Evaluation

of

STRENGTHENING OF AGRICULTURAL RESEARCH IN ERITREA
(GCP/ERI/006/ITA)
Preface

The following document represents the views of the independent evaluation mission on the performance and achievements of the project Strengthening of Agricultural Research in Eritrea (GCP/ERI/006/ITA). The project began its operations in September 2001 and most activities are planned to end in June 2006. (A forerunner project GCP/ERI/001/ITA Strengthening the Agricultural Research and Extension Division began in September 1996 and ended in March 2001.) After a slow start, a tripartite review meeting (TPR) in March 2004 extended the project (initially up to December 2005, now planned for 2007), and also made a provision for a full-time CTA.

This evaluation focuses on the current phase of the project and in particular on the period following the TPR, in order to assess results achieved and provide recommendations to the Government, FAO and the donor on the further steps necessary to consolidate progress and ensure achievement of overall objectives.

The evaluation mission started on 2 May 2006 and ended on 12 May 2006; the mission met with officials and experts in Asmara and visited several NARI substations in the Western and Eastern lowlands, to hold discussions with NARI staff and other officials in Zoba and sub-Zoba offices.

The report has some inbuilt redundancies: hasty readers should turn to the Executive Summary; the arguments found there are taken up and expanded in the Conclusions and Recommendations section. Finally, the body of the report contains more factual information, while report annexes provide information on the mission background, an extended discussion of capacity development issues, as well as statistical information on the main features of the project. The mission prepared an aide memoire in the country, which was used for debriefing and feedback sessions with NARI and project management, the Government, the Italian Cooperation office and the FAO Representation in Eritrea. The present report reflects the discussions on the aide memoire.

Evaluating the project was a challenging task given the complex nature and long history of the project, and the limited time available for the mission. The evaluation mission is most appreciative of the support given to the mission by the National Project Coordinator, the project CTA, the Director General of NARI, the FAO Representative, University of Asmara staff and the NARI staff and MoA officials met during the field visits. Thanks also go to other officials, collaborators and experts in Asmara, who provided information and discussed issues in a frank and constructive manner.

The Evaluation Mission

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<td>APDD</td>
<td>Agricultural Promotion &amp; Development Department</td>
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<td>CTA</td>
<td>Chief Technical Adviser</td>
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<td>DANIDA</td>
<td>Danish Technical Assistance Agency</td>
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<td>DARHRD</td>
<td>Department of Agricultural Research and Human Resource Development</td>
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<td>National Agricultural Research Institute</td>
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Executive Summary

Eritrea enjoyed strong economic growth and comparatively low inflation in the first few years of independence; however, in later years border conflicts with Ethiopia and trade embargoes changed this trend significantly. At the same time, the agricultural sector (where most of the population find employment) remained weak, despite significant investment in horticultural projects and large-scale cultivation in the western lowlands. The project GCP/ERI/006/ITA Strengthening of Agricultural Research in Eritrea with a of budget US$ 2,987,995 was intended to improve this situation by addressing observed weaknesses in agricultural research; it started in September 2001, following up on a first phase project (GCP/ERI/001/ITA) which operated from September 1996 to March 2001. (Most operations of the project ended in June 2006; the project will be kept operationally into 2007 in order to receive a major outstanding order for laboratory equipment, and continue support to project-funded MSc students at the University of Asmara.)

The Development Objective of the project was described as “the government’s development goal for the agricultural sector is to improve food security and livelihoods, including expanding agricultural export earnings, while ensuring the restoration and protection of the natural resource base. This is to be achieved by improving agricultural productivity, through the provision of appropriate technologies and services to farmers, and by building the capacity and performance of service-providing agricultural institutions, including research”. The five immediate objectives of this project are: (i) to continue building-up the capacity of NARI and improve its performance in managing and carrying-out effective agricultural research programmes, including updating the Medium-Term Agricultural Research Strategy and Operational Plan; (ii) to improve integrated land and water management for rainfed and irrigated agriculture, including aspects related to soil fertility, agro-forestry, and soil and water conservation; (iii) to test, select and make available to producers improved varieties and agronomic and soil management practices for horticultural crops; (iv) to improve the management of pastoral and intensive small ruminant production systems, particularly by addressing health and nutritional constraints; and (v) to test and provide agricultural engineering technologies, farm tools and implements that decrease post-harvest losses, improve the efficiency of human labour and animal draft power, and enhance moisture conservation.

Towards the attainment of these objectives, significant progress has been made in the following areas:

- NARI has established the physical infrastructure to support a full range of agricultural research activities, and has initiated and expanded adaptive research activities relevant for the agro-ecological conditions of the country;
- expertise available within NARI is bound to increase with the return of 10 MSc students currently funded by the project; and
- progress has also been made towards establishing NARI as a semi-autonomous body with greater authority over its budget and resource base\(^1\).

In addition, there is evidence that NARI is a respected factor in agriculture in Eritrea, having forged links not only with other government departments, but also with the University of Asmara (UoA), international NGOs and research organizations active in the country and the region. The project has thus provided a foundation for future effective agricultural research in Eritrea.

However, the mission also noted constraints in the project, which have already affected its performance and which could jeopardize future impact:

- owing to human resources and other constraints, certain lines of research have not been followed up (or only in a limited way);
- the adoption rate of results by the existing extension services and ultimately the farmers is often not known (or not recorded);
- the project has had to provide a significant amount of operational support; despite this, some functions (such as Internet access at NARI HQ\(^2\)) are not operational;

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1 A draft proclamation to this end is being prepared for review by the government.
2 Staff access the Internet from other offices or Internet cafes; the problem is being addressed by NARI management.
the person/months of consultancies actually made available to NARI are about 40% of the planned total (due to increases in other budget lines); as a result, particularly the areas of M&E and socio-economics in NARI were not appropriately covered;

- some crucial NARI units are without leadership and/or understaffed;
- FAO technical backstopping visits addressed relevant topics; however, it appears that particularly in the early years of the project, the Technical Task Force at FAO HQ did not provide the kind of comprehensive technical backstopping assistance that the project would have needed;
- project management from 2001 to 2003 was unsatisfactory; this has improved with the arrival of a CTA, the setting up of a revised project Management Team, the holding of monthly management meetings and the nomination of a new NPC, but team work and information exchange could still be better;
- feedback mechanisms for interaction with farmers as well as with other institutions and organizations are limited and could still be improved.

The development objective the project remains relevant and appropriate. NARI's organizational set-up and mandate follows the directions given in NARI's Medium-Term Plan (MTP), but several sectors represented in NARI’s organigram do not yet have the requisite staff. Follow-up and reinforcement is still required in some research aspects such as diagnostic surveys, socio-economic research, Monitoring and Evaluation (M&E), agricultural engineering, animal health and nutrition constraints, and research planning and priority setting with a view to optimizing impact at field (end user) level. The shortcomings that have become visible in the current project phase should be addressed so as to allow NARI to realize its full potential.

The mission recognizes that a long-term perspective is required for developing agricultural research capacity; it is also a challenging task, as the country faces substantial constraints in terms of skilled manpower as well as financial resources. Under the circumstances, the project has performed reasonably well compared to its very inauspicious beginnings. The momentum built by NARI should be kept: this will require continued attention given to NARI's institutional status and budget situation by policy-makers, as well as sustained efforts by NARI to develop meaningful research results, guidelines and specifications that can be taken up at field level. Opportunities exist for NARI to further enhance its performance and relevance; external support may be available in the future to assist NARI in this regard. The mission recommends that in the medium term, scenarios should be developed with a view to strengthening research-extension and farmer linkages as well as further developing research expertise. NARI has developed some recommendations for future development collaboration: these are reproduced (in a slightly edited way) in the annex. The mission recommends that these be revisited by a project identification/formulation mission in 2007, when the current project phase will be operationally closed and the current M.Sc. students have returned to NARI.

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3 A Note on Project's Capacity Building Component is found in Annex 4.
Conclusions and Recommendations

General

The development objective the project remains relevant and appropriate. Concerning its immediate objectives, NARI has established the physical infrastructure to support a full range of agricultural research activities, and has initiated and expanded adaptive research activities relevant for the agro-ecological conditions of the country. The expertise available within NARI is bound to increase with the return of 10 MSc students currently funded by the project. Progress has also been made concerning the status of NARI as a semi-autonomous body with greater authority over its budget and resource base. In addition, there is evidence that NARI is a respected factor in agriculture in Eritrea, having forged links not only with other government departments, but also with international NGOs and research organizations active in the country and the region.

However, owing to human resources and other constraints, certain lines of research have not been followed up (or only in a limited way), and the adoption rate of results by the existing extension services and ultimately the farmers is often not known (or not recorded). The project has also provided a significant amount of operational support; despite this, some functions (such as Internet access at NARI HQ) are not operational. NARI's organizational set-up and mandate follows the directions given in NARI's Medium-Term Plan (MTP), but several sectors represented in NARI's organigram do not yet have the requisite staff. Follow-up and reinforcement is still required in some research aspects such as diagnostic surveys, socio-economic research, Monitoring and Evaluation (M&E), agricultural engineering, animal health and nutrition constraints, and research planning and priority setting with a view to optimizing impact at field (end user) level. Finally, organizational linkages and feedback mechanisms for interactions with farmers as well as with other institutions and organizations are limited and could still be improved.

Project design, administration and management

Project design

After a relatively successful conclusion of the predecessor project, the current project was designed with objectives, workplans and management and oversight arrangements which proved over-optimistic. By the planned end of the project in December 2003, only 1/3 of the budget had been spent, largely on equipment, laboratory construction and operational funds.

The first mission by the Project Management Adviser in January 2004 (itself massively delayed) proposed a revised workplan for the period January 2004 to May 2005 (later extended to December 2005). The revised workplan was accepted by a TPR meeting in March 2004, and the TPR Meeting also agreed to create a full-time CTA position in order to allow sound management of the project. A revision of the project document, which could have provided better guidance, was not attempted.

Indicators, workplans and assumptions

The logical framework of the project suffered from some vague descriptions of planned objectives, outputs and indicators (such as Activity 1.2.2 Provide operating costs needed to implement project activities). Some outputs such as 1.4 (Socio-economic research and participatory diagnosis capacity established), and 1.5 (Production systems constraints and improvements identified) did not really belong under Immediate Objective One. (For the sake of internal consistency, the project logical framework should have treated outputs 1.4. and 1.5. under a separate immediate objective, i.e. “to strengthen NARI's capacity to conduct socio-economic and farming system research”).

Other major planned activities such as construction of soils (and later tissue culture lab) were not adequately costed, and for the main identified risks (delays in the recruitment, posting and retention of national project staff ... and delays in selecting and recruiting qualified external technical assistance for the project) no remedial measures were proposed. Attempts were made to improve the quality of

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4 Staff access the Internet from other offices or Internet cafes; the problem is being addressed by NARI management.
workplans, but also the revised workplans still displayed shortcomings regarding precise targets, responsibilities and budget implications.

Project beneficiaries

The target beneficiaries identified by the project are “small-scale, resource poor and commercial farmers of the priority areas” and extension staff, while NARI (formerly DARHRD) was seen as direct beneficiary through training, provision of equipment, supplies and operating costs. While there is evidence that some of NARI’s activities have reached the farmers (e.g. through seed multiplication, variety trials, etc), in the absence of an M&E system in NARI or its collaborating partners it is difficult to assess the overall benefits accrued so far to the target beneficiaries.

Institutional arrangements

The original implementation arrangements for the project envisaged the Director-General of NARI serving as the Project Manager, assisted by a National Project Co-ordinator (NPC) and the PMA (recruited by FAO on a consultancy basis), who were to form the Management Team. Following the TPR and the recruitment of a full-time CTA (and later the nomination of a new NPC), institutional and management improved with the creation of two new bodies: a revised project Management Team (comprising the DG of NARI, CTA, NPC, directors of the four Research Divisions of NARI, and the Operations Officer of the FAO Representation), and a Joint Monitoring Committee, comprising the DG of NARI, CTA, NPC, FAOR, and the Head of Italian Cooperation office in Eritrea. The Joint Monitoring Committee met in Oct 2004, Feb 2005 (with FAO’s lead technical backstopping officer present) and Sept 2005; the revised Management Team met monthly. Despite the frequent meetings, the mission’s impression is that team work and information exchange could still be better.

Technical and operational backstopping

The project received from 2001 to 2005 a total of 15 visits by consultants (16 were planned in the original project document); however, the person/months actually made available to NARI are about 40% of the planned total. In addition, the designations of the consultants differed significantly from the original consultants’ list. As a result, particularly the areas of M&E and socio-economics were not appropriately covered.

In addition, the project received three visits (in 2003, 2004 and 2005) by its FAO lead technical backstopping officer, and additional four visits by FAO technical backstopping officers between 2004 and 2005. While technical backstopping visits seem to have addressed relevant topics, it appears that Technical Task Force at FAO HQ did not provide the kind of comprehensive technical backstopping assistance that the project would have needed.

Government support

Eritrea’s progress in recent years has been overshadowed by external factors, and economic growth has been slow. Consequently, also the government budget for NARI appears to have been under pressure, and external assistance has supported many non-core functions. (The government allocation to NARI funds NARI staff salaries and other essential activities.)

The government has supported the proposed change in NARI’s status, which would establish NARI as a semi-autonomous body with greater authority over its budget and resource base.

The project document indicated that the government would contribute to the construction of research infrastructure and provide general operating expenses, TCDC experts and non-expendable equipment, to the tune of US$ 873,478. On the other hand, according to project progress reports, the project has been providing support for vehicle spare parts and servicing; for purchase of stationery

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5 An assumption that a DANIDA-funded agricultural extension would complement the NARI project was mentioned in the project document under On-going and Programmed Assistance, but was not listed under Risks. (The DANIDA project did not materialize.)

6 A draft proclamation to this end is being prepared for review by the government.
and other office and field supplies; and for payment of salaries for locally recruited labourers in the field and project administrative staff for smooth implementation of various research activities.

A government decision in 2004 temporarily restricting long term training abroad meant that a major component of the project (overseas degree training) could no longer be implemented on time. (The overseas training was substituted by MSc training at the University of Asmara.)

Not all counterpart positions envisaged in the project document have been filled: for example, the Head, Socio-economics Research Unit left NARI in January 2005 and has not been replaced (a current MSc student is expected to take his place later this year), the Planning, Statistics and Monitoring position has not been filled, and the NPC position remained vacant for several months when the original incumbent left.

**Project management**

Without a CTA for the first years of the project from 2001 to 2003 (and a relatively inexperienced NPC), the project suffered initially from a lack of day-to-day support and guidance. There was thus a need for inputs from the Project Management Adviser planned for in the project document, but this did not take place until the project had gone beyond its original NTE date.

With the arrival of a resident CTA in 2004 came the initiative to create a revised project Management Team and the setting-up of monthly management meetings. Thus, together with the nomination of a new NPC in 2005, the foundations were laid for more consistent management. This has led to enhancements in progress reporting (although the quality could still be improved), and attempts were made to improve workplanning. (Also here remains room for improvement.) However, while advances have been made regarding team work and information exchange, the mission found that a satisfactory level of transparency and joint decision-making has not yet been achieved.

**Results**

To build the capacity of NARI to carry out and manage agricultural research

The stated expectations of the project design were that research staff of NARI would have “gained in-depth knowledge of the main production systems of Eritrea ... will be capable of implementing a participatory technology development, assessment and transfer approach and will have identified appropriate technological and managerial improvements that will have a sustainable impact on the productivity of priority production systems”. In addition, the institutional capacity of DARHRD (now NARI) was to improve “in terms of: its ability, through research management training, to plan and manage resources; its numbers and quality of trained staff; its capacity to plan and implement relevant and effective participatory applied and adaptive on-farm research; and its access to essential laboratory facilities, field equipment, supplies and operating funds”.

In the course of project operations, emphasis shifted from a balance between short-term and long-term training to give emphasis to longer-term degree (MSc) training. This benefited 10 NARI staff (roughly 20% of research staff). Considering the relatively low level of academic qualifications at NARI, the MSc courses will bring undoubted benefits. At the same time, this choice also means that due to the absence of the staff for the two-year duration of the MSc course, some areas of expertise in NARI are not covered, and has also resulted in lost training opportunities for the rest of the staff.

Only one out of the four planned training events for researchers and extension workers foreseen by the workplan was implemented. In addition, the selection of trainees for the MSc courses were

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7 Staff presence is also influenced by national service, and/or re-assignments to other organizations such as Hamelmalo College. However, NARI expects to receive more MSc graduates from the current batch at UoA than just those funded by the project.

8 NARI will supply copies of Annual Reports to the mission. (The mission already received a copy of a PowerPoint presentation entitled Annual Report of the Major Achievements in 2005.)

9 However, some researchers benefited from short training courses funded from other sources than the project.

10 A review of the planning document for this course suggests that training was affected by several design shortcomings: lack of needs assessment, inadequate formulation of learning objectives, over-ambitious curriculum, teacher-centred learning methods, lack of learning process and outcome evaluation procedures.
apparently not based on a systematic assessment of training needs of NARI staff. (A specific activity line for training needs assessment was absent from project document.)

