEEN ESTC AND SAREC

June 30, 1994

Agreed Minutes of Discussions Between the Ethiopian Science and Technology Commission and SAREC

1. **Preamble**

A high level SAREC delegation led by Mr. Johan Holmberg, Acting Director General of SAREC, paid a working visit to Ethiopia from June 27 to 30, 1994 and held discussions with ESTC Officials on ongoing and future cooperation and the forthcoming evaluation of ESTC-SAREC collaboration. Present in the meeting were Mr. Anders Wijkman, Director General of SAREC and H. E. Ms. Ann Wilkens, Ambassador of Sweden to Ethiopia. The list of members of the ESTC delegation and SAREC delegation are attached in Annex 1 and 2, respectively.

The SAREC delegation also met:

- Ato Israel Kedane Mariam, Deputy Minister, Ministry of External Economic Cooperation.
- The Academic Vice President, Research and Publications Officer, and appropriate Deans of Faculties of Addis Ababa University.
- The President of Alemaya University of Agriculture and A. Director of Debre Zeit Agricultural Research Centre.

During the session, the sides exchanged views on the collaboration between ESTC and SAREC. The deliberations are summarized here below.

2. **Proposed Agenda for Discussion Between the ESTC and SAREC**

The agenda proposed by ESTC was adopted. It was agreed to discuss on the proposed extension of the present agreement by SAREC and future of AHRI under item number 8 of the Agenda, any other business.

After adoption of the agenda, an item by discussion was conducted and the following agreements and understandings were reached.

3. The bilateral cooperation of SAREC in Ethiopia will continue to be through the ESTC.

4. Given the broad outline of SAREC's mandate, both sides agreed that there are no real disparities between the mandates of ESTC and of SAREC. Therefore, submission of project proposals shall continue to be handled through the ESTC.

5. **Basic Principles of Bilateral Cooperation:**

a. Both sides emphasized the need for mutual respect and equilateral reciprocity: neither side will make unilateral discussions on any issue that requires consultation with the other side.

b. The setting of priorities will be that of the ESTC. When presenting proposals for funding, the ESTC will submit a number of projects/programs in excess of what which can be funded by the indicative budgetary figure provided before hand by SAREC. If SAREC does not agree to the prioritized project(s), it can take up any from among the remaining and/or make proposals of its won for ESTC's consideration. SAREC's reasoning for rejecting any project would be noted for future submissions.

c. The detailed modality of the various aspects of accountability (financial, technical, administration, etc.) will be worked by ESTC and submitted for SAREC's comments after which both sides will abide by what is mutually agreed.

6. **Conduct of Cooperation**

a. Manner of selection and approval of projects - the ESTC through the National S&T Councils (members are professionals outside of the ESTC: The respective sectoral departments act as the secretariat for these councils) shall select, prioritize, approve or reject project proposals. The approved projects shall then be submitted to SAREC by the ESTC. The rest shall be in accordance with 3(b) mentioned earlier.

b. Monitoring of projects - The ESTC and SAREC shall monitor the projects for compliance to the set objectives and time schedules and financial flows.

c. The intention of the parties is to increase procurement by Ethiopian Institutions and to reduce procurement for Ethiopian Institutions by Swedish Institutions to a minimum after 1 July 1995, subject to the findings of the evaluation to be carried out later in 1994.

d. Evaluation of projects at the end of each cycle prior to funding in the next cycle shall be conducted. The depth and extent of the evaluation shall depend on the project characteristics.

e. The ESTC assured SAREC that its close monitoring and involvement in the cooperation would not lead to increased bureaucratization.

7. **Miscellaneous**

a. Any modification and/or amendment shall be made only upon the agreement of both sides, i.e., ESTC and SAREC.

b. Financial accountability shall be as follows:

All monies earmarked for expenditure in and from Ethiopia shall be transferred to the ESTC accounts on a regular and quarterly basis, depending on the rate of implementation of projects as verified by the ESTC. Statements of accounts shall be prepared by the ESTC.

