Project Title:

Low Input Sustainable Agriculture in the Rift Valley, Central Ethiopia.

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Partner Institutions

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1. PROJECT BACKGROUND

1.1 Context

Ethiopia has the third lowest GNP per capita in the world and a shortfall in food even though agriculture plays a significant role in the country's economy. Population pressures and scarcity of good soils have forced agriculture to expand into marginal land and wildlife habitats. Inappropriate land use together with poor soil management practices have resulted in land degradation in many areas. The Rift Valley in Ethiopia is one such region where land management problems are particularly acute. There is a need to monitor and improve the resource base for sustainable food production in Ethiopia which would reduce pressure on land and match the capability of land to appropriate agricultural use. Knowledge and well-trained scientists are critical to long term solutions to land degradation and the development of sustainable land use is a key to secure food for the nation.

An adequate organizational structure for land and resource management exists in Ethiopia, but it is inefficient. For example, the present land use in the Rift Valley is primarily subsistence farming with little attention to soil and water conservation. In addition to poor-soil management practices, the natural presence of salinity and accelerated soil erosion compound the problem of soil degradation. Ethiopia's rate of soil erosion is one of the highest in the world (World Bank Report, paper no. 203, 1993). Soil fertility, especially phosphate and micronutrient availability on volcanic soils, require special fertilizer practices which are not now part of the subsistence farming routine. Maintaining organic matter in soils formed on volcanic materials is poorly understood and requires special attention. Agricultural research and training institutions can play a critical role in bringing about changes in the land-management practices.

Land degradation leads to diminishing economic growth in countries where wealth is largely agrarian. One way to combat land degradation and promote sustainable land use is to recognize the need for increasing organic matter in soils, by increasing biomass (vegetation production), and returning residues to soil. Such a strategy can only be pursued if the capacities of agricultural research, training, analytical service, and extension agencies in the region can be harnessed to address this issue and transfer the resulting knowledge to individual farmers.

1.2 Developing Country Priorities

Training is one of the top priorities for agriculture in Ethiopia. The World Bank and several European donor countries (Germany, Sweden, and The Netherlands) recognize that trained specialists are key to utilizing international assistance effectively. In many cases, projects are too complex to be managed by government staff. The Government of Ethiopia has already adopted this policy and several Ethiopians from the National Soil Laboratory (NSL) in Addis Ababa were trained through the FAO-United Nations

Development Program (UNDP) (9/7-ETH/87/101), which ended in early 1994 (under this program, two Ethiopian soil scientists were trained at the U of S). Ethiopia is also committed to expanding its education institutions and intends to make the Awassa College of Agriculture the core of a new southern university. Stimulating technological improvement in agriculture is a major challenge for Ethiopians and the international community over the next few decades.

In 1990, members of the Special Program for African Agricultural Research (SPAAR) agreed to launch a new initiative (World Bank Report, 1993, paper no. 203). The objective of this initiative was to increase agricultural productivity by re-invigorating national agricultural research capabilities within a regional context. The SPAAR recognized that a fundamental objective must be to make research more responsive to the challenges of local, national, and regional development, and to increase the efficiency of using available resources. This can be achieved through strengthened management and improved linkages between African research and education agencies and international agricultural organizations. The SPAAR recognized that all member countries' service and teaching institutions are poorly funded and need international cooperation. An adequate organizational structure for land and resource management exists on paper, but is inefficient in the field. The SPAAR stressed the importance of sharing information and research results, and networking between research institutions to develop a critical mass of knowledge. Ethiopia recognizes that the dissemination of research findings needs to be improved through their Institute of Agricultural Research (IAR). With respect to increased food production, the Ethiopian agricultural institutions primarily need to enhance the capacity for sustainable land use.

In 1993, the Government of Ethiopia negotiated a loan of about $ 2 billion from the World Bank to buy and utilize commercial fertilizers. Due to the massive application of fertilizers, Ethiopia is expected to harvest a high-crop yield this year for the first time in modern history. However, the effects of fertilizers will diminish within the next two to three years and, in the long term, Ethiopia cannot afford to buy large amounts of fertilizers. A complete assessment of the soil fertility, soil quality, and salinity data available so far (through the use of computers, including Geographic Information System (GIS) and networking through the SPAAR) is a need that has been identified by the government in a report to the World Bank in 1993. This process will significantly assist Ethiopia to reach sustainability in food production. The data that the NSL has produced for fragile degraded land in the Rift Valley are not sufficient and the laboratory's ability to analyze soils also needs to be upgraded.

