ANNEX E – PUBLIC INVOLVEMENT PLANS

PROJECT COORDINATION AND IMPLEMENTATION ARRANGEMENTS AT THE NATIONAL LEVEL

During PDF B phase, a detailed national project management and implementation structure and its linkage with the global coordination was discussed for each country. The project management and implement structure is based on each country national policies and organizational set up. These implementation and execution arrangements are designed for effective coordination of project activities at global, national as well as at project sites levels. Stakeholders were identified through consultation and are based on multi-institutional and multi-disciplinary approach. These are described below:

A common agreement was reached among partners for the Project Management Unit (PMU) across all the four countries. The Project management Unit will have the following personnel:

1. **National Project Director:** The PMU will be headed by a National Project Director who will lead the project in its technical and development directions. The National Project Director will be a staff member of the National Executive Agency (NEA).
2. **National Project Manager (to be hired by the project):** The National Project Manager will manage the overall project activities, undertaking all duties of the project management at national level as will be assigned under the supervision of the National Project Director and the Global Project Director, and in close collaboration with Global Project Manager. He or she will be responsible for compiling national reports, budgets and work plans.
3. **National Programme Assistant (to be hired by the project):** This will be technical person working under the direct supervision of the National Project Manager and overall supervision of the National Project Director.
4. **Support personnel:** These will include an Administrative Secretary and driver(s).

The country partners discussed the need for various committees at national and site levels for better coordination of project activities during PDF B phase. The various committees proposed are: National Steering Committee (NSC), National Site Coordination Committee (NSCC), Site Teams (ST), and National Technical/Thematic Team (NTT). National Technical/Thematic Experts will play a role in linking thematic aspects within and among countries. During the PDF-B phase, National Coordinators along with national focal team members visited each of the identified project sites to meet with leading local government officials, researchers, extension workers, media persons, key farmers and staff from local universities, schools, NGOs and community based organizations. This has facilitated to define the structure and role of Site Teams and National Site Coordination Committee for project implementation and their reporting to National Steering Committee.

1. **National Steering Committees (NSCs):** NSC will comprise high level personalities representing key sector and institutions and will ensure the project fits within national, regional and local needs and also in the global framework. The NSC will have responsibility for:

- Approval of project planning and monitoring at national level
- Review quarterly progress and financial reports
- Review annual summary reports
- Advice PMU on implementation problems at national level and suitable modification to the subsequent work plan.

The NSC will include representation from:

- Ministry of Agriculture
- Ministry of the Environment (or a representative of the GEF Focal point)
- National Executing Agency
- Representation from local institutions
- Representation from NGO
- Representation from farmers organization and/or farmers
- Representative of National Site Coordination Committee
- National Project Director
- National Project Manager (Member secretary).

The National Steering Committee will meet two times a year.

2. National Technical/Thematic Teams (NTT): National Thematic and Technical Teams will comprise of experts in the relevant disciplines and will provide overall technical guidance, review protocols, methodologies and technical reports, and assist in building thematic capacity at site and local levels. Members will consist of national and local experts, and site level thematic focal points.

3. Site Teams (ST): The composition of Site Teams and its role was discussed by each country national partners and it was agreed that one such Site Team will be established for each project site in each country (China: 6, Ecuador: 6, Morocco: 5, and Uganda: 4).

The Site Teams will consists of:

- Site Manager
- Local thematic contact people
- Participating farmers
- Local NGOs representative
- Development and extension staff.

The agreed responsibilities of Site Team will include:

- Developing together with the Site Coordination Committee six-monthly work plan
- Implementation of project activities on site
- Ensuring feed back from farmers
- Building relationship between farmers and national teams
- Organization of farmers training and cross site visits.

It was proposed that the Site Teams will be meeting quarterly.

4. National Site Coordination Committees (NSCC): In order to share cross sites experiences and to coordinate activities across sites, national partners proposed to have a National Site Coordination Committee. The members of the National Site Coordination Committee will be:

- Site coordinators form each of the project site
- National Project Manager.

The Site Coordination Committee will be responsible for:

- Developing annual work plan and budget for the respective sites
- Prepare quarterly progress reports and annual summary report and forward to PMU
- Coordinate activities of the different task teams at the sites and provide technical backstopping to the sites
- Linking Site Teams within country to ensure that lessons learned are shared among the sites and with national and global level operation.

The Site Coordinator will be the overall in-charge of the project site activities. National Site Coordination Committee will hold two meetings each year and one representative of the Site Coordination Committees will be member of National Steering Committee, on rotation basis.

CHINA – Public Involvement Plan:

Yunnan Agriculture University (YAU), Kunming, Yunnan will be the National Executive Agency for the implementation of project in China and will provide all necessary facilities for hosting the Project Management Unit.

National Steering Committees:
Following will be the members for National Steering Committee in China:

1. Ministry of Finance
2. Ministry of Agriculture
3. Ministry of Science and Technology
4. Ministry of Education
5. State Environmental Protection Bureau
6. National Agriculture Technology Extension Service Center
7. Kunming Institute of Botany
8. Fudan University
9. NGOs representative
10. Farmers and Farmers' organization representative
11. National Executing Agency (YAU)
12. National Project Director
13. Global Project Manager/Representative of Global Executive Agency
14. National Project Manager (Member Secretary).

The National Steering Committee will meet two times a year.

Provincial Management Teams:
There will be three Provincial Management Units, one each for Yunnan, Sichuan and Guizhou, which will manage funds and project activities at the respective provincial level. They will be composed of thematic and technical experts who will act as provincial focal points for project activities. Lead partners for each Provincial Management Teams are listed below (acronyms are defined in the box on the following page)**:**

- Yunnan Provincial Management Team (YPMT): CDS, CBIK, CNRCAB, FU, IRDC, KIB, YAAS, YAU and YU.
- Sichuan Provincial Management Team (SPMT): SAAA and SDAO.
- Guizhou Provincial Management Team (GPMT): GAAS, GDAO and GU.

The Provincial Management Team will meet two times a year.

National Site Coordination Committee:
A Site Coordination Committee will be set up to share cross sites experiences and to coordinate activities across sites. The Committee will develop annual work plans and budgets, prepare bi-annual progress reports and annual summary reports and forward them to the PMU. In addition, the Site Coordination Committee will Coordinate activities of the different task teams at the sites and provide technical backstopping to the sites, and link Site Teams within country to ensure that lessons learned are shared among the sites and with national and global level operation. The members of the National Site Coordination Committee will be:

- Site coordinators form each of the six project site (four in Yunnan Province, one in Sichuan Province and one in Guizhou Province)
- Thematic leaders
- The three Provincial Team Managers
- National Project Manager

The National Site Coordination Committee will meet two times a year.

Site Teams:
Six Site Teams will be established, one each for Yuanyang, Kunming, Zhongdian and Menghai in Yunnan province; Qionglai in Sichuan province; and Meitan in Guizhou province. Site Teams will be responsible for implementing project activities at site levels and will be proposing the work plan and regular feedback from farmers. The Site Team will comprised of a Site Manager, local thematic/technical contacts, farmers and local NGOs. The Site Manager will be responsible for day to day management of project activities.

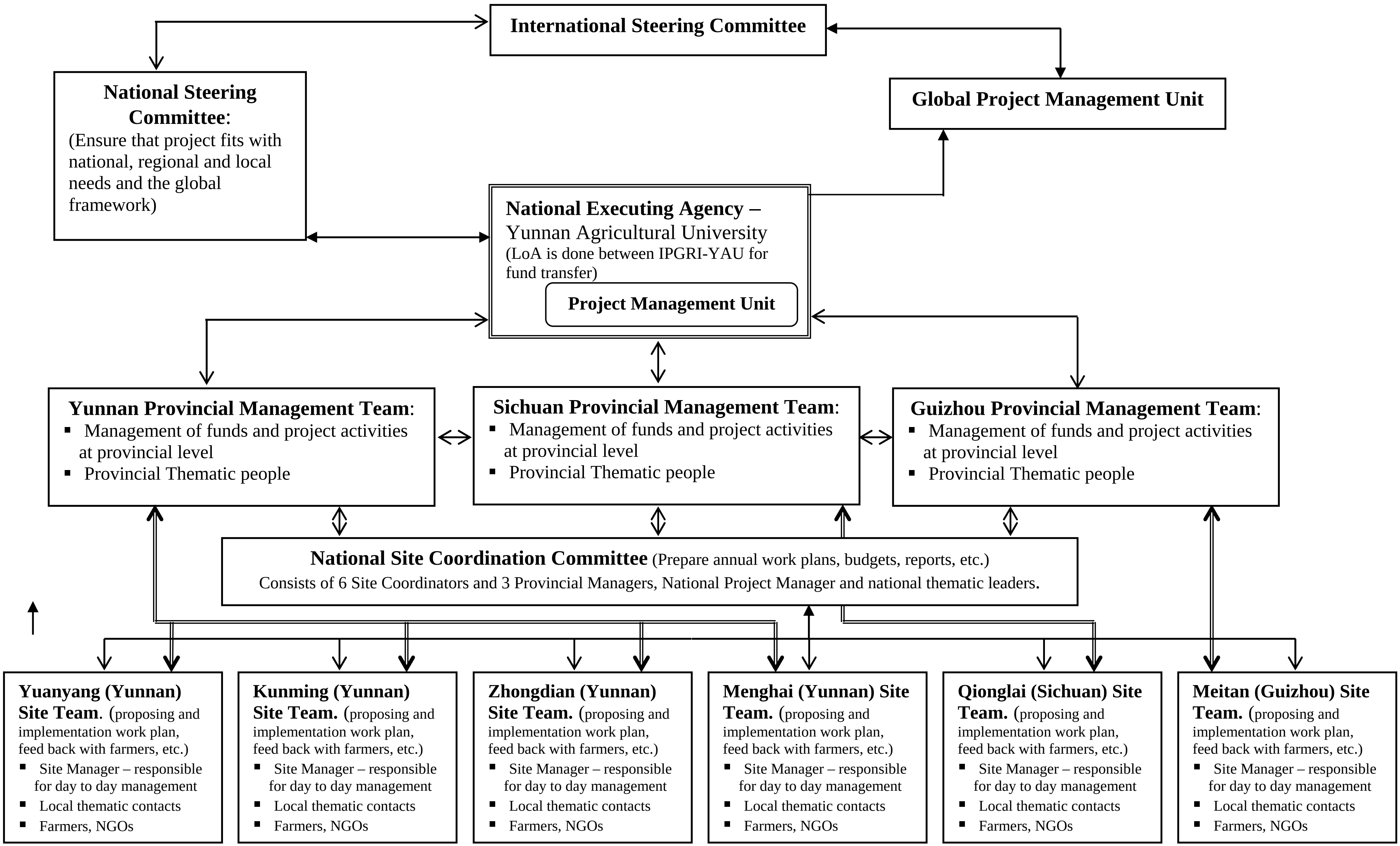
The Site Teams will be meeting quarterly each year.

List of stakeholders involved in China:

N		Name
1	ABTVS	Agricultural Broadcasting and TV School
2	CAS	Chinese Academy of Sciences
3	CBIK	Center for Biodiversity and Indigenous Knowledge
4	CDS	Center for Community Development Studies
5	CIEQB	Chinese Import and Export Quarantine Bureau
6	CNCAB	China National Center for Agriculture Biodiversity
7	DOA	Department of Agriculture (Yunnan, Sichuan and Guizhou)
8	DOE	Department of Education of Yunnan Province
9	DOF	Department of Finance of Yunnan Province
10	DOP	Department of Propaganda of Yunnan Province
11	DOF	Department of Finance of Yunnan Province
12	DOST	Department of Science & Technology of Yunnan Province
13	ED	Ethnic Department of Yunnan Province

14	FAS	Farmer Associated Society
15	FU	Fudan University
16	GAAS	Guizhou Academy of Agricultural Sciences
17	GASS	Guizhou Academy of Social Sciences
18	GU	Guizhou University
19	IRDC	Integrated Rural Development Center of GAAS
20	KIB	Kunming Institute of Botany of CAS
21	LAB	Local Agricultural Bureau
22	LATES	Local Agricultural Technology Extension Station
23	LFSC	Local Farm Supply Company
24	LSC	Local Seed Company
25	LTS	Local Technical School
26	LVLC	Local Village/Community Leadership Committee
27	MOA	Ministry of Agriculture
28	MOE	Ministry of Education
29	MOF	Ministry of Finance
30	MOLR	Ministry of Land and Resources
31	MOST	Ministry of Science & Technology
32	NATESC	National Agricultural Technology Extension Service Center
33	PAO	Poverty Alleviation Office of Yunnan Province
34	PRA	Participatory Rural Appraisal Network (Yunnan & Guizhou)
35	RDRC	Regional Development Research Center
36	SAAS	Sichuan Academy of Agricultural Sciences
37	SEPA	State Environmental Protection Administration
39	STPA	Science and Technology Popularity Association of Yunnan Province
40	WF	Women Federation of Yunnan Province
41	YAAS	Yunnan Academy of Agricultural Sciences
42	YASS	Yunnan Academy of Social Sciences
43	YAU	Yunnan Agricultural University
44	YBTVB	Yunnan Broadcasting and TV Bureau
45	YEPB	Yunnan Provincial Environmental Protection Bureau
46	YIG	Yunnan Institute of Geography
47	YNAS	Agronomy Society of Yunnan Province
48	YNBRD	Bio-Resources Innovative Development of Yunnan Province
49	YNCS	Crop Society of Yunnan Province
51	YNPPS	Plant Protection Society of Yunnan Province
52	YNSS	Seed Society of Yunnan Province
53	YU	Yunnan University

Project management and implementation structure in China:



Institutional profile for China stakeholders:

Country Research Partners	
Institution	**Role in the Project**
Yunnan Agricultural University (YAU): A comprehensive university established in 1938, develops agricultural education, science and technology by means of undertaking fundamental and applied research; teaches at all levels of higher education and additional professional education on wide range of agriculture, economics, social and humility sciences, engineering, education, and administration; focuses research on Sustaining Control of the Rice Blast by using biodiversity that has made its theoretical and practical achievements recognized well in worldwide; conducts research and development of the crops through multi-disciplinary research team from different colleges and institutes: • The Key Laboratory for Plant Pathology of Yunnan (KLPP) • School of Plant Protection (SPP) • School of Agriculture and Biotechnology (SAB) • Rice Research Institute (RRI) • School of Resources and Environment (SRE) • School of Economics and Trade (SET) • School of Humanities and Social Science (SHSS) • School of Science and Information (SSI)	As National Executing Agency and member of national steering committee. Housing of Project Management Unit and implementation of project activities and coordinating project partners in China. Maintaining accounts and producing activity reports; undertaking overall survey; establishing field experiment and demonstration plots in villages and farmer households; elaborating methodologies and protocols on the crop production and *in situ*/on-farm conservation; developing various technical packages of using crop biodiversity for disease/pest management; assessing existing database; developing database and methodologies for data analysis; holding degree or non-degree training program of the project; organizing national/regional training courses, workshops, and scientific conferences on agrobiodiversity.
China National Center for Agriculture Biodiversity (CNCAB): Funded by Central and Provincial Government in 2002. Educational and research institution specializing in conservation and the use of biodiversity against crop disease management using integrated traditional agriculture approaches and modern biotechnologies. Equipped with excellent hard-ware, including multi-media classrooms, computerized management systems, a library, access to the internet, conference rooms, laboratories for molecular and genetic research of plant, animal, and microbiological diversity.	Hosting international/national/regional training courses; carrying out overall researches on sustainable agriculture, agronomy, plant biology, pathology, entomology, integrated pest management (IPM), microbiology, and genetics; providing technology and information systems.
Yunnan Academy of Agricultural Sciences (YAAS): Established in 1976 as the center for comprehensive research on agricultural sciences in Yunnan Province. The main research focuses are applied technology and agricultural exploration. Its main research tasks from national and provincial government include: study on big issues in agricultural production; demonstration, extension, and transformation of new agricultural technologies. At its Institute of Biological Technologies & Crop Germplasm	Providing information on distribution and genetic diversity status of the local crop landraces in Yunnan; recommending local crop varieties use for mixture cropping against diseases and pests; hosting training on collection, identification, and conservation of crop germplasm resources; participating biology and genetic studies of

Resources, more than 17,000 accessions of crop genetic resources including rice, wheat, maize, barley and other minor cereal crops have been collected and preserved. Utilization and evaluation on PGR have been carried out. Indigenous knowledge (IK) related to PGR have been collected and analysed to conserve better PGR both *in situ* and *ex situ* as well as to protect farmers' right.	the current existing local varieties of rice, maize, faba bean, and barley in Yunnan. Recommending and providing local varieties use after multiplication of the crop varieties; training on Indigenous Knowledge collection and documentation. Participatory management of PGR and breeding.
Sichuan Academy of Agricultural Sciences (SAAS): Established in 1938 as the center for comprehensive research on agricultural sciences in Sichuan Province. The main tasks and research direction at its Plant Protection Institute are to study the monitor, systematic control and integrated management techniques of diseases, pests, weeds and rodents, which induce damages on the main crops in various ecotypes of Sichuan province; identify diseases or pests resistance and screen antigen of crop varieties such as of rice and wheat; undertake molecular biology, experiment and examination of effects and residues of the new pesticides, etc. At its Crop Research Institute, more than 4500 accessions of crop germplasm including rice, wheat, maize, oil seeds, sweet potato are conversed.	Providing information on distribution and genetic diversity status of the local crop landraces in Sichuan; recommending local rice , maize and faba bean varieties use for mixture cropping against disease and pest management; participating biology and genetic studies of the current existing local varieties and pathogen of rice, maize and faba bean in Sichuan; establishing field experiment and demonstration plots of the rice, maize and faba bean mixture cropping in villages and farmer households; elaborating methodologies and protocols on the rice, maize and faba bean reproduction and *in situ*/on-farm conservation.
Guizhou Academy of Agricultural Sciences (GAAS): Established in 1903 as the center for comprehensive research on agricultural sciences in Guizhou Province, covering research on 30 specialties including crop breeding, cultivation, microbiology, biotechnology, animal husbandry and veterinary, plant protection, agro-economics, soil and fertilizer, crop germplasm etc.	Providing information on distribution and genetic diversity status of the local crop landraces in Guizhou; recommending local rice varieties use for mixture cropping against disease and pest; participating in biology and genetic studies of the current existing local varieties and pathogen of rice in Guizhou; establishing field experiment and demonstration plots of the rice mixture cropping in villages and farmer households; elaborating methodologies and protocols on the rice reproduction and *in situ*/on-farm conservation.
Kunming Institute of Botany of CAS (KIB-CAS the Chinese Academy of Sciences): A branch of CAS (the Chinese Academy of Sciences) with more than 60 years of history on comprehensive multi-disciplinary research on the biodiversity and bioresources of the unique subtropical broad-leaved forests and those of the Himalayan sub-alpine vegetation. As a major part of the 'Research Base for Bio-resources and Biodiversity Conservation base in Southwest China, the studies of plant biogeography, photochemistry, ethnobotany, and conservation biology are now leading these fields in the botanical circle of China. Its Institute of Ethnobotany (IE-KIB), dedicated to the preservation, collection, and research of the indigenous environmental knowledge and the cultural	Member of National Steering Committee. Participating in ecology, indigenous environmental knowledge, and cultural diversity studies of rice, barley, maize, and faba bean at selected sites in Yunnan, Sichuan, and Guizhou; participating in biology and genetic study of the current existing local variety of rice, barley, and maize; agrobiodiveristy assessment; molecular biology of rice and barley; plant resources of the project site.