All monies allocated for Swedish institutions shall be disbursed from SAREC with statements of accounts to the ESTC.

c. Life spans of projects and programmes shall be predetermined on a case by case basis with the exception of those that are perennial in nature.

d. The ESTC will submit new proposals in their final form to SAREC at the beginning of January for a funding cycle that will begin in July of the same year.

e. The funding cycle shall normally be either 2 or 3 years.

f. Counterpart institutions in Sweden shall be visited for over all assessment of their cooperation with the Ethiopian researchers. The visit will be made by the ESTC sectoral experts once per funding cycle. Funds for this will be provided within the agreement.

g. Both sides agreed that the current agreement be prolonged by an additional 4 months.

8. **Evaluation of Projects**

Both sides reviewed the TOR presented by SAREC and the counter proposals submitted by the ESTC. Finally, it was agreed that the ESTC finalize the preparation of the TOR and submit to SAREC.

9. **New Proposals**

With respect to the new project proposals for the Interim Period, the following points were agreed upon.

a. The grass hopper project may be presented by ESTC for future funding in the next cycle. In the interim period of 94/95 SAREC will provide 20,000 SEK for preparatory purposes within the IPM programme.

b. With respect to the Biomedical Research Training Programme, both sides agreed to postpone the Ph.D programme for the 95/96 period, pending the out come of the evaluation which would look into the cost effectiveness of the programme.

c. For reasons of concentration, the SAREC delegation expressed that it will not support the Gondar College proposed as a separate project. However, for the possible replication of the Butajira experience in Gondar, an amount of 50,000 SEK will be provided within the budget of the Butajira Rural project for local planning costs.

10. **Armauer Hanson Research Institute (AHRI)**

It was concluded by ESTC and SAREC that possible options are to be discussed at a tripartite meeting involving ESTC, NUFU and SAREC to be held in Addis Ababa in September or October 1994.

This minutes of understanding is signed this day of June 30, 1994

For the Ethiopian Science
And Technology Commission

For SAREC

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ANNEX 1

Members of ESTC Delegation to the ESTC-SAREC Discussion

1.	Dr. Kebede Tadesse	Commissioner of the ESTC, Leader of the Delegation
2.	Ato Asrat Bulbula	Deputy Commissioner of the ESTC, Member
3.	Wro Abeba Gobeze	Senior Advisor to the ESTC, Member
4.	Dr. Beyene Kebede	Head, Agriculture & Environment Dept., Member
5.	Ato Getaneh Yiemene	Head, Planning and Policy Dept., Member
6.	Dr. Yemane Teklai	Head, Health and Population Dept., Member
7.	Ato Mulatu Keffelew	Head, Foreign Relations Service, Member

ANNEX 2

Members of SAREC Delegation to the ESTC-SAREC Discussion

1.	Mr. Johan Holmberg	Ass. Director General of SAREC, Leader of the Delegation
2.	Mr. Anders Wijkman	Director General of SAREC, Member
3.	H. E. Ms. Ann Wilkens	Ambassador of Sweden to Ethiopia, Member
4.	Mr. Claes Kjellstrom	Programme Officer for Ethiopia, SAREC, Member

ANNEX V: THE ETHIOPIAN S&T POLICY

THE TRANSITIONAL GOVERNMENT OF ETHIOPIA

ETHIOPIAN SCIENCE AND TECHNOLOGY COMMISSION

NATIONAL SCIENCE AND TECHNOLOGY
POLICY

DECEMBER, 1993
ADDIS ABABA

TABLE OF CONTENTS

INTRODUCTION

The peoples of Ethiopia are still victims of the problems of drought and famine, scarce employment opportunities, shortage of energy and other pressing needs. Hence, in order to bring about massive social and technical changes; to accelerate agricultural and industrial productivity; to facilitate the means for a rational conservation and use of natural resources and the provision of basic necessities of life (food, clothing, shelter, education, energy, health, etc.); to modernize communication networks and to generally improve the standard of living of the peoples' and to keep abreast with the technological advancement of the 21st century, extensive, popular participative and sustained Science and Technology (S&T) capacity building is a requirement.

The scientific and technological advances of the past years have made most third world governments well aware of the important role of science and technology for national development. However, least developed countries like Ethiopia have limited resources to allocate for their S&T capability building. This leaves no choice for these countries other than to plan & commit a share of their limited resources for a long term S&T capability building. Such a long term undertaking, however, can only succeed if it is guided by a clearly enunciated S&T policy.