The low frequency of short-term training may be related to the generally short duration of consultancy and backstopping missions, which did not allow for implementing full-fledged in-service training activities. (Consultant/expert person months actually made available to NARI are about 40% of the planned total.) Under the circumstances, the mission believes that more efforts could have been made to identify and recruit existing national expertise.

The provision of essential office and research equipment, supplies and operating costs has taken up a major part of the budget, but no specific targets were identified in the October 2004 workplan related to this “extended” output. This has caused some confusion and anxiety about available budgets.

NARI now has appropriate facilities and equipment for conducting research and continuing education activities; including three laboratories (for soil science, animal feed, tissue culture) which have been established/upgraded with project funds. However, at the time of the visit, the tissue culture and soil science laboratories were not yet operational due to delays in procurement of furniture. Moreover, although a local area network was created, Internet connection has not been working in Halhale for more than one year.\[11\]

The objective of improved agricultural research planning and management was addressed in NARI’s Medium Term Plan and Strategy, a document prepared with the assistance of two project-funded consultants. The document includes high-quality organizational analyses and makes sound and appropriate recommendations, while conceptually it faces a constraint in trying to combine a farming systems approach with a commodity-based approach. The document was officially adopted by NARI in 2005. (A draft proclamation to this end is under review by the government.) However, progress appears limited in some areas of MTP implementation: the re-organization of research work in a project mode has been slow, monitoring and evaluation of staff time allocation, performance and research outputs is not being conducted; and an analysis of economic impact of research projects has not been undertaken.\[12\]

The strengthening/setting-up of socio-economic research and participatory diagnosis capacity (focusing on production systems) was envisaged in the project document but has been achieved only to limited extent.\[13\] According to progress reports, this was due to the fact that NARI’s head of socio-economics research resigned in January 2005 and was not replaced. Apparently, no attempts have been made to fill the gap, for instance by recruiting (ad interim) a national consultant.

In the light of the above considerations, the evaluation mission believes that while in terms of physical infrastructure and formal education the foundations have been laid for NARI to improve its research capacity, in some planned components the project has remained below expectations.\[14\] The shortcomings were caused partly by internal factors related to project design, management and backstopping, and partly relate to external events beyond the control of the project.

Recommendations: In the light of donor’s intention to continue assisting in building up NARI capacity through a new project, the mission recommends that:

- once NARI has upgraded its human resource base with the arrival of the MSc graduates, action should be taken to strengthen research-extension and farmer linkages as well as further develop research expertise;
- the major outstanding item in terms of physical capacity building is the ordering and installation of the laboratory furniture. In the absence of a CTA, FAO must ensure that the installation of the furniture is properly supervised in order to guarantee the proper functioning of the laboratories (and also to prepare any claims in case of faulty or otherwise defective items);

\[11\] Staff access the Internet from other offices or Internet cafes; the problem is being addressed by NARI management.
\[12\] The newly recruited CTA made initial efforts to propose a sound M&E system, but this has not been translated into practice. On the other hand, there is evidence of activities aimed at strengthening NARI’s interface with the extension system, on a limited scale.

\[13\] In the context of a collaboration with ICARDA.
\[14\] An extended discussion of this aspect is found in the Note on Project’s Capacity Building Component in Annex 4.
• a four-six week feasibility and formulation mission should be fielded, giving particular attention to learning needs assessment and NARI institutional analysis; and

• Asmara University (through its Consultancy, Training and Testing Centre) should be involved in project formulation and collaborate in project implementation.

To improve integrated land and water management for rainfed and irrigated agriculture: including soil fertility, agro-forestry management and soil and water conservation

Several research initiatives were carried out in connection with this objective, including, among others:

• Field testing of tie ridgers to increase moisture conservation and grain yields in selected low rainfall locations (Akurdat, Guluj, Tekreret, Hagaz and others);
• Assessment of the effects of conservation tillage on soil structure, biomass production and yields in low rainfall areas (Hazemo, Guluj and Dubaruba);
• Analysis of 4,500 soil samples from different agroecological areas (Gerset, Afambo, Himbol, Hamalayet and others);
• On-farm fertilizer trials on major crops in different production areas
• Field testing of 50 indigenous fruit tree species;
• Assessment of the impact on land and water conservation of tree and shrubs agroforestry plantations;
• Assessment of impact of stone bands and tree planting on watershed management in a pilot catchment (Shambuko).

Most of these studies gave promising initial results, which were disseminated to concerned farmers by researchers and extension workers. Unfortunately, dissemination of technical findings was not supported by sound evidence of the economic comparative advantages of the improved natural resource management practices.

A presentation prepared by NARI indicated that there were gaps regarding the soil survey and land evaluation activities to classify the soils and to prepare soil maps and land suitability maps. This was (partly) attributed to the absence of dedicated materials and equipment in the FAO project, such as: GIS technology, equipment for digital mappings, non-availability of satellite images or aerial photographs, colour plotters; no training allocation.

The evaluation team also believes that insufficient efforts were made to systematise research findings and circulate in a format suitable for use by other researchers and decision makers. Subsequently the potential contribution of the above research activities to improving integrated land and water management for rainfed and irrigated agriculture is still largely untapped. Moreover, two major “normative” products foreseen by the October 2004 workplan (agroforestry diagnostic surveys and identification of soil nutrient/fertility classes) have not been delivered.

Recommendations: In order to enhance its capacity to generate information on natural resource management usable for local and national-level planning, NARI should:

• complement technical findings with relevant analysis of implementation costs and economic benefits for adopting farmers;
• develop further staff skills in data consolidation and reporting;
• invest more in research findings dissemination and in the production of guidelines for sustainable natural resource management in different agro-ecological areas of the country; and
• on-farm fertilizer trials as well as agroforestry studies should be economically analysed and demonstrated to farmers.

15 Conservation Agriculture, which was promoted already in 2003 by a FAO TCP project and was a planned activity under this objective, according to a NARI presentation was not followed up but because of budget constraints.

16 One NARI staff member apparently attended a short GIS course in Italy.
To test, select and make available for producers improved varieties, agronomic and soil management practices for horticultural crops

Among the problems to be addressed by the project was a stated lack of drought, pest and disease resistant crop varieties, good quality seed material and improved cultural practices among farmers. To this end, the project initiated a number of activities: variety testing of genetic materials of vegetables (onion, tomato, potato, pepper, garlic, sweet potato) and fruit crops (citrus, banana, mango, guava, papaya, date palm) for their adaptation, disease resistance agronomic practices and yield. For some varieties (e.g. citrus, banana, onion) dissemination to farmers or other users has already taken place. In addition, about 210 t of potato seed was multiplied in farmers’ fields and distributed to users, as well as pepper, onion and garlic seeds. In a presentation prepared by NARI, the main problems affecting this work were identified as shortage of skilled personnel and shortage of fuel.

The project document also contained a planned output regarding a tissue culture laboratory, for which a proposal was to be developed including a detailed work plan and specifications for equipment and infrastructure (to be funded/implemented during a follow-up phase). This plan was changed in the course of project implementation and funds were earmarked for the completion of the tissue culture laboratory in the current phase. The total cost of the tissue culture laboratory according to the 2005-2006 progress report amounted to US$ 142,813 (for civil works, equipment and supplies). According to the progress reports, the work required extensive preparation and was also affected by external constraints, such as the shortage of building materials in the country. Activities under this output also included the construction of a septic tank, a feature overlooked in the design of the soils laboratory. The laboratories are now ready except for the furniture, which has proved to be a major cost factor and for which a tender bids have been received. The laboratory component under this objective has been a source of major cost-overruns, apparently caused by inadequate design and changes to the original plans.

A major observed shortcoming in the activities under this immediate objective is the absence of systematic outreach/impact information. Progress reports give some idea of varieties and quantities of seeds etc passed on to farmers, but very little information about acceptance and performance in the field.

To improve pastoral and small ruminant production systems

The problem to be addressed under this immediate objective was a lack of improved livestock breeds and management practices; the project was to “ensure the participatory testing, selection, and dissemination of appropriate improved varieties of crops and livestock breeds”. In this context, the project supported the chemical and biological analysis of feeds in the soil and veterinary laboratories, as well as on-farm trials of multi-nutrition feed blocks in three agro-ecological areas of the country. Activities related to animal health-related outputs (develop parasite and disease control practices and recommendations, develop medical control practices for internal and external parasites) have apparently only started very recently. Likewise, the characterization of sheep and goat breeds started only in 2005-2006 with the purchase of a number of goats (64) and sheep (133).

One apparently major research activity (study of the effect of increasing amounts of fishmeal on the performance of the Holstein-Friesian cows, kept at Elabered Farm) appears largely unrelated to the objective of improving pastoral and small ruminant production systems.

Despite the apparent success of the feed blocks developed by NARI, it appears that overall progress under this objective has been substantially limited.

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17 A planned activity to identify and test on-station and on-farm IPM practices was not included in the workplan and apparently not followed up during project implementation. Some activities have taken place in the context of a DANIDA project.
18 Also, a budget of US$ 220,000 was earmarked “to assist with the construction of a soils laboratory”, without giving it a specific designation in the planned activities/outputs.
To test and provide agricultural engineering technology that decrease post-harvest and storage losses, improve the efficiency of human labour and animal draft power, and enhance moisture conservation

Two main research activities were implemented in connection with this objective:

- a comparative trial of local and improved wheat post-harvest storage technology, which showed that the improved metal-bin decreased risk of pest infestation and damage; and
- the development and testing of a labour-saving inter-row weeder and tie-ridger.

Although both activities gave initial positive technical results, the costs of metal bins turned out to be higher than foreseen. Adoption costs of the inter-row weeder were not clearly identified. Moreover, guidelines for blacksmiths were not developed.

Major factors affecting project results

Project performance has been affected by a number of internal issues: over-ambitious project design, absences of core international (CTA) and national staff (heads of crucial NARI units, temporary absence of NPC), non-availability of international consultants (due to security and travel restrictions), slow procurement procedures etc. In addition, external factors such as an uncertain security situation, slow growth of the economy (and concomitant problems like temporary fuel and building material shortages, budget limitations), temporary restrictions regarding long term training abroad have had a limiting effect on the project.

Issues

Sustainability

While the physical infrastructure necessary for agricultural research has largely been established at NARI (and also staff expertise is being upgraded), concerns remain regarding the funding for operational costs associated in particular with field research\(^{19}\). The change of status to a semi-autonomous body with greater authority over its budget and resource base may bring greater financial rewards to NARI, but the main source of regular funds is likely to remain the government, potentially augmented by donor contributions.

The guidance given in the 2004 Medium Term Plan and Strategy for NARI still appears relevant; however, while the proposed organizational structure has in principle been accepted, vacancies in crucial units mean that the NARI strategy can not be fully translated into action. Project activities designed with a view to optimizing research initiatives in terms of priority setting and performance monitoring, have not been implemented. Without sufficient feedback on the relevance and acceptance of results, NARI runs the risk of operating in isolation and losing touch with its partners and stakeholders.

Research-extension relationship (NARI’s role in the national agricultural research system vis-à-vis university and extension systems)

As the most prominent institution in the field of applied agricultural research, NARI plays a pivotal role in linking the national and international scientific community, with the extension system and the farming world. As highlighted in the Medium Term Plan and Strategy document, it is critical that NARI build strong linkages with the Agricultural Promotion & Development Department (APDD – the MoA’s entity in charge of advisory and extension services) and the College of Agriculture of the UoA. It appears that during the last two years, inputs provided by the project have been instrumental in strengthening this two-fold relationship. In particular:

\(^{19}\) However, according to NARI management the government has converted a significant number of day-labourers to contractual status.
• equipment, transport facilities and petty-cash funding made available by the project have facilitated (logistically) a higher involvement of NARI staff in activities implemented by APDD at the Zoba and sub-Zoba level; and

• projects grants have allowed 10 selected NARI staff to attend the MSc courses held by the College of Agriculture and other faculties of the UoA. Beyond the medium-term effects that this will have on NARI’s human capital, this initiative has enhanced the relationships with these two institutions and set up the foundations for further collaboration.

Despite these important achievements, two major shortcomings were identified by the mission in connection with NARI’s role in the research/extension relationship:

• insufficient sensitization and training of NARI staff on economic, social, and cultural dimensions of rural development is preventing full consideration of farmers’ views and priorities in NARI-promoted agricultural research; and

• lack of well-established in-house expertise in human resource development and social communication hampers NARI’s capacity to transfer on-station research findings to extension staff and contact farmers.

Recommendation: In order to address these problems, NARI should consider starting up an internal continuing education programme in the above two areas for its regular staff. A collaborative relationship with the College of Social Science and the Consultancy, Training and Testing Centre of the University of Asmara could be started in this connection. The mission suggests that project residual funds (if any) be allocated to fund under this arrangement, two three-day workshops, aimed at promoting the interest of NARI research staff in these two issues. One aspect of the education programme should be a sounder integration of action-oriented and participatory research methods into NARI on-farm research practice.
Main report

Introduction

Eritrea enjoyed strong economic growth and comparatively low inflation in the first few years of independence; however, in later years border conflicts with Ethiopia and trade embargoes changed this trend significantly. At the same time, the agricultural sector (where most of the population find employment) remained weak, despite significant investment in horticultural projects and large-scale cultivation in the western lowlands. The project GCP/ERI/006/ITA Strengthening of Agricultural Research in Eritrea was intended to improve this situation by addressing observed weaknesses in agricultural research; it started in September 2001, following up on a first phase project (GCP/ERI/001/ITA) which operated from September 1996 to March 2001.

According to the project document, only limited agricultural research in plant protection and soils had been carried out before independence. Immediately following independence, the Agricultural Research Department (later the Department of Agricultural Research and Human Resource Development – DARHRD) was established in 1992 with very limited personnel, infrastructure and equipment. Between 1995 and 2000, the total number of research staff increased from 35 to 77, of which 50 held degrees in agricultural disciplines.

The predecessor project was credited with successfully having built research and management capacity in DARHRD through the provision of: degree, short course and in-country training for national staff; technical expertise, vehicles, essential equipment, and supplies; the elaboration of an Operational Plan and a Strategy and Medium Term Plan for Research; and the development of management processes and capabilities: the establishment of a monitoring and evaluation system and the initiation of a management information system for research. (However, both systems were no longer in evidence at the time of the current evaluation.) The Phase II project was basically initiated as a follow-up project with a continuing focus on agricultural research. (The links with agricultural extension were expected to be handled jointly with a separate, but closely related, project to be implemented with the support of DANIDA.)

Assessment of Project Objectives and Design

According to the project document, project evaluators and external consultants recognized the success and effectiveness of the predecessor project, and recommended its continuation with some minor changes, among others: increasing the government’s budgetary allocation for research from its present low share of the sector budget; gradually shifting the focus from identifying and testing technologies that have quick impact to means of intensifying land use that are sustainable; and accelerating productivity increases in farm units by focusing on improved crops and livestock breeds, new crops, natural resource management, and transforming smallholder farms from subsistence production to a more commercial orientation.

The evaluation teams also commented that: some planned outputs (such as livestock breeding improvement and IPM establishment were too ambitious to achieve in a three year project effort given the capacity of research; that gender issues were not sufficiently addressed in research plans, training and staffing; and that inadequate emphasis was placed on livestock research activities during the first two years of the project. The substantial investment by the project in human resource development for research was identified as highly appropriate and in line with government priorities.

Consultants emphasised the need for continued efforts in farming systems research (characterization and diagnostic work, selection and improvement of alternatives), better linkages with extension, and more on-farm testing and selection together with farmers. More involvement of researchers in on-farm activities and joint planning and testing with farmers was considered to be desirable, and complementary on-station research should be guided by participatory on-farm constraint identification.

The Development Objective of the project was described as “the government’s development goal for the agricultural sector is to improve food security and livelihoods, including expanding agricultural export earnings, while ensuring the restoration and protection of the natural resource base. This is to
be achieved by improving agricultural productivity, through the provision of appropriate technologies and services to farmers, and by building the capacity and performance of service-providing agricultural institutions, including research”. The five immediate objectives of this project are: (i) to continue building-up the capacity of NARI and improve its performance in managing and carrying-out effective agricultural research programmes, including updating the Medium-Term Agricultural Research Strategy and Operational Plan; (ii) to improve integrated land and water management for rainfed and irrigated agriculture, including aspects related to soil fertility, agro-forestry, and soil and water conservation; (iii) to test, select and make available to producers improved varieties and agronomic and soil management practices for horticultural crops; (iv) to improve the management of pastoral and intensive small ruminant production systems, particularly by addressing health and nutritional constraints; and (v) to test and provide agricultural engineering technologies, farm tools and implements that decrease post-harvest losses, improve the efficiency of human labour and animal draft power, and enhance moisture conservation.