diversity of the Southwest China.	
Fudan University (FU): Founded in 1905 in Shanghai, now is one of the leading universities in China with a long history and an international reputation for academic excellence, offering a complete range of majors and disciplines: humanities, law, journalism, economics, management, information science and engineering, software, life science, nursing, basic medical sciences, public health, pharmaceutical technology, technology and engineering, international relations and public affairs, continuing education, network education and international cultural exchange.	Member of National Steering Committee. Promoting biodiversity, population genetics and molecular biology of the selected crops; holding degree and/or non-degree training program of the project.
Guizhou University (GU): Named in 1951, now is a multidisciplinary provincial key university, consisting of fifteen colleges: Humanities, Economics and Administration, Foreign language and International Study, Law, Arts, Science, Chemistry and Bio-Chemistry, Information and Computer Science, Biology and Environmental Science, Agronomy, Forestry, Animal Science, Vocational Technology, people's Armed Forces, and Adult Education, Science and Technology.	Collecting and evaluating genetic diversity of rice, maize, and faba bean landraces in Guizhou; studying effects of bio-pesticides on crop genetic diversity and the control of pests; undertaking cropping systems analysis.
Linkage and Support Unit (L&SU)	
Institution	**Role in the Project**
Bio-Resources Innovative Development of Yunnan Province (YNBRD):	Consulting on bio-resources legislations and regulations; providing information on policy making for conservation and use of agro-bio-resources.
Yunnan Provincial Environmental Protection Bureau (YEPB): The regional governmental function institution for monitoring and protecting eco-environment of Yunnan Province.	Consulting on environmental legislations and regulations; providing information on policy making for biosecurity assessment and biodiversity conservation.
Yunnan Academy of Social Sciences (YASS): Established in 1980. Its research focuses are Yunnan's ecology, culture, economy and society. Its Economic Research Institute is a multi-disciplinary center for advanced research and training in strategy and planning, regional economy, rural development, community development, resource economy, rural economics, demography, and sociology; providing the updated economic information for government policy decision and future development strategy.	Conducting the social and economic impact assessment as well as social-economic baseline survey of the project, motivating farmer's participation in the project.
Center for Biodiversity and Indigenous Knowledge	

(CBIK): A participatory learning organization, dedicated to biodiversity conservation and community livelihood development, as well as documentation of indigenous knowledge and technical innovations related to resource governance at community and watershed levels, which is supplementary for government works. The organization was established in 1995 as a membership non-profit organization. Its more than 100 members include research professionals, development practitioners and resource managers. CBIK aims to explore alternative development approaches for working directly with indigenous people and communities to enhance their livelihoods and maintain cultural and biological diversity through application of indigenous cosmovision knowledge, and innovative technology in the environment of rapid change and uncertainty faced by local people in SW China. CBIK also works to promote local and regional inter-sectorial and intercultural dialogue and communication among rural communities, NGOs, academia and governmental agencies. For this purpose, it conducts interdisciplinary research, facilitation for participatory development, consultation for cultural identity, networking for information sharing, and capacity building for watershed governance and livelihood development.	Assessing impact of indigenous knowledge on use and conservation genetic, biodiversity of rice, barley, maize, and faba bean at selected sites in Yunnan; Supporting for participatory action research organized by the farmer's group in the community level; Identifying and promoting local methods for farmers to efficiently use crop diversity information; Technique supporting and organizing for establishing farmer association and farmer field school; Assisting farmer's participation in the project; Designing and offering short-term training courses in participatory technology development, participatory action research; Documentation of traditional knowledge and their use in agrobiodiverstiy assessment; participatory monitoring and evaluation, and facilitation skill for workshop and field work with local community.
Yunnan Institute of Geography (YIG): Subordinated to Yunnan University (YU).	Providing biophysical information for the experimental site selection and description.
Regional Development Research Center (RDRC): Belongs to School of Resource, Environment and Earth Science, Yunnan University; undertakes studies on policy and management issues related to social development, industrial development, environment governance and ethnic development; enhances the managerial competence of development.	Identifying the training needs; designing and offering the short-term training courses in PRA, Gender & Development, and Community Leadership Development; conducting the social and economic impact assessment of the project.
Center for Community Development Studies (CDS): Operates as an independent, non-profit research organization working in the field of sustainable rural development. Undertakes studies, programs & projects on rural livelihood security issues, community-based natural resources management, policy advocacy, good governance and village-level democracy. Extensive experiences in carrying out cross-disciplinary research and effectively coordinating and managing multiple funded projects and programs, implementing internationally, nationally and locally-supported projects and programs in rural poverty reduction, community-based natural resource management and grassroots organization capacity building. Nationally and internationally trained research professionals in agricultural and rural development, social forestry, anthropology, rural	Studies of related policy and policy framework. Developing and testing community conservation and development plans. Testing alternative methods and tools for exploring approaches for practical initiative which address agro-biodiversity with livelihood security issue. Enhancing capacity building of local community, government and other partners through training, seminar, workshops and other consulting services.

economics, community rural development, social development, ecotourism and environmental politics.	
Integrated Rural Development Center (IRDC): Subordinated to Guizhou Academy of Agricultural Sciences, is a non-profit institution rendering research, training and consulting; focuses its working areas on: participatory rural development and community-based natural resource management, capacity building for communities, government officials, researchers and extension workers, information and outreach.	Provide assistance for the organization of training relating to participatory rural development and community based conservation and use of crop diversity.
Guizhou Academy of Social Sciences (GASS): Established in 1979, is now consisting of 9 institutes. Its Rural Development Research Institute (**RDRI**) studies the relationship between rural economic development and national economic policies, the economic development strategy in the county, poverty-stricken area development, the relationship among environments, resources, and social economy development.	Holding the training of community-based natural resource management through Participatory Rural Appraisal (PRA) network; assessing indigenous knowledge and minority traditional culture on crop biodiversity.
Governmental Institutions	
Institution	**Role in the Project**
Ministry of Finance (MOF): Drafts strategies, plans, laws, regulations and reforms on finance, taxation, tariffs, state capital funds and debt; Supervises financial appropriation for economic development and restructuring, central government agencies, national defense, foreign affairs, regional development, technological renovation and agricultural.	Member of National Steering Committee. Enhancing co-funding by national/regional government.
Ministry of Agriculture (MOA): Formulates and implements agricultural and rural economic development strategies, programs, and policies; drafts laws and regulations on animal and plant quarantine; handles foreign cooperation and exchange related to agriculture.	Member of National Steering Committee. Assisting in coordination of project implementation; ensuring proper use of government's contribution/policy for specific activities; enhancing co-funding by national/regional government.
Ministry of Science and Technology (MOST): Formulates strategies and plans for science and technology development as well as policies, laws and regulations that accelerate socioeconomic development through science and technology; optimizes the allocation of science and technology resources and administering the science and technology budget; organizes international cooperation.	Member of National Steering Committee. Assisting in establishment of information network between stakeholders and implementers; enhancing co-funding by national/regional government.
Ministry of Education (MOE): Guides universities' undertaking of major national scientific research projects; oversees state key labs and research centers at higher education institutions; regulates overseas education activities and education organizations stationed	Member of National Steering Committee. Assisting in publishing and distributing public awareness materials and knowledge on importance of crop biodiversity for

abroad; oversees related fund raising, appropriations and investment; manages related foreign support and loans.	sustainable development; enhancing co-funding by national/regional government.
State Environmental Protection Administration (SEPA): Formulates and enforces guidelines, policies, laws and regulations for environmental management, pollution control, and environmental impact assessments of development plans and technological policies; helps develop a national program for sustainable development; promotes eco-agriculture and protects biodiversity.	Member of National Steering Committee. Developing recommendations on conservation and management of crop intra-specific diversity and their submission to the legislative bodies; ensuring proper use of government's contribution for specific activities.
Ministry of Land and Resources (MOLR): The national governmental function institution for monitoring and protecting land and natural resources.	Provide project related information.
National Agricultural Technology Extension Service Center (NATESC): Established in 1995 as a national governmental function institution of MOA. Constitutes of the former National Agricultural Technology Extension Station, National Plant Protection Station, National Seed Station, and National Soil and Fertilizer Station; provides over all country's new agricultural technology extension network, training, technical services, and policy consultation.	Member of National Steering Committee. Assisting demonstration and extension of the project outcomes at different stages.
Yunnan Province Broadcasting & TV Bureau (YBTVB): The yunnan provincial broadcasting and YV programming organization.	Producing radio and TV programmes; distributing information via mass media; assisting in disseminating public awareness materials and knowledge on importance of crop genetic diversity in environment protection and ensuring food security.
Department of Propaganda (DOP) of Yunnan Province: The regional governmental function institution performed as mouthpiece. Focuses on culture and politics; Spreads information on Chinese government affairs and Chinese views on international affairs, as well as on economy, industry, trade, agriculture, sports and culture.	Distributing information via mass media; Assisting in disseminating public awareness materials and knowledge on importance of agro-biodiversity for sustainable development.
Department of Agriculture (DOA) of Yunnan Province: The regional governmental function institution under MOA.	Supporting extension network among stakeholders; assessing implementation results.
Department of Finance (DOF) of Yunnan Province: The regional governmental function institution under MOF.	Providing co-funds for the project.
Department of Education (DOE) of Yunnan Province: The regional governmental function institution under MOE.	Implementing the training strategy.
Department of Science and Technology (DOST) of Yunnan Province:	

The regional governmental function institution under MOST.	Monitoring implementation of the project; providing co-funds.
Yunnan Provincial Environmental Protection Bureau (YEPB): The regional governmental function institution under SEPA. An interdisciplinary body of natural and social science expertise focused on the regional environmental issues, operating at the interface between scientific and decision-making instances.	Monitoring and evaluating agro-environmental impact.
Other Organizations	
Organization	**Role in the Project**
Science and Technology Popularity Association (STPA) of Yunnan Province:	Assisting training and extension.
Poverty Alleviation Office (PAO) of Yunnan Province:	Assisting in capacity-building, training and extension in rural area.
Ethnic Department (ED) of Yunnan Province:	Assisting training and extension for minority farmers.
Women Association (WA) of Yunnan Province:	Assisting in capacity-building for female farmers.
Local Agricultural Bureau (LAB):	Organizing extension at the selected sites.
Local Seed Company (LSC):	Proving and conserving elite and local varieties.
Local Agricultural Technology Extension Station (LATES):	Implementing extension and training.
Local Technical School (LTS):	Assisting technology and information dissemination.
Local Village/Community Leadership Committee (LVLC):	Undertaking technology adoption.
Agronomy Society of Yunnan Province (YNAS):	Assisting technology and information dissemination.
Crop Society of Yunnan Province (YNCS):	

	Assisting technology and information dissemination.
Plant Protection Society of Yunnan Province (YNPPS):	Assisting technology and information dissemination.
Seed Society of Yunnan Province (YNSS):	Assisting technology and information dissemination
Farmer Associated Society (FAS):	Organizing technology and information dissemination, and farmer field school.
Participatory Rural Appraisal (PRA) Network of Yunnan and Guizhou Province:	Assisting technology and information dissemination.

List of stakeholders involved from different sectors:

N	Sector	Stakeholders
1	Farmers	Female and male farmers
2	Research and training Institutes/Universities	CAS-KIB, CNCAB, FU, GAAS, GASS, GU, SAAS, YAAS, YASS, YAU, YIG, YU
3	Professional Organizations	CBIK, CDS, IRDC, RDRC, YNAA, YNCA, YNPPA, YNSA
4	Seed Companies	LSC
5	Ministries	MOA, MOE, MOF, MOLR, MOST, NATESC, SEPA
6	Extension	LAB, LATES, LFSC, LSC, LVLC, FAS, YNAS, YNCS, YNPPS, YNSS
7	Education	ABTVS, LTS
8	Media	Local newspapers, Radio, TV, YBTVB,
9	International Agencies	IPGRI, FAO, Ford Foundation in China, , IRRI, UNEP, UNDP
10	Local Authorities	DE, DOA, DOE, DOF, DOST, LVLC, PAO, STPA, WF, YBID, YEPB

List of stakeholders involved from different project sites:

Local partners at project sites		
Project Sites	**Crops**	**Partners**
Goujie village Nanyang village Gucheng village of Yiliang County; Bangqiao village Lumeiyi village Shilin County Kunming, Yunnan Province	Rice, Faba Bean	Yunnan Agricultural University (YAU) Yunnan Academy of Agricultural Sciences (YAAS) Yunnan Academy of Social Sciences (YASS) Regional Development Research Center (RDRC) Center for Community Development Studies (CDS) Local Agricultural Bureau (LAB, including agricultural extension station, plant protection station and environment protection station) Individual farmers
Xiaoshuijing village Dayutang village Shengcun village Amengkong village Yuanyang County Honghe Prefecture Yunnan Province	Rice	Yunnan Agricultural University (YAU) Yunnan Academy of Agricultural Sciences (YAAS) Yunnan Academy of Social Sciences (YASS) Regional Development Research Center (RDRC) Center for Community Development Studies (CDS) Local Agricultural Bureau (LAB, including agricultural extension station, plant protection station and environment protection station) Individual farmers
Sicun village Nixi village Shangri-la County Diqing Prefecture Yunnan Province	Barley	Kunming Institute of Botany of CAS (KIB-CAS the Chinese Academy of Sciences) Yunnan Agricultural University (YAU) Center for Biodiversity and Indigenous Knowledge (CBIK) Regional Development Research Center (RDRC) Center for Community Development Studies (CDS) Local Agricultural Bureau (LAB, including agricultural extension station, plant protection station and environment protection station) Individual farmers
Xiding village Hanizu village Jiuguo village Manma village Nannong village Menghai County Xishuangbanna Prefecture Yunnan Province	Rice	Yunnan Academy of Agricultural Sciences (YAAS) Yunnan Agricultural University (YAU) Yunnan Academy of Social Sciences (YASS) Regional Development Research Center (RDRC) Center for Community Development Studies (CDS) Local Agricultural Bureau (LAB, including agricultural extension station, plant protection station and environment protection station) Individual farmers
Meitan county Zunyi Profecture Guizhou Province	Rice	Guizhou Academy of Agricultural Sciences (GAAS) Guizhong University (GU) Integrated Rural Development Center (IRDC) Guizhou Academy of Social Sciences (GASS) Local Agricultural Bureau (LAB, including agricultural extension station, plant protection station and environment protection station) Individual farmers
Huojing village Wolong village Guyi village Qionglai County Sichuan Province	Rice Maize	Sichuan Academy of Agricultural Sciences (SAAS) Sichuan Academy of Social Sciences (SASS) Local Agricultural Bureau (LAB, including agricultural extension station, plant protection station and environment protection station) Individual farmers

ECUADOR – Public Involvement Plan:

The National Autonomous Institute of Agricultural Research (Instituto Nacional Autónomo de Investigaciones Agropecuarias - INIAP), which operates under the Ministry of Agriculture, will be the National Project Executive Agency in Ecuador. INIAP will host the Project Management Unit and will provide all necessary support for the effective implementation of the project activities.

National Steering Committee:

Following will be members of National Steering Committee in Ecuador:

1. National Executive Agency (INIAP)
2. Minister of Environment (MoE)
3. Minister of Agriculture (MoA)
4. Non-Governmental Organizations (NGOs) representative
5. Representation from a farmer organizations or a farmer
6. National Project Director
7. Global Project Manager/Representative of Global Executive Agency
8. National Project Manager (Member-Secretary)

The National Steering Committee will meet once every year.

National Technical/Thematic Team:

- Thematic leaders will be the specialists responsible for the main activities at site level
- Thematic leaders will be responsible for the development of activities in coordination with site partners
- Thematic leaders will assist in capacity building of site level thematic focal people

National Site Coordination Committee:

- The national site committee will be composed of eight members, one representative from each of the sites, a representative from a farmer organization and National Project Manager.
- A representative of the National Site Coordination Committee will be a member of the National Steering Committee on rotation basis
- Representatives of Site Teams will be members of National Site Coordination Committee on yearly rotation basis
- Responsibilities of the National Site Coordination Committee will be to coordinate, evaluate and establish the implementation policies of the project at site level, assess, develop and coordinate the training for farmers and partners at site level and assess and give follow up recommendations of the National Steering Committee

Members of National Site Coordination Committee will meet two times every year.

Site Teams:

- Six site teams will operate in the project: 1. Carchi, 2. Imbabura, 3. Bolivar, 4. Cañar, 5. Loja and 6. Manabi

- Site Teams will be integrated by broadly specialized experts at site level
- All partners working at the site will be represented in Site Teams
- Main responsibility of Site teams will be to plan and follow up activities at site level
- One member from each Site Team will be represented at the National Site Coordination Committee on rotation basis.