According to an assessment conducted on the prevailing S&T situation in Ethiopia, lack of a clearly articulated policy has handicapped the growth, and application of S&T for national development. Hence, the situation is characterized by unnecessary duplication of efforts, programme redundancy, uneconomical/wasteful/ use of limited resource, continued dependency on foreign technology and above all, absence of national capability to bring about sustained, self reliant and popular-based socio-economic development.

Thus, to reduce the level of dependency and to increase the supply of locally required technology, the development of a planned technical infrastructure becomes a necessity. In view of this, therefore, and based on the Charter and the Economic Policy, the Transitional Government of Ethiopia (TGE) has issued this Science and Technology Policy in order to build the country's S&T capability, to coordinate related activities and to enhance their contribution to national economic development.

The policy document will serve as a spring board to initiate the formulation of detailed policies & prioritized action programmes for the different economic and service sectors. Some of the elements requiring capability building, according to the policy are research and development, development of traditional technologies, technology transfer and application, engineering design and consultancy, technology adaptation, science and technology (S&T) manpower training and development, collection and dissemination of S&T information and capacity building for effective & extensive S&T popularization.

The policy will help government bodies and private organizations, Research and Development (R&D) Institutes in the planning of their respective S&T activities. Furthermore, it will serve as a basis for international cooperation on scientific and technological matters. The major chapters in the policy document include: objectives of the national S&T policy, directives, strategies and priority sectors and programmes. It also determines the national S&T organization and structure, sources for financial support and the kind of international collaboration deemed appropriate.

OBJECTIVES OF THE POLICY

1. To build national capability to generate, select, import, develop, disseminate and apply appropriate technologies for the realization of the country's socio-economic objectives and to rationally conserve and utilize its natural and manpower resources.

2. To improve and develop the knowledge, culture and the scientific and technological awareness of the peoples of Ethiopia, and promote the development of traditional, new and emerging technologies.

3. To make Science and Technology (S&T) activities more productive, efficient and development oriented.

POLICY DIRECTIVES

The following are the policy directives intended to help realize the set objectives and to build S&T capabilities in the priority accorded areas of the economic and service sectors.

1. Build the capacity to search, select, negotiate, procure, exchange and introduce technologies suitable to Ethiopia's socio-economic conditions.

2. Establish and/or strengthen S&T institutes, Research and Development (R&D) centres and support services as necessary and appropriate in the various administrative regions.

3. Establish responsible bodies/organs in every economic and service sector for the execution of S&T development activities.

4. Facilitate conditions for the wider participation of women in S&T activities.

5. Establish a system to encourage young scientists and technologists.

6. Establish a system for a wider popularization of science and technology amongst different nations and nationalities utilizing their languages in order to improve and enrich the S&T culture of the Ethiopian peoples.

7. Create a conducive working environment to encourage scientists and researchers for better productivity.

8. Ensure rapid dissemination and application of Research and Development (R&D) results.

9. Encourage the private sector and its capital to participate in the promotion and development of scientific and technological activities.

10. Build trained manpower in Science and Technology (S&T) both in quality and quantity.

11. Promote the mutual support between S&T education, research and production.

12. Encourage the improvement, wider diffusion and application of traditional technologies.

STRATEGIES

1. Formulation and implementation of S&T plans, programmes and projects to accelerate the country's socio-economic development; self-sufficiency in food production and satisfying the need for other basic necessities with due attention to environmental protection.

2. Application of science and technology for awareness and control of environmental conditions and for the conservation and rational utilization of the natural resources of the country.

3. Develop, strengthen and modernize the country's engineering and technology base to build a strong national economy and to assist the chemical, textile, agro-industry, mineral and other production sectors which are necessary to meet the demand for basic consumer goods.

4. Expand and raise the quality and understanding of science and technology education at all levels of the educational establishments in all regions.

5. Facilitate conditions to create favourable & supportive relations between S&T education, R&D, and the production activities.

6. Promote, encourage and support the participation of urban and rural women in Science and Technology (S&T) education, application, employment, management and in the decision making processes of policy matters.

7. Establish a national S&T information network capable to acquire S&T information relevant to national development needs and suitably process it for dissemination to potential users in government and private sectors.

