



**New Partnership for
Africa's Development (NEPAD)
Comprehensive Africa Agriculture
Development Programme (CAADP)**



**Food and Agriculture Organization
of the United Nations
Investment Centre Division**

GOVERNMENT OF THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

SUPPORT TO NEPAD–CAADP IMPLEMENTATION

**TCP/ETH/2908 (I)
(NEPAD Ref. 05/08 E)**

Volume IV of VI

BANKABLE INVESTMENT PROJECT PROFILE

Client-oriented Agricultural Research for Development

January 2005

ETHIOPIA: Support to NEPAD–CAADP Implementation

Volume I: National Medium–Term Investment Programme (NMTIP)

Bankable Investment Project Profiles (BIPPs)

Volume II: Water Harvesting and Small–Scale Irrigation

Volume III: Human Resource Development for Agricultural Extension

Volume IV: Client–oriented Agricultural Research for Development

Volume V: Live Animal and Meat Export

Volume VI: Agricultural Marketing Improvement Programme 2 (AMIP 2)

NEPAD–CAADP BANKABLE INVESTMENT PROJECT PROFILE

Country: Ethiopia

Sector of Activities: Agricultural research

Proposed Project Name: **Client–oriented Agricultural Research for Development**

Project Area: Across major agro–ecological zones of Ethiopia

Duration of Project: Five years

Estimated Cost: Foreign Exchange..... US\$63.75 million
Local Cost..... US\$11.25 million
Total..... US\$75.00 million

Suggested Financing:

<i>Source</i>	<i>US\$ million</i>	<i>% of total</i>
<i>Government</i>	11.25	15
<i>Financing institution(s)</i>	63.75	8
<i>Beneficiaries</i>	–	–
<i>Private sector</i>	–	–
<i>Total</i>	75.00	100

ETHIOPIA:
NEPAD–CAADP Bankable Investment Project Profile
“Client–oriented Agricultural Research for Development”

Table of Contents

Abbreviations.....	iii
I. PROJECT BACKGROUND.....	1
A. Project Origin	1
B. General Information.....	1
II. PROJECT AREA.....	2
III. PROJECT RATIONALE.....	3
IV. PROJECT OBJECTIVES.....	4
V. PROJECT DESCRIPTION	5
<u>Component 1: Enhancing the Performance of Food, Agro–Industrial and Export</u> <u>Crops for Food Security and Poverty Reduction</u>	5
<u>Component 2. Strengthening Livestock Research for Development to Enhance its</u> <u>Contribution to Poverty Reduction and Food Security.....</u>	6
<u>Component 3. Strengthening Natural Resources Management Research for</u> <u>Sustainable Use, Agricultural Production and Environmental Protection</u>	7
VI. INDICATIVE PROJECT COSTS	8
VII. PROPOSED SOURCES OF FINANCING	8
VIII. PROJECT BENEFITS	9
IX. TECHNICAL ASSISTANCE REQUIREMENTS	9
X. ISSUES AND PROPOSED ACTIONS	10
XI. POSSIBLE RISKS	11
Appendix: Selected crops and their major agro–ecologies.....	13

Abbreviations

ADLI	Agriculture Development–Led Industrialization
ATVET	Technical and Vocational Education and Training [Programme]
CAADP	Comprehensive Africa Agriculture Development Programme
EARO	Ethiopian Agricultural Research Organization
EARS	Ethiopian Agricultural Research System
GDP	Gross Domestic Product
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
MOET	Multiple Ovulation and Embryo Transfer
MoARD	Ministry of Agriculture & Rural Development
NCBP	National Capacity Building Program
NEPAD	New Partnership for Africa’s Development
NETP	New Education and Training Policy
NMTIP	National Medium–Term Investment Programme
PCU	Project Coordination Unit
RCBP	Rural Capacity Building Program
SNNPR	Southern Nations, Nationalities & Peoples Region

I. PROJECT BACKGROUND

A. Project Origin

I.1. This project proposal, presented by the *Ethiopian Agricultural Research Organization* (EARO) on behalf of the *Ethiopian Agricultural Research System* (EARS), seeks to address the need for action-oriented research in three major spheres of agricultural activities: crops, livestock and natural resources management. Taking into account the complex relationship between agricultural production and management of natural resources, the proposed research interventions in crop, livestock and natural resource management are considered simultaneously toward attaining food security and reducing poverty.