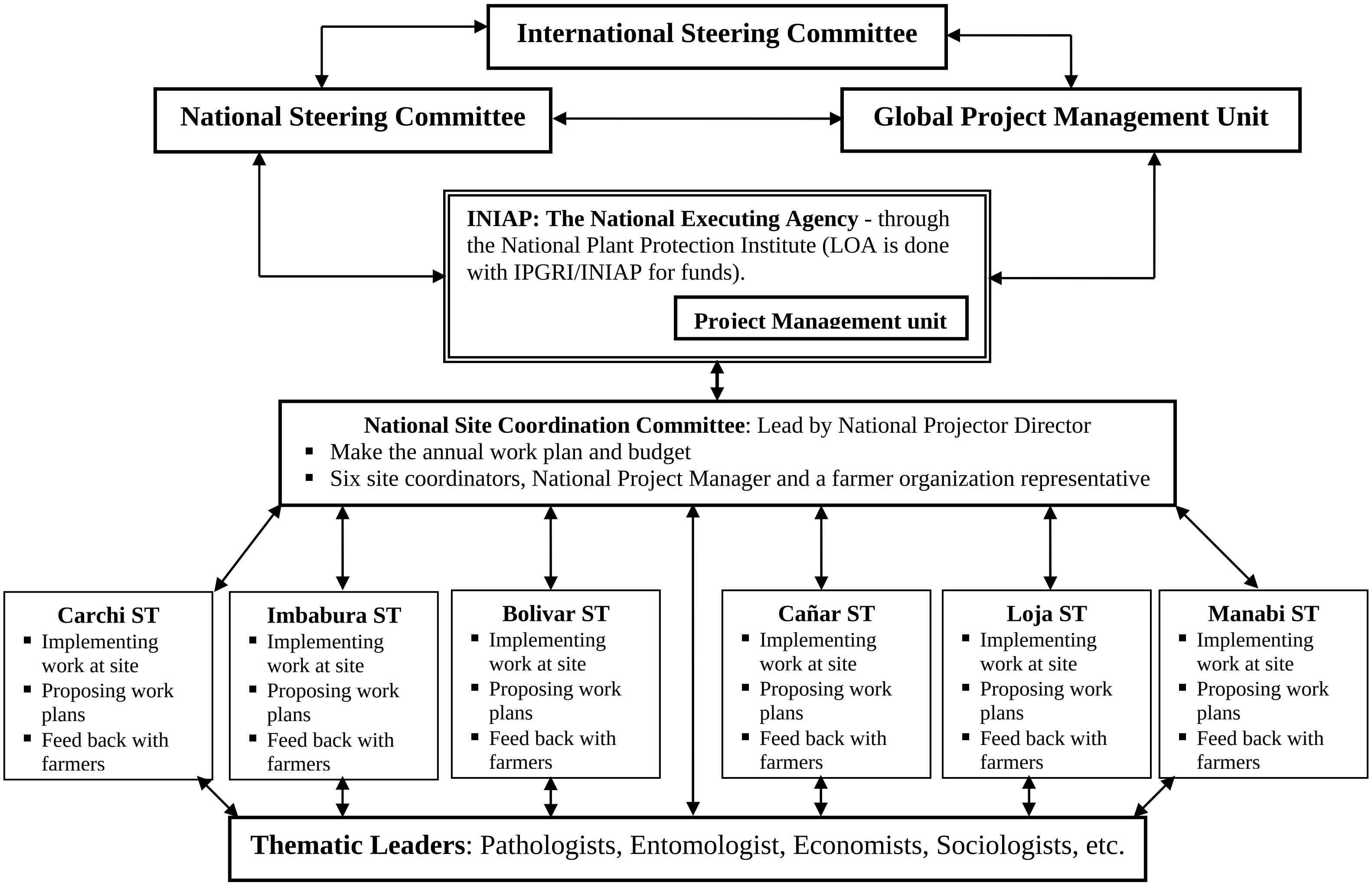
Members of Site Teams will meet four times in a year.

List of stakeholders involved in Ecuador:

DNPV	National Department of Plant Protection
DENAREF	National Department of Plant Genetic Resources and Biotechnology-INIAP**.**
PRONALEG	National Program of Legumes and Andean Grains-INIAP
PMA-INIAP	Maize Program-INIAP
UVTT	Technology Transfer and Validation Unit-INIAP
ECOPAR	Research Training and Technological Support Corporation for the Sustainable Manage of Tropical Ecosystems
FEPP	Fondo Ecuatoriano Populorum Progressio
FCA-UCE	Faculty of Agricultural Science-Central University of Ecuador
EPN	Polytechnic University of Ecuador
IASA	Andean Agricultural Institute of Higher Education
UCE	Catholic University of Ecuador
FAO	Food and Agricultural Organization
MMO	Municipality of Montufar
MOT	Municipality of Otavalo
CEA	Coordination of the Ecuadorian Agroecology
UTN	Northern Technical University
UCN	Northern Catholic University
MACRENA	Communitarian Management of Natural Resources
UBO	University of Bolivar
ITSSP	Technical Institute of San Pablo
UTT-Chillanes	Technology Transfer Unite-MAG
GPB	Provincial Government of Bolivar
PHD	Promocion Humana Diosesana
MSM	Municipality of San Miguel
MCH	Municipality of Chillanes
TUCAYTA	Corporation of Indigenous and Peasant Organizations of the group Cañaris (*Corporacion de Organizaciones Indigenas y Campesinas Cañaris*)
GPC	Provincial Government of Cañar
MCA	Municipality of Cañar
AAI	Agronomist Indigenous Association
DEIB	Intercultural Bilingual Educational Organization
UTT-Cañar	Technology Transfer Unite-MAG
UPML	Popular Union of Women of Loja

AGROC	Agro Artisan Association of El Carmen
ULA	Catholic University Alfaro
MCAR	Municipality of El Carmen
PROLOCAL	Local Project for Plantain
UESD	Equinoctial Technological University of Santo Domingo

Public Involvement Plan in Ecuador:



Partners profile and role:

<table>
<tr><th colspan="2">Executing Agency
National Autonomous Institute of Agricultural Research (Instituto Nacional Autónomo de Investigaciones Agropecuarias - INIAP)</th></tr>
<tr><td>Profile:
INIAP has more than 40 years of history on agricultural research in Ecuador. Officially INIAP initiated in 1959 with funding support from USA. One of the most important operational changes in its history was in 1992 when it was constituted as an autonomous and decentralized organization in legal, administrative, finance, and technical terms.

INIAP mission is to release technology and specialized services to increase agricultural productivity and boost national agro-biodiversity. Its research programs focuses on different crops such as African palm, rice, cocoa, coffee, banana and plantain, soybean, potato, maize, bean, faba bean, pea, minor cereals (wheat and barley), Andean fruits (cherimoya, three tomato, tobacco and naranjilla), apple and peach, agroforestry, and animal production. National departments of INIAP are plant protection, soil and water management, plant genetic resources and biotechnology, food quality (food nutritional analysis), planning, agricultural economics and biometrics.

INIAP has 230 scientists and technicians and has seven experimental stations. In the Litoral (coastal area), Experimental Station of Santo Domingo is located in Santo Domingo-Pichincha, Experimental Station of Pichilingue is located in Quevedo-Los Rios, Experimental Station of Boliche in Milagro-Guayas and experimental Station of Portoviejo-Manabi. In the Sierra (highland or Andean) region is located the Experimental Station of Santa Catalina in Mejia-Ecuador and the Experimental Station of Chuquipata in Azogues-Cañar and in the Amazonian (Amazon of Ecuador) region is located the Experimental Station of Napo-Payamino in Napo. In addition three experimental farms in Tumbaco-Pichincha, Bulcay-Azuay and Palora-Zamora Chinchipe complement activities of the main experimental stations.
INIAP has released 183 improved varieties of crops such as potato, bean, barley, wheat, cocoa, oat, rice, cotton, amaranth, pigeonpea, maize, chili, groundnut, coffee, cowpea, soybean, faba bean, African palm, quinoa, sorghum, grasses, cassava, and others. Additionally, INIAP offers services for soil and water analysis, clinical plant pathology, and food quality analysis.

INIAP has signed various agreements with CGIAR centers such as CIMMYT, CIP, IPGRI, and CIAT as well as research contracts with support organizations such as GTZ (Germany) and COSUDE (Switzerland), BID</td>
<td>Role:
Serve as National Executing Agency and member of National Steering Committee. Will host the National Project Management Unit and will provide all necessary facilities for its functioning. Through its Programs of maize (PMA) and legumes (PRONALEG), National Plant Protection Department (DNPV) and National Plant Genetic Resources and Biotechnology (DENAREF) and the Validation Technology Unites of Carchi, Bolivar, Loja and Manabi, INIAP will be responsible for the implementation of the project and coordinating project partners in Ecuador. It will maintain accounts and prepare activity reports; undertaking overall survey; establishing field experiment and demonstration plots in villages and farmer households; elaborate methodologies and protocols on the crop production and in situ /on-farm conservation; developing various technical packages on use of crop biodiversity for disease / pest management; assessing existing database; developing database and methodologies for data analysis; holding degree or non-degree training programme of the project; organizing national / regional training courses, workshops, and scientific conferences on agrobiodiversity.</td></tr>
</table>

(Inter-American bank of development), IDRC (Canada), IICA, FAO, Common Fund of Commodities (The Netherlands), CIRAD (France), FONTAGRO (Andean Countries), USAID and USDA (USA), International Foundation for Science (Sweden), and others.	
National Department of Plant Protection (DNPV), INIAP	
Profile: Since 1962 until 1992 the Departments of Entomology, Plant Pathology, Nemathology and Weed Science developed complementary technology to varieties improved by the different crop programs of INIAP. In 1993, Departments of Entomology, Plant Pathology, Nemathology and Weed Science were integrated in the National Plant Protection Department (DNPV) which is operating at national level at the Experimental Stations of Santa Catalina-Mejia, Pichilingue-Quevedo, Boliche-Milagro, Portoviejo-Portoviejo and Chuquipata-Azogues. Mission of the DNPV is to increase productivity of the main crops cultivated in Ecuador through the development of environmentally healthy technology in Plant Protection and also to offer laboratory services and consultancy. Main objectives of the DNPV are: (1) To develop scientific information on plant protection, (2) To develop integrated pest management technologies (IPM), (3) to organize training events on IPM technology, (4) to offer plant protection diagnostic services, and (5) to establish linkages at national and international level. IPM programs are developed in multidisciplinary teams and farmers play an important role through participatory approaches. Development of IPM programs are regularly conducted in collaboration with national and international universities (Ohio State University, Virginia State University, Michigan State University) and with international Centers (CIP, CIAT) and NGO`s. The DNPV has research facilities to work with etiology, epidemiology, and development of disease and pest control strategies. Conventional and at present also biotechnological tools are being implemented at the DNPV. Disease diagnosis (clinic) as a service for farmers is also an important activity of the department. DNPV also supports Breeding Programs in selecting new sources of resistant to pest and pathogens through studding pathogen evolution as well as characterizing resistance in breeding programs germplasm as well as wild relatives.	**Role:** The DNPV will be responsible of coordinating research as well as administrative activities with partners in Ecuador and also globally. It will maintain accounts and coordinate reports preparation, undertaking overall survey. Establishing field experiments and demonstration plots of the common bean, maize and faba bean and plantain mixture cropping in villages and farmer households. Recommending use of local crop varieties for mixed cropping against diseases and pests. Participating in biological and genetic studies of the current existing local varieties and pathogens of maize, common bean, faba bean and plantain. Elaborate methodologies and protocols on the crop production and *in situ* / on-farm conservation; developing various technical packages on use of crop biodiversity for disease / pest management; assessing existing database; developing database and methodologies for data analysis ; holding degree or non-degree training program of the project; organizing national / regional training courses, workshops, and scientific conferences.
National Department of Plant Genetic Resources and Biotechnology (DENAREF), INIAP	
Profile:	**Role:**

A major activity of DENAREF is to coordinate plant genetic resources activities at national level. The national gene bank was established in 1989 with major funding support from IPGRI, USDA, COSUDE, GTZ and others. It is located at Experimental Station "Santa Catalina" in INIAP. The major units of the genebank includes: seed bank, seed lab, tissue culture lab, molecular biology lab and different areas with field collections (field genebank). Presently there are 10 professional staff, which includes 6 technical staff and 4 students from different universities. Professional staff at this genebank has expertise in the fields of molecular biology, plant genetic resources management and others and also has higher education from USA, Costa Rica and France along with several short training courses from different countries. The long-term facility for base collection at this genebank includes two modules of capacity 66 and 40.6 m^3, respectively. Presently only one module is under operation which runs at -18^0C. The other genebank facilities include a room for slow drying (28.6 m^3) seed germination and testing. Genebank's present holding is about 12,000 accessions for long-term conservation, which includes about 70% native collections and 30% exotic collections. In addition to this the genebank also maintains about 8,000 collections in field genebank and *in vitro* collections, The field genebanks are maintained at three experimental stations of INIAP namely "Santa Catalina", "Napo" and "Pichilingue". Hence the total collection maintained by this genebank is about 20,000. In addition to field facilities for morphological characterization of germplasm collections, the genebank also has facilities for *in vitro* conservation through tissue culture and for molecular characterization (through RAPDs, SSRs and AFLP's) of selected accessions. DENAREF staff has characterized about 40% of the total preserved accessions for various quality traits and stress resistance. The publications of INIAP includes one crop germplasm catalogue, many national/international publications related to *ex situ* and *in situ* conservation of plant genetic resources and also maintains a database for 15,000 accessions. Additionally, DENAREF staff also has experience in *ex situ* and on-farm conservation. They are focal points for FAO initiative on Plant Genetic Resources, for regional networks REDARFIT, REDBIO and TROPIGEN, and for national meetings on biodiversity policies. DENAREF also keep living samples of patented varieties and also conduct analysis of DHI to submit patents.	Providing information on distribution of genetic diversity status of the local crop landraces. Recommending and providing use of local varieties. Establishing field experiments and demonstration plots of the common bean, maize and faba bean and plantain mixture cropping in villages and farmer households. Elaborating methodologies and protocols on maize, common bean, faba bean and plantain reproduction and *in situ*/on-farm conservation. Providing biophysical information for the experimental site selection and description. Proving and conserving elite and local varieties. Conducts training on collection, identification, and conservation of crop germplasm resources. Identifying and promoting local methods for farmers to efficiently use crop diversity information. Studies of related policy and policy framework. Consulting on bio-resources legislations and regulations. Providing information on policy making for conservation and use of agro-bio-resources. Providing information on policy making for biosecurity assessment and biodiversity conservation. Consulting on environmental legislations and regulations. Developing recommendations on conservation and management of intraspecific crop diversity and their submission to the legislative bodies.
National Program of Legumes and Andean Grains (PRONALEG), INIAP	

Profile: PRONALEG is responsible for developing improved varieties and production technology for bean, faba bean, pea, quinoa and Amaranths. The bean breeding program initiated in 1975 and its activities focused on improving varieties for the commercial market. Main breeding objectives are: (i) improve varieties with resistance to diseases, (ii) broad adaptations, (iii) tolerance or resistance to virus, (iv) yield and others traits. Breeding assistance with molecular markers (SSR´s) is being implemented at PRONALEG. Nineteen bean varieties have so far been released; six are of climbing type and 13 of bush type. Faba bean breeding programme initiated in 1975 and continued until 1996. The focus of faba bean breeding programme was to generate high yielding varieties with large grain, tolerance to diseases and those preferred for market. In Ecuador only two varieties have been released through direct selection of local varieties. Variety INIAP-440-'Quitumbe' and variety INIAP-441-'Serrana' were released for local consumption in North Ecuador. Both varieties released do not have resistances to rust, anthracnose virus and root rot. As a consequence of lack of economic resources all the breeding activities have been stopped. PRONALEG is working in collaboration with CIAT through projects such as FONTAGRO and IPRA and also with the Collaborative Research Support Program (CRSP) through a group of USA Universities with the economical support of USAID. These projects have strengthened areas as plant breeding, nitrogen fixation, seed production and assisting breeding. This program also supported professional training (M.Sc, Ph.D.) and short training at USA universities (Minnesota University).	**Role:** Providing information on distribution pattern and genetic diversity status of the local crop landraces. Establishing field experiments and demonstration plots of the common bean and faba bean mixture cropping in villages and farmer households. Elaborating methodologies and protocols on common bean and faba bean reproduction and *in situ*/on-farm conservation. Proving and conserving elite and local varieties. Conducts training on collection, identification, and conservation of crop germplasm resources. Identifying and promoting local methods for farmers to efficiently use crop diversity information. Recommending use of local crop varieties for mixed cropping against diseases and pests. Participating in biological and genetic studies of the current existing local varieties and pathogens of common bean and faba bean. Utilizing diversity reach strategies in improving new varieties.
Maize Breeding Program (PMA), INIAP	
Profile: Mission of the maize program of INIAP is to develop varieties, hybrids and crop technologies of maize suitable to different maize cropping conditions in Ecuador. Maize breeding programme of the highlands valleys initiated its activities during 1962. Main breeding objectives are to improve yield keeping quality and improve resistance to main pest and diseases. Seventeen out crossing varieties using germplasm from Mexico, Guatemala, Colombia, Peru and local collections have been so far released. At present 8 out of 17 varieties released are not in cultivation and the main causes hypothesized by maize breeders are farmer preference for local varieties due to local demand, its narrow adaptation and others. Therefore, breeders have now concentrated in improving	**Role:** Providing information on distribution and genetic diversity status of the local maize landraces. Establishing field experiments and demonstration plots of maize mixture cropping in villages and farmer households. Elaborating methodologies and protocols on maize reproduction and *in situ*/on-farm conservation. Proving and conserving elite and local varieties. Conducts training on collection, identification, and conservation of crop germplasm resources. Identifying and promoting local methods for farmers to efficiently use crop diversity information. Recommending use of local crop varieties for

local material. The last six out of the 17 improved varieties derive from landraces, which includes: *Blanco Blandito*, *Guagal*, *Chaucho*, *Mishca*, *Chulpi and Zhima*. CIMMYT is collaborating for training and specific funding activities for regeneration of genebank accessions. The Durable Resistance Program for the Andean Highlands of Ecuador, Peru and Bolivia have also collaborated with PMA in developing new material with better levels of resistance to Cob rot and other diseases.	mixed cropping against diseases and pests. Participating in biological and genetic studies of the current existing local varieties and pathogens. Utilizing diversity reach strategies in improving new varieties.
Technology Transfer and Validation Unite (UVTT), INIAP	
Profile: Main objectives of the UVTT are to transfer technology developed by Programs and Departments of INIAP. It also contributes in the execution of integral project where farmer training is key point, and develops and publishes documents related to farmers (e. g. manual, brochure, bulletins, pamphlets, etc). Recently, UVTTT has supported impact studies on agricultural technologies for improved varieties in use, subsidies program and others. The UVTT Unite also carrying out activities in coordination with NGO´s aiming farmers' development. The UVTT carried out participatory research using new methodologies as farmer field schools, participatory research and other technology transfer approaches. The UVTT Unite has offices and its activities are taking place in the main crop production areas of Ecuador. The UVTT-Carchi in the northern of Ecuador is mainly working with IPM programs on potato pest and diseases, validating new cultural practices for potato crop management and evaluating and selecting new potential potato germplasm. The UVTT-Bolivar in the central part of Ecuador is validating and transferring technology mainly on maize, bean and potato crops. The UVTT-Loja in the southern part of Ecuador is working on farmer organization and development on maize and barley and on other crop alternatives.	**Role:** Establishing field experiments and demonstration plots of maize, common bean, faba bean and plantain in their cropping system. Assessing impact of indigenous knowledge on use and conservation of genetic biodiversity at selected sites. Supporting for participatory action research organized by the farmer's group in the community level. Identifying and promoting local methods for farmers to efficiently use crop diversity information. Provides technical support for establishing farmer association and farmer field schools. Assisting farmer's participation in the project. Designing and offering short-term training courses in participatory technology development, PRA, Gender & Development, Community, Participatory action research, documentation of traditional knowledge and their use in agrobiodiverstiy assessment. Participatory monitoring and evaluation, and facilitation of workshops and field work with local community. Developing and testing community conservation and development plans. Enhancing capacity building of local community, government and other partners through training, seminar, workshops and other consulting services. Supporting extension network among stakeholders; Undertaking technology adoption; Assisting in publishing and distributing public awareness materials and knowledge on importance of crop biodiversity for sustainable development. Producing radio and TV programmes distributing information via mass media.
Central University of Ecuador. Faculty of Agricultural Science (UCE-FCA)	
Profile: The mission of the UCE-FCA is to educate professionals on Agriculture with a real knowledge of national and international reality with a strong commitment of searching technical and scientific solutions to production	**Role:** Participating in biological and genetic studies of the current existing local varieties and pathogens of maize, common bean and faba bean. Establishing field experiments and