8. Develop the capacity and the mechanism to search, choose, negotiate, procure, adapt and exchange technologies that are appropriate and environmentally sound to the Ethiopian socio-economic conditions.

9. Ensure that technologies transferred are appropriate and that the necessary material inputs and manpower resources are available and when deemed necessary develop capacities to modify/alter and adapt the technologies to make them suitable to the natural endowment of the country.

10. Establish a system to encourage and support applied and basic S&T research in areas appropriate to the needs of the country.

11. Encourage and support the publication of books, research results, journals and periodicals of Science and Technology interest in the different languages of nations and nationalities as appropriate.

12. Build capability and methodology to identify the scientific content of traditional technologies; improve & change those that are useful for wider dissemination and diffusion.

13. Establish efficient mechanisms for a speedy dissemination and application of Research and Development (R&D) results.

14. Develop a conducive working environment and an appropriate career and promotion structure for scientists and researchers and encourage & support the establishment of professional and amateur associations.

15. Encourage and support the participation of Ethiopian scientists and researchers in national, regional and international conferences, symposia and workshops.

16. Prepare awards and prizes for outstanding innovations and productive achievements in the fields of Science and Technology (S&T).

17. Establish an efficient national patent and technology transfer system to promote and support local technological innovations and creative achievements.

18. Promote locally developed material inputs.

19. Encourage the private sector and its capital to participate in S&T development activities through the provision of tax and other incentive mechanisms.

20. Mobilize resources for S&T development and strengthen international cooperations.

PRIORITY SECTORS AND PROGRAMMES

Although the intent of the government is to promote balanced and integrated development, it is difficult to build all the necessary Science and Technology capability owing to limitations for investment. Therefore, based on the country's development policy directives and in view of the need to alleviate the basic and urgent problems of the peoples, the S&T policy accords priority to the following sectors and programmes. Sectoral S&T policies and programmes will be formulated by the respective sectors on the basis of this national Science and Technology Policy.

A. AGRICULTURE

1.0 To support activities for self-sufficiency through improved food supply.

1.1 Support and encourage research to raise the productivity of crops, animal resources and production implements in kind, quality and quantity, taking into account environmental protection as well as people's tradition and culture.

1.2 Encourage the use of irrigation schemes of different scales and forms to secure reliable production.

1.3 Encourage and support research on methods of reducing pre and post harvest loss during agricultural production employing appropriate technologies for prevention, handling & processing.

1.4 Encourage and support techniques for the development of appropriate and productive fish species in rivers, lakes and artificial /manmade/ ponds and encourage its wider and sustained availability for consumption.

1.5 Facilitate the application of technologies for large scale food storage and conservation in all localities as far as it is feasible.

2.0 Promote and support Science and Technology (S&T) activities that would facilitate the supply of agricultural raw materials for industrial use in sufficient quantity & quality.

3.0 Develop and support S&T methods that upgrade the quality, quantity and variety of exportable agricultural products.

4.0 Support and strengthen strategies that would promote the dissemination of appropriate rural technologies for integrated rural development by studying and developing the long standing cultural knowhow and methodology.

B. NATURAL RESOURCES DEVELOPMENT & ENVIRONMENTAL PROTECTION

1. Develop a system that would help to map out the country's eco-system/ecology to identify and register the diverse biological resources and to collect, store, protect and utilize the plant and animal genetic resources contained therein.

2. Support studies that would help to design and implement appropriate land use, practical and sustainable soil conservation methods.

3. Encourage mechanisms that would help to maintain the natural forest, and in general control deforestation and ecological imbalance.

4. Facilitate research and development programmes that would help to discover, popularize and develop fast growing, drought resistant and multi-purpose tree species so as to rehabilitate and develop degraded environments.

5. Facilitate studies and research to reduce and control the polluting effects of agricultural and industrial chemicals on environmental air, soil and water.

6. Establish a system of educational and social programmes/methods to enhance the awareness, knowledge and participation of the public on environmental protection and rehabilitation.

7. Strengthen technologies/methods that would help to follow up changes in the environment and to forecast, prevent and minimize the effects of natural disasters.

C. WATER RESOURCES DEVELOPMENT

1. Support research that would help to improve the quantity, quality, conservation, and utilization of ground and surface water.