1.3 Needs of the Developing Country Institutions

The University of Addis Ababa College of Agriculture in Awassa (UAACAA) is a state institution of higher education, which is to become the nucleus of a university envisaged in the south and, therefore, needs human resources development. Its mandate also involves sharing information about soil degradation

that includes soil erosion, fertility (phosphorus availability and micronutrients, especially zinc deficiency in the Valley), salinity problems, and crop diversification. The UAACAA, in addition to becoming part of the new SPAAR information network, is also committed to developing new research activities, as well as education and technology transfer initiatives. The faculty work under difficult circumstances, with considerable responsibilities for teaching about dryland agriculture and soil management, as well as supervising student research projects. The UAACAA provides scientific knowledge to the NSL for the training of laboratory staff on a yearly basis and indirectly helps farmers. Additional training for the UAACAA staff is, therefore, essential for the improvement of agriculture in the Rift Valley.

The IAR in Awassa, which is situated near the College of Agriculture, has the task of developing soil management strategies for degraded land in semi-arid regions. Strategies must be of the direct benefit to the farmers and the research findings must be translated into practice by extension work, specifically in the Ethiopian Rift Valley. This government institution has the mandate to improve soil quality, reduce the risk of soil erosion and loss of soil organic matter, and to develop methods for managing organic matter and improving soil fertility that are viable under Ethiopian conditions. The desire to develop methods, which are more sustainable and compatible with local conditions has resulted in local farmers requesting government and university assistance. Sustainable crop production reduces pressure on land and increases the chance of land recovery from misuse of the past. All these have significant consequences for the survival of rural communities by providing employment and income and decreasing migration to major urban centers.

The IAR employs several graduates from the UAACAA and, with limited resources, carries out cooperative research in the Rift Valley, often cooperating with international institutions (German, Swedish, and Dutch international programs) and has an ongoing regional program on soil erosion, fertility, and salinity. The IAR maintains a database of past research and has a well-organized library. Awassa College of Agriculture has close scientific and technical cooperation, and fieldwork with the IAR. However, this institution is ineffective in field research initiatives. The IAR, therefore, requires human resource development, and needs to be part of the information network. In addition to new sites, the IAR's existing experimental sites in the Valley will be used to monitor the key soil characteristics for soil quality evaluation and developing methods to combat soil degradation.

The National Soil Laboratory (NSL) is a government institution, providing analytical services primarily for IAR and the UAACAA. The NSL has close relationships with both the IAR and UAACAA. This is the only well-organized soil and water testing laboratory for agriculture in the country. The NSL's primary mandate is to determine the fertility and organic matter status of Ethiopian soils. The laboratory has established a soil information center, but requires expert help with processing and interpreting the many

data. This service laboratory also performs physical, biological, and chemical analysis on soils that can be used for the assessment of land degradation. Recommendations for fertilizer application to the soils in the Rift Valley are difficult, as the mainly volcanic soils have particular requirements for commercial fertilizers. Ethiopia needs very much to solve this problem.

1.4 Strategies and Priorities in HRD

The relationship between the U of S and the three cooperating Ethiopian institutions stems from the fact that the U of S has significant international experience in dryland agriculture. The College of Agriculture at the U of S has a special role in Canadian prairie agriculture to prepare university students for careers in agriculture, food, and environmental science and conduct research for the benefit of producers, processors, and consumers. The College also assists developing countries to deal with various agricultural problems including food production constraints. The College has developed an excellent unit called Agricultural Information Technology, which will train researchers from the NSL in computer application in databases, modeling, and communication.