and productivity of food, raw products, and export products through a solid formation to improve a rational management of the natural resources. Main objectives are: 1) orient the scientific research to evaluate the national policy to mediate in the area, production and yield of the main products of economical interest; 2) Reorganize the agricultural research according to new socioeconomic and policy scenarios in concordance with international treaties; 3) Incorporate new production technologies at the teaching-learning processes and strengthen the professional learning to actualize professors; 4) Plan of integral development of the academic centers (CADET-CADER) and supply them with modern commercial production which will allow professors and students to work in better conditions to increase academic standard and more efficiently transfer knowledge in the aim of solving agricultural problems based on research.	demonstration plots of maize, common bean and faba bean mixture cropping in villages and farmer households. Developing and testing community conservation and development plans. Conducting the social and economic impact assessment as well as socio-economic baseline survey of the project. Testing alternative methods and tools for exploring the approaches for practical initiative which address agro-biodiversity with livelihood security issue. Assisting in publishing and distributing public awareness materials and knowledge on importance of crop biodiversity for sustainable development.
Non governmental organizations (NGO´s)	
Corporation for Research, Education and Management of Tropical Agroecosystems (EcoPar)	
Profile: EcoPar is an Ecuadorian entity established officially on June 03 of 2002. The mission is to conserve tropical ecosystems and sustainable manage of natural resources through ecological studies, remediation and reforestation, training and consultancies to social organizations and private and public organizations. EcoPar cover the following thematic areas: forestry research on applied ecology and geography for conservation and development; management and participative conservation of natural resources in tropical ecosystems; training for communicatory management of natural resources; assistance interinstitutional agreements at national and international level; development of tools and methodologies for the development of environmental plans. EcoPar members are having experience in the field of biology, forestry, geography, sociology, anthropology botany, ecology, education, and public relationship. Multidisciplinary teams have been working with different governmental and non governmental educational organizations in the coastal, highlands and Amazon area of Ecuador.	**Role:** Assessing the socio economic baseline as well as the social and economic impact and of the project. Testing alternative methods and tools for exploring the approaches for practical initiative which address agro-biodiversity with livelihood security issues. Assisting in the establishment of information network between stakeholders and implementers. Assisting in publishing and distributing public awareness materials and knowledge on importance of crop biodiversity for sustainable development Producing radio and TV programme; distributing information via mass media; assisting in disseminating public awareness materials and knowledge on importance of crop genetic diversity in the context of environment protection and ensuring food security. Monitoring and evaluating agro-environmental impact. Enhancing capacity building of local community, government and other partners through training, seminar, workshops and other consulting services. Holding the training of community-based natural resource management through Participatory Rural Appraisal (PRA) network; assessing indigenous knowledge and minority traditional culture on crop biodiversity. Assisting demonstration and extension of the project outcomes at different stages Organizing technology and information

<table>
<tr><td></td><td>dissemination and farmer field schools. Assisting in capacity-building for female farmers.</td></tr>
<tr><th colspan="2">Fondo Ecuatoriano Populorum Progressio (FEPP)</th></tr>
<tr><td>Profile:
FEPP is a non-governmental organization created in 1970 and during last 30 years is associated with developmental programmes in Ecuador. The mission of FEPP is to assist the rural and semi-urban poor, without distinction of race, color or gender, with the realization of their development aims and aspirations and to improve their livelihood. This is done primarily through the following actions: 1) Raising of awareness regarding socioeconomic and political responsibilities and rights; 2) Consolidation of the social and legal organization of their communities and associated institutions and federations; 3) Provision of financial services, especially small credit facilities, allowing the rural and semi-urban poor for their better development.

Currently, FEPP is active in 20 provinces out of 22 provinces in Ecuador. The main areas of action of FEPP programmes for crop genetic resources conservation and food security are to:
Improve food production through improvement of traditional crops and practices as well as through the diversification of agricultural production based on low-input and sustainable methodologies
Increase quality of farm products and to decrease the post-harvest losses in order to increase farm incomes
Support commerce of farm products destined for the market
Provide support for community services projects such as providing school lunches
Propitiate processing and local transformation of farm production and to provide support for entry into market
Contribute to conservation and the management of natural resources, in particular through the introduction and use of sustainable land use practices, and
Promote and organize youth training and professional development schemes in order to create new employment opportunities and improve community services and welfare.</td><td>Role:
Assisting in establishment of information network between stakeholders and implementers. Assisting in publishing and distributing public awareness materials and knowledge on importance of crop biodiversity for sustainable development.

Producing radio and TV programme; distributing information via mass media. Monitoring and evaluating agro-environmental impact. Enhancing capacity building of local community, government and other partners through training, seminar, workshops and other consulting services. Holding the training of community-based natural resource management through Participatory Rural Appraisal (PRA) network; assessing indigenous knowledge and minority traditional culture on crop biodiversity. Organizing technology and information dissemination, and farmer field school. Assisting in capacity-building, training and extension in rural area. Assisting training and extension for minority farmers. Assisting in capacity-building for female farmers. Implementing the training strategy.</td></tr>
<tr><th colspan="2">Corporation of Indigenous and Peasant Organizations of the group Cañaris (TUCAYTA)</th></tr>
<tr><td>Profile:
TUCAYTA (Tucuy Cañar Ayllucunapac Tantanacuy) is the acronym in Quechua language of the NGO integrated by indigenous and peasants of 15 communities and four</td><td>Role:
TUCAYTA role will be very similar to FEPP. Assisting in establishment of information network between stakeholders and</td></tr>
</table>

agro-livestock cooperative from the Province of Cañar. 90 % of members of this organization are indigenous of the group Cañaris. TUCAYTA is a NGO established by the Ministry of Social Welfare on December 3 of 1998. The main objective of TUCAYTA is enhancing the sustainable use of natural resources as water, soil, seeds and local knowledge. TUCAYTA is based in the Cañar municipality in the province of Cañar. TUCAYTA activities are involving 7850 families composed by 90% indigenous and 10% of mestizos. TUCAYTA initiated its activities administrating the Potococha irrigation system and then the organization involved in technology transfer with an agro-ecological and managerial orientation. The save and credit cooperative Mushuc Yuyal is also administrated by TUCAYTA. Implementation of micro-companies to process barley, pea, faba bean and maize is also an activity of TUCAYTA. This NGO has also been involved in the development of a micro-companies to produce compost, organic horticulture, medicinal plants and natural products. Conservation of highland forest "paramos" is at present an important activity of TUCAYTA.	implementers. Assisting in publishing and distributing public awareness materials and knowledge on importance of crop biodiversity for sustainable development. Producing radio and TV programme; distributing information via mass media; assisting in disseminating public awareness materials and knowledge on importance of crop genetic diversity in environment protection and ensuring food security. Enhancing capacity building of local community, government and other partners through training, seminar, workshops and other consulting services. Holding the training of community-based natural resource management through Participatory Rural Appraisal (PRA) network; assessing indigenous knowledge and minority traditional culture on crop biodiversity. Assisting demonstration and extension of the project outcomes at different stages. Organizing technology and information dissemination, and farmer field school. Assisting in capacity-building, training and extension in rural area. Assisting in capacity-building for female farmers. Implementing the training strategy.

Following are stakeholders involved from different sectors:

Sector	Stakeholders
Farmers	UPML, TUCAYTA, AGROC, PROLOCAL, Female and male farmers
Research and training Institutes/Universities	DNPV, DENAREF, PRONALEG, PMA, UVTT, UTT-Chillanes, ECOPAR, FEPP, AAI, FCA-UCE, UCN, UTN, UBO, ULA, ITSSP, CEA, MACRENA, AAI, DEIB.
Professional Organizations	AAI, DEIB,
Ministries	MA, MAG
Extension	UVTT, UTT, ECOPAR, CEA, MACRENA, FEPP, PHD, AAI.
Education	UVTT, UTT, ECOPAR, FEPP, MAGRENA, PHD, CEA, MACRENA, AAI, DEIB, FAO, FCA-UCE, UCN, UTN, UBO, ULA, UESD, ITSSP, DEIB, MMO, MOT, GPC, GPB, MSM, MCH, MCA, MCAR.
Media	Local newspapers, Radio, TV
International Agencies	IPGRI, FAO, IRRI, CIAT, CIP, TNC, UNEP, UNDP
Local Authorities	MA, MAG, INIAP, FCA-UCE, UCN, UTN, UBO, ULA, UESD, ITSSP, DEIB, MMO, MOT, GPB, MSM, MCH, MCA, MCAR.

Potential stakeholders per region:

PICHINCHA:

DNPV	National Department of Plant Protection
DENAREF	National Department of Plant Genetic Resources and Biotechnology-INIAP.
PRONALEG	National Programme of Legumes and Andean Grains-INIAP
PMA-INIAP	Maize Programme-INIAP

UVTT	Technology Transfer and Validation Unit-INIAP
ECOPAR	Research Training and Technological Support Corporation for the Sustainable Manage of Tropical Ecosystems
FEPP	Fondo Ecuatoriano Populorum Progressio
FCA-UCE	Faculty of Agricultural Science-Central University of Ecuador
EPN	Polytechnic University of Ecuador
IASA	Andean Agricultural Institute of Higher Education
UCE	Catholic University of Ecuador
FAO	Food and Agricultural Organization
MAG	Ministry of Agriculture

CARCHI:

UVTT-Carchi	Validation and Transfer Technology Unite-INIAP
ECOPAR	Research, Training and Technological Support Corporation for the Sustainable Manage of Tropical Ecosystems
MMO	Municipality of Montufar
UTN	Northern Technical University
UTT-Montufar	Technology Transfer Unite-MAG

IMBABURA:

CEA	Coordination of the Ecuadorian Agroecology
MOT	Municipality of Otavalo
UTN	Northern Technical University
UCN	Northern Catholic University
MACRENA	Communitarian Management of Natural Resources

BOLIVAR;

UVTT-Bolivar	Validation and Transfer Technology Unite-INIAP
FEEP	“Fondo Ecuatoriano Populorum Progressio”
FAO	Food and Agricultural Organization
UBO	University of Bolivar
ITSSP	Technical Institute of San Pablo
UTT-Chillanes	Technology Transfer Unite-MAG
GPB	Provincial Government of Bolivar
PHD	“Promosion Humana Diosesana”
MSM	Municipality of San Miguel
MCH	Municipality of Chillanes

CAÑAR:

TUKAYTA	Families Union of Cañar
GPC	Provincial Government of Cañar
MCA	Municipality of Cañar
AAI	Agronomist Indigenous Association
DEIB	Intercultural Bilingual Educational Organization
UTT-Cañar	Technology Transfer Unite-MAG
CEA	Coordination of the Ecuadorian Agroecology

LOJA:

UVTT-Saraguro	Validation and Technology Transfer Unite-INIAP
FEEP	Fondo Ecuatoriano Populorum Progressium
CEA	Coordination of the Ecuadorian Agroecology
UPML	Community Union of Women of Loja

MANABI:

UVTT-El Carmen	Validation and Technology Transfer Unite-INIAP
AGROC	Agro Artisan Association of El Carmen
ULA	Catholic University Alfaro
MCAR	Municipality of El Carmen
PROLOCAL	Local Project for Plantain
UESD	Equinoctial Technological University of Santo Domingo

MOROCCO – Public Involvement Plan:

The Executive Agency in Morocco will be the Hassan II Institute of Agronomy and Veterinary Medicine (IAV), Rabat, which operates directly under the authority of Ministry of Agriculture, Rural Development, and Marine Fishery. A Project Management Unit will be based at the IAV, Department of Agronomy, Plant Genetics and Agrobiodiversity, Rabat, Morocco. The National Executing Agencies will work in close partnership with IPGRI in the Execution of the project.

National Steering Committee (NSC) of Morocco will consists of the following members:

1. Institut Agronomique et Vétérinaire Hassan II
2. Central Department of Crop production in the Ministry of Agriculture (DPVCTRF)
3. Ministry of Agricultural, Rural Development, and Fishery, Central Department of Crop Production (DPV)
4. Central Department of Technical Training, Research, and Development (DERD)
5. Provincial Directorate of Agricultural Development and Extension (Direction Provincial d'Agriculture, DPA) of Taounate Province
6. Representation of NGO from Taounate and Taza sites
7. Representation from Farmers
8. Representation from Farmers' Organizations (Chambre d'Agriculture and cooperatives)
9. Representation from local institutions
10. National Project Director
11. Representation from Global Executive Organization
12. National Project Manager (Member Sectary)

National Site Coordination Committee (NSCC): The National Site Coordination Committee includes the Site Coordinators, the National Project Director, and National Technical/Thematic leaders to insure cross site exchanges and linkages.

Site Teams (ST): Site Team include the Site Coordinator, representatives of each LTC, local representatives from local communities, government agencies, local NGOs. Among the members of ST will be representatives with skills and expertise in different disciplines relevant to the project activities. The composition of the ST is as follows:

- Site Coordinator
- Representatives of:
  - Farmers
  - NGOs
  - Development Organisation
  - Extension and Transfer staff
  - Members from Local Technical teams

National Technical/Thematic Team: The scientific leaders of each thematic area will be organized in a multidisciplinary working groups at the national level. Its members will be scientists and technical specialists from different stakeholders institutions at national and local levels and include local thematic focal points. In particular members will include expertise in:

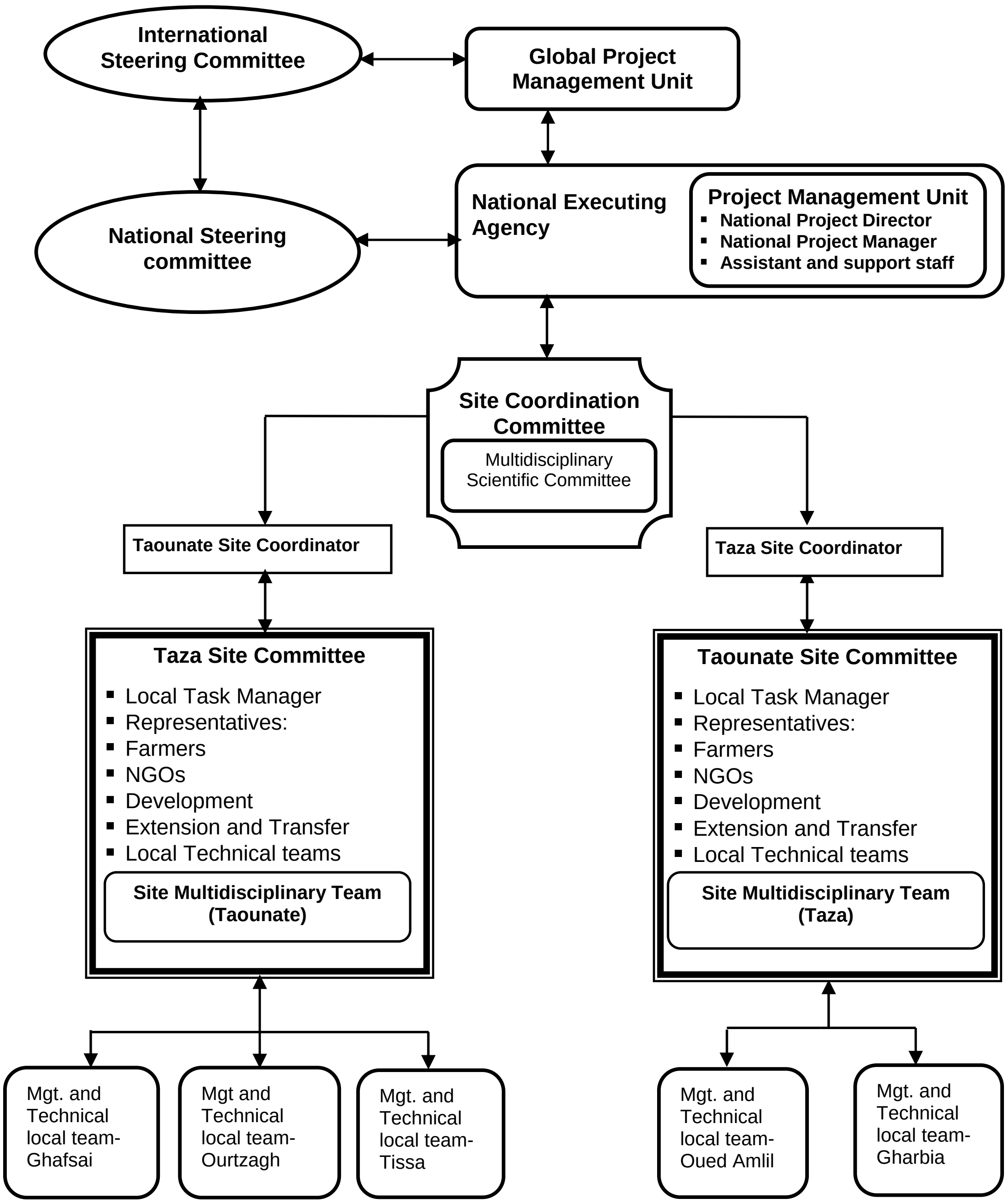
- Genetics
- Plant Pathology
- Entomology
- Agronomy
- Agroecology
- Economics
- Participatory approaches

List of stakeholders involved in Morocco:

1. Agence de Développement des zones du Nord (National Agency for Development of Northern Region of Morocco)
2. Association BOUAJOUL pour le developpement local du Douar Bouajoul, Commune Ghafsai
3. Association marocaine des producteurs de semences (AMMS)
4. Association of Local Development, Oued Amlil, Taza
5. Association of Local Development, Tissa
6. Association AFAK pour le developpement local du Douar Sidi Senoun, Commune Ourtzagh
7. Central Department of Plant Protection
8. Central Department of Crop production
9. Chambre d'Agriculture of Taounate and Chambre d'Agriculture de Taza
10. CT 3208 Ourtzagh (Center of Extension); CT 2307 Tissa, CT2302 Karia, CT Mokhrissate Chaouen
11. CT Oued Amlil DPA-Taza (Direction Provinciale d'Agriculture)
12. Direction de l'Enseignement, de la Recherche et de Développement
13. DPA-Taza (Direction Provinciale d'Agriculture)
14. Ecole National d'Agriculture
15. Hassan II Institute of Agronomy and Veterinary Medicine
16. Institut de technologie appliquée
17. Institut National de la Recherche Agronomique

18. Ministry of Agriculture, Rural Development, and Fishery
19. Ministry of Communication and Information
20. Ministry of Environment
21. Ministry of National Education, Higher Education, Professional Training, and Scientific Research (Ministère de l'Education Nationale, de l'Enseignement Supérieur, de la Formation des Cadres et de la Recherche Scientifique)
22. ORMVAL (Regional District of Irrigation Loukkos) is one of the nine regional development districts
23. Provincial Directorate of Agricultural Development and Extension (Direction Provincial d’Agriculture, DPA) Taounate

Administrative management for project execution in Morocco:



Institutional Profile for the project in Morocco:

Research Partners	
Institution	**Role in the Project**
Hassan II Institute of Agronomy and Veterinary Medicine (IAV): IAV is a comprehensive agricultural university established in 1968, deals with agricultural education, training, research and development. It plays an important role in the Moroccan National PGR programme. IAV sits on the National Council for Environmental Protection. IAV includes 43 departments covering all disciplines in agronomy sciences (crops production, agrobiodiversity, soil sciences, plant protection, animal production, social and economic sciences), Veterinary Medicine (all related disciplines), food sciences and technology, rural engineering and machinery and topography. This provides a unique situation with expertise in most disciplines related to agriculture, rural development and natural resources management; particularly in agriculture biodiversity. Many research programmes in the different departments focus on are directly related to research on *in situ* conservation and on-farm management of crop diversity. Agrobiodiversity focus group including representatives from different departments discusses orientation of research strategies in this area. IAV Hassan II has responsibility for national research in cultivated cereals, grain legumes, and other important field crops, breeding, PGR activities, collection, *in situ* conservation, *ex situ* conservation, evaluation, genetic analysis of diversity including molecular markers, GIS, documentation and data analysis, socio-economic studies, ethnobotany and human resources. IAV has the national mandate for Master and Ph.D. training in agricultural, as the main agricultural university that provides the majority of the Moroccan scientists and in general particularly for the Ministry of agricultural and ministry of environment. IAV is also the largest agricultural university in Africa and host a large population of foreign students from a large number of African countries who represent nearly 15 % of the total number of students enrolled annually. FAO awarded IAV on the world food day, October 2004 for the contribution to the improvement of farmers' livelihoods through the work on *in situ* conservation of agricultural biodiversity. Scientists from the institute developed expertise in the area of on-farm conservation and use of plant genetic resources for sustainable development. IAV participates to the National Environmental Council and are heavily involved in the preparation of the National Biodiversity Strategy and Workplan. IAV operates through it laboratories located in Rabat and Agadir campuses and through regional experimental stations	Under the Ministry of Agriculture, IAV was designated as the National Executing Agency and will serve member of national steering committee. It will host the Project Management Unit and provide offices and other support. Implementation of the project and national coordinating project partners in Morocco. Maintaining accountability and preparing project reports; undertaking overall survey; establishing field experiments and trials; conducting demonstration plots in villages and on farms; elaborating methodologies and protocols on the crop production and *in situ* on-farm conservation; developing various technical packages on use of crop biodiversity for disease and pest management; assessing existing database; developing database and methodologies for data analysis; Participatory management of PGR ; Participating in biological and genetic studies of the current existing local varieties and pathogens; holding degree or non-degree training program of the project; organizing national and regional training courses, workshops, and scientific conferences on agrobiodiversity; oversea and follow all project activities.

and on-farm trials in references regions in partnership with the network it established with farmers and farmers associations. Most research projects conducted at IAV are defined and conducted with participation of partners, clients, regional and local stakeholders. IAV developed strong partnerships relations with national and international research organizations, development structures and services, private sector and NGO's.	
Ecole National d'Agriculture (ENA): ENA is located in Meknes, near the two project agroecological regions. The National School of Agriculture offers training in M.Sc., in applied Agronomy, Rural Sociology and Rural Development. Students from this institute are able to gain practical field experience by their participation in the project activities. Close collaboration has been active with IAV in the area of student exchange, student advisory committees and joint research and development activities. ENA has developed very good facilities for interface between research and development for technology transfer and extension under the national strategy of development.	Close to the project sites, ENA will contribute in hosting national and regional training courses; carrying out research on sustainable agriculture, agronomy. Providing facilities and hosting training on technology transfer and extension to NGO's and development services; providing technology and information systems. Studying the effects of bio-pesticides on crop genetic diversity and the control of pests; undertaking cropping systems analysis.
Institut National de la Recherche Agronomique (INRA) : INRA is an agricultural research institute under the Ministry of Agriculture. INRA will be working in the project through its national agricultural research programmes in Cereals, Soil Science and the Environment, and Socio-economics and Genetics. Project partners from the institute have good experience in PGR activities for cultivated species, evaluation and breeding, socio-economic surveys and policy. INRA operates through six regional centers with experimental stations distributed over the country territory.	Providing information on IPM (integrated pest management program) on cereals and grain legumes in semi-arid region. Distribution and genetic diversity status of the crop in their *ex situ* collections. Recommending and providing use of local varieties for reproduction of the crop varieties; providing support for linking *ex situ* conservation to *in situ* conservation of genetic diversity; strengthening participatory plant breeding as an option to add value to local crop landraces; approaches for linking breeders methods to farmers selection methods; participating in biological and genetic studies of the current existing local barley varieties and pathogens.
Direction de l'Enseignement, de la Recherche et de Développement (DERD): Under the Ministry of Agriculture, DERD coordinates technical training in agricultural schools and applied agricultural technologies. It is also involved in the applied research, technology transfer, and mainstreaming of research results into development through targeted actions. DERD has strong partnerships with research and training institutes. It is the main structure for mainstreaming research results into development through extension and information	Disseminating information; Contributing to enhancing resources for training; Supporting brochures and flyers publications; Helping in up-scaling the project activities; linking to other ministerial departments.

dissemination via technology transfer bulletin edited in cooperation between IAV and DERD in the Ministry of Agriculture framework. DERD is also strongly linked to DPV and DPVCTRF departments under the mission of establishing national agricultural development strategy.	
Educational Institutions	
Primary and high Schools: In each of the provinces hosting the project sites, there are primary and high schools targeting teaching in agriculture disciplines under the ministry of education.	Local project partner. Curriculum development and revision; Local Public awareness.
Local Technical Agricultural Training (ITA- institut de technologie appliquée) : In each project site there are technical schools and institutes of Applied Agricultural Technology.	Supporting organizing local and regional training; Holding the training of community-based natural resource management; Local Experimental Stations; Contributing to on-farm demonstrations for farmers; assessing indigenous knowledge and minority traditional culture on crop biodiversity. Collecting and evaluating genetic diversity of barley and faba bean landraces in Taounate and Taza sites.
Extension - Development	
Provincial Directorate of Agricultural Development and Extension (Direction Provincial d'Agriculture, DPA) Taounate: This is regional implementing agency of the development programmes and local extension institutions under the Ministry of Agriculture. In each province DPA authority extends over all the territory of the province. It has the responsibility for regional development plans and priorities in line with national strategies. DPA implements the development program actions through CT's (Centres de Travaux), which are local centrers of development and extensions. Each CT controls a subdivision of a district of the province that includes a number of communities each of which contains a number of villages. Each CT has sub-CT's that cover 1 or 2 communities. This structure ensures the proximity of the extension to the farmers and farming communities. These services are in close contact with local farmers, they are responsible for extension and technology transfer. Personal representing different services will be part of the site project teams. These personnel are important implementers of the project in different project sites.	Member of National Steering Committee. Participating in agronomy, indigenous environmental knowledge, and agroecosystems studies of faba bean, grain legumes, barley, and cereals in the Taounate province; participating in participatory research involving the existing local varieties of faba bean and barley; *in situ* assessment of agrobiodiveristy through farmers' knowledge; Organizing technology and information dissemination, and farmer field school Collecting and evaluating genetic diversity of barley and faba bean landraces in Taounate.
DPA-Taza (Direction Provinciale d'Agriculture): This is regional implementing agency of the development programmes and local extension institutions under the Ministry of Agriculture in the province of Taza. DPA implements the development program actions through CT's (Centres de Travaux), which are local centrers of development and extensions. Each CT controls a subdivision of a district of the	Participating in agronomy, indigenous environmental knowledge, and agroecosystems studies of faba bean, grain legumes, barley, and cereals in the Taza province; participating in participatory research involving the

province that includes a number of communities each of which contains a number of villages. Each CT has sub-CT's that cover 1 or 2 communities. This structure ensures the proximity of the extension to the farmers and farming communities. These services are in close contact with local farmers, they are responsible for extension and technology transfer. Personal representing different services will be part of the site project teams. These personnel are important implementers of the project in different project sites.	existing local varieties of faba bean and barley; *in situ* assessment of agrobiodiveristy through farmers' knowledge; Organizing technology and information dissemination, and farmer field school; Collecting and evaluating genetic diversity of barley and faba bean landraces in Taza site;
CT 3208 Ourtzagh (Center of Extension); CT 2307 Tissa, CT2302 Karia, CT Mokhrissate Chaouen: Each CT controls a subdivision of a district of the province that includes a number of communities each of which contains a number of villages. Each CT has sub-CT's that cover 1 or 2 communities. This structure ensures the proximity of the extension to the farmers and farming communities. These services are in close contact with local farmers, they are responsible for extension and technology transfer. Personal representing different services will be part of the site project teams. These personnel are important implementers of the project in different project sites.	Local project partner. Member of National Steering Committee. Participating in agronomy, indigenous environmental and agricultural knowledge, and agroecosystems studies of faba bean, grain legumes, barley, and cereals in the Taounate province; Extension; Demonstrations; Implementing farmer field school; Collecting and evaluating genetic diversity of barley and faba bean landraces in Taounate site.
CT Oued Amlil DPA-Taza (Direction Provinciale d'Agriculture): This CT is one of the largest of DPA-Taza. It controls a subdivision of a district of the province that includes a number of communities each of which contains a number of villages. This structure ensures the proximity of the extension to the farmers and farming communities. These services are in close contact with local farmers, they are responsible for extension and technology transfer. Personal representing different services will be part of the site project teams. These personnel are important implementers of the project in different project sites.	Local project partner. Member of National Steering Committee. Participating in agronomy, indigenous environmental and agricultural knowledge, and agroecosystems studies of faba bean, grain legumes, barley, and cereals in the Taounate province; Extension; Demonstrations; Implementing farmer field school; Collecting and evaluating genetic diversity of barley and faba bean landraces in Taza sites.
ORMVAL (Regional District of Irrigation Loukkos) is one of the nine regional development districts.	Stations for trials and experiments on diseases and pests; seed multiplication, etc.
Governmental Institutions	
Institution	**Role in the Project**
Ministry of Agriculture, Rural Development, and Fishery: Formulates and implements agricultural and rural development strategies, programmes, and policies; Handles foreign cooperation and exchange related to agriculture. Oversees key labs and research centers at higher education institutions under its authority; oversees related fund raising, appropriations and investment.	Assisting in coordination of project implementation; ensuring proper use of government's contribution and policy for specific activities; ensuring proper use of government's contribution for specific activities.

Central Department of Plant Protection: Technical Control, Quality Control and Frauds Repression under the Ministry of Agriculture, is the national authority responsible for plant health and disease. Drafts laws and regulations on animal and plant quarantine.	Member of National Steering Committee. Enhancing co-funding by national/regional government.
Central Department of Crop production: Central Department of Crop production in the Ministry of Agriculture (DPV) is the central organ responsible for establishing national production strategies and the priority setting in development and extension. DPV is mainly responsible for: • Establishing basis for establishing the politics of the ministry of agriculture in crop production and transformation of agricultural products. • Elaborate and define objectives and programmes of production taking into account possibilities and potential of the physical environment, economic conditions or the market, national and regional needs, and ways and possibilities of exportation; • Prepare technical means and contribute to elaborate economic measures that can improve transformation of plant products, to protect products processed by agricultural and food industry and favour their marketing; • Execute, participate or control l agro-economic studies for development projects in dry land areas and irrigated zones; • Participate in promotion of sector professional organisation.	Member of National Steering Committee. Assisting in establishment of information network between stakeholders and implementers; Linking to other projects and programmes targeting the target project region; scaling up the project activities to other regions; mainstreaming the project products and achievements into national development strategies and programmes.
Agence de Développement des zones du Nord (National Agency for Development of Northern Region of Morocco): Governmental body under the authority of the Prime Minister with mission in participatory rural development and community-based natural resource management, capacity building for communities; economic development strategy in northern provinces, poverty-stricken area development, the relationship among environments, resources, and social economy development for actions in the northern provinces.	Linking with regional development initiatives for livelihood improvement and human development; contributing to strengthening women role in decision making through education of farmers daughters and supporting women NGO's.
Ministry of National Education, Higher Education, Professional Training, and Scientific Research (**Ministère de l'Education Nationale, de l'Enseignement Supérieur, de la Formation des Cadres et de la Recherche Scientifique):** The Ministry for National Education, Higher education, Professional training, and Scientific Research works out and implement the governmental policy in the domains of education and training in schools and universities and scientific research. It ensures and follows its execution in accordance with the laws and legislation in force. It is responsible moreover of planning, coordination and evaluation of the activities of professional training, in collaboration with the ministries concerned and having under their authority higher education and training institutes and universities. Guides universities' undertaking of major national	Training; dissemination of information; curriculum development; holding degree or non-degree training program of the project; Assisting in publishing and distributing public awareness materials and knowledge on importance of crop biodiversity for sustainable development.

scientific research projects.	
Ministry of Environment: Formulates and enforces guidelines, policies, laws and regulations for environmental management, pollution control, and environmental impact assessments of development plans and technological policies. Helps develop a national program for sustainable development; Promotes eco-agriculture and protects biodiversity.	Implementing CBD; Developing recommendations on conservation and management of biodiversity; their submission to the legislative bodies.
Ministry of Communication and Information Media: **Local and regional media (newspapers, radios). National TV's and newspapers:** Concerns on culture, economics, politics, country development news; Disseminate information on Moroccan governmental activities in economy, industry, trade, agriculture, sports and culture.	Producing radio and TV programme; distributing information via mass media; assisting in disseminating public awareness materials and knowledge on importance of crop genetic diversity in environment protection and ensuring food security.
Nongovernmental Organizations (NGOs)	
Organization	**Role in the Project**
Non-Government Organizations (NGO's): Non-Government Organizations will be involved at each site in project implementation, and community based activities for adding benefits from local crop resources to farmers, and helping to promote the active role of farming communities in planning, decision-making, and information management. Key contact NGO's are: • Association of Local Development, Tissa • Association of Local Development, Oued Amlil, Taza • Association AFAK pour le developpement local du Douar Sidi Senoun, Commune Ourtzagh, • Association BOUAJOUL pour le developpement local du Douar Bouajoul, Commune Ghafsai	Main project partners. AFAK is member of National Steering Committee. Assisting in identifying local target groups for training; assisting in organizing local training for women; Assisting in capacity-building, training and extension in rural area.
Farmers and Farmers Communities: Farmers and farmers' communities are the primary participants and target group for the effective implementation of the project. Hence, male and female representatives of farmers from the 2 sites will be part of the site teams.	Main local partners. On-farm trials; main target group of most of the project activities.
Chambre d'Agriculture of Taounate and Chambre d'Agriculture de Taza: Agriculture chamber in each province is a professional structure that represents farmers.	Local partners. Assisting training and extension for minority farmers; Information dissemination on technology; linkages with local and regional authorities; organizing regional fairs.
Other institutions and partners	

Local Authorities: County Province	Organizing extension at the selected sites.
Seed Traders in local markets:	Proving and conserving elite and local varieties.
IAV Info:	Assisting in technology and information dissemination.
Editor of bulletin de transfer de technology:	Organizing technology and information dissemination; Assisting technology and information dissemination

Stakeholders involved from different sectors:

N°	Sector	Stakeholders
1	Farmers	Female and male farmers
2	Research and training Institutes	IAV, INRA, ENA, Institute of Journalism
3	Professional organizations	NGO, Coopératives, Chambre d'Agriculture, Organisation of Local Development, Professional associations
4	Seed Enterprises	Regional seed distribution points
5	Ministries	Ministère d'Agriculture (Directions centrales : DPV, DPVCTRF, DERD) Ministère d'Education Nationale Point Focal GEF (Ministère d'Environnement)
6	Extension	ORMVAL (Regional District of Irrigation Loukkos), DPA-Taounate (Direction Provinciale d'Agriculture), CT 3208 Ourtzagh (Center of Extension); CT 2307 Tissa, CT2302 Karia, CT Mokhrissate Chaouen CT Oued Amlil (
7	Education	Primary Schools, high schools, ITA Sahael Boutahar (Local technical education) (Institut de Technologie Agricole)
8	Media	Local newspapers, Radio, TV
9	International Agencies	IPGRI, GEF, UNEP
10	Local Authorities	County, Province

The stakeholders located at the project sites are listed bellow:

Site	Partners
Taounate	• Female and male farmers • DPA Taounate (Direction Provinciale d'Agriculture) • Chamber of Agriculture province de Taounate (Chambre d'Agriculture) • Centre of Extension (Centre de Travaux) CT 3208 Ourtzagh • Centre of Extension (Centre de Travaux) CT 2307 Tissa • NGO of local development (Association de Développement Local) AFAK Sidi Sennoun • NGO of local development and the environment protection (Association locale pour le développement et la protection de l'environnement) BOUAJOUL • NGO of Rural Women Tissa • ITA (Institute de Technologie Agricole) • Ecole primaire Sidi Sennoun • Regional Office of Plant Protection Department (DPVCTRF) • Local Authorities, Caidat Ourtzagh District • Local Authorities, Caidat Tissa District
Taza	• Female and male farmers • DPA Taza (Direction Provinciale d'Agriculture) • Chamber of Agriculture province de Taza (Chambre d'Agriculture) • Centre of Extension (Centre de Travaux) CT Oued Amlil • NGO of local development (Association de Développement Local) Oued Amlil • ITA (Institute de Technologie Agricole), Oued Amlil • Ecole primaire et college Oued Amlil • Regional Office of Plant Protection Department (DPVCTRF) • Local Authorities, Caidat Oued Amlil

UGANDA – Public Involvement Plan:

National Agricultural Research Organization (NARO), which is overall governmental institutions in-charge of all agricultural research in crops, fish, livestock, forestry, and food processing in Uganda, will be the National Executing Agency. NARO will house the Project Management Unit (PMU) and will provide the necessary space and support to ensure the smooth running of the project activities.