2. Support the efforts towards a multi purpose water resource development for an integrated provision of water resources for agriculture, energy, transport and private use.

3. Encourage appropriate techniques for the supply of reliable and clean water for urban and rural dwellers.

4. Support efforts to develop public awareness on the control of sedimentation, watershed management and use of rain water.

D. ENERGY

1.0 To promote activities that would facilitate the use of different and coordinated methods to ensure the supply of sustainable and reliable energy.

1.1 Support research on the development and utilization of fast-growing tree species and strengthen bio-mass energy development.

1.2 Facilitate conditions for the expansion and utilization of water as a source of energy.

1.3 Encourage research that would promote the supply and use of petroleum, natural gas, coal and geothermal energy resources.

1.4 Support techniques that would help the search and use of alternative and renewable sources of energy.

2.0 Encourage and support strategies for efficient and economical use of energy in all sectors.

3.0 Support research on the development of equipment for the generation and utilization of energy.

4.0 Encourage research, development and utilization of energy technologies suitable to the rural population and their wide popularization and dissemination.

E. INDUSTRY

1.0 Encourage efforts to build and develop the capacity to produce essential inputs for the development of the agricultural sector.

2.0 Support measures and activities that would help to produce basic consumer goods, implements and equipment.

3.0 Encourage Research and Develpempent (R&D) activities that would help to manufacture implements to promote small scale and rural industries.

4.0 Support techniques for the production of industrial raw materials and other inputs locally.

5.0 Support research to make traditional and handicrafts technology modern and productive.

6.0 Encourage technological activities that would help to prevent environmental pollution arising from industrial processes and by-products and also promote the appropriate utilization of by-products.

7.0 Encourage and facilitate ways and means to build capacity in basic design and manufacturing, project engineering and technology transfer.

F. CONSTRUCTION

1.0 Facilitate and support conditions suitable for the production, use, and popularization of appropriate and local-specific construction materials, equipment and technology which do not aggravate the deterioration of the forest resources of the country.

2.0 Build the necessary capability in construction design, management, execution and follow-up in priority accorded economic sectors particularly in water works, dams, and irrigation; transport and communication systems (roads, ports, airports etc) and industry.

3.0 Support research activities geared towards the generation and development of technologies for a labour intensive and speedy over-all development of the construction sector.

4.0 Encourage and support research activities leading to the improvement and wider application of traditional construction technologies.

G. TRANSPORT AND COMMUNICATIONS

1.0 Support capability building in the selection, utilization and repair of modern as well as alternative transport means.

2.0 Support research programmes for capability building in the production, utilization, repair and maintenance of appropriate public and freight transport services for rural areas.

3.0 Encourage and support research for the production and application of simple telecommunication equipment to expand, develop and disseminate modern communication services in the different parts of the country.

H. MINERAL RESOURCES

1.0 Support the expansion of appropriate techniques and modern technologies that would help to prospect and identify the country's mineral resources.

2.0 Support the preparation and dissemination of simple techniques and strategies that promote the exploration, study and utilization of mineral resources through the involvement and participation of the massive rural community.

3.0 Support capability building to study, explore and develop petroleum, natural gas, coal, iron, and other industrially useful minerals.

4.0 Help to strengthen Science and Technology (S&T) activities in the fields of hydrology and seismology.

I. HEALTH AND POPULATION PLANNING

1. Support Research and Development (R&D) activities on the prevention & control of communicable and parasitic diseases.

2. Promote activities that would improve and sustain maternal & child health and techniques helpful for family planning.

3. Encourage and support research and studies on the causes and solutions of urban and rural community health problems.

4. Promote and strengthen methods for essential food supply and appropriate nutrition.

5. Encourage and support research on traditional medicine and on health related beliefs and attitudes.

6. Support studies and research on environmental pollution and health problems associated with industry, agriculture, transport, etc.