The target beneficiaries identified by the project are “small-scale, resource poor and commercial farmers of the priority areas” and extension staff, while NARI (formerly DARHRD) was seen as direct beneficiary through training, provision of equipment, supplies and operating costs. While there is evidence that some of NARI’s activities have reached the farmers (e.g. through seed multiplication, variety trials, etc), in the absence of an M&E system in NARI or its collaborating partners it is difficult to assess the overall benefits accrued so far to the target beneficiaries.

However, with the benefit of hindsight, the current project was designed with objectives, workplans and management and oversight arrangements which proved over-optimistic. The logical framework of the project suffered from some vague descriptions of planned objectives, outputs and indicators (such as Activity 1.2.2 Provide operating costs needed to implement project activities). Some outputs such as 1.4 (Socio-economic research and participatory diagnosis capacity established), and 1.5 (Production systems constraints and improvements identified) did not really belong under Immediate Objective One. (For the sake of internal consistency, the project logical framework should have treated outputs 1.4. and 1.5. under a separate immediate objective, i.e. “to strengthen NARI’s capacity to conduct socio-economic and farming system research”).

Other major planned activities such as construction of soils (and later tissue culture lab) were not adequately costed, and for the main identified risks (delays in the recruitment, posting and retention of national project staff ... and delays in selecting and recruiting qualified external technical assistance for the project) no remedial measures were proposed. Attempts were made to improve the quality of workplans, but also the revised workplans still displayed shortcomings regarding precise targets, responsibilities and budget implications. The first mission by the Project Management Adviser in January 2004 (itself massively delayed) proposed a revised workplan for the period January 2004 to May 2005 (later extended to December 2005). The revised workplan was accepted by a TPR meeting in March 2004, and the TPR Meeting also agreed to create a full-time CTA position in order to allow sound management of the project. A revision of the project document, which could have provided better guidance, was not attempted.

The original implementation arrangements for the project envisaged the Director-General of NARI serving as the Project Manager, assisted by a National Project Co-ordinator (NPC) and the PMA (recruited by FAO on a consultancy basis), who were to form the Management Team. Following the TPR and the recruitment of a full-time CTA (and later the nomination of a new NPC), institutional and management improved with the creation of two new bodies: a revised project Management Team (comprising the DG of NARI, CTA, NPC, directors of the five Research Divisions of NARI, and the Operations Officer of the FAO Representation), and a Joint Monitoring Committee, comprising the DG of NARI, CTA, NPC, FAOR, and the Head of Italian Cooperation office in Eritrea. The Joint Monitoring Committee met in Oct 2004, Feb 2005 (with FAO’s lead technical backstopping officer present) and Sept 2005; the revised Management Team met monthly. Despite the frequent meetings, the mission’s impression is that team work and information exchange could still be better.

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20 An assumption that a DANIDA-funded agricultural extension would complement the NARI project was mentioned in the project document under On-going and Programmed Assistance, but was not listed under Risks. (The DANIDA project did not materialize.)
Project Implementation, Efficiency and Management

Project Budget and Expenditure

The following shows the Financial Statement for April 2006; more detailed financial information can be found in the Budget Revision “F” of 2005 reproduced in the annex.

Printed on: 28-APR-06 11.48.44 (via FPMIS)

Financial Statement (Trust Funds)

Activity: TFIT11ER01200 (TF Project)
From: 2001-09 To: 2006-03

| TF_Acct: TFIT11ER01200 101680 GCP/ERI/006/ITA (Project) | Organization: N/A |

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Status of Activities and Outputs

The following section focuses on the years since 2004; activities and outputs achieved before that relate mainly to equipment, laboratory construction and provision of operational funds. (It should be kept in mind that the project has had a slow start, and by the planned end of the project in December 2003, only 1/3 of the budget had been spent. As mentioned before, the project was extended to double its originally envisaged duration without, however, substantially modifying the project document or its scheduled activities.)

**Immediate Objective I: To build the capacity of DARHRD to manage and carry out agricultural research**

Output 1.1 Human resource training needs identified and capacity in key subject areas improved

Activity 1.1.1 Train national staff through degree and short term courses

The project has been funding Master of Science degree training at the University of Asmara for staff of NARI since 2004. In the project document, there was a plan to train six M.Sc. and 20 man-months of short term training. However, due to government regulations temporarily suspending long-term training abroad for all national staff, this activity was re-dedicated to M.Sc. training at the University of Asmara. Also, funds earmarked for short-term training courses were partly absorbed by the M.Sc. funding requirements.

Currently (2005-06) ten students are enrolled in the Master programme. Of these, two are studying Animal Science, two Soil Science and one Development Economics and have completed their first year successfully. One student in Development Economics has successfully completed his undergraduate studies and joined the programme. One student in Horticultural Sciences, dismissed after the first semester 2004, was readmitted to the current Academic Year. Nominations and fellowship forms for additional candidates were submitted by NARI to FAO and three additional staff of NARI were enrolled in the Academic year 2005 – 2006 for studies in Horticulture (two students) and Agronomy (one student)\(^2\).

Activity 1.1.2 Recruit essential technical expertise to support project objectives and provide in-service training for national staff

Not all planned consultancy inputs and technical backstopping missions could take place as envisaged. Partly this had to do with the security situation in the country (UN Phase 3). It appears also that not much in-service training organized by the project has taken place; however, this is partly offset by training courses organized by other institutions and attended by NARI staff. Moreover, NARI maintains formal linkage arrangements and various types of technical and experience sharing...
activities (established by the project) with regional networks such as ASARECA (Association for Strengthening Agricultural Research in Eastern and Central Africa) and INTSORMIL, and several CGIAR centres (e.g. CIMMYT, ICARDA, ICIE, ICRAF, ICRISAT, ILRI) and Institutions.

There was no reporting in progress reports for Activity 1.1.3: Strengthen local in-service training for research and extension staff and farmers.

Output 1.2 Essential office and research equipment, supplies and operating costs provided (including a full-fledged soil and water laboratory)

Activity 1.2.1 Procure necessary equipment and supplies for office, laboratory, and field requirements of the project (including a full-fledged soil and water laboratory).

The project provided funding for building, equipping and providing supplies for the soil and water laboratory, and in addition (following NARI’s request as a high-priority addition) also funding for civil works, equipment and supplies for a tissue culture laboratory. (Estimated total cost for tissue culture laboratory = US$ 142,813.) In addition, a septic tank (not included in the design and contract for the construction of the Soil laboratory (US$ 17,698), equipment for supplying and distribute electrical power to laboratories on the entire site of NARI was procured (about US$0 15,000), as well as sheep and goats (US$ 17,600). Other miscellaneous field and office equipment and supplies (such as vehicles, computers, printers, laboratory equipment and supplies) were also provided to NARI.

A major outstanding budget item remains the furniture for the Soil, Tissue Culture and Animal Nutrition laboratories: after a lengthy process (specifications were completed in May 2005; after requests for modifications tender issued in December 2005; only offer received in January 2006) the order was not yet completed in May 2006.

Activity 1.2.2 Provide operating costs needed locally to implement the project activities.

The project has been providing support for essential local operating expenses such as vehicle spare parts and servicing; for purchase of stationery and other office and field supplies; and for payment of salaries for locally recruited labourers in the field and project administrative staff for smooth implementation of various research activities.

Output 1.3 Agricultural research planning and management improved

Activity 1.3.1 Update the agricultural research strategy and operational plan, including proposals of institutional and coordination adjustments as appropriate: this was in the main addressed through two an international consultancy in 2004 to revise and update NARI’s Medium-Term Plan (MTP).

Activity 1.3.2 Improve research/extension/farmer linkage and coordination at national and zonal level.

On-farm researches and participatory activities continue in various parts of the Country. These include trials on horticultural crops, soil fertility management, agro-forestry and agricultural engineering. Researchers from NARI have organized demonstrations of increased yield, improved varieties, and appropriate technologies for various commodities with extension staff and farmers. One farmer field day was also organized in Hagaz in 2005. Senior researchers have actively participated in organizing on-farm trials and demonstrations. However, it appears that in terms of information management, only the first steps have been made to establish a database for library resources and management information purposes.

Activity 1.3.3 Review and improve monitoring-evaluation (M&E) and management information systems (MIS) and supporting databases for agricultural research.

This activity has lagged behind, mainly because the Head of the Planning / Monitoring and Evaluation Unit resigned in February 2005 and was not replaced. (A current M.SC. student is expected to take over this position upon return.)
Output 1.4  Socio-economic research and participatory diagnosis capacity established (including research impact assessment system, and output and performance assessment system)

Activity 1.4.1  Design and initiate research impact assessment system.

Some studies were conducted at the farm in Halib-Mentel early on in the project lifetime; however, the Head of the Socio-Economic and Farming Systems Unit, who was the only researcher in charge of socio-economic studies, resigned in 2004 and was not replaced.

Activity 1.4.2  Establish an output and performance assessment system for the Division of Agricultural Research.

No reporting (see 1.4.1 above)

Output 1.5  Production systems constraints and improvements identified

Activity 1.5.1  Continue participatory diagnostic studies and surveys on livestock, crop production and land management systems in high priority areas; with a view to identifying constraints and opportunities and provide orientation for the research plans

Activity 1.5.2  Select with farmers, in 3 pilot areas/sites, appropriate crop, livestock and land management practices that are viable and sustainable, to improve production systems' productivity

Activity 1.5.3  Carry out economic evaluation as well as the assessment of social/cultural appropriateness of promising technologies identified/developed by the Research Division

Combined with Output 1.4 – no special report (see 1.4.1 above)

Immediate Objective 2: To improve integrated, land and water management and conservation for rainfed and irrigated agriculture, including soil fertility, agro forestry and soil conservation.

Output 2.1  Land management and in-situ conservation technologies developed and tested

Activity 2.1.1  Review evaluation information on soil and water conservation technologies and test and develop improved technologies

Soil and water conservation trials were conducted at Halhale during 2003 and 2004, to examine the usefulness of tie-ridging practice for improved soil moisture conservation. However, the trials resulted in water logging, showing that Halhale is not a water deficient area and appropriate site for tie-ridger research. Therefore, further trials were conducted during the 2005 crop season on water deficit areas of Galuj, Tekreret, Akordat and Shambuko.

Activity 2.1.2  Test and develop alternative land husbandry practices focusing on conservation tillage, to improve moisture retention and infiltration and reduce erosion:

Apparent some Conservation Agriculture (zero tillage) on-farm research was initiated in 2003 in the context of an FAO TCP project (TCP/ERI/3005). While some promising results were reported, on-farm CA activities were not taken up in the last two years. (But some research was done at Halhale – see below.)

Activity 2.1.3  Test and develop alternative land husbandry practices focusing on conservation tillage, to improve moisture retention and infiltration and reduce erosion:

See above

Output 2.2  Soil and plant nutrition management practices developed and disseminated.

Activity 2.2.1  Using the integrated soil and plant nutrition management concept, develop and test soil fertility management options for major soil types, AEZ and cropping systems
Under this activity, Soil surveys and land evaluations have been carried out to assess the potential of land for horticultural and cereal production. In addition, soil and water samples are continuously being analysed following requests from farmers, researchers, or institutions.

Activity 2.2.2 Identify and establish soil fertility classes and threshold levels of plant nutrients in cereals and horticulture crops

Six participatory fertilizer trials were conducted on station and on farm with the participation of farmers, using Barley, Wheat, Sorghum and Taff, to assess the effect of different types and rates of fertilisers (mainly Urea and DAP) in different agro ecological zones. The objective of these studies was to determine the optimum rates of N and P to maximise the yield of the crop considered under local conditions.

Activity 2.2.3 Undertake technical studies and investigation on: availability and agronomic efficiency of local sources of plant nutrients for enhancing soil fertility and productivity

A survey of soil types and evaluation of land have been conducted in selected areas of the country having agricultural potential. The lack of information on the characteristics of soil and land in Eritrea is one of the major limiting factors in developing soil and land management techniques for improved and sustainable production. So far no systematic study was available on the morphological characteristics of the Eritrean soils, though there are some studies on the surface soils in very few areas. Since recently, the soil research unit has been making a remarkable effort, as one of its major activities, to characterize and classify soils and the land at the research stations, and in some selected agricultural potential areas, especially for irrigation, in the country. Soil classification and land suitability maps and descriptions have been produced for the Fanko Area in Gash-Barka and some areas of Southern Red Sea region.

Some limited Conservation Agriculture activities at the research station in Halhale were started in 2005. Eight treatments with four replications were used: Treatment 1: Hand Planting, legume rotation; Treatment 2: Oxen disc plough, legume rotation; Treatment 3: Direct tractor planting legume rotation (no till); Treatment 4: Hand planter (barley); Treatment 5: Oxen disc plough (barley); Treatment 6: Direct tractor planting (barley); Treatment 7: Oxen traditional planting, legume rotation; Treatment 8: Oxen traditional planting (barley). The data have been collected and are awaiting analysis.

Output 2.3 Agro-forestry technology tested, varieties and species selected and disseminated to farmers

Activity 2.3.1 Carry out agro-forestry diagnostic studies in the main production systems.

One agro-forestry site for promoting watershed rehabilitation and sustainable development was established at Shambuko in 2003. However, the activity was interrupted due to operational difficulties in that area. (Reportedly this was resumed and completed in 2005.)

Activity 2.3.2 Identify and test with farmers agro-forestry options (including improved fallow) to improve land and water management, improve soil quality and productivity and to enhance fodder and fuel production (indigenous species and, where appropriate, exotic species). Special emphasis will be placed on options and species contributing to soil fertility restoration and soil and water conservation.

Relay cropping of Cereals with Pigeon pea and Sesbania was initiated in 2003, sowing a local cultivar of barley and planting Sesbania sesban and Cajanus cajan. to study the effect of relay cropping of barley. Barley was harvested during October 2005. In 2005 it was not possible to collect data on the above ground biomass weight of the shrubs, since they died due to frost.

As application of fertilizers or use of animal manure is normally not feasible for small-scale farmers, alley cropping of barley with Casuarina cunninghamiana (hereafter referred to as Casuarina) was initiated in July 2001 at Halhale research station. These studies aim at improving crop yields and land productivity through nitrogen fixation, leaf litter production, soil and water conservation. In the trials, biomass and grain weight of barley, and growth and survival of trees were recorded.
Barley was harvested and sample threshing of barley carried out in October 2005. The survival of Casuarina ranged from 20 to 92%, depending on the spacing between plants, with the highest survival (92%) with 1 x 4 m spacing, which also allowed obtaining fastest growth and strongest plants. Measurements of plant height and root collar diameter growth were conducted.

The possibility to establish through direct sowing four species of shrubs used in the short rotation improved fallow experiment was investigated. The objective was to assess biomass production of trees and residual benefits to crop (wheat or barley) yields. This experiment was initiated in July 2005 at Halhale research station with seven treatments replicated three times in randomized complete block design (RCBD).

Trials with local accessions of Acacia senegal were established in Shambuko in August 2005, to find out which local germplasm has superior characteristics for maximizing adaptability, high regeneration and yield (quantity and quality) under stress condition.

Other experiments were conducted on rhamnus and apple, and coppicing fallow experiments with Leucaena leucocephala, domestication of indigenous fruit trees, establishment of seed stands for the production of improved germplasm, establishment of live fences, and different water harvesting methods for better survival and establishment of trees.

In addition, and seeds of trees or shrubs were provided to various Zobas: about 3 Kg of Rhamnus prinoides were provided to Gash Barka and Debub Zobas, while 1 Kg was sold to Self Help NGO; 0.5 Kg of Acacia albida were provided to Maakel Zoba; 10 Kg of Moringa oleifera were sold to Refugee Trust NGO; 2.5 Kg of Schinus molle were provided to Gash Barka Zoba; and 3.2 Kg of Acacia senegal to Gash Barka Zoba. Also, 100 Kg of seedlings of Hibiscus cumnasis were provided to Gash Barka Zoba. Seeds were collected from Gash Barka and Debub Zobas: 9 Kg of Acacia senegal and 0.5 of Boswellia papyrifera were collected from Maimne; and 1 Kg of Acacia senegal from Halib Mentel.

Activity 2.3.3  Develop with farmers a model of agro-forestry systems in two pilot sites, for promoting watershed rehabilitation and sustainable management

A pilot site was established at Shambuko for promoting watershed rehabilitation to rehabilitate the area and create a model site that integrates physical and biological soil and water conservation measures and different agroforestry practices. For this purpose the following actions were taken: terracing the degraded land and improving the cover of grass and trees by introducing new perennial forage crops and leguminous shrubs/trees to stabilize the bands.

Experiments for appropriate water harvesting and micro-catchment water-harvesting techniques have been set up. The objective was to compare tree survival and development with the following four water harvesting structures / micro-catchments: (1) circular water harvesting basin (control); (2) V-shaped micro-catchment; (3) half-moon shaped water harvesting basin; and (4) tie ridges (trench bands with a tie ridge in the middle).