Total six graduate students and 7 scientists from Ethiopia will be trained both in Ethiopia and Canada in this project. Training is one of the top priorities for agriculture in Ethiopia. The students will be trained in the areas of soil conservation and land degradation, management of organic matter, salinity, soil fertility, crop management and diversification, and plant ecology. Students will specialize in one aspect to certain degree, but develop a system-oriented knowledge of all areas pertinent to sustainable agriculture. Two Canadian will have an opportunity to work in Ethiopia, each one for about a year to collect data. The Canadian Coordination Committee will make their selection and arrangements of supervisors. They will be full time graduate students at the U of S. Funds will be made available for Canadian students while they are in Ethiopia for field work, including their travel. The University of Saskatchewan or other sources could fund the reminder of their graduate studies.

Canadian graduate students will carry out part of the field works and participate in training activities together with their local partners. They will be able to observe the annual cycle of agricultural activities in the Rift Valley. Furthermore, they are expected to learn more about food security program in East Africa and build relationships with Ethiopian partners for future exchange of knowledge and collaboration.

The students from Ethiopia will be trained for the M.Sc. degree (Soil and Crop Sciences) at this stage, and they will take graduate courses and laboratory training at the U of S, but do their field and some laboratory works in Ethiopia within the framework of the project. Final degree will be granted by the local Ethiopian University. Their duration in Canada is expected to be 8 to 10 months and they will receive stipend for the time they will be in Canada. The Canadian Team will coordinate their courses through the Graduate

Committees of the Departments under which they will study. The project director will coordinate all the graduate work through the U of S College of Graduate Studies and Research. The M.Sc. graduates and professors who will spend short periods in training and consultation at the U of S are considered to be the core faculty for the planned university in Southern Ethiopia. They will be nominated by Ethiopian Coordination Committee and final decision will be made by the Project Committee, considering the U of S College of Graduate Studies and Research, criteria for graduate students. The Ethiopian team members recognize that the selection and promotion of the trainees is very important for the success of the project after their return to Ethiopia.

Three scientists from the NSL will be trained on the recently developed and straightforward soil-testing techniques, based on ion exchange membranes, which have been developed by Dr. Schoenau (a member of the team). A scientist will be trained in Agricultural Information Technology. Three scientists from the IAR will be provided advance training in the areas of soil fertility, soil erosion, crop diversification, and extension. Only three individuals from this group will have additional laboratory training in Canada. Budget provides funds for six travel for 3 to 4 members of the Ethiopian Coordination Committee who will come to Canada for management, coordination, studies on curriculum, Internet, and other trainings.

The Ethiopian institutions are committed to providing opportunities for the participation of women (letters from the Dean dated April 3, and April 25/96). The NSL and IAR have women on their staff in scientific and supervisory positions. The UAACAA requires research assistance and staff education. Women are increasingly the main workers and decision-makers on the farms as men migrate to town and cities looking for work.

The U of S Coordination Committee will arrange a supervisor for each graduate student from the graduate faculty of the U of S. The supervisors will spend short period in Ethiopia for discussions, seminars, and lectures at the graduate level. The Coordinator will develop a detailed program of study for the scientists coming to Canada, and provide space in the laboratories at the U of S. During their stay in Canada, the Ethiopian participants will be introduced to fertilizer companies, the Potash Phosphate Institute of Canada in Saskatoon, local agriculture businesses, and Agriculture and Agri Food Canada research centers in Saskatchewan.

1.5 Canadian ODA Priorities

The project directly addresses the central pillars of CIDA ODA assistance strategy:

Strategy formulation and partnership building: The project will link the three Ethiopian institutions with the U of S to develop together ecologically sound and sustainable agriculture on degraded,

fragile lands in the Rift Valley. It will expand the ongoing relationship between the cooperating partners. By training current and potential staff members, the project will support the process of the UAACAA becoming a new university in the southern region. The project is designed to strengthen the database and, more importantly, to allow data interpretation of the materials that are accumulating at the NSL. It will improve linkages with African research and education as well as international agricultural organizations. These efforts will help Ethiopia avoid a food supply catastrophe in the future and regaining its place as a major agricultural country.