7. Strengthen research on clean water supply and environmental sanitation.

8. Support studies and research on the prevention of newly emerging disease.

9. Encourage and support research on health service systems.

10. Support research on the control of population dynamics.

J. EDUCATION

1. Search for ways to strengthen Science and Technology (S&T) education at all levels of the educational establishments.

2. Support ways for the domestic production and maintenance of S&T educational equipment and materials.

3. Encourage ways whereby research results from higher educational institutions can be applied.

4. Encourage basic research and support the development of the appropriate professional manpower.

5. Encourage techniques whereby education can be linked and made complementary to peoples' every day living.

K. NEW & EMERGING TECHNOLOGIES

1.0 Assist appropriate methodologies for the application of bio-technology in the fields of agriculture, health and industry.

2.0 Organize and support the development of facilities, manpower, workshops, support centres, and the publication of journals in order to promote and coordinate bio-technology activities and their diffusion.

3.0 Support training and skill development in micro-electronics especially in computers and the establishment of institutes to back up the effort.

4.0 Support the effort to promote awareness, knowledge and application of new and emerging transport and communication technologies specially of those of telecommunications and new materials.

ORGANIZATION & STRUCTURE OF SCIENCE AND TECHNOLOGY

In line with the envisaged role of Science and Technology (S&T) in the national development, a functional organizational structure for the coordination, promotion and development of S&T activities is required. To this end, the organizational structure of the S&T system in Ethiopia shall have the following four functional levels.

A. National S&T Council
B. Technical Advisory Committee of the National S&T Council
C. Ethiopian Science and Technology Commission
D. S&T operational Institutes and Centres

The Commission shall be the Secretariat of the National Science and Technology Council.

A. NATIONAL SCIENCE AND TECHNOLOGY (S&T) COUNCIL

The National S&T Council is the highest decision making body for S&T policy and plan of action. Based on the National S&T Policy, it establishes and directs the general framework and strategy for S&T development and determines the role of S&T in the national economy. The Council shall be chaired by the Prime Minister with the Commissioner of S&T as its Secretary. The Council shall have the following members.

The Prime Minister	Chairman
Commissioner of S&T	Member & Secretary
Minister of Planning and Economic	

Development	Member
Minister of External Economic Cooperation	Member
Minister of Health	Member
Minister of Natural Resources Development & Environmental Protection	Member
Minister of Industry	Member
Minister of Mines and Energy	Member
Minister of National and Regional Administration Affairs in the Prime Minister's Office	Member
Minister of Women Affairs in the Prime Minister's Office	Member
Three Prominent Professionals	Members

The Professionals will be nominated by the Commissioner of the Ethiopian Science and Technology Commission (ESTC), to be appointed by the Prime Minister.

The Council meets once every three months and evaluates the performance of S&T activities on the basis of which it issues guidance, directives and decisions. Additional meetings can be held as and when necessary.

B. TECHNICAL ADVISORY COMMITTEE OF THE NATIONAL SCIENCE AND TECHNOLOGY (S&T) COUNCIL

The Committee is composed of renowned and experienced scientists and engineers drawn from different branches of S&T; chairpersons and secretaries of Science and Technology Councils and three professionals who are also members of the National S&T Council. The Committee is chaired by the Commissioner of S&T. Its main objective is to undertake the necessary preliminary work and consolidate matters that will be submitted to the Council and to advise the Council on any technical matters.

C. SCIENCE AND TECHNOLOGY COMMISSION

The Ethiopian Science and Technology Commission is a government institution, headed by a Commissioner and governed by its own regulations. The Commission is accountable to the Prime Minister. It is the central organ empowered with responsibilities and mandates to plan, promote, coordinate, finance and oversee science and technology activities of the country. It is also responsible to advise the government on issues of S&T, implement the government's S&T policy and follow up the appropriate and immediate application of Research and Development (R&D) results.

The Commission shall have the mandate to organize different S&T Councils composed of renowned professionals, R&D representatives from the economic and service sectors, to assist in the formulation of S&T policies and priorities and to screen projects that are eligible for research grants.

The Sectoral Science and Technology Councils will be chaired by the elected members of the Councils with the sectoral Department Heads of the Commission acting as secretaries. The Councils prepare detailed policies and guidelines, set priorities of R&D plans, determine the financial assistance for research programmes and projects submitted to the Commission and follow-up their implementation. They will also study ways of application of research and development results generated from various sectors and present these to the National Science and Technology Council through the Commissioner. The respective sectoral Departments of the Commission shall act as their Secretariats.