Activity 2.3.4  Disseminate agro-forestry technology to extension and farmers

Under this heading, two Farmers’ Days on agro-forestry activities were conducted at Halhale Research station. Furthermore, seedlings of apple, apricot and peach were tested (viability and germination), germinability was also tested for five Acacia species, seeds (Rhamnus prinoides, Schinus molle, Acacia Senegal) were collected and provided free of charge to local offices of MoA. A total of 10,900 seedlings of various species (400 - 1,500 each species) of trees and shrubs were grown for research purposes at Halhale, Bietgiorgis and Akurdel Nurseries.

In June 2005 an intensive training course in agroforestry was given on “Trees in Integrated Farming Systems” to 19 extension officers from five Zobas and one from Forestry and Wildlife Research Unit.

Output 2.4  Irrigation management, particularly for horticulture crops, tested and disseminated.

There was no reporting under this output.
Immediate Objective 3: To test, select and make available for producers improved varieties, agronomic and soil management practices for horticultural crops

Output 3.1 Horticultural crop varieties and management practices tested and disseminated (including initial work on establishment of a tissue culture laboratory)

Activity 3.1.1 Conduct on-station and on-farm trials on priority horticulture crop varieties and management practices including fertilization and irrigation

A garlic population and fertilizer trial was conducted from 2002/2003 to 2004/2005, to investigate the effect of different planting dates, level of nitrogen fertilization and different plant populations on yield and quality of local garlic. Also, evaluation trials of sweet potato were launched to determine adaptability, yield and quality potential of sweet potato and to identify early clones. An on-station tomato variety evaluation study has been conducted at Halhale, while a tomato hybrid observation trial was started with seeds obtained from the Faculty of Agriculture Sciences in Godollo, Hungary. An onion variety trial was conducted during three consecutive years on station at Halhale, and subsequently continued on-farm in 2006. Also, an onion variety purification programme was started in year 2002. The main objective of the breeding programme is genetic purification of the adapted and popular variety ‘Haggaz’ by eliminating the undesirable traits of premature bolting and splitting. This breeding programme uses two methods, the phenotypic recurrent mass selection, inbreeding, and bulking. Furthermore, a Chilli Pepper Variety Development Programme was started in 2003, to develop one or more varieties of chilli pepper that meet the quality demand in Eritrean market for fresh and dry consumption. A final selection cycle is planned before seed multiplication and distribution to farmers.

Regarding fruits based on qualitative and quantitative evaluations and field observation done in the citrus variety collection plot at Halhale, the cultivars are now ready to be released to a specific agro-ecological zone of Debub region. A banana development programme is continuing in providing farmers with planting materials. In 2006, plantations of banana were under extreme water stress, due to shortage of fuel for water pumping. In 2005, about 3,000 seedlings of the selected banana cultivars (Williams and Grand Naine) were distributed to MoA farm at Akordat, in Gash-Barka region. In addition to this, 2,800 seedlings of the cultivars selected were distributed to farmers in Megoraybe area. Mango trees of nine varieties (introduced from Sudan in 2001 and added to the collection plot in Tekreret) are at beginning of fruit bearing stage. Data on yield, time of flowering and other horticultural characteristics are being recorded. For date palms, the collection plot in Gahtielay includes 16 varieties (introduced in 1999-2000). The plot includes soft, semi-soft and semi-hard date types. Other varieties present are Kush Zabad, Shieshi and Zahidi (from tissue culture imported from the UK). Most varieties are at fruit bearing stage and preliminary data have been collected.

A major activity for NARI is seed multiplication, particularly concerning Pepper (at Gahtielay and Halhale research stations) and potato. Regarding the latter, a workshop concerning national seed potato multiplication pilot project was held in March, 2004 (financed by CHIHDP). In that context, about 210 t of seed potatoes were distributed to farmers.

Activity 3.1.2 Test genetic material of priority horticultural crops for recommendation and dissemination to extension and farmers

Most activities are covered under 3.1.1 above. In addition, a tomato plant population (spacing) and planting method experiment was undertaken, as well as a tomato variety on-farm trial, a potato cut, whole and fertilizer trial, and a Tomato Improvement Programme.

Activity 3.1.3 Provide proposal for the establishment and development of a realistic tissue culture laboratory and human resource capacity, to produce material for fruit trees. The proposal will include detailed work plan, required equipment and infrastructure which will be initiated under this phase of the project and completed in the subsequent phase.

This activity presents a conceptual problem: due to budget constraints at the time of project formulation, only the preparation of proposals for laboratory construction was envisaged. However, following NARI’s requests and with the approval of the Project parties, the actual construction works (not originally budgeted) were undertaken and equipment and supplies procured. In this
context, extensive civil works needed for the adaptations to use part of the newly built Soil laboratory to accommodate a Tissue Culture laboratory. (This included contracts for civil works as well as equipment and supplies needed to make the new tissue culture laboratory operational.) In addition, other miscellaneous field and office equipment and supplies were also provided to NARI.

Two NARI staff were selected for training in tissue culture (at AGERI in Egypt) and to work in the new Tissue Culture Laboratory: Mr. Tsegay Berhane, Director of the Crop Improvement Division will be in charge of the laboratory and Mrs. Alganesh Tesfamariam, Technician, will also work in the laboratory.

**Immediate Objective 4: To improve pastoral and small ruminant production systems**

Output 4.1 Applied and adaptive research on animal nutrition continued

Activity 4.1.1 Carry out chemical and biological analysis, assess and develop feed additives and supplements to improve animal nutrition

Under this activity, chemical analysis of animal feed was conducted with the support of the Central Veterinary Laboratory: between late 2005 and May 2006 13 animal feed samples were analysed. A major activity seems to have been tests at Elabered Estate Dairy Farm to study the effect of increasing amounts of fishmeal on the performance of the Holstein-Friesian cows, whose normal diet is forage based. Trials were conducted using increasing amounts of fishmeal in the concentrate. This study was ongoing from 2004; however, it appears unrelated to the Immediate Objective.

Activity 4.1.2 Develop region specific multi-nutrient blocks through on-farm trials in three agro-ecological zones for sheep and goat feed supplements

The development of region specific multi nutrient blocks through on-farm trials in three agro-ecological zones was completed. The three regions considered were: (1) the central highland zone; (2) the coastal plain zone; and (3) the southern lowland zone. The blocks had different composition in the different zones: in the first zone they were based on wheat bran, or chopped straw; in the second zone crop residues of Salicornia, or salt bushes were used; and in the third zone chopped Sorghum, or sesame was used. All these formulations showed to have a satisfactory physical structure and were successfully accepted by the animals.

Additional animal nutrition research was undertaken on assessing oat/vetch mixtures under rainfed conditions in Eritrean highlands, and assessment of Alfalfa Production in Eritrean Highlands. In addition, observational trials on different kinds of forages were carried out.

Output 4.2 Applied research on animal health continued to develop parasite and disease control practices and recommendations including pastoralism

No activities.

Activity 4.2.1 Continue surveys of external and internal parasites of sheep and goats, and identify the seasonal dynamics of the parasites

Two studies were initiated in Senafe sub-Zoba (Debub region: (a) Identification of species of gastro-intestinal parasites and their seasonal dynamics in sheep; and (b) Identification of species of ticks and their seasonal dynamics on cattle. Villages were randomly selected by the Agricultural sub-zoba concerned extension workers. In each village 12 sheep (total 48 fat-tailed) for gastro-intestinal parasite and six cows, Arado breed type (a total of 24 cows) were selected for tick-study. Sampling was delayed because of the lack of fuel and difficulties for transportation of NARI staff in early 2006.

Activity 4.2.2 Develop medical control practices for internal parasites and carry out trials of feed blocks with anti-helmantics.

Nothing in 2005/06 reports

Activity 4.2.3 Develop medical control practices for external parasites and carry out economically viable acaricide trials
A Sheep and Goat Mobile Spray Race was designed and the materials required for its construction were purchased (Pipes, pump, metal sheets and bars, welding material, etc.). (Nothing in 2005 report.)

Output 4.3 Indigenous livestock breeds characterized and improved with breeding stock and better management practices

Activity 4.3.1 Characterize and record sheep and goat breed performance for milk and meat yield

The purchase of animals continued and was completed as planned, in view of their use to characterize breeds for higher performance. A total of 133 ewes and rams of the highland fat-tailed sheep were bought from the highland of Eritrea and currently they are 197 heads with their progeny. These sheep were collected from different parts of Debub region and the studies are being conducted at Halhale research centre.

These sheep were bought from different localities of Debub region. Anthelmintics were administered as prophylactics and control measure to the animals purchased. Forty-two fecal samples were submitted to the Central Veterinary Laboratory for the identification of eventual gastrointestinal parasites. Sixty-two fecal samples from the goats and 115 from the sheep were submitted to the Central veterinary laboratory for the diagnosis of the internal parasites.

To characterize the dairy goat, a total of 64 Hassani goats was bought in Gash Barka, with the assistance of the Ministry of Agriculture of Tessenai. These goats were kept 14 days in quarantine at Tessenai - Ministry of Agriculture, to check the conditions of the animals. They arrived in Halhale in October 2005. Four of these goats died. After conducting post-mortem examination, the cause of death was identified as acute pneumonia. Studies are in progress.

Activity 4.3.2 Continue to improve, through selection, the breeding herds for sheep and goat and distribute breeding stock to farmers to improve breed performance.

This activity is related to 4.3.2 above; distribution to farmers to farmers will only be possible after conclusion of trials.

Activity 4.3.3 Continue on-farm small ruminant management trials, collect production and health performance records, and disseminate synthesised results and information to extension and farmers.

No reports

Immediate Objective 5: To test and provide agricultural engineering technology and implements that decrease post harvest and storage losses, improve the efficiency of human labour and animal draft power, and enhance moisture conservation

Output 5.1 Technologies to minimize post harvest storage losses of cereals tested and provided to farmers

Activity 5.1.1 Carry out studies and quantitative assessments of post harvest losses of staple cereals

Studies on improved storage for cereals were apparently completed during the early project stages; available information is summarized under 5.1.2 below.

Activity 5.1.2 Test and select with producers appropriate post harvest and storage technologies and practices

On farm tests on improved storage methods (metal bin and traditional Kofo) were conducted using barley, wheat, sorghum and chickpea. Ten metal bin stores were distributed in Debub region, ten in Maekel region and two in Gash Barka region. Thirty-five q of wheat, 28.77 q of barley, 5.43 q of chickpea and about 8 q of sorghum were stored in the containers distributed at the three zobas, after verifying infestation rate, moisture content, temperature and percent of germination. Apparently, the
improved storage structures showed very satisfactory results compared to the traditional type, but the costs of the material for the bin proved high (following government restrictions on imports).

Output 5.2 Labour saving and moisture conserving machinery, implements and tools developed, tested and disseminated.

For this output, no activities have been reported.

**Technical and operational backstopping**

The project received from 2001 to 2005 a total of 15 visits by consultants (16 were planned in the original project document); however, the person/months actually made available to NARI are about 40% of the planned total. In addition, the designations of the consultants differed significantly from the original consultants’ list. As a result, particularly the areas of M&E and socio-economics were not appropriately covered. (One reason given was counterparts did not exist at NARI.)

In addition, the project received three visits (in 2003, 2004 and 2005) by its FAO lead technical backstopping officer, and additional four visits by FAO technical backstopping officers between 2004 and 2005. While technical backstopping visits seem to have addressed relevant topics, it appears that Technical Task Force at FAO HQ did not provide the kind of comprehensive technical backstopping assistance that the project would have needed.

**Government support**

Eritrea’s progress in recent years has been overshadowed by external factors, and economic growth has been slow. Consequently, also the government budget for NARI appears to have been under pressure, and external assistance has supported many non-core functions. (NARI salaries and other essential activities are funded from government allocations to NARI.)

The government has supported the proposed change in NARI’s status, which would establish NARI as a semi-autonomous body with greater authority over its budget and resource base.\(^{22}\)

The project document indicated that the government would contribute to the construction of research infrastructure and provide general operating expenses, TCDC experts and non-expendable equipment, to the tune of US$ 873,478. On the other hand, according to project progress reports, the project has been providing support for vehicle spare parts and servicing; for purchase of stationery and other office and field supplies; and for payment of salaries for locally recruited labourers in the field and project administrative staff for smooth implementation of various research activities.

A government decision early in the life of the project temporarily restricting long term training abroad meant that a major component of the project (overseas degree training) could no longer be implemented on time. (The overseas training was substituted by MSc training at the University of Asmara.)

Not all counterpart positions envisaged in the project document have been filled: for example, the Head, Socio-economics Research Unit left NARI in January 2005 and has not been replaced (a current MSc student is expected to take his place later this year), the Planning, Statistics and Monitoring position has not been filled, and the NPC position remained vacant for several months when the original incumbent left.\(^{23}\)

**Project management**

Without a CTA for the first years of the project from 2001 to 2003 (and a relatively inexperienced NPC), the project suffered initially from a lack of day-to-day support and guidance. There was thus a need for inputs from the Project Management Adviser planned for in the project document, but this did

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\(^{22}\) A draft proclamation to this end is under review by the government.

\(^{23}\) Staff presence is also influenced by national service, and/or re-assignments to other organizations such as Hamelmalo College. However, NARI expects to receive more MSc graduates from the current batch at UoA than just those funded by the project.
not take place until the project had gone beyond its original NTE date.

With the arrival of a resident CTA in 2004, the creation of a revised project Management Team and the setting-up of monthly management meetings, and the nomination of a new NPC in 2005, the foundations were laid for more consistent management. This has led to enhancements in progress reporting (although the quality could still be improved), and attempts were made to improve workplanning. (Also here remains room for improvement.) However, while advances have been made regarding team work and information exchange, the mission found that a satisfactory level of transparency and joint decision-making has not yet been achieved.

Assessment of Results and Effectiveness

Immediate Objective One: To build the capacity of NARI to carry out and manage agricultural research

The stated expectations of the project design were that research staff of NARI would have “gained in-depth knowledge of the main production systems of Eritrea ... will be capable of implementing a participatory technology development, assessment and transfer approach and will have identified appropriate technological and managerial improvements that will have a sustainable impact on the productivity of priority production systems”. In addition, the institutional capacity of DARHRD (now NARI) was to improve “in terms of: its ability, through research management training, to plan and manage resources; its numbers and quality of trained staff; its capacity to plan and implement relevant and effective participatory applied and adaptive on-farm research; and its access to essential laboratory facilities, field equipment, supplies and operating funds”.

In the course of project operations, emphasis shifted from a balance between short-term and long-term training to give emphasis to longer-term degree (MSc) training. This benefited 10 NARI staff (roughly 20% of research staff). Considering the relatively low level of academic qualifications at NARI, the MSc courses will bring undoubted benefits. At the same time, this choice also means that due to the absence of the staff for the two-year duration of the MSc course, some areas of expertise in NARI are not covered, and has also resulted in lost training opportunities for the rest of the staff.

Only one out of the four planned training events for researchers and extension workers foreseen by the workplan was implemented. In addition, the selection of trainees for the MSc courses were apparently not based on a systematic assessment of training needs of NARI staff. (A specific activity line for training needs assessment was absent from project document.)

The low frequency of short-term training may be related to the generally short duration of consultancy and backstopping missions, which did not allow for implementing full-fledged in-service training activities. (Consultant/expert person months actually made available to NARI are about 40% of the planned total.) Under the circumstances, the mission believes that more efforts could have been made to identify and recruit existing national expertise.

The provision of essential office and research equipment, supplies and operating costs has taken up a major part of the budget, but no specific targets were identified in the October 2004 workplan related to this “extended” output. This has caused some confusion and anxiety about available budgets.

NARI now has appropriate facilities and equipment for conducting research and continuing education activities; including three laboratories (for soil science, animal feed, tissue culture) which have been established/upgraded with project funds. However, at the time of the visit, the tissue culture and soil science laboratories were not yet operational due to delays in procurement of furniture. Moreover, although a local area network was created, Internet connection has not been working in Halhale for more than one year.

NARI will supply copies of Annual Reports to the mission. (The mission already received a copy of a PowerPoint presentation entitled Annual Report of the Major Achievements in 2005.)

However, some researchers benefited from short training courses funded from other sources than the project.

A review of the planning document for this course suggests that training was affected by several design shortcomings: lack of needs assessment, inadequate formulation of learning objectives, over-ambitious curriculum, teacher-centred learning methods, lack of learning process and outcome evaluation procedures.

Staff access the Internet from other offices or Internet cafes; the problem is being addressed by NARI management.
The objective of improved agricultural research planning and management was addressed in NARI’s Medium Term Plan and Strategy, a document prepared with the assistance of two project-funded consultants. The document includes high-quality organizational analyses and makes sound and appropriate recommendations, while conceptually it faces a constraint in trying to combine a farming systems approach with a commodity-based approach. The document was officially adopted by NARI in 2005. (A draft proclamation to this end is under review by the government.) However, progress appears limited in some areas of MTP implementation: the re-organization of research work in a project mode has been slow, monitoring and evaluation of staff time allocation, performance and research outputs is not being conducted; and an analysis of economic impact of research projects has not been undertaken.