I.2. The nature and approach of the proposed project derive from the strong need for broad based technologies as reflected in the government’s development policies and strategies, including *Rural Development Policies and Strategies*, *Rural Capacity Building Program* (RCBP) and *National Medium Term–Investment Programme* (NMTIP), toward improving food security and export performance of the agriculture sector. In more specific terms, the project proposal draws heavily on the experience gained and lessons learnt from completed or ongoing research efforts of the EARS over the last four decades. In this respect, the project aims at fine-tuning and scaling up the stock of already available agricultural technologies and thereby offers practical remedies to overcome the persisting problems holding back growth in agricultural production and productivity. Also considered in the proposal is the need for triggering a take-off of pipeline projects that have been designed on the basis of the overall national development plan and concomitant EARS research strategies. Thirdly, and perhaps more importantly, the proposed project is designed to bridge the gap in agricultural research and extension linkages that has increasingly become a crosscutting priority for the widespread promotion and utilization of appropriate technologies.

B. General Information

I.3. Ethiopia is a country of more than 1.1 million km², with an estimated population of 70 million. Approximately 31 million ha of the total area is agricultural land, of which an average of no more than 10 million ha is cultivated annually. Agriculture is the most important enterprise, providing employment for more than 80 percent of the country’s population and accounting for about 50 percent of the total GDP and 90 percent of export earnings.

I.4. Ethiopia is a country of diverse agro-ecological features and therefore produces a wide range of crops and animals. Major food and cash crops include cereals, roots and tubers, pulses, oilseeds, vegetables, fruits, coffee, cotton, tea, sugarcane, and tobacco and spices (see Appendix). In terms of livestock resources, the country ranks first in Africa and tenth in the world. An estimated 40 percent of the country’s landmass receives a mean annual rainfall of 900 to 2,200 mm; and it is believed that the country has adequate water resource potential that could be utilized to irrigate some 3 to 5 million hectares of its arid and semi-arid land area.

I.5. In spite of its high agricultural potential, however, Ethiopia has been faced with food deficits and abject poverty over the last several decades. Productivity of crops and livestock has not shown sustained increases over the years and environmental degradation has been taking place at an alarming rate. The national average productivity of crops and livestock for Ethiopia is even lower than the African average, in sharp contrast to what could be achieved on farmers’ fields where improved crop varieties, livestock breeds and production technologies have been adopted. Overall, Ethiopia is typical of a poor agrarian economy where agricultural production is predominantly a traditional occupation of

millions of smallholder farmers for subsistence that is dependent on the vagaries of nature, particularly rainfall; cultivation of cereal crops is essentially a low-input and low-output production system; livestock productivity is dismally low for all species; the structure of the country’s exports reflects heavy reliance on a small number of primary commodities that makes the national economy susceptible to weather and price related shocks; and there is a clear manifestation of the cause-and-effect relationship between heightened depletion of natural resources and declining agricultural productivity. Thus, until the end of the 1980s, the country’s agricultural sector has been far from playing its strategic role in advancing overall national economic development.

I.6. Since 1992/93, growth in agricultural production and productivity has undoubtedly shown significant positive out-turns as a result of macroeconomic reforms and favourable weather conditions. However, growth in agricultural GDP has not been a linear process and, on average, has not been high enough to demonstrate the leading role that the agricultural sector could play in national development as envisaged under the current government’s policies and strategies.