National Steering Committee:
The National Steering Committee of Uganda will include the following members:

1. Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)
2. Ministry of Finance, Planning and Economic Development
3. Ministry of Education and Sports
4. Buganda Cultural Development Foundation (BUCADEF)
5. National Agricultural Research Organization (NARO)
6. Makerere University
7. Representative of NGOs
8. Farmer representative
9. National Project Director
10. Global Project Manager/Representative of Global Executive Agency
11. National Project Manager (Member-Secretary)

National Technical/Thematic Team (NTT**):** National Technical/Thematic Team will be comprised of experts in the relevant disciplines and will provide overall technical guidance, review protocols, methodologies and technical reports and assist in building thematic capacity at site and local levels. Members will consist of national and local experts, and site level thematic focal points.

National Site Coordination Committee (NSCC): National Site Coordination Committee will comprise a site coordinator and a site coordination Team. The team will prepare work plans, budgets and reports and forward to the PMU. The team will coordinate activities of the different task teams at the sites and provide technical backstopping to the sites. The team will include representatives from Parish task forces and technical expertise from the National Technical Committee and local technical expertise in the different key disciplines. The NSCC will coordinate activities of the different task teams at the sites.

- Site Coordinator will be the overall in charge of the project site activities
- Parish Task Force representative from each Parish
- Members of the National Technical Team and Local Parish teams

District Project Management Unit (DPMU): District Project Management Unit will comprise a District Project Management Team, which will include:

- Key partners in the district and site coordinator, plus the scientific theme leaders
- Headed by a person appointed by the National Executing Agency the NARO
- The District Agricultural office will be a member on the committee

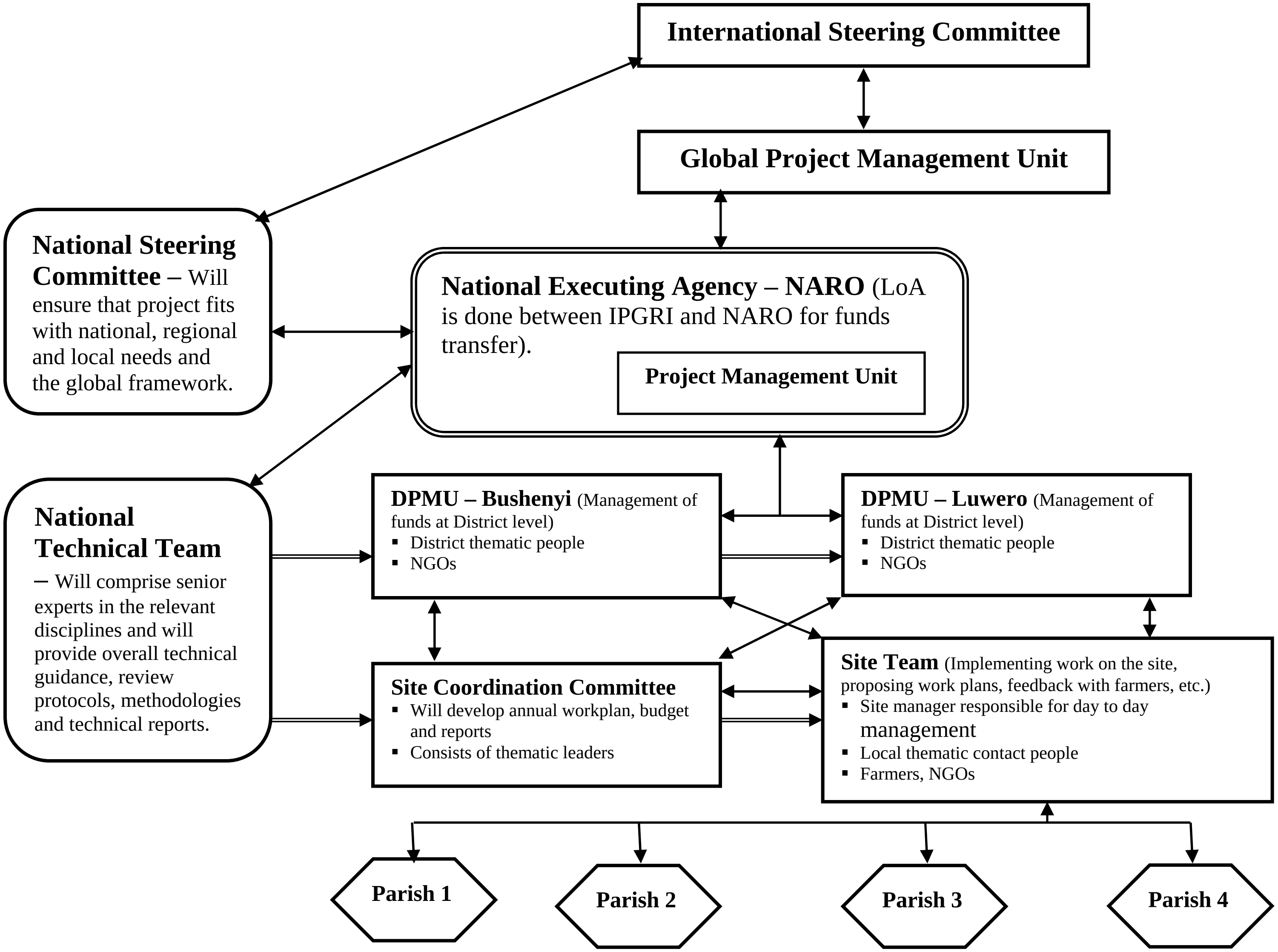
- One NGO will be the Secretariat
- Funds will be managed through an account with agreed co-signatories from the key partners

Parish Task Force (PTF): Parish Task Force, which will be similar to Site Teams, will be led by the Parish Chief/Chair of Local Council; PTF's will comprise nine key farmers from the villages in the parish. The role of Parish Task Force will be to: (i) handle the day to day participatory issues to engage the parish farmers into the project activities, (ii) identify trial/demonstration sites and farms, (iii) have a Secretary, who will provide regular reports to the sites coordinator. Local staff will be identified as technical thematic focal points, which will interact with the National Technical Team and receive technical training to build local capacity in thematic areas.

Project stakeholders in Uganda are listed below:

1. Adventist Disaster and Relief Agency (ADRA)
2. Agricultural Productivity Enhancement Program (APEP)
3. Buganda Cultural Development Foundation (BUCADEF)
4. Bukalasa Agricultural College
5. Bushenyi District Farmers Association(BUDFA)
6. Church of Uganda
7. Gulu University; Faculty of Agriculture Engineering
8. Joint Energy Environmental Program (JEEP)
9. Kawanda Agricultural Research Institute
10. Land Alliance
11. Luwero District Farmers Association (LUDFA)
12. Makerere University
13. Ministry of Agriculture Animal Industry and Fisheries (MAAIF)
14. Ministry of Education
15. Ministry of Finance Planning and Economic development
16. Ministry of Lands, Water and Environment
17. Ministry of Local Government via the higher and lower Local governments
18. Namulonge Agricultural, Animal Production Research Institute
19. National Agricultural Research Organisation
20. National Environmental Management Authority (NEMA)
21. National Forestry Authority
22. The National Agricultural Advisory Service (NAADS)
23. Uganda Catholic Secretariat (CARITAS)
24. Uganda National Farmers Federation
25. Volunteer Efforts for Development Concerns (VEDCO)

Public involvement Plan in Uganda:



Institutional profile for Uganda stakeholders:

<table>
<tr><th colspan="2">Country Research Stakeholders</th></tr>
<tr><th>Institution</th><th>Role in the project</th></tr>
<tr><td>National Agricultural Research Organisation:
NARO is the overall government institution in charge of all agricultural Research in crops, fish, livestock, forestry, appropriate technology and food processing in Uganda. It also has agricultural research and development centres in different agro-ecological zones of the country.

NARO is an umbrella organization comprising of nine (9) Research Institutes. The Research Institutes are the technical arm of NARO each with a varying research mandate. Cross-cutting issues related to natural resource management, socio-economics, on-farm and post-harvest handling are addressed across the commodities. These institutes are:
• Agricultural Engineering and Appropriate Technology Research Institute (AEATRI).
• Coffee Research Institute (CORI)
• Fisheries Resources Research Institute (FIRRI).
• Food Science and Technology Research Institute (FOSRI)
• Forestry Resources Research Institute (FORRI)
• Kawanda Agricultural Research Institute (KARI)
• Namulonge Agricultural Research Institute (NARI) .
• Livestock Research Institute (LIRI)
• Serere Agricultural Research Institute (SARI)</td><td>NARO through (Plant Genetic Resource Programme) will a member of the National Steering Committee and will coordinate the project partners in Uganda.

Mandates and drives the project through coordination with all stakeholders, monitoring, evaluating and reporting. Conserves Plant Genetic Resources and increase crop intraspecific diversity utilisation of the scientific knowledge enhancement. Assessment of the existing knowledge on crop intraspecific diversity for pest/ disease management. Develop methodologies for data analysis. Developing various technical requirements. Establish field experiment and demonstration plots in villages and farmers households. Holding community based training on crop intraspecific diversity through Participatory Rural Appraisal network; assessing farmers' indigenous knowledge. Organise degree and non- degree training programs; workshops, conferences on agro-biodiversity at inter/ national/ regional levels. Hosting international/ national/ regional training courses; carrying out overall researches on sustainable agriculture, agronomy, plant biology, pathology entomology, Integrated Pest Management (IPM), microbiology and genetics; technology and information system. Sensitization of participating Councillors on how they can work with various stakeholders from the private sector and communities.</td></tr>
<tr><td>Kawanda Agricultural Research Institute:
The institute is under NARO. It is in charge of research in Banana, Soils, Post harvest handling and Horticulture.</td><td>Providing information on distribution and genetic diversity status of the local crop varieties at project operational sites. Recommend banana/ plantain landraces for mixture cropping against pest/ disease; host pathogens, isolates and conservation of crop germplasm resources. Establish filed experiment and demonstration plots of bananas/ plantains resistant to pests and diseases. Collecting and evaluating genetic diversity of bananas/ plantain landraces, studying costs of bio- pesticides on crop genetic diversity and the control of pests undertaking cropping systems analysis.</td></tr>
<tr><td>Namulonge Agricultural, Animal Production Research Institute:</td><td></td></tr>
</table>

The institute is charge of research in maize, beans, Root and tuber crops, pastures, rice and livestock.	Provide information on distribution and genetic diversity status of the local crop varieties at project sites. Recommend beans landraces for mixture cropping against pest/ disease; host pathogens, isolates and conservation of crop germplasm resources. Establish filed experiment and demonstration plots of resistant bananas/ plantains to pests/ diseases.
The National Agricultural Advisory Service (NAADS): As a government agency offers the technical guidelines and expertise to farmers to improve their agricultural outputs in Uganda.	To mobilise and sensitise farmers on agricultural productivity at project sites; offering advisory services on use of Integrated Pests Management to control pest/ disease pressure. Organize and conduct community visioning workshops to demonstrate the importance and crop intraspecific diversity of sound agro-biodiversity management and sustainable development.
Linkage and Support Unit	
Institution	**Role in the project**
National Environmental Management Authority (NEMA): Is the agency in charge of ensuring environment management policies and laws are implemented.	Develop recommendation on conservation and management of crop intraspecific genetic diversity. As a national environment agency; participate in ecology, agro-biodiversity assessment; crop diversity and management practices, biology and genetic study of the existing local target crop landraces, cultural diversity studies of target crops landraces at project operational sites in Uganda.
National Forestry Authority: In charge of managing forestry reserves and ensuring appropriate use of forestry resources.	Mobilize and Sensitize farmers on appropriate conservation techniques of natural resources.
Makerere University; Faculty of Agriculture, Department of crop science, Botany, Zoology, Faculty of Environment and Natural resources. The different faculties offer courses in a wide range of disciplines, and undertake research in agriculture related activities.	Member of National Steering Committee. Train trainees in Agronomy, Forestry, Ecology, Biology, Crop Breeding and Biotechnology, Plant Industry, Fruit Growing, Gardening and Viticulture, Agro-ecology, Natural Resource Management, Agro-ecology, Horticulture, Sericulture. Promoting biodiversity, population genetics and molecular biology of the selected crops; holding degree or non- degree training courses of the project.
Bukalasa Agricultural College: Trains mid-level technicians in crop husbandry	To develop training manuals on conservation and use of crop genetic diversity to control pests and

	diseases.
Gulu University; Faculty of Agriculture Engineering: The faculty offers courses in a wide range of disciplines, and undertakes research in agriculture related activities.	To develop training manuals on conservation and use of crop genetic diversity to control pests and diseases.
Agricultural Productivity Enhancement Program (APEP): Aims to expand rural economic opportunities in the agricultural sector by increasing food and cash crop productivity and marketing. The program builds on sector successes with added emphasis on creating economies of scale that catalyze transformation of agriculture from low input/ low output, subsistence farming to commercially competitive agriculture. APEP addresses targeted commodities and related systems; production to market transactions; and improvements in input distribution, technology transfer, and producer organisations; and development of competitive agricultural enterprises. APEP is consistent with the Government of Uganda's Poverty Eradication Action Plan (PEAP), Plan for Modernisation of Agriculture (PMA), and Medium-Term competitiveness strategy (MTCS) APEP focuses on banana and has two additional components that address biotechnology and bio-safety concerns as well as agricultural education.	Support the project in capacity building offering technical guidance, training farmers, in use of agricultural technology developments, technology transfer, etc. for enhanced agricultural productivity and use of crop genetic diversity to control pests and diseases. Support the collaborative research on Integrated Pest Management in bananas, plantains and common beans.
Government Ministries	
Institution	**Role in the project**
Ministry of Agriculture Animal Industry and Fisheries (MAAIF): **Vision:** The vision of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) is to support the national development goal of poverty eradication, by providing an enabling environment in which a profitable, competitive, dynamic and sustainable agricultural and agro-industrial sector, can develop. **Mission:** The Ministry's mission is to support national efforts to transform subsistence agriculture to commercial production in crops, fisheries and livestock, by ensuring that the agricultural sector institutions provide efficient and effective demand-driven services to the farming community. Whilst services are provided to the sector as a whole, the primary focus is on resource-poor farmers. **Mandate:** The mandate of MAAIF is to support, promote and guide the production of crops; livestock and fish, in order to ensure improved quality and increased quantity of agricultural produce and products for local consumption, food security and export.	Member of the National Steering Committee. Participate in project coordination and implementation; ensure proper use of crop intraspecific diversity. Formulate Policy on use of crop genetic diversity. Streamline and up date Crop census Information dissemination. Facilitating the zoning of bananas and beans. Enforce compliance (quarantine). Assist in establishment of information dissemination network between stakeholders and implementers; enhancing co- financing the project Participate in Monitoring and evaluation project activities.

Ministry of Finance Planning and Economic development: The mandate of the Ministry are : • To manage and control public finances in a prudent and sustainable manner. • To ensure efficiency and effectiveness of all public spending, and • To oversee the planning of national strategic development initiatives in order to facilitate economic growth, efficiency, stability, eradication of poverty and enhancement of overall development. The Ministry recognize that all stakeholders in the Ugandan budget process have a right to participate constructively in that process, and to know how and why our country's money is being spent.	Member of the National Steering Committee. Support and enhance co- funding of the project activities. Participate in monitoring and evaluation of the project activities.
Ministry of Education and Sports: **Mission:** To provide for, support, guide, coordinate, regulate and promote quality education and sports to all persons and in Uganda for national integration, individual and national development**.** Strategic objectives of the Ministry are : • To ensure universal and equitable access to quality basic education • To improve the quality of education • To ensure equal access by gender, district and special needs at all levels of education. • To build capacity of districts by helping education managers acquire and improve on their knowledge, skills and attitudes to be able to plan, monitor, account and perform managerial functions	Member of the National Steering Committee. Raising awareness materials knowledge on crop genetic diversity for sustainable agriculture. Enhance the stakeholders' Capacity Building; farmers, farmer organizations, institutions.
Ministry of Local Government via the higher and lower Local governments: **Mission:** To coordinate, support and advocate for Local Governments for sustainable, efficient and effective service delivery in the decentralized system of governance. **Vision:** To have a democratic, participatory, decentralized local government system that can sustain development and deliver services efficiently and effectively to the people.	The institution's role will be to mobilization of information and resources as well as participation in project monitoring and evaluation. The Central government will Lobby and advocate for Co-funding. Mobilization of Higher and Lower Local Councils and their respective communities; • Community stakeholder consultations; • Set and prioritize strategies for achieving community and District visions; • Development of indicators for achieving the desired vision; • Development of district and national visions.
Ministry of Water, Lands and Environment: Mandate of the Ministry: To promote and ensure the	Developing recommendations on conservation

rational and sustainable utilization and development and safeguard of Land and water resources and environment, for social and economic welfare and development as well as for regional and international peace. In addition, the Ministry promotes the utilization of weather and climatic information for sustainable development. The main functions of the Ministry includes: • Land Management consisting of Physical Planning, Land Administration, Land Registration, Surveys and Mapping • Water Resources Management covering hydrological and hydro geological data, control of resources utilization, control of water quality, development and management of water supplies. • Environmental Affairs including forestry management and wetlands management • Meteorological Services including meteorological data, weather and climate forecasting, and advising on atmospheric pollution.	and use of crop intraspecific diversity and their submission legislative bodies to ensure compliance to conservation and biological diversity.
Other organizations.	
Institution	**Role in the project**
Buganda Cultural Development Foundation (BUCADEF): In addition to promoting cultural aspects of communities, the organisation mobilise farmers to enhance their productivity.	Member of National steering Committee. Assisting in mobilisation, training and extension services.
Uganda Catholic Secretariat (CARITAS):	Participate in the development of the participatory methodology, mobilization, monitoring the project progress; contribute the resources and information as well as managing of trials. Mobilise farmers and transport at project sites.
Volunteer Efforts for Development Concerns (VEDCO):	Mobilisation of farmers' for Capacity building. Co funding the project activities. Participate in the project Monitoring and evaluation.
Uganda National Farmers Federation: This is the overall institute that brings farmers together. It has offices at District and national levels.	Mobilisation and sensitisation of farmers on use of crop intraspecific diversity. Participate in capacity building.
Adventist Disaster and Relief Agency (ADRA): This NGO also takes participates in mobilising farmers to enhancing their agricultural productivity.	Organize and conduct community sensitisation workshops to demonstrate the importance of crop intraspecific diversity of sound agro-biodiversity

	management and sustainable agricultural.
Church of Uganda: This is a Christian church which has a branch at the project sites and mobilises farmers/ Christians especially women to enhance their agricultural productivity.	Organize and conduct church community sensitisation workshops to demonstrate the importance of crop intraspecific diversity of sound agro-biodiversity management and sustainable agricultural;
Joint Energy Environmental Program (JEEP):	Mobilize and organize workshops for Local communities to popularize, use of crop intraspecific diversity. Holding training sessions for Action planning.
Land Alliance:	Voluntary Legal advice (Land Alliance) in case of a land conflict management arise.
Luwero District Farmers Association (LUDFA):	Mobilization and sensitisation of farmers workshops; on use of crop intraspecific diversity Participation in complimentary project initiatives Participate in project Monitoring and evaluation process. Participate in farmers cross site visits.
Bushenyi District Farmers Association(BUDFA):	Mobilization and sensitisation of farmers workshops; on use of crop intraspecific diversity Participation in complimentary project initiatives Participate in project Monitoring and evaluation process. Participate in farmers cross site visits.
Electronic Media; (Radios, TV's Print extra):	Produce radio and TV programmes; Distribute information via mass media; assisting in disseminating public awareness materials and acknowledge on the importance of agro-biodiversity, use of crop diversity to control pests/ diseases for sustainable development. Assisting in disseminating public awareness materials and knowledge on the value of crop genetic diversity.
Farmers organizations:	Farmers will provide land, manage the trials, participate in mobilization of the community, and provide information monitor and evaluate the project' progress. Participate in farmers cross site visits. Trained Farmers in use of crop intraspecific diversity will also train fellow farmers to ensure the projects' scalability and replicability of acquired knowledge after the projects' five years. Undertaking technology adoption via coordination and networking with all the project stakeholders. Organise technology

	and information dissemination among farmers and farmers' community based groups.