The strengthening/setting-up of socio-economic research and participatory diagnosis capacity (focusing on production systems) was envisaged in the project document but has been achieved only to limited extent. According to progress reports, this was due to the fact that NARI’s head of socio-economics research resigned in January 2005 and was not replaced. Apparently, no attempts have been made to fill the gap, for instance by recruiting (ad interim) a national consultant.

In the light of the above considerations, the evaluation mission believes that while in terms of physical infrastructure and formal education the foundations have been laid for NARI to improve its research capacity, in some planned components the project has remained below expectations. The shortcomings were caused partly by internal factors related to project design, management and backstopping, and partly relate to external events beyond the control of the project.

Immediate Objective Two: To improve integrated land and water management for rainfed and irrigated agriculture; including soil fertility, agro-forestry management and soil and water conservation

Several research initiatives were carried out in connection with this objective, including, among others:

- Field testing of tie ridgers to increase moisture conservation and grain yields in selected low rainfall locations (Akurdat, Gulu, Tekreret, Hagaz and others);
- Assessment of the effects of conservation tillage on soil structure, biomass production and yields in low rainfall areas (Hazemo, Gulu and Dubaruba);
- Analysis of 4,500 soil samples from different agroecological areas (Gerset, Afambo, Himbol, Hamalayet and others);
- On-farm fertilizer trials on major crops in different production areas;
- Field testing of 50 indigenous fruit tree species;
- Assessment of the impact on land and water conservation of tree and shrubs agroforestry plantations;
- Assessment of impact of stone bands and tree planting on watershed management in a pilot catchment (Shambuko).

Most of these studies gave promising initial results, which were disseminated to concerned farmers by researchers and extension workers. Unfortunately, dissemination of technical findings was not supported by sound evidence of the economic comparative advantages of the improved natural resource management practices.

A presentation prepared by NARI indicated that there were gaps regarding the soil survey and land evaluation activities to classify the soils and to prepare soil maps and land suitability maps. This was (partly) attributed to the absence of dedicated materials and equipment in the FAO project, such as:

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28 The newly recruited CTA made initial efforts to propose a sound M&E system, but this has not been translated into practice. On the other hand, there is evidence of activities aimed at strengthening NARI's interface with the extension system, on a limited scale.

29 In the context of a collaboration with ICARDA.

30 Please refer to the Note on Project’s Capacity Building Component in Annex 4.

31 Conservation Agriculture, which was promoted already in 2003 by a FAO TCP project and was a planned activity under this objective, according to a NARI presentation was not followed up but because of budget constraints.
GIS technology, equipment for digital mappings, non-availability of satellite images or aerial photographs, colour plotters; no training allocation.

The evaluation team also believes that insufficient efforts were made to systematise research findings and circulate in a format suitable for use by other researchers and decision makers. Subsequently the potential contribution of the above research activities to improving integrated land and water management for rainfed and irrigated agriculture is still largely untapped. Moreover, two major “normative” products foreseen by the October 2004 workplan (agroforestry diagnostic surveys and identification of soil nutrient/fertility classes) have not been delivered.

Immediate Objective Three: To test, select and make available for producers improved varieties, agronomic and soil management practices for horticultural crops

Among the problems to be addressed by the project was a stated lack of drought, pest and disease resistant crop varieties, good quality seed material and improved cultural practices among farmers. To this end, the project initiated a number of activities: variety testing of genetic materials of vegetables (onion, tomato, potato, pepper, garlic, sweet potato) and fruit crops (citrus, banana, mango, guava, papaya, date palm) for their adaptation, disease resistance agronomic practices and yield. For some varieties (e.g. citrus, banana, onion) dissemination to farmers or other users has already taken place. In addition, about 210 t of potato seed was multiplied in farmers’ fields and distributed to users, as well as pepper, onion and garlic seeds. In a presentation prepared by NARI, the main problems affecting this work were identified as shortage of skilled personnel and shortage of fuel.

The project document also contained a planned output regarding a tissue culture laboratory, for which a proposal was to be developed including a detailed work plan and specifications for equipment and infrastructure (to be funded/implemented during a follow-up phase). This plan was changed in the course of project implementation and funds were earmarked for the completion of the tissue culture laboratory in the current phase. The total cost of the tissue culture laboratory according to the 2005-2006 progress report amounted to US$ 142,813 (for civil works, equipment and supplies). According to the progress reports, the work required extensive preparation and was also affected by external constraints, such as the shortage of building materials in the country. Activities under this output also included the construction of a septic tank, a feature overlooked in the design of the soils laboratory. The laboratories are now ready except for the furniture, which has proved to be a major cost factor and for which a tender bids have been received. The laboratory component under this objective has been a source of major cost-overruns, apparently caused by inadequate design and unscheduled changes to the original plans.

A major observed shortcoming in the activities under this immediate objective is the absence of systematic outreach/impact information. Progress reports give some idea of varieties and quantities of seeds etc passed on to farmers, but very little information about acceptance and performance in the field.

Immediate Objective Four: To improve pastoral and small ruminant production systems

The problem to be addressed under this immediate objective was a lack of improved livestock breeds and management practices; the project was to “ensure the participatory testing, selection, and dissemination of appropriate improved varieties of crops and livestock breeds”. In this context, the project supported the chemical and biological analysis of feeds in the soil and veterinary laboratories, as well as on-farm trials of multi-nutrition feed blocks in three agro-ecological areas of the country. Regarding the latter, in some agro-ecological zones farmers are already using the feed blocks with the assistance of NGOs (CARE).

Also, various feed mixtures (oat/vetch mixtures with different combinations of cereal and legumes under rainfed conditions in Eritrean highlands) were tested and an assessment conducted of alfalfa production in the Eritrean Highlands. Activities related to animal health-related outputs (develop

32 One NARI staff member apparently attended a short GIS course in Italy.
33 A planned activity to identify and test on-station and on-farm IPM practices was not included in the workplan and apparently not followed up during project implementation. Some activities have taken place in the context of a DANIDA project.
34 Also, a budget of US$ 220,000 was earmarked “to assist with the construction of a soils laboratory”, without giving it a specific designation in the planned activities/outputs.
parasite and disease control practices and recommendations, develop medical control practices for internal and external parasites) have apparently only started very recently. Likewise, the characterization of sheep and goat breeds started only in 2005-2006 with the purchase of a number of goats (64) and sheep (133).

One apparently major research activity (study of the effect of increasing amounts of fishmeal on the performance of the Holstein-Friesian cows, kept at Elabered Farm) appears largely unrelated to the objective of improving pastoral and small ruminant production systems.

Despite the apparent success of the feed blocks developed by NARI, it appears that overall progress under this objective has been substantially limited, and also unfocused.

Immediate Objective Five: To test and provide agricultural engineering technology that decrease post- harvest and storage losses, improve the efficiency of human labour and animal draft power, and enhance moisture conservation

Two main research activities were implemented in connection with this objective:

- a comparative trial of local and improved wheat post-harvest storage technology, which showed that the improved metal-bin decreased risk of pest infestation and damage; and

- the development and testing of a labour-saving inter-row weeder and tie-ridger.

Although both activities gave initial positive technical results, but the costs of metal bins turned out to be higher than foreseen following government restrictions on imports. Adoption costs of the inter-row weeder were not clearly identified. Moreover, guidelines for blacksmiths were not developed.

Major factors affecting project results

Project performance has been affected by a number of internal issues: over-ambitious project design, absences of core international (CTA) and national staff (heads of crucial NARI units, temporary absence of NPC), non-availability of international consultants, slow procurement procedures etc. In addition, external factors such as an uncertain security situation, slow growth of the economy (and concomitant problems like temporary fuel and building material shortages, budget limitations), temporary restrictions regarding long term training abroad have had a limiting effect on the project.

Issues

Sustainability

While the physical infrastructure necessary for agricultural research has largely been established at NARI (and also staff expertise is being upgraded), concerns remain regarding the funding for operational costs associated in particular with field research. The change of status to a semi-autonomous body with greater authority over its budget and resource base may bring greater financial rewards to NARI, but the main source of regular funds is likely to remain the government, potentially augmented by donor contributions.

The guidance given in the 2004 Medium Term Plan and Strategy for NARI still appears relevant; however, while the proposed organizational structure has in principle been accepted, vacancies in crucial units mean that the NARI strategy can not be fully translated into action. Project activities designed with a view to optimizing research initiatives in terms of priority setting and performance monitoring, have not been implemented. Without sufficient feedback on the relevance and acceptance of results, NARI runs the risk of operating in isolation and losing touch with its partners and stakeholders.

35 However, according to NARI management the government has converted a significant number of day-labourers to contractual status.
Research-extension relationship (NARI’s role in the national agricultural research system vis-à-vis university and extension systems)

As the most prominent institution in the field of applied agricultural research, NARI plays a pivotal role in linking the national and international scientific community, with the extension system and the farming world. As highlighted in the Medium Term Plan and Strategy document, it is critical that NARI build strong linkages with the Agricultural Promotion & Development Department (APDD – the MoA’s entity in charge of advisory and extension services) and the College of Agriculture of the UoA. It appears that during the last two years, inputs provided by the project have been instrumental in strengthening this two-fold relationship. In particular:

- equipment, transport facilities and petty-cash funding made available by the project have facilitated (logistically) a higher involvement of NARI staff in activities implemented by APDD at the Zoba and sub-Zoba level; and

- projects grants have allowed 10 selected NARI staff to attend the MSc courses held by the College of Agriculture and other faculties of the UoA. Beyond the medium-term effects that this will have on NARI’s human capital, this initiative has enhanced the relationships with these two institutions and set up the foundations for further collaboration.

Despite of this important achievements, two major shortcomings were identified by the mission in connection with NARI’s role in the research/extension relationship:

- insufficient sensitization and training of NARI staff on economic, social, and cultural dimensions of rural development is preventing full consideration of farmers’ views and priorities in NARI-promoted agricultural research; and

- lack of well-established in-house expertise in human resource development and social communication hampers NARI’s capacity to transfer on-station research findings to extension staff and contact farmers.
Annexes

Terms of Reference

Joint Evaluation Mission by the Government of Italy, FAO and the Government of Eritrea

GCP/ERI/006/ITA
Strengthening of Agricultural Research in Eritrea

1. BACKGROUND OF THE PROJECT

1.1. General
Eritrea gained its independence and was internationally recognized as a sovereign State in 1993, after about 30 years of liberation struggle. A border conflict erupted with Ethiopia in 1998 and recurrent drought have also been affecting its development. Since 1993, Eritrea has been shaping the structure of its public sector, with newly formed Ministries, including the Ministry of Agriculture. It is a low-income food deficit country, with the need to improve national food production and agricultural productivity to achieve sustainable food security. Agriculture represents the base of its economy and about 80 per cent of the population lives in rural areas and is dependent on subsistence agriculture. Agricultural research has to play a key role to develop this sector, in identifying and improving appropriate management practices and production and farming systems, selecting varieties adapted to local conditions, identifying improved varieties to meet production requirements, as well as sustainable land and water use and conservation practices. However, the goal of developing a viable national research system has been facing funding and human resources constraints, both in numbers and qualifications.

The Government of Italy expressed interest in supporting the task of establishing the new agricultural research system of Eritrea and has been providing funding for ad hoc projects, especially if focused on adaptive research and participative.

Within this context GCP/ERI/006/ITA was formulated, to strengthen agricultural research in Eritrea. However, this project encountered serious operational difficulties and was largely delayed, with an overall stagnation of activities during its first three years. The project started in July 2001 and it should have been completed by April, 2004. Instead, at the beginning of September 2004 most of activities were still to start, including core activities such as training. Among the main causes for this situation, the tri-partite review (TPR) meeting held in March, 2004 noted a lack of daily management, lack of technical capacity in managing the project, and insufficient human resources. As of mid-January 2004, only US$ 0.991 million had been spent out of a total budget of US$ 2.987 million and that was mainly for procurement and operational expenses. Difficulties were as well experienced in the communication between NARI and the local FAO representation regarding the programme and operations.

The CTA was hired in September 2004, but a full time NPC was not made available. After this event, there was a substantial change and acceleration in the implementation of the activities, with a budget delivery in one year (2005) of about the double of the delivery in the previous years. Major activities such as the construction, furnishing and equipping of the new soil and tissue culture laboratories, which were not part of the Project Document, were decided before the arrival of the CTA. These activities - and further modifications later requested - required substantive resources (funds, time, etc.).

The progress of work also suffered from difficulties non-inherent to the project itself, such as (a) sudden resignations and frequent absences of NARI staff, which delayed the implementation of activities; (b) the difficult situation the beneficiary country is facing after the recent war and the continuing tension with Ethiopia, which has also had an impact on the possibility of deployment of personnel from the Ministry of Agriculture (MoA); (c) Government restrictions for travel abroad of personnel of NARI; (d) internal situation and security restrictions limiting travel and work in the country for UN personnel during some periods in the course of the implementation of the project; (e) shortage of building materials in Eritrea; and (f) escalating costs for goods and services in the Country, that required budget revisions and reallocation of funds to priority activities.
1.2. Previous project

The GCP/ERI/001/ITA - Strengthening of Agricultural Research and Extension Division in Eritrea, with a Donor budget of US$ 4.46 million - initiated in September 1996 and ended in March 2001. Also in this case FAO was designated as the Executing Agency and the National Agricultural Research Institute (NARI) as Implementing Agency of the project.

The development objective of that project was to improve the quality of research and extension services provided to farmers so as to assist the farming community, in the medium and long term, to improve its production systems and the productivity of crop and animal production, to integrate agroforestry techniques capable of providing valuable products and to contribute to food security and a general improvement of the standard of living in rural areas.

The three immediate objectives of that project were to:

- establish an institutional capacity in the Department of Agricultural Research of MOA by contributing to the development of sound organization and management practices and by providing short courses and degree training for staff;
- contribute to the development of selected priority production systems in different agro-ecological zones; and
- improve the plant protection capacity and technology of the Department of Agricultural Research in order to benefit farmers.

Considering the prevailing circumstances, the support received through the project was useful, further assistance was recommended and the GCP/ERI/006/ITA - Strengthening of Agricultural Research in Eritrea - is the follow-up of GCP/ERI/001/ITA.

1.3. Objectives and outputs of the project

The focus of the present project is on the research conducted at the NARI of Eritrea.

The extension component (present in the previous project GCP/ERI/001/ITA) was supposed to be conducted separately, through another project funded by DANIDA, but subsequently the Danish support was not provided and this component was not implemented.

GCP/ERI/006/ITA was designed to assist the Department of Agricultural Research and Human Resource Development (DARHRD) of the Ministry of Agriculture (MoA) of the Government of the State of Eritrea to build-up its institutional capacity for the generation and dissemination of relevant improved agricultural technology and modern cultural practices (in the context of production / farming systems) to concretely address a government policy of highest priority related to food security, poverty alleviation and the conservation of the natural resource base. Under the latest organizational structure of the MoA, the DARHRD changed in 2003 into a semi-autonomous body called NARI, with the exclusive mandate to conduct agricultural research and develop agricultural technologies that sustainably enhance agricultural productivity.

The Objectives and Outputs of the Project, as per Project Document (PRODOC), are:

Development Objective

Improvement of food security and livelihoods, including expanding agricultural export earnings, while ensuring the restoration and protection of the natural resource base. This is to be achieved by improving agricultural productivity, through the provision of appropriate technologies and services to farmers, and by building the capacity and performance of service-providing agricultural institutions, including research.

Immediate Objectives and Outputs
Immediate Objective 1. To continue building-up the capacity of NARI and improve its performance in managing and carrying-out effective agricultural research programmes, including updating the Medium-Term Agricultural Research Strategy and Operational Plan.

Output 1.1. Human resource training needs identified and capacity in key subject areas improved.
Output 1.2. Essential office and research equipment, supplies and operating costs provided.
Output 1.3. Agricultural research planning and management improved.
Output 1.4. Socio-economic research and participatory diagnosis capacity established.
Output 1.5. Production systems constraints and improvements identified.

Immediate objective 2. To improve integrated land and water management for rainfed and irrigated agriculture, including aspects related to soil fertility, agro-forestry, and soil and water conservation.

Output 2.1. Land management and in-situ conservation technologies developed and tested
Output 2.2. Soil and plant nutrition management practices developed and disseminated.
Output 2.3. Agro-forestry technology tested, varieties and species selected and disseminated to farmers.
Output 2.4. Irrigation management, particularly for horticultural crops, tested and disseminated.

Immediate Objective 3. To test, select and make available to producers improved varieties and agronomic and soil management practices for horticultural crops.

Output 3.1. Horticultural crop varieties and management practices tested and disseminated.

Immediate Objective 4. To improve the management of pastoral and intensive small ruminant production systems, particularly by addressing health and nutritional constraints.

Output 4.1. Applied and adaptive research on animal nutrition continued.
Output 4.2. Applied research on animal health continued to develop parasite and disease control practices and recommendations including pastoralism.
Output 4.3. Indigenous livestock breeds characterised and improved with breeding stock and better management practices.