I.7. The short-term gains in increased agricultural GDP in the 1990s was achieved primarily through a top-down delivery of research and extension services and massive production inputs including improved seeds, fertilizers and credit. Among the limitations of such a supply-driven research and advisory services system, which have received increased recognition over the recent years, are that the system mainly targeted at high potential areas; giving inadequate attention to marginal areas of the county. Limited attempts were made to involve farmers in the research process through participatory needs assessment, establishment farmer research group and on-farm research. Overall, however, the research and advisory system remained heavily relying on the linear-sequential model of technology generation, dissemination and utilization in which extension workers and farmers play limited role in the adaptation of such technology to local conditions. Cognizant of such limitations, the government has, within the broader *Agricultural Development-Led Industrialization* (ADLI) strategy and *National Capacity Building Program* (NCBP) and the *New Education and Training Policy* (NETP), embarked on reforming the agricultural research and advisory services.

I.8. With respect to the technology development sub-system, substantial efforts have already been made for the development of demand-driven technologies through a shift in focus toward a more decentralized agricultural research services. The EARS is currently organized under EARO as an apex body for enhanced coordination, regional agricultural research institutes and higher learning institutions; and consists of 37 major research centres, sub-centres and testing sites located across various agro-ecological zones. The capacity of EARS to undertake agricultural research for development has increased substantially in recent years through the substantial support from the government, multilateral organizations and bilateral aid agencies.

I.9. Notwithstanding the efforts made so far to enhance the efficiency and effectiveness of the EARS, however, further investment is needed to consolidate and expand research initiatives in the areas that have been identified as critical for the agricultural development of the country. This project proposal is a major step in that direction.

II. PROJECT AREA

II.1. For the purpose of this project profile, the detailed specification and description of the project areas presented in the main project proposal document are summarized as follows. The selection of the study areas is based on a two-pronged strategy: prevailing opportunities and technology gaps for raising crop and livestock productivity and ensuring sound ecological

management on the one hand; and the need for appropriate institutional arrangement for the effective implementation of the project on the other.

II.2. In broad terms, the project areas cover the country’s ecological settings that are relevant to plant and animal agriculture and that have been identified as priority areas for the conservation and development of natural resources. Based on this criterion, project areas were selected to represent the highland and the low land areas.

II.3. The highland ecology is characterized by altitudes of >1,500 m, annual rainfall ranging from 800 to greater than 2,200 mm; a wide range of food and agro-industrial crops; high human and livestock density; declining soil fertility and fragile environments. The highland environment accounts for about 40 percent of the country’s area, and about 80 percent of its human and cattle population. The dominant features of the lowland agro ecology are low altitudes (<1,500 m), low and erratic rainfall; recurrent droughts; high ambient temperature; serious land degradation particularly around watering points; vegetation cover of short grasses, legumes, scattered shrubs and trees; and agro-pastoral and pastoral systems based on communal grazing. The lowland areas account for about 60 percent of the total area of the country, the entire camel population, 45 percent of the small ruminant and 20 percent of the cattle population.

II.4. Within the broad agro-ecological settings, the specific project sites were selected on the basis reasonable proximity to research and development agencies that have been identified as having a strategic advantage in technology development in the various agro-ecological settings and thus could collaborate in the successful implementation of the project. The distribution of the project sites, therefore, roughly corresponds to the location of EARS centres, other commodity research centres, commercial farms, and agro-industries.

III. PROJECT RATIONALE

III.1. The government’s development policies, programs and strategies have attached an overriding importance to the transformation of the agricultural sector as an engine to the attainment of food security, poverty reduction and enhanced overall economic growth. Similarly, the need for transforming the country’s agriculture as a prerequisite for the elimination of hunger and poverty has received increased recognition among international development concerns including the Coalition for Food Security and NEPAD-CAADP framework.

III.2. It is almost universally accepted that growth in agricultural production and productivity is a function of technology generation and utilization. Accordingly, substantial public resources have been invested in building the organizational and technical capacity of the EARS since its inception in the late 1940s. As a result of such efforts, a number of crop and livestock production technologies have been generated and released for use by farmers. Results of on-station and on-farm experimentation suggest that strategic removal of constraints is technically possible and this can potentially double the current crop and livestock productivity and contribute to rapid economic growth of the country. However, agricultural research in Ethiopia has, until recently, focused mainly on increasing the yield potential of limited number of crop and animal species and on the relatively high potential areas of the country. Consequently, there is a widespread criticism that the technologies generated over the years have not made significant impact on raising agricultural production and productivity. Although availability of technology is but one of a wide range of factors that contribute to raising agricultural production and productivity, it is commonly believed that the backlog of hitherto unused technologies

is due to, among others, the inadequacy of research initiatives in taking into full consideration the needs and priorities of smallholder farmers operating in diverse agro-ecological setting.