Helping people to help themselves: The knowledge gained by the Ethiopian scientists will increase the country's capacity to train its own people, particularly in the area of sustainable land use and crop production. It will strengthen the agricultural project management capacity of Ethiopian scientists and technicians. The project, by focusing on institutional and human resource development, will have long-term benefits, which is consistent with the self-help philosophy of the CIDA ODA strategy.

Alleviation of poverty: The project will increase the capacity of Ethiopia to deal with land degradation and the development of appropriate technology for improved food security which is essential for Ethiopia in the next decade. Rural poverty is the most significant factor in land degradation and quality loss. The farmers have utilized soil resources for short-term return, paying almost no attention to the long-term consequences of soil degradation and loss of soil quality. Currently, farmers have difficulty growing crops sufficient for themselves and their income level is extremely low. Better management of soil resources will alleviate rural poverty substantially.

The role of women*:* Although discrimination based on gender is not as serious a problem as it is in some North African countries, women in Ethiopia are disadvantaged and lack employment opportunities. Women and children will receive special attention in agricultural development. On behalf of the three cooperating institutions in Ethiopia, the Dean of the Faculty of Agriculture, Dr. Z. Ghebre Mariam, indicated an emphasis on the training of women who are generally under-represented in agricultural institutions. The project will help women in the farming community and promote opportunities for employment. The project will educate the participants about the importance of the optimal use of all human resources regardless of gender, religion, or ethnic background. Among the two Canadian students who will work in Ethiopia, at least one will be female.

Sustainability*:* One of the important aspects of this project is the human resource development within the three cooperating institutions. This makes the project sustainable and results obtained are long term. Enhanced academic qualification and development-related research skills will stimulate technological advancement in southern Ethiopia. These will significantly assist Ethiopia to reach sustainability in food

production. Upgrading laboratory conditions in the NSL will increase the ability of its scientists to analyze soils and interpret the developments as they move to low-input, sustainable agriculture and a more effective use of chemical fertilizers.

Environment protection: The project addresses improved soil management technologies, which are compatible with local conditions in a very dynamic context. Human-induced soil erosion is a very serious environmental problem for Ethiopia. The nature of degradation and degree of contamination of the ecosystem are critical when considering sustainable land development. Sustainable crop production will reduce pressure on land and increase the chance of land recovery from misuse in the past.

1.5 Strengths of the Canadian University

The U of S Mission Statement strongly promotes international activities at all levels, including teaching. The College of Agriculture has ongoing projects in soil conservation, dryland agriculture, and sustainable land management in several developing countries. This proposal fits into the strategy and will form a major part of the University's initiative to become a center of excellence for training, education, and research in dryland agriculture. The proposed Ethiopian project has several similarities to the College of Agriculture's successful CIDA-supported projects in the Northeast Brazil. The project was started in the mid-seventies, and is related to sustainable agriculture in the poor dryland of Pernambuco State. Through this project, the U of S has established laboratories and provided education for many graduate students, most of whom are now full faculty members of the Pernambuco Rural University. The current focus of the project is centered on crop production under irrigation in addition to dry farming, management of saline soils, and soil and water conservation.

The U of S has also administered a long and successful program in the dryland Northeast region of China since the mid-eighties. The Departments of Soil Science and Civil Engineering at the U of S are just beginning a project to upgrade training in soil conservation and sustainable agriculture in hill lands, and land subsidence and geo-technical engineering in Vietnam. The Ethiopian project will be a second U of S commitment in Africa, in addition to an ongoing CIDA-supported linkage program in Mozambique involving the College of Dentistry.

International students make up more than half of the graduate students in the College of Agriculture. A few of them are supported by assistantships from CIDA. The College of Agriculture organized an international workshop on semi-arid agriculture in Saskatoon (June 11-16/89, sponsored by CIDA), and has recently added new courses to its undergraduate teaching programs related to tropical soils and agricultural systems. Courses are being developed on tropical soils at graduate level. The College also provides a forum through which the role of Canada in the world development program is addressed. This project will

also allow Canadian students to work in Ethiopia, learn about the conditions in developing world, and collaborate with Ethiopian scientists in their field activities.