Immediate Objective 5. To test and provide agricultural engineering technologies, farm tools and implements that decrease post harvest losses, improve the efficiency of human labour and animal draft power, and enhance moisture conservation.

Output 5.1. Technologies to minimize post harvest storage losses of cereals tested and provided to farmers
Output 5.2. Labour saving and moisture conserving machinery, implements and tools developed, tested and disseminated.

1.4. Timeframe and budget of the project

The long term nature of research and the time necessary to implement activities and obtain results requires years, and the time estimated for this kind of project at the time of its formulation was at least five years. Nevertheless, since the Donor could not consider a duration of over three years, it was planned to have initially a first phase with a duration of about three years and a follow-up phase of additional two years.

The Project Document was signed in June 2001 and the project started in July 2001 (but becoming fully operational only in September 2001), with a duration of 33 months for the first phase, and with a Not To Exceed date (NTE) of April 2004. Because of the low implementation and budget delivery until then, a Chief Technical Advisor (CTA) was hired in September 2004 and the NTE of the project extended to April 2006 without increase in funding, to allow performing planned activities.

The budget allocated for the first phase includes a contribution from the Donor of about US$ 2.99 million and a contribution from the Government of about US$ 1.11 million.

1.5. Overall progress of the project to date
The following is a summary of the progress of the main components of the project to date:

New laboratory facilities were built (soil and tissue culture laboratories), and are being furnished and equipped. Septic tank was built and extensive modification required for the new tissue culture laboratory were made, including civil works and electrical, sanitary and aluminium (doors) works. Electrical generator, air conditioners and exhaust-fans were received and installed in the new building. Equipment and supplies for the new laboratories were received. Office equipment (including computers and printers) has been provided as well to NARI.

Long term training: ten MSc students are being trained in various areas of study at the University of Asmara. Several workshops and short term training courses were organized at NARI. Over nine person/month consultancy inputs were provided to NARI. The Medium-Term Agricultural Research Strategy and Operational Plan was updated.

Soil and water conservation trials were conducted at various localities. The usefulness of tie-ridging was studied under different environmental conditions in Eritrea. Soil analyses and on-farm participatory trials were conducted in the main cereal and horticultural crops. Research on various fertilizers was carried out in different agro-ecological zones, both on-farm and on-station. Studies were conducted using the integrated soil and plant nutrition management concept and soil surveys were performed to assess the potential of land for horticultural and cereal production.

Novel studies on the domestication of indigenous fruit trees were conducted. Agro-forestry technology and inputs were disseminated to extension and farmers (e.g. seedlings of improved varieties). Researches on coppice fallow, relay cropping and alley cropping were conducted on various species to identify best practices under Eritrean conditions and to increase land productivity through nitrogen fixation and soil and water conservation. Genetic traits of seed of tree germplasm was selected and distributed to beneficiaries. Various methods of water harvesting were tested for better establishment and survival of trees.

Trials have been conducted under Highlands and Lowlands climatic conditions on vegetable and fruit crops to evaluate the productivity and performance of varieties, improve varieties, and identify appropriate cultural practices. Experiments were conducted using various crop varieties / hybrids / clones, fertilizers, plant densities, and planting and mulching methods. Adaptive research trials for the selection of improved horticultural varieties have been conducted at NARI and in farmer’s fields. Multiplication of seed of improved varieties has been conducted and seed distributed to farmers.

Animal nutrition studies were conducted using different types of forage, animal feed and additives suitable for local conditions. The production potential of introduced species (e.g. alfalfa) was assessed under local conditions and studies have been conducted to optimize cultural practices. Species to use under rainfed conditions were studied. The adaptability and nutritive value as animal feed of selected forage species have been evaluated under Eritrean conditions. Biological traits and performance of those species under local conditions were characterized as well. Simple technologies to disseminate to farmers were identified and adapted to local conditions (e.g. multi-nutrient feed blocks). Surveys for and studies on parasites of sheep and cattle are in progress at various localities to provide knowledge base and methods for control. Sheep and goats for characterizing and selecting improved breeds for milk and meat production have been purchased and studies are in progress.

On-station and on-farm studies were conducted and improved storage structures to decrease post-harvest losses were identified. Farm tools and implements to improve efficiency of farming practices have been tested.

A detailed understanding of the overall progress of the project can be obtained reading the following documents:

- Project document (2001)
- Progress reports
- Backstopping Mission Reports
- Minutes of the meetings of the Joint Monitoring Committee
- Aide-Memoires by the Lead Technical Unit (H. Mwandemere, 2003 and 2005)
2. PURPOSE OF THE EVALUATION

The Project Document stipulated that "the progress of the project will be evaluated by a Tripartite Review-cum-Evaluation Mission at the beginning of its third year". However, due to the delay in the implementation of the project, the Tripartite Review Mission was held almost at the end of the third year, and at that time it was premature to have the Evaluation Mission because of the limited achievements until then.

The evaluation is intended, as the project draws to a close in April 2006, to provide recommendations to the Government, FAO and the donor on the further steps necessary to consolidate progress and ensure achievement of objectives. Any further need for external assistance, will be identified. The Donor has expressed interest in funding a follow-up to this project.

In case the mission will confirm the need for a follow-up phase, or project - as planned in the Project Document - the mission should recommend the objectives and major outputs for a successive phase, to allow an expeditious preparation and approval of the new project.

3. SCOPE OF THE EVALUATION

In reviewing the project, the evaluation mission may wish to take into account those significant changes that have occurred since its inception, especially institutional and policy changes for agricultural research in the country, the local operating conditions, as well as the changes in the project management during the course of the implementation of the project. Also, the findings and recommendations of the tripartite review conducted in March 2004, and the related follow-up actions taken should be considered.

Specifically, the mission will:
(a) Verify the continuing relevance and significance of the project to Eritrean agricultural development, particularly the priority needs for agricultural research;
(b) Examine the appropriateness and realism of project objectives and design, including the priority setting and implementation approach. This should take into account the institutional and policy changes that have occurred in the Ministry of Agriculture, including the new structure of NARI and the Medium-term Research Strategy and Plan; the evolving local operating conditions; and should include assessment on:
   ☐ Clarity and consistency between the objectives, output, activities, resources and timeframe;
   ☐ Realism and clarity of underlying assumptions, pre-requisites, and prior obligations for effective implementation targets as well as adequacy of the managerial and institutional framework for project implementation;
   ☐ The extent to which efforts have been made in the design and implementation plan to ensure the project’s cost-effectiveness; and
   ☐ Areas needed for re-orientation or modification;

(c) Review overall efficiency of project implementation (against the implementation plan), including: the timeliness of activities and output performance, implementation difficulties; management adequacy and effectiveness; adequacy of monitoring and reporting; and the extent and quality of support to the project by the government and FAO (both operational and technical);
(d) Assess the project’s effectiveness to date in terms of producing the expected outputs (both quantity and quality) and progress towards achieving the immediate objectives:
   ☐ Continuing building-up the capacity of NARI and improve its performance in managing and carrying-out effective agricultural research programmes, including updating the Medium-Term Agricultural Research Strategy and Operational Plan.
   ☐ Improving integrated land and water management for rainfed and irrigated agriculture, including aspects related to soil fertility, agro-forestry, and soil and water conservation,
Testing, select and make available to producers improved varieties and agronomic and soil management practices for horticultural crops,

Improving the management of pastoral and intensive small ruminant production systems, particularly by addressing health and nutritional constraints; and

Testing and providing agricultural engineering technologies, farm tools and implements that decrease post harvest losses, improve the efficiency of human labour and animal draft power, and enhance moisture conservation.

(e) Examine the prospects for sustainable use and development of the project’s achievements, taking into account the institutional strength of NARI, the relevance and viability of improved technologies extended, and the government’s likely support for a national agricultural research system in policy and resources;

(f) Assess the cost-effectiveness of the project and analyse the key factors that have facilitated or impeded the project’s effectiveness, and draw lessons and identify issues to be addressed in future; and

(g) Based on the foregoing, assess and make recommendations regarding:

- key priority follow-up actions needed to achieve fully the objectives of the project;
- additional areas where action is desirable to ensure adequate development of national capacity for agricultural research at NARI in a sustainable manner; and
- the nature and scope of a follow-up phase, or project.

4. COMPOSITION OF THE MISSION

The mission will comprise nominated representatives from FAO, Government, and Donor. The FAO mission member will serve as the Team Leader.

The composition and qualifications of the mission will be as follows:

- FAO: Expert in agricultural development with experience in the evaluation of similar institutional capacity-building projects;
- Donor: Agricultural research specialist with experience in developing country national agricultural research programmes, fluent in English and with good writing capabilities;
- Government: Agricultural specialist with knowledge of policies and priorities of the government for agricultural research.

Mission members should be independent and thus have no previous direct involvement with the project either with regard to its formulation, implementation, or backstopping. They should preferably have experience of project evaluation and a good understanding of current and historic issues of Eritrea.

5. TIMETABLE AND ITINERARY OF THE MISSION

Considering the time needed to accomplish its tasks, the mission should take place over a period of 14 days.

Considering the difficulties to travel from Asmara to other African cities, especially Accra, it is recommended to have briefing and debriefing at FAO HQ. If necessary, a video-conference could be arranged in Rome to communicate with Accra.

The Team Leader will be technically briefed by the various FAO units involved in the project (especially SDRR, AGPC, AGLL, FONP, AGAP, and AGST).

The team will travel to Asmara, Eritrea, in December 2005, where the Team Leader and the Consultant nominated by the Donor will join the Government representative for briefing with project management, the FAOR and the implementing agency of the Government (MoA).

A tentative travel schedule for the mission is provided below.

Tentative travel schedule (December 2005)
Day 1 Travel to Asmara
Day 2 Briefing with FAOR and CTA, Minister of Agriculture, Italian Ambassador
Day 3 Meetings with DG of NARI, NPC and CTA; visit of NARI research fields (Halhale)
Day 4 Meetings with Government Institutions
Day 5 Visit to NARI substations: Highlands
Day 6 Visit to NARI substations: Western lowlands
Day 7 Visit to NARI substations: Eastern lowlands
Day 8 Meetings with Project Management
Day 9-13 Writing mission report
Day 13 Debriefing meetings (on the basis of a written presentation: draft report or aide-memoire)
Day 14 Travel to Rome

6. CONSULTATIONS

The mission will maintain close liaison with the Representatives of the donor and FAO and the concerned national agencies, as well as with national and international project staff. Although the mission should feel free to discuss with the authorities concerned anything relevant to its assignment, it is not authorised to make any commitments on behalf of the Government, the donor, or FAO.

7. REPORTING

The mission is fully responsible for its independent report which may not necessarily reflect the views of the Government, the donor or FAO. The report will be written in conformity with the FAO Guidelines, with the following headings:

I. Executive Summary (Main Findings and Recommendations)

II. Introduction

III. Background and Context

IV. Assessment of Project Objectives and Design
   A. Justification
   B. Objectives
   C. Project Design

V. Assessment of Project Implementation, Efficiency and Management
   A. Project Budget and Expenditure
   B. Activities and Outputs
   C. Government Support
   D. Project Management
   E. Technical and Operational Backstopping

VI. Assessment of Results and Effectiveness
   A. Effects and Impact
   B. Sustainability and Environmental Impact of Results
   C. Gender Equity in Project Implementation and Results
   D. Cost-effectiveness
   E. Major Factors Affecting the Project Results

VII. Conclusions and Recommendations
   A. Conclusions
   B. Recommendations

VIII. Lessons Learned

Annexes
1. Terms of Reference
2. List of places visited and key persons met by the mission
3. List of documents and other reference materials consulted by the mission
The draft report will be completed, to the extent possible, in the country and the findings and recommendations fully discussed with all concerned parties and wherever possible consensus achieved.

The mission will discuss its conclusions and recommendations in a de-briefing meeting to be held in Asmara; the conclusions and recommendations should provide sufficient technical guidance and specify the resource requirements, to enable FAO, the donor, and the Government of the State of Eritrea to make informed decisions for the residual project life. Furthermore, the mission's recommendations should provide guidance on the need for further technical assistance and donor support beyond the current project.

The mission will also complete the FAO Project Evaluation Questionnaire.

The mission leader bears responsibility for finalisation of the report, which will be submitted to FAO within two weeks of mission completion. FAO will submit the report to Government and Donor together with its comments.
**Mission itinerary and list of people met**

1 May 2006 (evening)
arrival Asmara

2 May 2006 Asmara
Mr Admir Bay, FAO Representative
Mr Luca Fornasari, CTA GCP/ERI/006/ITA

Mr Emanuele Pignatelli, Ambassador of Italy

Mr Heruy Asghedom, Director General Agricultural Promotion and Development Department, Ministry of Agriculture

3 May 2006 Halhale (NARI Headquarters)
Mr Iyassu Gebretatios Director General NARI
Mr Asmerom Kidane, National Project Coordinator

Short visit to NARI substation Mendefera

4 May 2006 field trip to NARI substations (accompanied by DG NARI, NPC, Directors)
Gahtelay
Sheeb
Mr Zeremariam Ghebremichael, NARI communication officer

Mr Habtemichael Solomon, Plant Protection Expert/Extensionist, sub-Zoba office
Mr Idris Shkor, Administration Head sub-Zoba (also Head, Farmers’ Association)

5 May 2006 field trip to NARI substations (accompanied by DG NARI, NPC, Directors)
Elabered Farm (citrus trials)
Halibmentel (pilot demonstration on soil conservation and fertility improvement techniques using tree rows planted on contours as barrier hedges)
Hagaz (NARI substation: onion, sorghum, millet, okra, vegetables)
Commercial farm near Hagaz (onions)
Site near Adigat (Moringa oleifera stand)
Tikririt (NARI substation: bananas, mangos)
Mr Musi, NARI substation manager

Adigat (MoA office)
Mr Ahmed, MoA extensionist

6 May 2006 Asmara
Internal mission meeting

7 May 2006 Asmara

8 May 2006 Asmara
Mr Tekleab Mesghena, Director General Department of Regulatory Services MoA

Mr Solomon Haile, Director of Planning and Statistics Division MoA

Mr Arefaine Berehe, Minister of Agriculture
9 May 2006 Asmara
Mr Iyassu Gebretatios Director General NARI
Mr Asmerom Kidane, National Project Coordinator
Ms Emma Gori, Director Italian Cooperation Asmara
CARE Eritrea
Mr Eyob
Mr Paul Roden, Syngenta Foundation

10 May 2006 Asmara
Mr Zemenfes, Dean of School of Post-graduate Studies, University of Asmara
Mr Janardhan Rao, Country Director CONCERN
Mr John Weakliam, Country Director Refugee Trust
Mr Tewodros Okubay, (former NPC)

11 May 2006 Asmara
Report writing
Discussion of draft aide memoire with senior NARI staff

12 May 2006 Asmara
Debriefing with Mr Arefaine Berehe, Minister of Agriculture
Debriefing with NARI management, Italian Cooperation and FAOR

13 May 2006
Mission departure
Documents consulted by the mission

Internal FAO and project reports (country reports, other briefing material, progress reports, BTO reports, etc)

NARI PowerPoint presentations and reports

The Economist Intelligence Unit (various documents)

Various policy papers
Note on project’s capacity building component

Building NARI’s capacity of designing and agricultural research and communicating its findings to relevant audiences was a major concern for GCP/ERI/006 ITA designers. Capacity building is mentioned in the development objective of the project and is the subject of Immediate Objective One: to continue building-up the capacity of NARI and improve its performance in managing and carrying out effective agricultural research.

Based on this consideration, a systematic review of capacity building activities and outputs in project final biennium (2004-2006) was carried out by the evaluation mission. The findings of this exercise are presented in this annex.

1. Capacity building activities design and plan

The project logical framework merges under IO1 five major outputs, as follows:

1.1 Human resource training needs identified and capacity in key subject areas improved
1.2 Essential office and research equipment, supplies and operating costs provided
1.3 Agricultural research planning and management improved
1.4 Socio-economic research and participatory diagnosis capacity established
1.5 Production systems constraints and improvements identified

Scope and content of outputs in this list are rather heterogeneous and not fully consistent with the wording of IO1. In particular, the evaluation team mission considers that for the sake of internal consistency, the project logical framework should have treated outputs 1.4 and 1.5 under a separate immediate objective (i.e. “to strengthen NARI’s capacity to conduct socio-economic and farming system research”). An additional important flaw in IO1 logical framework is the lack of an activity line for a learning needs assessment (which is mentioned in Output 1.2.). This has had important implications on short term planning (workplans) and implementation of training activities.

The project lists for each one of these outputs a number of activities and targets (presented as indicators of achievement), based on which the master workplan for the project was drafted. After a long and difficult inception period with limited delivery (April 2001 – December 2003), this plan was revised by the Project Management Advisor. The revised plan was endorsed in April 2004 by the Tripartite Review (TPR) mission and subsequently adopted, with minor adjustments by the Project Management Team, in October 2004. This revision allowed the project to develop according to a more realistic operational framework, but it did not amend the above inconsistencies and omissions.. This 2004-2005 (extended to 2006) workplan is taken as the baseline reference for the following assessment of implementation of IO1 activities during project’s last biennium.