III.3. The underlying rationale of this research proposal is, therefore, that the experience gained and lessons learned from research and development efforts over the last fifty years reinforced by effective communication strategies provides a promising avenue toward the development and widespread promotion and adoption of appropriate agricultural technologies. The design features of the proposed project are congruent with its rationale. Thematically, the project embraces the essential components of agricultural production. In terms of approach and methodology, the project puts emphasis on adapting findings from national and international research institutions to specific agro-ecological conditions of the country and on engaging the relevant stakeholders including the ultimate beneficiaries in the research process.

IV. PROJECT OBJECTIVES

IV.1. The overall objective of the project is to enhance market oriented agricultural production through availing broad-based agricultural technology while sustaining the natural resource base. This would contribute to the national efforts to the attainment of food security, poverty reduction, and eventually to the advancement of national development.

IV.2. The specific objectives relating to components and subcomponents of the project are to:

- Assess, validate and promote technologies for the production, processing and utilization of indigenous food crops in different agro-ecologies of the country
- Validate the productivity, drought tolerance, disease and pest resistance, and end-use quality of new crops for production in food insecure areas.
- Scale-up, develop and promote appropriate technologies for the production and processing of high value crops for domestic and international markets.
- Assess, develop and demonstrate sustainable and environmentally acceptable disease, insect and weed management options that would minimize crop losses in the field and storage
- Develop methods and recommend interventions for improving formal and informal seed systems
- Develop appropriate technologies that enhance feed supply, feeding systems and reproductive management for market-oriented livestock production
- Develop animal health technologies for the prevention and control of economically important diseases for market oriented livestock production
- Develop post harvest technologies for meat, milk, honey, fish, eggs hides and skins
- Assess land, water and forest resource potentials and their limitations to agricultural production and quantify its impact on water supply, the environment and biophysical and socioeconomic situations.

- Select, verify and promote best–bet technological options appropriate for integrated natural resources management, sustainable agricultural production and environmental protection
- Conduct socio–economic studies on the characterization of farming systems and the identification of key opportunities and constraints that impinge on the adoption and impact of improved technologies for crop and livestock production and natural resource management.
- Strengthen the human resource and physical facilities of collaborating research institutions for the effective implementation of the project.

V. PROJECT DESCRIPTION

V.1. The project will have a lifespan of five years and consists of three major research components as described below. The three components of the project are to be implemented concurrently over the five–year period.

Component 1: Enhancing the Performance of Food, Agro–Industrial and Export Crops for Food Security and Poverty Reduction

V.2. This component will address the appropriate technology needs for enhancing crop production and productivity both for food and the market.

V.3. Traditional and indigenous crops will get research emphasis primarily for food security. These include cereals, roots and tubers, and vegetables. However, some of these crops have the dual purposes as export/agro–industrial and food crops. For example, ‘*teff*’ varieties with low gluten content are being exported to European countries; there is a high demand for yellow maize in countries like Japan; durum wheat is needed for pasta processing industries and malting barley for breweries.

V.4. The research system shall also give due consideration to introduction of technologies developed elsewhere including non–traditional crops such as cassava, pearl millet, quinoa, grain amaranth, as alternatives in the food insecure areas of Ethiopia. Preliminary research outputs are already available in the country on these crops, which could serve as a basis for up scaling. Research support shall also be needed to extend the use of crops such as ‘*enset*’ from the south to other parts of the country where they are not currently grown.

V.5. Export and agro–industrial crops that would receive major emphasis include coffee, pulses, oil crops, cotton, spices, medicinal and aromatic plants, and fruits. Production and productivity of these crops will be further enhanced through introduction and adaptation of technologies developed elsewhere. The EARS has produced results on improved variety development and production practices for most of these crops; and technologies are being introduced from abroad. Major emphasis under this project will thus be on scaling–up of these technologies.