The College of Agriculture has state-of-art laboratory facilities, and instrumentation, and experience in training of foreign graduates and professionals. The Departments of Soil Science, and Crop Science and Plant Ecology will commit their lab and human resources for this project. The staff has been involved in CIDA-, IDRC-, FAO-, and UNDP-supported projects in Ethiopia, Brazil, Ghana, China, Indonesia, India, and recently in Vietnam.

This project has evolved from a relationship between University of Saskatchewan (U of S) and University of Addis Ababa (College of Agriculture in Awassa), Institute of Agricultural Research (IAR) and National Soil Laboratory at a time when they were seeking an appropriate place for training Ethiopian scientists funded by FAO-United Nations Development Program (UNDP) (9/7-ETH/87/101). In 1992, Dr. A. R. Mermut met with officers from the Ministry of Agriculture and the Ministry of Natural Resources and Environmental Protection, as well the Dean of the Faculty of Agriculture and several faculty members in Awassa and the IAR. Possible projects of national concern were discussed for the first time in 1993 when Dr. Mermut worked on the FAO-UNDP project. As a direct result, two Ethiopian scientists were trained at the University of Saskatchewan for four to six months. The two sides exchanged letters and refined their ideas concerning a development project in the dryland Rift Valley. The provision of AUCC-CIDA funds will allow us to initiate a development project in the Ethiopian part of the dryland Rift Valley.

2. GOALS AND OBJECTIVES OF THE PROJECT

Within the framework of the UPCD linkage projects, the primary goal of this project is to enhance the capabilities of the three Ethiopian Agricultural Training, Research, and Service Institutions. The University of Addis Ababa's College of Agriculture in Awassa, the Institute of Agricultural Research, and the National Soil Laboratory. The project will: (1) Upgrade Ethiopian Faculty member's qualifications, and increase their knowledge of land degradation problems such as salinity, erosion, soil quality loss, and provide research experience for scientists and extension specialists. (2) The Ethiopian counterpart institutions to address the land degradation problems in the Rift Valley of South-central Ethiopia and search for innovative and environmentally sustainable technologies to increase food production on drylands.

2.1 Goals of the Project

The goals of this project are to enhance the capacity of Ethiopians to contribute to sustainable land use in south central Ethiopia by:

a- upgrading human resources of three agricultural training, research, and service institutions in Ethiopia,

b- addressing the land degradation problems, and

c- establishing a framework for continuing collaboration amongst four partner institutions in the search for innovative and sustainable technologies which are compatible with local conditions in order to increase food production of drylands.

2.2 Specific Objectives

1. To link the three Ethiopian institutions with the U of S to develop land-management practices, which could reverse the process of, land degradation in the Rift Valley.

2. To enhance the capacities in the Ethiopian institutions to promote improved land management practices among the farmers in the semi arid Rift Valley by the adoption of sustainable land-management technologies.

3. To contribute to the U of S to become a center of excellence for training, education and research in dryland agriculture and further strengthen their internationalization initiatives.

2.3 Critical Assumptions

The philosophy underlying this project is that collaborative training and research between Canadian and Ethiopian educational, technical and service institutions is the best method to train and strengthen the institutional and research capabilities of the developing country collaborators. It is also instrumental in

strengthening close collaboration between Ethiopian Institutions. Following points are also considered for the formulation of the project:

1. Formulating written contracts signed by all parties related to work assignments and using facilities, at each stage of the project.
2. Giving greater responsibilities for the trainees so that there will be no non-returned problem considering the needs of the Ethiopian cooperating Institutions.
3. Insisting that women participants are involved at all throughout the project and be given same respect and status of male participants.
4. Gathering information for networking and new strategy development.
5. Simplifying the field research at the expanse of more demonstrations and involvement of farmers.
6. Motivating individual farmers to adopt the management strategies recommended through the research results.
7. Assessing the socio-economic impact of implementation of the field research results.

2.4 Environmental Impact

Population pressures and scarcity of good soils have forced agriculture to expand into marginal land and wildlife habitats resulting in serious land degradation over most of the country. The Ethiopian government recognizes that all land-management practices must be environmentally sensitive to protect the quality of soils for future food production. The existence of acute poverty in Ethiopia and degradation of ecosystems are related critical issues, and essential concerns for environmentally sustainable development. Sustainable crop production reduces pressure on land and increases the chance of land recovery from misuse of the past. All these have significant consequences for the survival of rural communities by providing employment and income and decreasing migration to major urban centers.