Stakeholders involved at the project sites are listed below:

District	Sub county	Target Landraces	Partner organisation
Bushenyi	**Ngoma**	Bananas, plantains and Common Beans	APEP; ASASURIDE; BUDFA (Branch of UNFA); CoU; Entaasi News paper, Eshato News paper, Kolping (Catholic Church); LoG; Media; Orumuri News paper, Mothers' Union; NAADS; NEMA; New Vision; Monitor; NFA; Radio West; Rukararwe Partnership; RUWASA; UWESO
Luwero	**Nakaseke**	Bananas, plantains and common Beans	ADRA; APEP; BUCADEF; CARITAS; JEEP; Land Alliance; LoG; LUDFA; Media; New Vision, Bukedde, Monitor, TV, Radio, Nakaseke- Telecentre; NAADS; NEMA; NFA; VEDCO

PROJECT COORDINATION AND IMPLEMENTATION ARRANGEMENTS AT THE GLOBAL LEVEL

IPGRI will serve as the project executive agency at the global level. It will oversee the Global Project Management Unit (PMU), located at its headquarters in Rome. The project will constitute a single specific task within IPGRI's Project E01: Agricultural Biodiversity and Ecosystems. Dr. Devra Jarvis, Senior Scientist will directly supervise the project and act as Global Project Director. The PMU will include a Global Project Manager and a Programme Assistant to be hired for the project. The PMU will rely on Technical Advisors for guidance on thematic issues. The PMU will:

1. Establish reporting guidelines for all partners and ensure that they submit quality reports meeting reporting schedule,
2. Prepare quarterly financial, biannual progress reports and annual summary progress reports for UNEP, and
3. To carry out a programme of regular visits to project sites to supervise activities and to address concerns relating to implementation problem.

The Global Project Director will provide technical and development leadership to the project team, represent IPGRI at International Steering Committee Meetings, and supervise the Global Project Manager.

A Global Project Manager will be hired to coordinate implementation of action plans and strategies in all the four countries. The major responsibilities will include:

- Provide administrative leadership to the project team and act as the main project representative at global level;
- Observe agreed project management procedures in order to facilitate project implementation and ensure delivery of high quality outcomes;
- Prepare global workplan and annual updates including national budget allocations;
- Facilitate communications and linkages at global and national levels, as well as with UNEP-GEF;
- Serve as Executive Secretary and provide assistance to the International Steering Committee in coordinating project implementation at the global level;
- Provide assistance to national partners and institutions to develop and execute the approved national and regional action plans;
- Provide support to National Steering Committee meetings;
- Manage the project budget, in accordance with the agreed work plan and approve disbursal of project funds, taking into account the decisions of the international and national steering committees;
- Draft terms of reference and conduct hiring procedures of international project staff and consultants;
- Review terms of reference of sub-contractors and conduct procedures for initiating sub-contracts;
- Co-ordinate, aggregate, and submit all monitoring and evaluation reports;

- Provide timely quarterly financial and bi-annual progress reports to UNEP/GEF through the IPGRI Diversity for Livelihoods Programme and Finance & Administration Group;
- Maintain good communication with the project donors and secure additional finances, for the approved work plan as necessary;
- Update the International Roster of Technical Experts and National Rosters of experts with the National Management Units
- Update and keep track of project publications, persons trained, and workshops held.

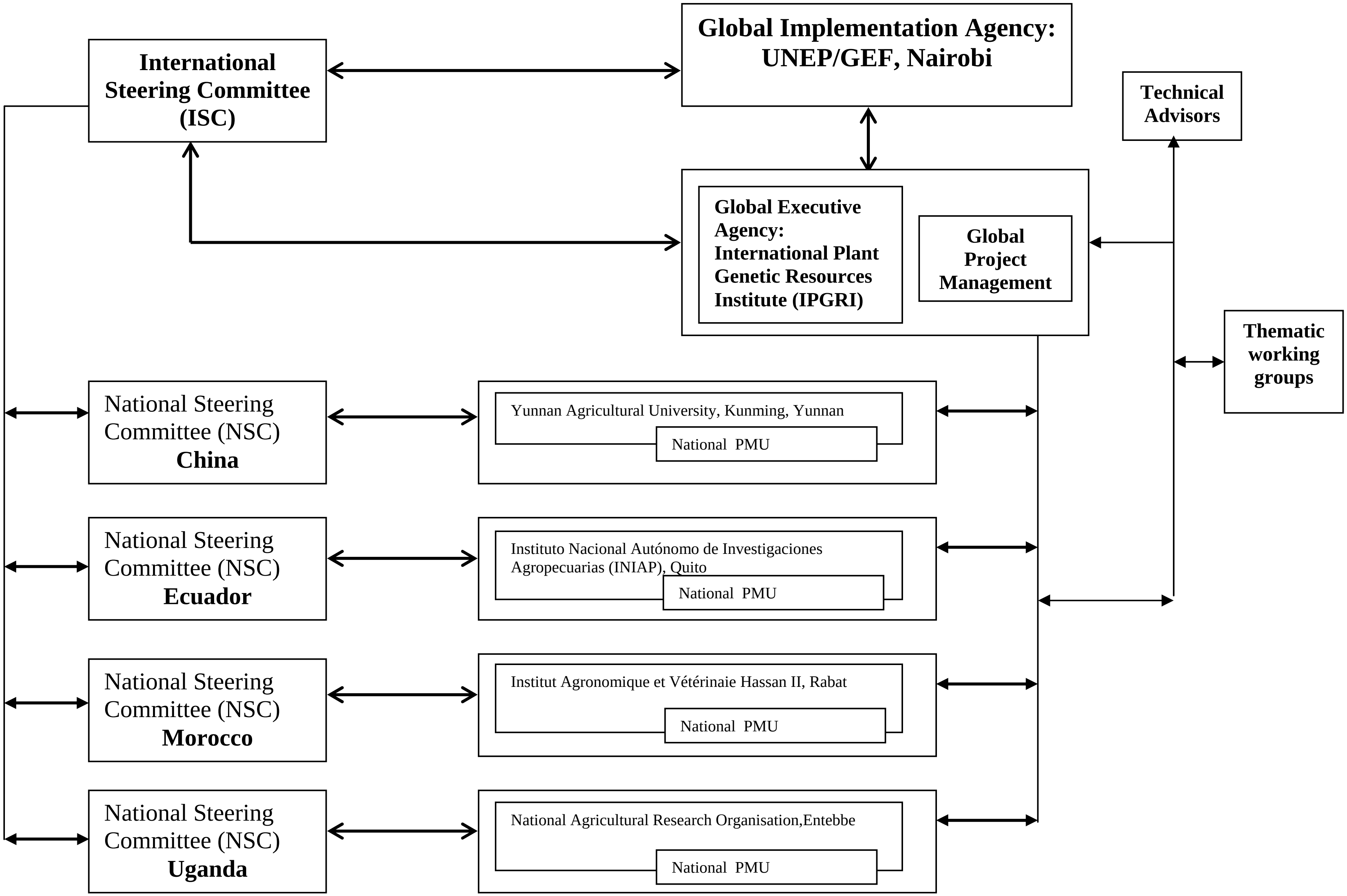
A Programme Assistant will be hired and will provide the Global Project Manager with the following support:

- Proofreading of project documents, including national reports, quarterly financial and bi-annual progress/technical reports, meeting reports, technical correspondence, and other related papers as requested by the Global Project Manager;
- Formatting reports, proceedings, and other relevant documents in UNEP-GEF and IPGRI formats;
- Assisting the Global Project Manager in the management, coordination and implementation of activities;
- Assisting the Global Project Manager in monitoring the implementation of national work plans;
- Assisting the Global Project Manager in communication with national partners by phone, fax, and other correspondence;
- Assisting the Global Project Manager in organizing and conducting International Steering Committee Meetings and National Workshops.

An International Steering Committee (ISC) will be established to oversee project implementation. The International Steering Committee (ISC) will comprise representation from each of the Project Management Unit at national level (National Project Director), IPGRI (Global Project Director), representatives from international partners (FAO; SDC, University of Kassel, Germany, Washington State University), a UNEP/GEF representative, and the Global Project Manager, who will act as Member Secretary to ISC. ISC responsibilities includes: review bi-annual progress and quarterly financial reports, annual summary progress reports, provide policy guidance to the project, assist PMUs with developing linkages with other related projects, and overall guidance for the project implementation. ISC will be meeting once a year.

A team of Technical Advisors will be linked at international and national levels. Members of international and national teams will take part in thematic and/or technical working groups and workshops to support technical aspects of the project including in the areas of, plant population genetics, pathology, entomology, ecology, anthropology, sociology, economics, participatory approaches, law and policy. An international and national rosters of experts has been established organized by disciplines of potential expertise that can be called upon during project implementation (Annex K). Several International Institutions have already made in-kind commitments to participate as technical advisors, these includes: CSIRO, Washington State University, Oregon State University, Cornel University, the University of Kassel, IRRI, IFPRI, UPWARD, and FAO. The details of these international institution/organizations are listed below.

Project Management Structure at Global level:



Institutional Profile for International Partners for the project:

<table>
<tr><th colspan="2">Research Partners</th></tr>
<tr><th>Institution</th><th>Role in the Project</th></tr>
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International Plant Genetic Resources Institute (IPGRI):
http://www.ipgri.cgiar.org

The International Plant Genetic Resources (IPGRI) is a Centre of the Consultative Group on International Agricultural Research (CGIAR). Founded in 1974, IPGRI is the world's largest international institute dedicated solely to the conservation and use of plant genetic resources. It has a staff of around 300, in 22 offices around the world, with its headquarters based in Rome, Italy. The institute is funded mainly by developed-country donor and development agencies, but also by an increasing number of less developed countries.

IPGRI's Vision – People today and in the future enjoy greater well-being through increased incomes, sustainably improved food security and nutrition, and greater environmental health, made possible by conservation and the deployment of agricultural biodiversity on farms and in forests.

As per mission - IPGRI undertakes, encourages and support research and other activities on the use and conservation of agricultural biodiversity, especially genetic resources, to create more productive, resilient and sustainable harvests. Its aim is to promote the greater well-being of people, particularly poor people in developing countries, by helping them to achieve food security, to improve their health and nutrition, to boost their incomes, and to conserve the natural resources on which they depend.

As per IPGRI new strategy the objectives includes:

1. Demonstrating the social, economic and environmental benefits of agricultural biodiversity
2. Ensuring that agricultural biodiversity is conserved, characterized and used to improve productivity
3. Generating knowledge about agricultural biodiversity through research, and making such knowledge available
4. Developing human and institutional capacity to conserve and make effective and sustainable use of agricultural biodiversity
5. Analyzing policies and fostering an environment that supports the conservation and use of agricultural biodiversity
6. Raising awareness of the value of agricultural biodiversity and the importance of the conservation of genetic resources

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IPGRI will be the executing agency for the project and will play a role in supporting project implementation at the global level. It will host the coordination team that will be established to oversee the project and provide appropriate financial and management services to support the smooth execution of project activities. The global coordination team (1 Scientist and 1 Programme Assistant) will be based at IPGRI headquarters in Rome as part of its Diversity for Livelihoods Programme. The Finance and Administration Group will oversee the financial management of the project and senior management will provide overall oversight of project implementation.

In addition to this, IPGRI will allocate substantial professional and supportive staff time and other resources (office space, computing equipments, communication facilities, and other office operating facilities, etc.) to ensure smooth project implementation.

Each of IPGRI's regional and sub-regional offices (based in the regions of the partner countries) will play a role in supporting project implementation. They will identify staff with specific responsibility to support project implementation and make such resources available as per appropriate (e.g. staff time for travel and scientific backstopping).

IPGRI will also be responsible for setting up National Management Unit in each country and will appoint, in consultation with respective national executive agency, a National Project Manager, A Programme Assistant, and other staff, if required.

IPGRI will also be responsible for coordinating: International Steering Committee meetings, organization of thematic meetings/trainings/ workshops, compilation of country reports for submission to UNEP/GEF and other donors, global publications, financial reports to UNEP/GEF and other donors, etc.

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IPGRI does not have its own laboratories or field sites, but works with a global range of partners to maximize impact, to develop capacity and to ensure that all stakeholders have an effective voice. The proposed project is very much in line with IPGRI new strategies of promoting use of crop diversity for sustainable conservation on-farm for economic and environmental benefits. The work, as proposed, will provide substantial research support and the outcomes will be made available to partners. IPGRI also houses the International Network for Improvement of Banana and Plantain (INIBAP).	
Swiss Agency for Development and Cooperation (SDC): **http://www.deza.admin.ch** The Swiss Agency for Development and Cooperation (SDC) is part of the Federal Department of Foreign Affairs. Its mandate is based on the Federal Law on International Development Cooperation and Humanitarian Aid enacted on 19 March 1976. SDC aims to help partner countries overcome endemic poverty and to achieve food security and environmental sustainability. To manage this support efficiently, SDC promotes growth among the most disadvantaged groups in society by helping them to improve production, manage environmental problems and provide better access to education and basic health care. New approaches to agriculture confront producers in an increasingly liberalized market, in which there is unequal access to assets and limited participation in decision-making. SDC believes research and knowledge can pave the way forward. The Natural Resources and Environment Division is focused on supporting the sustainable use of natural resources, which is vital to long-term improvement of living conditions for disadvantaged population groups and to assure the basis of future production. The Division promotes sustainable and efficient use of resources, prevention of environmental disasters, and protection of people and resources from harmful substances.	SDC will provide cash inputs to the project to support global workshops on participatory diagnostic approaches and data analysis and to standardize assessment methods across countries for pest, pathogen and environmental interactions. SDC's contribution will also support targeted work in each of the four project countries to determine whether inraspecific diversity with respect to resistance exists within the sites, and to develop participatory tools to determine whether there is diversity in virulence and aggressiveness of pathogens and biotype diversity. SDC support will also be given towards identifying and compiling farmer knowledge and practices in on-going systems of pest and disease management and to make global comparisons of diversity rich practices. Support is also targeted at the documentation of successful experiences and the development of protocols for benefit sharing of genetic material and new methods of diversity management In additional to financial support to project activities, SDC will provide linkages to other SDC supported project to enhance the exchange of knowledge and best practices across projects on various aspects of sustainable use of natural resources, prevention of environmental disaster, and plans to implement strategies and policies. SDC will also assistance with working processes, e.g., evaluations, monitoring systems, elaboration of project planning, and participate in the International Steering