V.6. Ethiopia has both comparative and competitive advantage in developing and marketing many of the export crops mentioned above. Currently, research in developing such origin–based coffee varieties and hybrids are at an advanced stage. Furthermore, recent developments elsewhere show that Ethiopia is home for naturally decaffeinated coffee. Research under this project will focus on

screening, identification and developing such materials from the nearly 5 thousand accessions that are currently in our possession.

V.7. The private industry in Ethiopia has recently intensified greenhouse production of flowers for European markets, where regulations on pesticide residue and quarantine are strict. Research should take the lead in developing integrated pest management (IPM) techniques for this emerging industry. Collaboration with overseas institutions that have long experience in this area is crucial to jumpstart the work under the proposed project.

V.8. Experience shows that availability of seed/planting material plays a key role in the expansion of improved crop varieties to end-users. The research system shall collaborate with relevant institutions to improve the seed system in the country. Developing capacity for rapid multiplication of planting materials through tissue culture, use of irrigation during off-season shall receive significant emphasis under this project.

V.9. Pests will pose a significant threat to agricultural development in the process of agricultural intensification. The threats may come from upsurge of local pests or inadvertent introduction of foreign organisms. Research and development in an IPM approach will be pursued under this project to implement pest management tactics against key pests of selected crops.

V.10. The development and promotion of post-harvest technologies will receive particular attention under this project. These include minimizing crop losses and food processing; the latter would consist of food preservation at the household level, as well as innovations for commercial level food processing to add value.

Component 2. Strengthening Livestock Research for Development to Enhance its Contribution to Poverty Reduction and Food Security

V.11. The proposed research project in livestock, as in crops, shall focus on boosting market-oriented animal production both for increased food availability and for domestic and international markets.

V.12. Milk, poultry and meat, honey and fish are the commodities that are given high priorities for food security. Livestock research for development efforts shall focus on both lowlands (pastoral/agro-pastoral areas) and highlands, including the small-scale producers as well as commercial farms in urban and peri-urban areas.

V.13. Agro-industries dealing with meat, milk, animal feed, poultry and fish processing in urban and peri-urban shall be supported through the proposed project.

V.14. High priority commodities for export are hides and skins, meat, live animals and honey. Small ruminants and cattle are targeted as the major resources for export. This would mean that this component of the proposed project would focus on the enormous livestock wealth in the pastoral and agro-pastoral areas of the country.

V.15. Efforts for establishing disease-free zones for improving competitiveness in the export market shall be given particular attention. Emphasis shall also be given to scaling-up of research results on skin diseases, due to which Ethiopia's loss in the export market is estimated at about US\$ 14 million per annum.

Component 3. Strengthening Natural Resources Management Research for Sustainable Use, Agricultural Production and Environmental Protection

V.16. Ethiopia cannot hope to realize sustainable growth in agricultural production and productivity without sound management of its natural resources. Accordingly, the proposed project will generate technologies and information that support the development and large-scale dissemination of appropriate technologies toward the conservation, rehabilitation and utilization of the country’s land, water and forest resources. The major areas of emphasis in this component include soil nutrition, integrated watershed management, small-scale irrigation, and forestry research.

V.17. Of particular emphases under soil nutrition is the development of soil-test based recommendations for fertilizer application and finding alternatives to inorganic fertilizers such as *Rhizobium* inoculants and green manure.

V.18. The integrated watershed management research shall be carried out in targeted catchments representing both the low and high rainfall areas in Oromiya, Amhara, Tigray, SNNPR and Afar regional states. Integrated watershed management research shall draw on experiences from previous efforts carried out in the country as well as recent developments from our partner CG centres such as ICRISAT.

V.19. Research in small-scale irrigation shall be tailored particularly to the technology needs of areas that are prone to low and erratic rainfall and those that are selected for high value export crops such as horticultural crops and spices. Specific research sites have been selected on the basis of existing local knowledge, market accessibility, and high potential impact on food security and income generation.