The project addresses improved soil management technologies which are compatible with local conditions in a very dynamic context.

2.5 Women in Development

The Ethiopian agricultural institutions are committed to provide opportunities for the participation of women as scholars, decision-makers, and farmers in food production sector. The NSL and IAR have women on their staff in scientific and supervisory positions, despite the fact that women are generally under represented in agricultural institutions. Women are increasingly the main workers and decision makers on the farms as men migrate to towns and cities looking for work, and they grow most of the family's food. They process food, and sell in the marketplace. They also do a vast variety of work to

support life and the development of the country. Women are essential and cannot be ignored in agricultural development.

The Dean College of Agriculture in Awassa is recognizing the importance of the gender issue and together with the Project Committee to make sure that while selecting graduate students from both Canadian and Ethiopian sides preference will be given to women. The Project Committee, although as it was initiated from the beginning, do not have woman member, but committed to consult women association, agencies and groups in Addis Ababa and Awassa at the onset of the project to establish the real needs, how to empower women to build a better rural development, and find out the most effective way to response these very important questions. The Project Committee will evaluate the issue of women in development during the annual meetings.

Women in Ethiopia, as in many developing countries, are unfortunately disadvantaged and lack employment opportunities. The project will help in the farming community and promote opportunities for employment of women as it will increase the need for better planning and more labor. These will be considered during the extension activities and annual workshops. The project will educate the participants about the importance of the optimal use of all human resources regardless of gender, religion, or ethnic background.

2.6 Benefits to U of S and Ethiopian Institutions

a. Increased conditions for the U of S initiative to become center of excellence for training, education, and research in dryland agriculture.

b. Increased ability of Canadians to work in international development program, especially food security, soil fertility, and resource management programs in Africa.

c. Canadian students and scientists learning about the conditions in developing world.

d. Promotion of the integration of the various units in the Faculty of Agriculture, U of S.

e. Increased graduate activities in the College of Agriculture, the U of S.

f. Opportunity for data interpretation through GIS for sustainable land use and land degradation.

g. Upgrading of information technology and networking of the three Ethiopian Institutions.

h. Increased ability of data interpretation which has been generated through several international assistance programs.

j. Training, upgrading, and curriculum development for the faculty of agriculture in Awassa.

h. Direct involvement of farmers for training and education through fieldwork extension, and workshops.

i. Opportunity for mutual benefit for the integration of knowledge from collaborative activities

3. MANAGEMENT STRATEGY AND APPROACH

3.1 Management Structure

The following management structure has been agreed by the partners :

Directors: 1 Canadian 3 Ethiopians. They will be responsible for daily administration and decisions in line with policies suggested by Project Committee.

Team members: 5 Canadian (D. W. Anderson, J. J. Schoenau, G. Scoles (Crop Science Department), 3 Ethiopians (in addition to directors, one from each co-operating institutions).

Ethiopian Coordinating Committee: Directors, team members.

U of S Coordination Committee : Director, team members (see above).

Coordination Committees will be responsible for advising the Project Committee based on guidelines laid down in the project work plan. They will meet on a yearly basis

Project Committee: Canadian and Ethiopian Directors and team members. This Committee will approve work plans, budgets and reports, monitor the project, review evaluation, coordinates information sharing, and provide overall guidance. Since it will be very costly to bring all the members together every year, Project Committee Meeting will take place when a member(s) of the Coordination Committee visiting from either side and brings the suggestions of their respective Coordination Committee's for general discussions.

Monitors: They (Dean Faculty of Agriculture, Director International Liaison Office of the U of S) will not be directly involved in the project but will attend the annual Project Committee meetings and provide suggestions to the annual report.

The Canadian project director with his current status will be more committed to the project than other staff member of his faculty. He will be the responsible individual to coordinate the entire project together with the members of the U of S Coordination Committee. Others mentioned in the project are the team members and both Saskatchewan and Ethiopian teams will have more members than those indicated in the project.