2. Project implementation (productivity)

i) Output 1.1: Human resource training needs identified and capacity in key subject areas improved

Output 1.1 planned and achieved targets for the period October 2004 – April 2006 are listed in the table below.

Table 1: Training targets: planned vs. achieved (2004-2006)

<table>
<thead>
<tr>
<th>2004-2005 targets as per October 2004 workplan</th>
<th>Targets achieved as per April 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seven MSc trainings started in 2004 and completed by the end of 2006</td>
<td>10 NARI staff enrolled in MSc course of the College of Agriculture of the University of Asmara (plus one dismissed in 2005)</td>
</tr>
<tr>
<td>Eleven short training courses organized by the end of</td>
<td>Largely unachieved. One eight day study tour to</td>
</tr>
</tbody>
</table>
Kenyan Agriculture Research Institute, focusing on research management was carried out by 2 NARI senior managers in 2005

Sixteen man-months of short-term international consultants recruited by the end of 2005

Four short in-country training sessions implemented by the end of 2005 for research and extension staff (in total 30 research and 60 extension staff will receive in-country training)

The table indicates that most planned short-term training sessions for NARI staff were not implemented during the period under review. In contrast, the number of NARI staff enrolled in MSc training courses (at the College of Agriculture of the University of Asmara) increased from 7 (planned) to 11 (achieved). According to the Project Management Team, this reflects a preference for shifting the available resources from short-term training to the MSc programme. The evaluation team considers that this choice has led to a skewed and inappropriate concentration of most resources available for training (about US$ 200,000) on 11 “privileged” persons (corresponding to 20% of total staff). This choice translated into limited access for the majority of colleagues to any continuing education opportunity and entailed a high organizational opportunity cost (related to the absence from work of the above staff for the two-year duration of these MSc courses).

A breakdown of the 2004-2005 and 2005-2006 batches of project-supported NARI MSc trainees by course subject is presented in the table below.

Table 2 – Distribution of project-supported NARI’s trainees by course subject and batch

<table>
<thead>
<tr>
<th>MSc course subject</th>
<th>2004-2005 batch</th>
<th>2005-2006 batch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal science</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Soil Science</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Development economics</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Horticulture</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Agronomy</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

As suggested by Table 3, project productivity was below the planned targets also regarding the recruitment of consultants and experts for delivering in-service training. Consultant/expert person months actually made available to NARI were about 40% of the planned total for the period under review. In general, consultancy topics look relevant to project research activities (as specified under IO 2-4). However, it must be noticed that most expert inputs were delivered in the framework of very short FAO backstopping mission, which did not allow for implementing full-fledged in-service training activities. The evaluation team acknowledges that limitations to international missions to Eritrea have affected project capacity to meet the expected target. However, it also believes that insufficient efforts were made by the Project Management Team to identify and recruit existing national expertise.

Table 3 - Consultancies and backstopping mission to GCP/ERI/006/ITA: 2004 – 2006.
<table>
<thead>
<tr>
<th>Date</th>
<th>Field</th>
<th>Consultant/Service Provider</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept-Oct 2003</td>
<td>Agriculture Research</td>
<td>FAO Backstopping (Mwandemere)</td>
<td>8 days</td>
</tr>
<tr>
<td>March 2004</td>
<td>Agriculture Research</td>
<td>FAO Backstopping (Mwandemere)</td>
<td>8 days</td>
</tr>
<tr>
<td>2004</td>
<td>Agroforestry</td>
<td>FAO backstopping (Oudara Souvannavong)</td>
<td>7 days</td>
</tr>
<tr>
<td>2004</td>
<td>Soil management Research</td>
<td>FAO backstopping (José Benitez)</td>
<td>6 days</td>
</tr>
<tr>
<td>Aug-Sep 2004</td>
<td>Tissue culture</td>
<td>Consultancy (Alain-Noel Hamon)</td>
<td>30 days</td>
</tr>
<tr>
<td>Oct-Dec 2004</td>
<td>Strategic Planning</td>
<td>Consultancy (Johannes Roseboom)</td>
<td>60 days</td>
</tr>
<tr>
<td>Oct. 2004</td>
<td>Animal Feed and Nutrition</td>
<td>FAO backstopping (Andrew Speedy)</td>
<td>7 days</td>
</tr>
<tr>
<td>Nov. 2004</td>
<td>Soil science</td>
<td>Consultancy (Claudio Lo Sterzo)</td>
<td>8 days</td>
</tr>
<tr>
<td>Jan. 2005</td>
<td>Horticulture</td>
<td>FAO backstopping (Enrique Arias)</td>
<td>9 days</td>
</tr>
<tr>
<td>2005</td>
<td>Soil fertility</td>
<td>Consultancy (Mali Ram Mostara)</td>
<td>30 days</td>
</tr>
<tr>
<td>Feb 2005</td>
<td>Agriculture Research</td>
<td>FAO Backstopping (Mwandemere)</td>
<td>8 days</td>
</tr>
</tbody>
</table>

Finally, it must be stressed that only one out of the four planned training events for researchers and extension workers foreseen by the workplan was implemented. A review of the planning document for this agroforestry course suggests that training was affected by several design shortcomings (lack of needs assessment, inadequate formulation of learning objectives, over-ambitious curriculum, teacher-centred learning methods, lack of evaluation procedures). The evaluation team acknowledges that this was largely due to the lack of expertise in training methodology within NARI staff, but remarks that also in this case insufficient efforts were made to get technical assistance from relevant national institutions (e.g. the Consultancy, Training and Testing Center of Asmara University).

**ii) Output 1.2: Essential office and research equipment, supplies and operating costs provided**

No specific targets were identified in the October 2004 workplan in connection with activities related to this “extended” output. During on-site visits, the mission found that NARI’s headquarters at Halale is endowed with appropriate facilities and equipment for conducting research and continuing education activities (office space, meeting room, projector; computers, office space). There is also a library, which includes CD-ROM compilations and FAO publications (made available by CTA). However, this library needs to be expanded and updated. According to NARI’s head of human resource development, funds for subscribing to scientific journals and purchasing basic textbooks were not made available by the project. (NARI was, however, provided with hardcopies of FAO publications, library software, over 5,000 electronic copies of publications on various topics and several copies of CD-ROMs to access the FAO database.) Moreover, although a local area network was created, the Internet connection has been out of order in Halale for more than one year.

Well established experimental plots are included in the Halale compound, as well as three laboratories (for soil science, animal feed, tissue culture) that were been implemented and equipped through project funds. However, at the time of the visit, the tissue culture and soil science laboratories were not still operational due to delays in the procurement of furniture.
Field sub-stations (satellites) in Gahtelay and Hagaz were found equipped with the hardware needed for conducting adaptive field research activities (e.g. irrigation). However, office premises, equipment and materials were not available.

**iii) Output 1.3: Agricultural research planning and management improved**

Output 1.3: planned and achieved targets for the period October 2004 – April 2006 are listed in the table below:

Table 4 – Targets for output 1.3: planned vs. achieved (2004-2006)

<table>
<thead>
<tr>
<th>2004-2005 targets as per October 2004</th>
<th>Targets achieved as per April 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft of NARI’s medium term plan and strategy document finalized and approved</td>
<td>Implemented as planned (by December 2004)</td>
</tr>
<tr>
<td>Improve research/extension/farmer-linkage through FAS planning and coordination committees by the end of 2005</td>
<td>Partially implemented (only scattered evidence available)</td>
</tr>
<tr>
<td>M&amp;E system assessed and updated by mid-2005</td>
<td>Not achieved</td>
</tr>
<tr>
<td>Management information system and data base established by the end of 2005</td>
<td>Not achieved</td>
</tr>
<tr>
<td>Appropriate approaches and key indicators of research impacts, designed by the end of 2005</td>
<td>Not achieved</td>
</tr>
</tbody>
</table>

A first draft of NARI’s medium term plan and strategy document for 2002-2006 was prepared by a project-hired consultant in the biennium 2001-2003 (Peterson 2002). By 2004, an early revision of this document for the period 2005-2010 was deemed necessary because of two major institutional and policy changes: the planned establishment of NARI as a semi-autonomous agency and the introduction of a stronger commodity focus in Eritrean agricultural policy. This revision was carried out by a second consultant (Roseboom 2004), during a 60-day assignment (October-December 2004).

The evaluation team believes that this document includes a high-quality and detailed organizational analysis, conducive to sound and appropriate operational recommendations. However, the document is conceptually flawed by the somehow strained attempt of combining the (micro-economic and socially oriented) farming systems approach (prevailing in Peterson’s document) with the (macro-economically-oriented) commodity-based approach (favoured by the Eritrean government). In addition, lack of references to Sustainable Livelihoods Approaches and Sustainable Agriculture and Rural Development Policies is an additional conceptual weakness for a document that was developed within the framework of a FAO project.

Although an official endorsement from the Ministry of Agriculture is still pending, the document was officially adopted by NARI in 2005. However, during the last 16 months apparently little action has taken place to implement its recommendations. In particular: medium-long term plans for NARI divisions were not developed; re-organization of a research work in a project mode has not taken place; monitoring and evaluation of staff time allocation, performance and research outputs is not being conducted; analysis of economic impact of research projects has not been undertaken. On the other hand, initial exploratory attempts have been undertaken to identify financial sources other than the Ministry to complement core funding.

Also, initial (2004) efforts to introduce a sound M&E practice, based on a management information system, have apparently not progressed, partly due to staff constraints. Moreover, the evaluation mission was not able to obtain evidence of any assessment of research impact (e.g. adoption studies). Hence, several relevant targets foreseen by the October 2004 workplan should be considered as not achieved.
On the other hand, there is some evidence (confirmed through interviews and field visits) of ongoing activities aimed at strengthening NARI’s interface with the extension system. The mission considers it unfortunate that only limited project support was given to these initiatives, and that official reporting in this connection was scattered and anecdotal.

**iv) Outputs 1.4: Socio-economic research and participatory diagnosis capacity established, and 1.5: Production systems constraints and improvements identified.**

October 2004 targets for these two (closely related) outputs are presented in the table below.

Table 5 – Outputs 1.4. and 1.5. targets (2004-2006)

<table>
<thead>
<tr>
<th>ProDoc Output</th>
<th>October 2004 workplan targets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output 1.4 Socio-economic research and participatory diagnosis capacity established</strong></td>
<td>Appropriate approaches and key indicators of research impacts, designed by the end of 2005</td>
</tr>
<tr>
<td></td>
<td>NARI’s output and staff performance appraisal methods designed and implemented by the end of 2005</td>
</tr>
<tr>
<td><strong>Output 1.5 Production systems constraints and improvements identified</strong></td>
<td>Improved guidelines and methodologies for participatory diagnosis developed by the end of 2005</td>
</tr>
<tr>
<td></td>
<td>Improved production systems in 2 sites improved by the end of 2005</td>
</tr>
<tr>
<td></td>
<td>Socio-economic evaluation of promising technologies of various research disciplines undertaken on annual basis and synthesized. Simple leaflets disseminated to extension and farmers.</td>
</tr>
</tbody>
</table>

All these targets were not achieved by May 2006. According to progress reports, this was due to the fact that NARI’s official in charge of socio-economics research resigned in January 2005 and has not replaced. However, the mission regrets that no initiative was taken by the Project Management Team to fill the gap, for instance by recruiting (ad interim) a national consultant.

The evaluation mission believes that lack this reflects a general lack of concern for socio-economic implications of agriculture research that is evident also in project design, institutional arrangements, and implementation. Additional evidence of this trend include:

- Not formulating an immediate objective for socio-economic research in the project log frame.
- Not involving SDAR staff (or social scientist from other FAO services) in project backstopping
- Not implementing the foreseen three-month mission of the international consultant in socio-economics, nor exploiting the relevant funds for hiring local expertise.
- Ignoring the potential of a partnership with the College of Social Sciences of the University of Asmara (that, through the University’s Consultancy, Training and Testing Center has been doing consultancy work in sister-areas for NARI and international development institutions such as IFAD).

3. **Degree of achievement of IO1 and considerations for the future.**

IO1 only partially achieved

The major success of the project in the area of capacity building was upgrading the basic training of 10 young NARI core staff professional, by enrolling in Asmara University course MSc course in agronomy, soil science animal science, horticulture and development economics. The curricula of these courses were developed through a nation-wide needs assessment exercise supported by the Wageningen University (The Netherlands) and the Free State University (South Africa). The curricula appear to fit the situation of Eritrean agriculture. NARI’s trainees perceive this training as highly
relevant to their learning needs and professional role. MSc theses are highly instrumental to on-going NARI research\textsuperscript{36}.

On the other hand, NARI lacks a continuing education programme in support to NARI’s research activities, which would ensure sustainability to the capacity building process. No specific input on active learning on-the-job training, self-education, tutorial work, peer evaluation, and other continuing education methods has been delivered (but was also not foreseen) by the project. The opportunity of getting assistance from the Asmara University Centre for Training, Consulting and Testing was lost. The responsibility for human resource development and communication was given to staff who had never received any training in these areas, and no action was undertaken by the project to fill the gap and mitigate the problems.

Though the project was implemented in difficult circumstances, its unsatisfactory performance in the area of continuing education depends largely on factors related to project design, management and backstopping. In particular, both FAO and NARI have not given support to build up the necessary expertise in human resource development and continuing education (which was not foreseen in the prodoc) and socio-economics (which, on the contrary, was foreseen but not made available). Several arguable decisions and arrangements (e.g. the allocation of in-service training resources to fund MSc scholarships, the failure in establishing M&E and information systems, the neglect of socio-economic research, the inadequate identification of important potential national partners, such as Asmara University’s Consultancy, Training and Testing Center) could have been influenced by decision-makers’ and implementers lack of technical competence in these fields.

In the light of donor’s intention to continue assisting in building up NARI capacity, the evaluation mission recommends that:

- No action should be taken until all the NARI staff enrolled in the MSc programme finish their courses (second semester of 2007)
- A four-six week feasibility and formulation mission should be fielded with a twofold mandate: learning needs assessment and NARI institutional analysis
- Asmara University (through its Consultancy, Training and Testing Center) should be institutionally involved in project formulation and implementation

\textsuperscript{36} Complaints exist among trainees for some organizational flaws affecting the courses (that are run for the first time) and the lack of practical training opportunities, as well as for the scholarship (which is deemed insufficient to fully cover the cost of living).
NARI recommendations for future support 2007-2010/2011

During the evaluation mission debriefing, the mission and NARI management agreed that future support for research should be based on NARI’s own plans. As a result, it was decided that all the concerned NARI Divisions and unit heads prepare recommendations for their respective areas of work.

The following is an edited summary of the recommendations.

I. Capacity building: NARI needs assistance in capacity building in terms of facilities and training

a. Facilities such as chemicals and equipments for soils, tissue culture, animal nutrition, germplasm conservation and regeneration and crop protection laboratories and field works.

b. Training in terms of long term and short term (local and abroad for special techniques), in service training and trainings for extension workers and farmers that will be useful in technology transfer and demonstrations.

II. Support to research: NARI needs support for running of some research areas that were not addressed in the two phases of the project. The areas that need support area:

a. Soil survey and land evaluation: this area was only touched upon in both project phases; the objective would be to identify potential production areas

b. Conservation agriculture: activities started with an FAO TCP project but were discontinued due to budget problems. The results of the two-year study were promising for soil conservation. This study should be continued in more areas and it should be demonstrated to farmers for soil and water conservation.

c. Establishment of gene bank for vegetatively propagated crops

d. Survey of forest and agro-forestry in Eritrea with the assistance of a consultant

e. Develop and test small-scale irrigation system and water harvesting techniques

f. Complete animal breed characterization for small ruminants

g. Survey and analyse the different tick species and gastrointestinal parasites of livestock in Eritrea.