V.20. Forestry research shall focus on agro-forestry, biomass energy and pulp, non-timber products, and rehabilitation and conservation of degraded ecosystems. Major target areas for agro-forestry shall be the *enset*-coffee-cereal-livestock land use system in the southwest, the red Nitosols and Vertisols areas in the central highlands, the low potential highland areas, and the semi-arid areas in the northwestern parts of the Awash basin.

V.21. The focus of rehabilitation and conservation of degraded forest ecosystems shall be selected forest areas particularly in northern Ethiopia. These shall include parks, animal sanctuaries and reserves. Restoration efforts shall be based on techniques learned from indigenous knowledge from areas with remnant natural forests. Emphasis shall be given to selection and adaptation of indigenous tree species that are threatened with extinction.

VI. INDICATIVE PROJECT COSTS

VI.1. Indicative cost estimates of the project are presented in Tables 1 and 2. The costs are estimated based on current local market prices. It is envisaged that that 40 percent of the total estimated costs will be allocated to crop research while the remaining will be equally divided for research in livestock and natural resource management; and international development partners are expected to contribute an estimated 85 percent of the financial project costs (Table 1). With respect to the spread of the estimated costs over the lifespan of the project it is to be noted from Table 2 that the peak financial outlays will occur during the third year of project implementation.

Table 1: Indicative Costs Summary by Component and by Source of Financing

Component	Government	Financing institution	Beneficiaries	Private Sector	Total
1. Enhancing Performance of Export, Agro-Industrial and Food Crops for Food Security and Poverty Reduction	4,500	25,500	–	–	30,000
2. Strengthening Livestock Research for Development to Enhance its Contribution to Poverty Reduction and Food Security	3,375	19,125	–	–	22,500
3. Strengthening Natural Resources Management Research for Sustainable Use, Agricultural Production and Environmental Protection	3,375	19,125	–	–	22,500
Total Baseline Project Costs ('000 US\$)	11,250	63,750	–	–	75,000

Table 2: Indicative Cost Summary by Component by Year

Component	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1. Enhancing Performance of Export, Agro-Industrial and Food Crops for Food Security and Poverty Reduction	3,000	6,000	12,000	6,000	3,000	30,000
2. Strengthening Livestock Research for Development to Enhance its Contribution to Poverty Reduction and Food Security	2,250	4,500	9,000	4,500	2,250	22,500
3. Strengthening Natural Resources Management Research for Sustainable Use, Agricultural Production and Environmental Protection	2,250	4,500	9,000	4,500	2,250	22,500
Total Baseline Project Costs ('000 US\$)	7,500	15,000	30,000	15,000	7,500	75,000

VII. PROPOSED SOURCES OF FINANCING

VII.1. It is anticipated that the financial requirements of the projects will be met both from domestic international sources.

VII.2. The Ethiopian Government is expected to make financial contribution in the form of budgetary outlays to cover the operational costs of the project including local personnel costs. In addition, it is anticipated that the government will avail existing physical facilities including laboratory, farm and office facilities for use by the project. It is envisaged that non-government research and development organizations operating in the project areas, agro-industries and the ultimate project beneficiaries themselves will make significant contribution in cash and in kind toward the implementation of the project.

VII.3. More significantly, however, the successful implementation of the project would be practically impossible without external source of finance. It is, therefore, taken almost for granted that financial support will be forthcoming from bilateral and multi-lateral aid agencies under the NEPAD-CAADP framework.

VIII. PROJECT BENEFITS

VIII.1. The successful completion of the project is expected to result in a number of short-term and long-term benefits accruing to various groups of stakeholders and the country at large.

VIII.2. The immediate benefits of the project relate mainly to ***strengthened institutional capacity*** in terms of increased knowledge and improved skills among actors in the agricultural research and development system required for the generation and promotion of demand-driven technologies. Through the more participatory methods under the proposed project, researchers will develop a deeper understanding of local needs and priorities of smallholder agricultural producers and will be able to formulate research designs that are responsive to the technology needs of such producers; extension workers will improve their competence in research methods; farmers will be empowered in terms of demonstrating their capabilities in the research process particularly in the identification of research problems based on their felt needs; and policy makers and planners will be persuaded to allocate increasing public resources in support of the further promotion of client-responsive agricultural research.