D. SCIENCE AND TECHNOLOGY (S&T) OPERATIONAL INSTITUTES AND CENTRES

There shall be research institutes, technology centres, design enterprises, and various S&T support services in various sectors and higher educational establishments which would be responsible for the actual performance of S&T activities. Each economic and service sector shall have research and development representatives who will help to co-ordinate S&T programmes and projects and work closely with the Commission.

In addition, the Commission shall establish under it science and technology support services, centres and Research and Development (R&D) units as deemed necessary particularly in areas requiring special attention. The Commission shall assist and support those establishments which reach the stage of maturity either to merge with other relevant organizations or function as autonomous bodies.

FINANCING OF S&T

1.0 In order to support and sustain the different S&T activities, build up S&T capability in all sectors and apply generated research results, up to 1.5% of the country's Gross Domestic Product (GDP) shall be allocated annually for S&T development.

2.0 In addition to the funds raised from domestic sources, the government shall permit the flow of S&T finance from bilateral and multilateral sources.

3.0 Resources for R&D may also be generated through active participation in bilateral and multilateral research projects and through participation in regional and international S&T programmes.

4.0 Furthermore, private and public firms, interested individuals and other non-governmental donors shall be encouraged to provide funds for the advancement of S&T activities.

5.0 S&T institutions shall be encouraged to generate funds by commercializing their services and outputs. Funds thus generated shall be utilized by the institutions for the promotion and expansion of their S&T activities.

6.0 Equipment and materials imported for R&D activities shall be exempted from all taxes. In addition, tax incentives shall be provided for the resources committed to R&D by the private sector.

ALLOCATION OF FINANCE TO SCIENCE AND TECHNOLOGY (S&T) ACTIVITIES

1.0 S&T activities, plans and research projects to be supported from government funds and from bilateral and international assistance received by the government shall be duly submitted to the Commission for approval.

2.0 Approval & the level of support shall be determined:

a. on the basis of the S&T policy of the government.
b. in line with the priority accorded sectors.
c. taking into consideration their contribution to national economic development.
d. weighing their potential in promoting appropriate technology.
e. considering their contribution in mitigating dependence on foreign technology.

3.0 Even though the usefulness of basic research results cannot be pre- determined, the necessary assistance shall be accorded to basic research for their contribution to the development of knowledge and in anticipation of their prospect for future use.

INTERNATIONAL COOPERATION IN S&T

1.0 Cooperation in S&T at sub-regional, regional and international levels shall be accorded due consideration for the mobilization of resources, exchange of information and experience as well as to carry out joint S&T programmes.

2.0 Active S&T cooperation shall be fostered with developing countries particularly with neighbouring countries with a view to exchanging appropriate technologies and for the sharing ofresources for collaborative research programmes.

3.0 Active S&T cooperation shall be pursued with developed countries to build national S&T capability and foster its application for development.

4.0 An effective Science and Technology (S&T) cooperation shall be promoted between Ethiopia and the United Nation (UN) system.

5.0 Conditions shall be created to encourage regional and international financing institutions to participate in the mobilization of resources to fund S&T projects that assist development activities.

6.0 Planned and productive study tours and participation of Ethiopian scientists and technologists in international conferences, symposia, workshops and seminars shall be implemented.

7.0 Steps will be taken to ensure that regional and international S&T cooperations initiated locally as well as externally are based on mutual understanding and legal agreements.

Sida Evaluations - 1995/96

95/1 Educação Ambiental em Moçambique. Kajsa Pehrsson
Department for Democracy and Social Development

95/2 Agitators, Incubators, Advisers - What Roles for the EPUs? Joel Samoff
Department for Research Cooperation

95/3 Programa de Gemelagem Beira - Gotemburgo. Arne Heilemann, Lennart Peck
Department for Democracy and Social Development

95/4 Evaluation of the Establishing of the Bank of Namibia 1990-1995. Jon A. Solheim, Peter Winai
Department for Democracy and Social Development

96/1 The Beira-Gothenburg Twinning Programme. Arne Heileman, Lennart Peck
Department for Democracy and Social Development

96/2 Debt Management. Kari Nars
Department for Democracy and Social Development

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Department for Democracy and Social Development

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Department for Democracy and Social Development

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Department for Central and Eastern Europe

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