III. Strengthening research, extension, and farmer linkages for dissemination of technologies. There are some technologies that were developed during the Phases I and II of the project. Most of these technologies (crop varieties, agro-forestry, animal feed blocks, metal bin, tie ridges and others) need further verification and demonstrations to extension workers and farmers for adoption. This part was supposed to be supported by DANIDA in the phase II of the project life; however, as the DANIDA project did not materialize this did not happen. Hence to improve the agricultural production the above mentioned technologies and others should reach to farmers to improve the food security of the country.
Project statistics

List of reports produced by consultants

1. Post Harvest (Lindsay Semple, 2001)
2. Animal Production (Asefaw Tewelde, 2001)
3. Animal Nutrition (Chedly Cayouli, 2001)
4. Soil Fertility (Richard Barber, 2002)
5. Farming Systems (Horst Wattenbach, 2002)
7. Agroforestry (Chin Ong, 2002)
12. Strategic Research Planning (Han Roseboom, 2004)
13. Laboratory furniture (Claudio Lo Sterzo, 2004)
15. Soil Fertility (Mali Motsara, 2005)

List of equipment - with value above US$ 1,000 - purchased throughout the project life (2001 - 2006)

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Radio with accessories</td>
<td>6,189.41</td>
</tr>
<tr>
<td>2</td>
<td>Purchase of Toyota Hilux 4x4 double cab pick up long wheel base DLX, 2800cc Diesel Engine</td>
<td>15,827.97</td>
</tr>
<tr>
<td>3</td>
<td>Codan NGT VR mobile radio package complete</td>
<td>5,836.70</td>
</tr>
<tr>
<td>4</td>
<td>Atomic Absorption Sectrometer- model analyst 200</td>
<td>25,800.00</td>
</tr>
<tr>
<td>5</td>
<td>Ballistic blanket kit for Toyota Landcruiser SW HZJ 105 L LHD 71040365</td>
<td>12,609.17</td>
</tr>
<tr>
<td>6</td>
<td>Ballistic blanket kits for Toyota Hilux double cabin LN 1661 in protection level v50 600m/sec</td>
<td>4,718.24</td>
</tr>
<tr>
<td>7</td>
<td>Toyota Coaster bus high roof cooler</td>
<td>42,915.00</td>
</tr>
<tr>
<td>8</td>
<td>Dell Optiplex GX280, P4</td>
<td>2,239.00</td>
</tr>
<tr>
<td>9</td>
<td>Computer Dell Optiplex GX260 (2)</td>
<td>1,412.27</td>
</tr>
<tr>
<td>10</td>
<td>Computer Dell Optiplex GX260</td>
<td>1,412.27</td>
</tr>
<tr>
<td>11</td>
<td>Evaporograph piche type complete with accessories</td>
<td>5,112.82</td>
</tr>
<tr>
<td>12</td>
<td>Evaporograph piche type complete with accessories</td>
<td>5,112.82</td>
</tr>
<tr>
<td>13</td>
<td>Evaporograph piche type complete with accessories</td>
<td>5,112.82</td>
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<tr>
<td>14</td>
<td>Computer Dell Optiplex P4</td>
<td>1,057.00</td>
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<td>Description</td>
<td>Price</td>
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<tr>
<td>---</td>
<td>----------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>15</td>
<td>Computer Dell Optiplex Gx60SMT</td>
<td>1,310.00</td>
</tr>
<tr>
<td>16</td>
<td>Computer Dell Optiplex Gx60SMT</td>
<td>1,310.00</td>
</tr>
<tr>
<td>17</td>
<td>Hot Extraction Unit, Analytical Equipment</td>
<td>13,160.00</td>
</tr>
<tr>
<td>18</td>
<td>Weighing Creates for Small Ruminants</td>
<td>1,592.57</td>
</tr>
<tr>
<td>19</td>
<td>Weighing Creates for Small Ruminants</td>
<td>1,592.57</td>
</tr>
<tr>
<td>20</td>
<td>Weighing Creates for Large Ruminants</td>
<td>3,835.44</td>
</tr>
<tr>
<td>21</td>
<td>Moisture Probe, soil testing</td>
<td>1,557.40</td>
</tr>
<tr>
<td>22</td>
<td>Coaster Bus</td>
<td>37130.00</td>
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<tr>
<td>23</td>
<td>Fat System, 2055 with SOCAP</td>
<td>20,557.00</td>
</tr>
<tr>
<td>24</td>
<td>Generating Set model COELMO JDI (30KVA) John Deere</td>
<td>7,998.80</td>
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<td>25</td>
<td>Deionizer SG - 2000 complete with conductivity meter and tubes</td>
<td>1,059.42</td>
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<td>26</td>
<td>Hybridization Oven Unitherm 6/12</td>
<td>2,463.94</td>
</tr>
<tr>
<td>27</td>
<td>Reverse Osmosis System</td>
<td>6,451.89</td>
</tr>
<tr>
<td>28</td>
<td>Reverse Osmosis System</td>
<td>6,451.89</td>
</tr>
<tr>
<td>29</td>
<td>Ultra Pure water System Arium 611D with Cartridge Kit</td>
<td>7,259.28</td>
</tr>
<tr>
<td>30</td>
<td>Water Distillation Unit 12L/H/MOD.20 230 V/3PH 50/60 HZ, 2, 3</td>
<td>2,845.51</td>
</tr>
<tr>
<td>31</td>
<td>Glassware washer DS 500D, INCL. Steam condenser with accessories</td>
<td>5,499.26</td>
</tr>
<tr>
<td>32</td>
<td>Water glass still Fistreem III 8LTR/H240. 50Hz with 4 heaters &amp; resorvoir of 50L, wall mounting bracket</td>
<td>5,774.33</td>
</tr>
<tr>
<td>33</td>
<td>Water glass still Fistreem III 8LTR/H240. 50Hz with 4 heaters &amp; resorvoir of 50L, wall mounting bracket</td>
<td>5,774.33</td>
</tr>
<tr>
<td>34</td>
<td>Sterilisation vertical Autoclave Striclav-s AES - 75 with lock door microprocessor controlled 75L, accepts max 2 baskets 230v/50Hz with perforated basket, CI-75 380x260mm</td>
<td>5,231.95</td>
</tr>
<tr>
<td>35</td>
<td>Sterilisation vertical Autoclave Striclav-s AES - 75 with lock door microprocessor controlled 75L, accepts max 2 baskets 230v/50Hz with perforated basket, CI-75 380x260mm</td>
<td>5,231.95</td>
</tr>
<tr>
<td>36</td>
<td>Precision Balance, 360G/ 0.001G, 128x128mm, with motorised internal calibration, 230v/50Hz (delivered direct replacement / improved model CBW6H)</td>
<td>1,206.77</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Price</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>37</td>
<td>Horizontal Laminar flow bench MH - 100, 1,5m wide suitable for 2 persons, with tempered glass side, fluorescent lighting and stainless steel work surface W1H socket, 230V/50Hz, with support stand/base assembly</td>
<td>5,207.55</td>
</tr>
<tr>
<td>38</td>
<td>Horizontal Laminar flow bench MH - 100, 1,5m wide suitable for 2 persons, with tempered glass side, fluorescent lighting and stainless steel work surface W1H socket, 230V/50Hz, with support stand/base assembly</td>
<td>5,207.55</td>
</tr>
<tr>
<td>39</td>
<td>Micorbiological incubator incucell 222, standard &quot;Blue line&quot;, Temp, range, 5°C above Ambient up to 70°C interior: 540x540x760 mm (WxDxH), INCL. 2 shelves, 230V/50Hz,</td>
<td>2,347.00</td>
</tr>
<tr>
<td>40</td>
<td>Benchtop small centrifuge Z200A, 600RPM, MAX, capacity 6x50ML, 230V/50Hz, with angle rotor tube of 30mm diam.</td>
<td>1,538.41</td>
</tr>
<tr>
<td>41</td>
<td>Refrigerator/Freezer 270L, refrigerator: 0 to + 8°C, 206L, freezer, -10 to -20°C, 63L, white 230V/50Hz,</td>
<td>1,743.61</td>
</tr>
<tr>
<td>42</td>
<td>Precision balance, 3100G/0.01G, 165x165mm, with motorised with internal calibration</td>
<td>1,354.29</td>
</tr>
<tr>
<td>43</td>
<td>Digestion block &quot;Bloc digest M12&quot; Micro for 12 tubes, incl, dry block, controller, rack support and fume extractor 230V/50Hz with accessories</td>
<td>3,491.66</td>
</tr>
<tr>
<td>44</td>
<td>Muffle furnace, 2L, 100 - 12000°C, 240/50Hz</td>
<td>1,374.26</td>
</tr>
<tr>
<td>45</td>
<td>KJELDAHL Distillation system KI 9/16, 6-place system, Micro, 100 ML, 230V/50HZT, supplied with KJELDAHL flasks, Reitmair tops, condensers, outlet tubes, ERLENMEYER flasks, all rubber connections, support rings and power cord</td>
<td>3,554.88</td>
</tr>
<tr>
<td>46</td>
<td>KJELDAHL Distillation system KI 9/16, 6-place system, Micro, 100 ML, 230V/50HZT, supplied with KJELDAHL flasks, Reitmair tops, condensers, outlet tubes, ERLENMEYER flasks, all rubber connections, support rings and power cord</td>
<td>3,554.88</td>
</tr>
<tr>
<td>47</td>
<td>Glassware drying cabinets XAS 560,556L, external DIM: 965x640x1285MM, up to max. 60°C, 2000W, INCL 2 shelves 230V/50Hz,</td>
<td>3,244.32</td>
</tr>
<tr>
<td>48</td>
<td>Glassware drying cabinets XAS 560,556L, external DIM: 965x640x1285MM, up to max. 60°C, 2000W, INCL 2 shelves 230V/50Hz,</td>
<td>3,244.32</td>
</tr>
<tr>
<td>#</td>
<td>Description</td>
<td>Supplier</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>49</td>
<td>Hand Penetrometer set, 3m depth incl, hand AUGER,</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Dell Optiplex 170L</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Dell Optiplex 170L</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Dell Optiplex 170L</td>
<td></td>
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<tr>
<td>53</td>
<td>Dell Optiplex 170L</td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
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[ updated on 16 April 2006 ]

**List of FPOs issued during 2005**

<table>
<thead>
<tr>
<th>Description</th>
<th>Supplier</th>
<th>Amount in US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorola GP340 portable radio</td>
<td></td>
<td>958.34</td>
</tr>
<tr>
<td>Fan &amp; Air conditioner</td>
<td>Andrews</td>
<td>4,968.90</td>
</tr>
<tr>
<td>Generating Set mod. Coelmo JDI (Coelmo)</td>
<td>Coelmo</td>
<td>6,655.00</td>
</tr>
<tr>
<td>Laboratory equipments (LABOR Partner)</td>
<td>Labor partner</td>
<td>10,885.66</td>
</tr>
<tr>
<td>Laboratory supplies &amp; equipments (LABSCO)</td>
<td>LABSCO</td>
<td>15,318.40</td>
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<tr>
<td>Laboratory supplies &amp; equipments (AMEX)</td>
<td>AMEX</td>
<td>117,491.00</td>
</tr>
<tr>
<td>Laboratory supplies (LABSCO)</td>
<td>LABSCO</td>
<td>5,954.00</td>
</tr>
<tr>
<td>Laboratory Chemicals (Chimica omnia)</td>
<td>Chimica omnia</td>
<td>5,371.43</td>
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<tr>
<td>Purchase of scanner (Sinet systems)</td>
<td>Sinet systems</td>
<td>834.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>168,436.73</strong></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Supplier</th>
<th>Amount in US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase of Digital camera</td>
<td>Jacky International</td>
<td>514.00</td>
</tr>
<tr>
<td>Purchase of computers &amp; printers</td>
<td>Sinet systems</td>
<td>5,640.83</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>6,154.83</strong></td>
</tr>
</tbody>
</table>

**List of Contracts during 2005**

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Amount in Nkf</th>
<th>Amount in US$</th>
<th>5% retention in Nkf</th>
<th>5% retention in US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bizen Contractors</td>
<td>252,828.00</td>
<td>16,855.20</td>
<td>12,641.40</td>
<td>842.76</td>
</tr>
<tr>
<td>Bizen Contractors</td>
<td>211,320.00</td>
<td>14,088.00</td>
<td>10,566.00</td>
<td>704.40</td>
</tr>
<tr>
<td>Electromechanical Engineering Contractors</td>
<td>310,972.00</td>
<td>20,731.47</td>
<td>15,548.60</td>
<td>1,036.57</td>
</tr>
<tr>
<td>Alufactory Eritrea P.L.C</td>
<td>161,949.00</td>
<td>10,796.60</td>
<td>8,097.45</td>
<td>539.83</td>
</tr>
<tr>
<td></td>
<td><strong>937,069.00</strong></td>
<td><strong>62,471.27</strong></td>
<td><strong>46,853.45</strong></td>
<td><strong>3,123.56</strong></td>
</tr>
</tbody>
</table>

List of FPOs issued 2001-04
### 2001

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount in US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm chairs &amp; tie up wiring tables</td>
<td>22,200.00</td>
</tr>
<tr>
<td>Purchase of one lot of tyre for vehicles and agricultural tractors</td>
<td>26,870.68</td>
</tr>
<tr>
<td>Toyota (Japan) 4wd land cruiser SW STD, Diesel</td>
<td>25,698.07</td>
</tr>
<tr>
<td>One lot of chemicals and reagents</td>
<td>22,126.87</td>
</tr>
<tr>
<td>Purchase of mango seedlings</td>
<td>2,430.00</td>
</tr>
<tr>
<td>One lot of Laboratory equipment</td>
<td>8,091.26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>107,416.88</strong></td>
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</tbody>
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### 2002

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount in US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office supplies and other supplies</td>
<td>21,838.85</td>
</tr>
<tr>
<td>Purchase of one lot of tyre for vehicles and agricultural tractors</td>
<td>2,800.00</td>
</tr>
<tr>
<td>Codan NGT VR mobile radio package complete</td>
<td>2,816.35</td>
</tr>
<tr>
<td>Chemicals and reagents</td>
<td>15,743.38</td>
</tr>
<tr>
<td>Vehicle tyres and spare parts</td>
<td>12,500.50</td>
</tr>
<tr>
<td>Arm chairs mod. ONDA C5001 with legs polished aluminium, seat and arms</td>
<td>19,700.00</td>
</tr>
<tr>
<td>Purchase of Toyota Hilux 4x4 double cab pick up long wheel base DLX, 2800cc Diesel Engine</td>
<td>15,827.97</td>
</tr>
<tr>
<td>Codan NGT VR mobile radio package complete</td>
<td>5,836.70</td>
</tr>
<tr>
<td>Tip tags FLMK CNO BLU, GRE, ORA, YEL and Tip tag applicator</td>
<td>4,122.22</td>
</tr>
<tr>
<td>Atomic Absorption Sectrometer- model analyst 200</td>
<td>25,800.00</td>
</tr>
<tr>
<td>Evaporograph, Piche type, Drum notation one week; measuring range</td>
<td>23,519.83</td>
</tr>
<tr>
<td>Ballistic blanket kit for Toyota Landcruiser SW HZJ 105 L LHD 71040365</td>
<td>12,609.17</td>
</tr>
<tr>
<td>Radio with accessories</td>
<td>6,189.41</td>
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<td><strong>Total</strong></td>
<td><strong>169,304.38</strong></td>
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### 2003

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
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<td></td>
</tr>
<tr>
<td>Description</td>
<td>Amount in US$</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Ethylfast Ethylene gas generator, with of box of reagen and ethyl</td>
<td>3,245.94</td>
</tr>
<tr>
<td>Fat extraction unit</td>
<td>20,557.00</td>
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<tr>
<td>Tyres and fuel filter</td>
<td>7,524.00</td>
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<tr>
<td>Dell Optiplex GX260, P4</td>
<td>2,501.76</td>
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<tr>
<td>light weight bullet proof vest</td>
<td>910.00</td>
</tr>
<tr>
<td>Ballistic blanket kits for Toyota Hilux double cabin LN 1661 in protection level v50 600m/sec</td>
<td>4,718.24</td>
</tr>
<tr>
<td>Metrological equipments</td>
<td>25,127.77</td>
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<tr>
<td>Supply of laboratory supplies and equipments</td>
<td>21,597.76</td>
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<tr>
<td>Purchase of chemicals</td>
<td>9,975.72</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>96,158.19</strong></td>
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2004

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount in US$</th>
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<tbody>
<tr>
<td>Microscope leica</td>
<td>10,500.00</td>
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<tr>
<td>Moisture probe</td>
<td>2,786.78</td>
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<tr>
<td>Toyota Coaster bus high roof cooler</td>
<td>42,915.00</td>
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<tr>
<td>Dell Optiplex GX260, P4</td>
<td>5,167.00</td>
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<tr>
<td>Dell Optiplex GX280, P4</td>
<td>2,239.00</td>
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<tr>
<td>Chemicals</td>
<td>7,627.78</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>71,235.56</strong></td>
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<tr>
<td>Description</td>
<td>Prior to 2003</td>
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<tr>
<td>5300 Salaries Professional (5011 - Expense Parent)</td>
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<tr>
<td>- Expenditure</td>
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<tr>
<td>5500 Salaries General Service (5012 - Expense Parent)</td>
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<td>5570 Consultants (5013 - Expense Parent)</td>
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<td>- Expenditure</td>
<td>134,388</td>
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<td>5650 Contracts (5014 - Expense Parent)</td>
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<td>372,726</td>
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<td>5660 Locally Contracted Labour (5020 - Expense Parent)</td>
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<td>5900 Travel (5021 - Expense Parent)</td>
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<td>- Expenditure</td>
<td>160,075</td>
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<tr>
<td>5920 Training (5023 - Expense Parent)</td>
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<td>- Expenditure</td>
<td>59,220</td>
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<tr>
<td>6000 Expendable Procurement (5024 - Expense Parent)</td>
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<td>6100 Non Expendable Procurement (5025 - Expense)</td>
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<td>- Expenditure</td>
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<td>TOTAL</td>
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