VIII.3. Some years after the completion of the project, more ***tangible and measurable economic benefits*** will start building up both ***at household and societal levels***. Smallholder farmers and their household members will benefit from increased food availability and income streams accruing to the use of improved and sustainable crop and livestock production technologies; and from enhanced employment opportunities arising from the diversification and intensification of agricultural production. At a national level, the project will contribute to improving the food security and poverty situation through the greater availability of increased food, feed and fibre production; sustained supply of raw materials for local agro-industries; and increasing sustained supply of raw materials the country's foreign exchange earnings from export of high value crops and animal products

IX. TECHNICAL ASSISTANCE REQUIREMENTS

IX.1. Short-term technical assistance may be needed in the following areas where local experience is limited.

- Launching of innovative food processing technologies;
- Establishment of systematic race analysis, bio-control, immunological methods and post harvest pest research facilities and systems;
- Launching of IPM for greenhouse conditions;
- Establishment and strengthening of food quality, molecular and tissue culture laboratories;
- Evaluation of coffee quality and determination of caffeine content and ochratoxin level in coffee;

- Breeders for selected crops like spices and medicinal plants;
- Animal biotechnology: to initiate the research program specifically in designing the research activities on reproduction such as *Multiple Ovulation and Embryo Transfer* (MOET); strengthening diagnostic capacity and practical hands-on training in MOET, AI in small ruminants and poultry.
- Animal product processing and value adding to assist in the effective utilization of laboratory equipment for strategic research in animal product evaluation processing and quality attributes meat laboratory currently being set up at the Adami Tulu research centre.
- Rumen ecology, stress physiology
- Integrated watershed management research, biotechnology, and pulp technology.

X. ISSUES AND PROPOSED ACTIONS

X.1. EARO is committed to the effective implementation of the proposed project. However, there are some critical issues pertaining to the wider institutional environment in which the project is envisaged to operate. Most of the issues and proposed actions considered below revolve around the need for reciprocal cooperative interaction among key stakeholders’ in the planning, implementation and monitoring of the project; and

X.2. ***Research and Extension Linkages.*** In particular, strong linkage between research and extension is critical for the effective implementation of the project. The recently restructured *Ministry of Agriculture and Rural Development* (MoARD) that brought research and extension under one umbrella; the ongoing initiatives to strengthen research–extension–farmer linkages at all levels; and the launching of *Agricultural Technical and Vocational Education and Training* (ATVET) program that is expected to produce a large number of frontline extension workers specializing in crop and animal sciences and natural resource management are potential opportunities for fostering linkages between the extension and research professions.

X.3. However, further measures need to be taken to overcome barriers to linkage at grassroots levels including the longstanding tradition of assigning multiple tasks to extension workers; giving them little time to interact with researchers.

X.4. ***Stimulating Sustained Participation of Ultimate Beneficiaries.*** A number of research activities of the project particularly those under its natural resource management component are less likely to yield immediate returns in terms of increased farm production and productivity. Such a lag in the flow of expected benefits may erode the continued participation of farmers in the implementation of the project. Thus, it is important that innovative initiatives are taken as part of the project activities that combine the realization of immediate benefits with its overall impact over the longer term. Some of the possible actions with regard to the natural resource component include the use of fruit and forage trees for conservation, legumes that provide ground cover as well as useful feed for animals and high value marketable crops.

X.5. ***Implementation Arrangements: Autonomy and Accountability.*** Decentralization of decision-making in research management toward increased efficiency has increasingly become a key element within the overall effort to improve the functioning of EARS. This will provide an added

opportunity for the effective implementation of the proposed project. However, considering the wide range of implementing partners of the project other than federal research centres, it is imperative that joint commitment for the effective execution of the project is ensured through the signing of a binding agreement among its collaborating institutions.

X.6. EARO’s accumulated experience in research project planning and implementation, and its human and physical resources shall be used as springboard for effective implementation of the proposed project toward the realization of its impact oriented objectives. A *Project Coordination Unit* (PCU) will be established at EARO’s HQ. PCU is responsible for the coordination of the project.

X.7. ***Technology Adaptation, Release and Multiplication.*** One of the focal operational areas of the proposed project is the adaptation of technologies from other countries that have proven merit. This requires the necessary arrangements to be in place to do this effectively. It is proposed that efforts be made to facilitate the timely importation of the desired patented and other technologies

X.8. The multiplication of livestock technologies has been a major bottleneck. Building of a modest capacity for multiplications of livestock technologies for research purposes and provision of basic starting stock for multiplication centres of the extension service is embodied in this project. It is believed that government will devise policies that support large-scale multiplication of technologies.

X.9. ***Motivation of the Scientific Workforce.*** Finally, the effective implementation of the project assumes the existence of competent and motivated scientific work force that is dedicated to the transformation of the agricultural sector. In this regard, there is an urgent need to improve salary scales and related incentive packages and thereby for retaining existing research as well as recruiting additional staff.

XI. POSSIBLE RISKS

- ***Policy risk.*** A new institutional culture and capacity is required in facilitation of technology importation. A certain degree of risk in delay and shortage of anticipated technologies could be experienced in the course of project implementation. EARO has established a committee of professionals to follow up such issues that might reduce the risk in this regard.
- ***Inadequate interest and financial capacity of ultimate beneficiaries.*** The intended ultimate beneficiaries may not be economically capable to contribute to project activities in terms of cost sharing for on-farm and scaling up activities of the project.
- ***Market situation.*** Market availability and the short shelf-life of livestock and crop products coupled with increased production of such products could entail certain degree of risk for participating producers; until such time that processing and post harvest technologies developed under the project are widely used.
- ***Natural calamities.*** Agricultural production is weather dependent and the performance of the project implementation could be affected by unpredictable climatic situations. Any natural calamity like disease outbreak may affect project implementation.
- ***Implementation delays.*** In the past, many similar projects failed due to delays in approval of proposals, timely release of fund and procurement of field and laboratory facilities.

- **Research staff turnover.** Availability of qualified research staffs is very critical for the success of the project. Nevertheless, past experience shows that qualified staff turn over is high due to attractive employment opportunities elsewhere.

APPENDIX: SELECTED CROPS AND THEIR MAJOR AGRO-ECOLOGIES

Component/Crop species	Major Agro-ecologies	Research Centres
<i>Export and industrial crops</i>		
Coffee	H2	Jimma
Ginger	H2	Jimma (Tepi)
Black pepper, Korerima	H2	Jimma (Tepi)
Black and white Cumin	H2, M2	Jimma, EORC, Holetta
Capsicum	SH2, SM2	Bako, Melkassa
Fenugreek	SM2, M2	EOrc, Debre Zeit and Adet
Pyrethrum, Geranium, <i>Cymbopogon</i> spp. and 'endod'	M2	EOrc, Kulumsa, Debre Zeit
Sesame	A1, M2	Werer, Humera
Chickpea (Kabuli)	SM2	Debre Zeit
Lentil	SM2	Debre Zeit
Faba bean	M2	Holetta
Haricot bean (canning type)	SM2	Melkassa
Mango	SM2	Melkassa
Avocado	SM2	Melkassa, Jimma
Pineapple	H2	Jimma,
Garlic	SM2	Debre Zeit
Tomato	SM2	Melkassa
Cotton	A1	Werer
Barley	M2, SM2	Holetta, Sinana, Debre Birban
Wheat	M2, SM2, M2	Kulumsa, Debre Zeit, Holetta, Adet, Sinana
Maize	H2, SH2	Bako, Awassa, Jimma
<i>Indigenous food crops</i>		
Teff	SM2, M2	Debre Zeit, Holetta, Adet, Sinana
Sorghum	M2, SM2, A1	Mieso, Alemaya, Sirinka
Enset	SH2	Areka, Awassa, Jimma
Noug (Niger seed)	M2	Holetta, Adet
<i>New crops</i>		
Cassava, Millets, ...	Various	Various