	Committee.
International Rice Research Institute (IRRI): http://www.irri.cgiar.org The International Rice Research Institute (IRRI), a Centre of the Consultative Group on International Agricultural Research (CGIAR), is an autonomous non-profit agriculture research and training center established to improve the well-being of present and future generation of farmers and consumers, particularly those with low income. It is dedicated to help farmers in developing countries produce more food on limited land using less water, labor and chemicals, without harming the environment. IRRI was established in 1960 with its headquarters in Los Banos, Philippines and offices in ten countries. Most of IRRI's research is done in cooperation with national agricultural research and development institutions, farming communities, and other organizations of the world's rice producing nations. The major research agenda includes: 1. Poverty alleviation 2. Sustaining natural resources in the face of the growing intensification of rice-based systems due to increased population pressure 3. Fast-tracking scientific and technological interventions to address rice production and farmer livelihood issues in developing countries 4. Facilitating research and development linkages Research on Natural Resource Management (NRM) which includes IPM is being carried out in 2 projects: Project 4 - Favorable Rice Systems and Project 8 – Unfavorable Rice Systems. In both projects, pest management research covers 1. exploiting genetic diversity for crop improvement 2. increasing biodiversity to enhance natural control mechanisms and 3. communicating research results to farmers. Research activities are carried by scientists in the Entomology and Plant Pathology Division (EPPD) in collaboration with social scientists, plant breeders, agronomists and ecologists within IRRI, Advanced Research Centers and national programs. IRRI has developed a network of collaborating national program scientists in all Asian rice growing countries in conducting genetic, ecological and sociological research. In addition, EPPD scientists are also involved in communicating IPM through mass media and radio soap operas. IRRI is undergoing strategic planning where the new focus will be on environmental sustainability towards a Doubly Green Revolution that will repeat the successes of the Green Revolution, with environmental sustainability and social equity. To meet this goal, IRRI in November 2004 launched the IRRI Environmental Agenda (IEA) to serve as a framework for all plans and activities for the next 2	IRRI's input into the project will be through its Environmental Agenda and Project 8 on unfavorable rice systems and support in mainstreaming and replicating good practices through their expertise in communication strategies and participatory approaches in rice management. The two major components within the Agenda relevant to this project will be Biodiversity and Reducing Farm Chemicals. IRRI will be able to provide the following inputs to the project: 1. Development of communication strategies 2. Rice entomological research, such as taxonomy and biology. 3. Ecological research in rain fed rice systems 4. Environmental sustainability indicators – Analysis and developing monitoring systems. 5. Serve as an advisor to the project

decades.	
University of Kassel, Witzenhausen, Germany: The major objectives of the Department of Ecology and Protection at the University of Kassel (http://www.wiz.uni-kassel.de/phytomed/index_e.html) are to determine and optimize methods that enhance plant health in organic agriculture. Methods include direct measures such as the use of resistance, alternative pesticides and biological control agents and indirect measures such as tillage methods, rotation and nutrition management. The emphasis is on developing strategies aimed at increasing durability of resistance through diversification and integration of different cultural methods based on population biology and genetics. The fields of major interest of this Department are population biology, ecology and genetics of host-pathogen interactions in agricultural systems. The main focus is on the use of genetic diversity and resistance gene management for the control of diseases and pests in practical agriculture with emphasis on organic farming. Its current research focuses on important plant health problems in organic agriculture such as late blight of potatoes seed health and the use of cereal cultivar mixtures for disease control, yield stability and quality.	Close cooperation has already been developed with the university of Kassel in the area of genetic resources, genetics of host-pest interaction in agricultural systems, and the use of crop genetic diversity and resistance gene management for the control of diseases and pests. Collaborative research will be, mainly with Ecuadorian national partners from INIAP and other stakeholders, conducted on developing approaches/protocols and testing methods on use of crop diversity and host-pest interaction. Principal staff participating in this project (Dr. Maria R. Finckh, Head of Department) will supervise M. Sc and Ph.D. students registered at the University of Kassel. Recent work at University of Bonn in Germany (Prof. Sikora Group) has shown that fungal and bacterial endophytes play a key role in the health status of bananas. Therefore, in collaboration with Prof. Sikora, banana samples differing in health status will be examined for endophytes and banana varieties will be compared for their reaction to pests and pathogens in the presence and absence of their endophytes. The work described will be conducted by a team of two PhD students, one each from Ecuador and Germany, supported by a number of Ecuadorian and possibly German M. Sc. students, who will be involved in the sub-projects.
Washington State University (WSU), Pullman, Washington, USA: http://www.wsu.edu Washington State University (WSU) is the land grant university of the state of Washington with responsibilities for teaching, research, and extension/outreach. The University has 21,000 students and offers more than 100 major fields of study. Emphasis is placed upon innovative educational programs to prepare graduates and citizens to live and work in an increasingly interdependent world. WSU is a recognized leader in distance education, and its libraries have in-depth collections in many disciplines. The University has a long and successful history of	The Department of Plant Pathology is responsible for the solution of disease problems of all crops, including forest, grain, forage, fruit, and vegetable crops and specialized crops such as ornamentals, bulbs, nursery stock, turf, and vegetable and grass seed. It also cooperates with federal plant pathologists (USDA)--all of whom have courtesy faculty appointments--and participates in regional and interregional projects and disease problems of importance throughout the Pacific Northwest, the nation, and the world.

working in developing countries in a variety of settings to improve agricultural production, incomes, and the lives of the local people and their communities. The university's international development activities began with initial efforts in Pakistan in 1975. Since that time the university's faculty and units have conducted successful projects and activities in many countries throughout the world including Indonesia, Sudan, Jordan, Yemen, Lesotho, Cameroon, Mali, Malawi, Botswana, Morocco, Chile, Russia, Uzbekistan, Kazakhstan, and others. These international development activities have included a wide variety of programs, disciplines, and subject matters including agriculture, marketing, business development, education, strengthening of extension, and others. WSU has assisted in the planning, organization, strengthening and development of public and private sector institutions worldwide. WSU has provided technical assistance and training to ministries, research, education and technology transfer institutions.

The University has established as a priority the internationalization of its curricula and programs to enable the university to be truly global and supports collaborative and cooperative activities around the world.

The Department of Plant Pathology at Washington State University has offered a strong program of graduate study and research for many years. The department's faculty and graduates have continued to provide national leadership to the field by serving as officers of the American Phytopathological Society and as editors of the society's journals--Phytopathology, Plant Disease, and Molecular Plant-Microbe Interactions. They likewise serve many other scientific societies and their scholarly publications, including The Mycological Society of America, Society of Nematologists, American Society for Microbiology, International Society of Plant-Microbe Interactions, and others.

Although the department's academic program is centered at the University's Pullman campus, disease research is conducted at agricultural research centers strategically located throughout the state. Graduate students are thus provided with unusual opportunities for training and experience in plant disease investigations in a highly diversified agricultural setting, through involvement in the department's state-wide research program and contact with its extensive faculty.

The Social and Economic Sciences Research Center (SESRC) at Washington State University is the largest university-based survey research center in the Pacific Northwest. Initially established in 1970 as the Social Research Center, and renamed in 1985, the SESRC offers

The following WSU staff will participate in the project:

Timothy Murray is the Department Chair of Plant Pathology. His research specialty is in diseases of small cereal grain crops, especially wheat. Ecology, epidemiology, and control of soilborne plant pathogens, including cultural, chemical, and disease resistance. Genetics of disease resistance and the use of alien species as sources of disease resistance genes. Mapping and tagging disease resistance genes with molecular markers.

Tobin Peever is an associate professor of plant pathology. His research program is focused on the population genetics and evolutionary biology of plant-pathogenic fungi. The goal is to understand the significance of evolutionary forces that shape the genetic structure of pathogen populations and to apply this knowledge to design more stable and environmentally sound management strategies to control plant disease. Current research in his lab is focused on the evolutionary genetics of host specificity at the species level and the role of host specificity in fungal speciation. He is also studying the molecular systematics of A. alternata and closely related small-spored Alternaria species on citrus and other hosts and are using Alternaria species to determine the role of mating genes in asexual fungi. He collaborates extensively with several members of this department as well with numerous others around the globe.

The US University Consortium

It is proposed that a "Sandwich Ph.D. Programme" between Washington State University, Oregon State University and Cornell University (US Universities) with national Universities from Morocco and Uganda will be implemented to produce additional high-level faculty and professional expertise, enhance the quality and relevance of higher education, and provide well trained researchers to participate in project activities in their respective countries. It is proposed that the students who will enter the "Sandwich" programme will receive a Ph.D. from the US Universities based upon satisfactory performance and completion of the requirements. The students will enroll at either US University depending on their research topic for three semesters plus a summer

over 25 years of professional experience in survey research. The SESRC's primary objectives are to: 1. Design and conduct surveys 2. Provide technical consultation 3. Train and educate graduate and undergraduate students 4. Conduct innovative research designed to improve the quality of survey methods in the field of public opinion	session. Upon completion of their course work, preliminary exams, prospectus defense, and 1-year residency requirement, students will return to their respective countries approximately for 2 years of research work and their dissertations. Their Ph.D. committee members will include at least two from the US University and at least one national university faculty member. This approach will be cost effective and will strengthen higher education in Morocco and Uganda. A feature of this programme is that the student's thesis research will focus on the project main research questions in their respective countries. During this 2 year research period, the Ph.D. students will be expected to assist in teaching one course each year at their home university on subject matter they will study at the US University. Another dimension of this programme will be the appointment of qualified national university staff from these two countries as adjunct faculty in relevant departments at the US University and the appointment of qualified faculty as adjunct faculty at these national universities in Morocco and Uganda.
Oregon State University (OSU), Corvallis, Oregon, USA: http://oregonstate.edu The Botany and Plant Pathology Department offers programs leading to B.S., M.A., M.S., and Ph.D. degrees that prepare our graduates for a variety of future opportunities. Our graduates are employed in both the public and private sector by local, state, national or international employers. Professional opportunities exist in numerous fields including: ▪ plant disease research and management ▪ plant physiology, biochemistry, molecular biology ▪ plant genetics ▪ marine and aquatic botany ▪ plant ecology ▪ botanical taxonomy, structure, evolution, biogeography ▪ plant product monitoring, program administration, sales	Chris Mundt is a professor of plant pathology. His research is in breeding disease-resistant crops that have often been countered by the ability of plant pathogen populations to evolve greater virulence. His research program focuses on development of strategies to increase the durability of host plant resistance. Specific interests include studying the influence of host genetic diversity on plant disease epidemics and using quantitative and population genetic approaches to analyze host-parasite interactions. The program has both basic and applied objectives, and utilizes a variety of methodologies including field experiments, controlled environment studies, and computer modeling.
Cornell University, Ithaca, New York, USA: Cornell is a learning community that seeks to serve society by educating the leaders of tomorrow and extending the frontiers of knowledge. Cornell University represents a distinctive mix of eminent scholarship and democratic	Cornell scientists will contribute expertise in population genetics of both host plants and pathogens; their role will be in the training of graduate students and other scientists in

ideals and is a recognized center of excellence in international agriculture.

The Institute for Genomic Diversity (IGD) of College of Agriculture and Life Science, Cornell University (http://www.igd.cornell.edu) is devoted to research and training in genetic diversity, plant genomics, biodiversity conservation, and solving affecting global food security. Their education and research projects include both hosting visitors at IGD and co-organizing workshops and other resources for the international community. The visitors at IGD are encouraged to utilise the Institute's facilities to learn how to generate and analyze data for their research or train in the latest equipment and techniques.

The Institute for Genomic Diversity hosts scientists from around the world who come to learn molecular techniques and apply them to their own projects. Since its inception, the IGD has received scientists from international agricultural research centers including CIAT, CIP, CIMMYT, ICARDA, IITA, ILRI, ICRAF, ICRISAT, and IPGRI. National program scientists at the IGD have included individuals from Brazil, Chile, Colombia, Costa Rica, Germany, India, Kenya, Mexico, and Spain. The IGD has a population geneticist on staff, Dr. Martha Hamblin, and there is considerable additional expertise in population genetics at Cornell (Professors Chip Aquadro, Andy Clark, Carlos Bustamente) housed in the same building as the IGD.

population genetics theory and practice, and in the molecular characterization of diversity in crop plants and pathogens.

Thus students would have the opportunity not only to learn the technical aspects of collecting genetic diversity data, but also to be well trained in the analysis and interpretation of these data.

The following research programs will contribute directly to this project.:

1. The Institute for Genomic Diversity (IGD), headed by Professor Stephen Kresovich, is devoted to research and training in genetic diversity, plant genomics, and biodiversity conservation, with an emphasis on globally important crops. Currently, the major projects at the IGD focus on genetic diversity in maize and sorghum, crops for which the IGD has developed a large database of variation at molecular markers. While the IGD has not done a lot of work on rice, there is considerable expertise in rice at Cornell in the laboratory of Professor Susan McCouch in the Department of Plant Breeding and Genetics.
2. Professor Michael Milgroom, in the Department of Plant Pathology, has considerable experience researching the population genetics of fungal plant pathogens. He has worked on the genetics and population biology of numerous fungi, including those that cause diseases on rice, barley, wheat, chickpeas, melons, canola, grapes and forest trees. He also has worked extensively with the population genetics of fungal viruses. One of Milgroom's primary interests for both research and teaching is the integration of population genetics and epidemiology for solving disease management problems. Milgroom's lab is equipped for the development and use molecular markers of fungi. Recent work has been done in close association with IGD.
3. Professor Rebecca Nelson has a joint appointment in the Departments of Plant Pathology and Plant Breeding & Genetics, and is affiliated with the IGD. Her teaching responsibilities are in the field of International Agriculture and Rural Development. She has worked on pathogen population biology, the genetics

	and deployment of host plant resistance, and practical disease management with smallholder farmers in Asia and Latin America. She studied diseases of rice while working at the International Rice Research Institute in the Philippines from 1988-1996 and diseases of potato while working at the International Potato Center in Peru from 1996-2001. Her laboratory currently works on diseases of maize, and she has funded collaborations with groups in E. Africa (Kenya) and Asia (Philippines and Indonesia) as well as with groups in the US. Current studies in her laboratory focus on the molecular genetics of quantitative resistance to maize diseases of importance in Africa. Rebecca serves as Program Director for The McKnight Foundation Collaborative Crop Research Institute, which funds crop research related to food security and under-researched crops in Africa, Asia and Latin America.
Users' Perspectives With Agricultural Research and Development (UPWARD): UPWARD is a partnership program of the International Potato Center (CIP). It supports Asia-wide networking on participatory research and development (PR&D) for sustainable agricultural livelihoods (www.cip-upward.org). UPWARD takes PR&D as a family of approaches, methods, attitudes and behaviors that seek greater participation of intermediate- and end-users in investigating and seeking improvements in local situations, needs and opportunities. Launched in 1989, UPWARD seeks to address three important challenges facing agricultural research and development today: linking users and R&D professionals for more effective agricultural innovation; bringing sustained benefits to less favored farming areas and marginalized groups, especially women; and working with households and local communities as key actors in research and learning activities. Over 50 organizations in Asia and around the world participate in UPWARD and these include national/local research institutes, universities/colleges, international research/donor organizations, development and extension agencies, NGOs and local government units. Its Coordinating Office is located in the Philippines. The UPWARD program consists of three inter-related components:	UPWARD will support the project by contributing to PR&D methodology development, field-testing and training. During the PDF-B, UPWARD provided expertise support and facilitated the process of developing protocols for participatory diagnosis. It will continue to play this role during project implementation, particularly in refining and field-testing the protocols. UPWARD will also provide similar methodological support to other project components such as: 1. Participatory on-farm experimentation to develop and evaluate technologies, practices and procedures, and 2. Trainings, learning workshops and information services for capacity development of project partners. The project is also expected to facilitate cross-learning with the on-going CIP activity on sweetpotato on-farm conservation and use, being undertaken by the Genetic Resources Division and UPWARD in Southeast Asia.

Root and tuber crop innovations: To introduce innovations that optimize the contribution of root crops within specific functional niches in local agricultural livelihood systems. *PR&D methodologies:* To field-test and promote participatory approaches in developing and sustaining local innovations. *Partnerships and networking: T*o strengthen PR&D capacity and networking among Asian R&D professionals and their organizations. Within its broad livelihood systems framework, UPWARD seeks to strengthen the dynamic interrelationship among three thematic areas: - Integrated crop management: Documentation of local production systems with emphasis on root crops, users' soil resource management, integrated and community-based management of pests and diseases, seed supply, and improved management of homegardens and non-conventional production systems. - Genetic resources conservation: Conservation of germplasm and associated local knowledge, participatory multi-user varietal evaluation, strengthening local capacity for conservation through use, and promotion of biodiversity conservation through homegardening - Processing, marketing and consumption: Enhancing production-marketing linkages, post-harvest handling and storage, household and community-based enterprise development, and family food consumption and nutrition. UPWARD also deals with *crosscutting research*: Linking PR&D with policy, participatory monitoring and evaluation, capacity development, building platforms for multi-stakeholder partnerships, engendering research and development, and strengthening local knowledge systems. In partnership with the CGIAR Systemwide Program on Urban and Peri-Urban Agriculture (Urban Harvest), UPWARD also undertakes research to assess needs and opportunities and to introduce innovations for improving agri-based livelihood in urban and peri-urban areas.	
Commonwealth Scientific and Industrial Research Organisation (CSIRO): http://www.csiro.au CSIRO Plant Industry is one of the larger Divisions of CSIRO, Australia's scientific research organisation servicing agriculture, industry, and the natural environment. It is a unique research organisation which because of its breadth, diversity and global credibility, can deliver focused and strategic research on significant	The principal staff person participating in the project is Dr Tony Brown, presently a Chief Research with CSIRO Plant Industry. He has considerable experience and achievement in researching the organization of genetic variation within natural

national and global issues. CSIRO Plant Industry applies strategic research in the plant sciences to promote profitable and sustainable agri-food, fiber and horticultural industries, develop novel plant products and improve natural resource management. Priority is given to developing alliances with industry and other research organizations in Australia and overseas to enhance research outcomes and their application.	or agricultural plant populations, the factors maintaining this variation, its role in adapting plants to their environment and the systematic and evolutionary relationships between crops and their related wild species. His other experience is working with plant breeders to exploit variation present in natural populations of crop wild relatives (barley, soybeans, cotton) in plant improvement. These studies furnish the basic data and germplasm essential to efficient programs for the optimal sampling, conservation and use of plant gene pools.
Food and Agriculture Organization of the United Nations (FAO): http://www.fao.org The Food and Agriculture Organization of the United Nations (FAO) leads international efforts to defeat hunger. Serving both developed and developing countries, FAO acts as a neutral forum where all nations meets as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information and help developing countries and countries in transition modernize and improve agriculture, forestry and fisheries practices and ensure good nutrition for all. The Plant Production and Protection (AGP) Division of FAO (http://www.fao.org/ag/agp) addresses the development of sustainable agricultural systems to improve crop and grassland productivity, to create conditions for enhances food security and general economic development and to conserve the environment through the development of agriculture's biological resources. AGP's major activities include the provision of regional and global fora for common action among countries and programmes on the conservation of plant genetic resources for food and agriculture (PGRFA), crop improvement and seed production development, and environmentally sound management of pests, including Integrated Pest Management (IPM). Major outputs of AGP cover: seed security, a rolling Global Plan of Action for the Conservation and Sustainable use of PGRFA, biosecurity in relation to the spread of plant pests and weeds including International Standards for Phytosanitary measures, reduction of risk of pesticides use to the human health and the environment and ecological approaches to achieve sustainable intensification of crop and grassland production and diversification opportunities.	FAO will contribute its staff time to provide scientific backstopping for activities related to Integrated Pest Management and setting up of Farmers Field School at site levels in all the four countries. FAO staff will also provide technical support on pathological and entomology aspect of the project. FAO will also contribute its staff time to serve on International Steering Committee of the project and will provide all logistic arrangements for holding of International Steering Committee meetings as and when organized at FAO and also providing facilities for holding of other project related meetings in Rome. FAO is also the Implementing Agency for EU-China-FAO Programme on 'Enhancing Farmers' Awareness and Protection of Agro-biodiversity (EFAPA) in South/West China. The developmental objective of this programme is to bring about 'Improved agro-biodiversity protection and rural livelihoods of male and female farmers in selected provinces in China South/West region', which includes the provinces of Yunnan, Sichuan, Xinjiang and Inner Mongolia. IPGRI is part of the consortium of international agencies for this project which includes: FAO, IPGRI, IUCN and Amber Foundation of Germany, and will be working closely with FAO for the implementation of this project in China..

The Plant protection Service of FAO (http://www.fao.org/ag/AGP/AGPP) addresses international aspects of plant protection and closely cooperates with regional and national plant protection organizations and programmes. The programme addresses plant quarantine in the Secretariat to the International Plant protection Convention, setting standards, exchanging information and fostering cooperation. Concerning pesticide management, the programme promotes the implementation of the International Code of Conduct on the Distribution and Use of Pesticides; it provides jointly with UNEP the Secretariat to the Rotterdam Convention on the PIC procedure on certain hazardous chemicals and pesticides in international trade and, with WHO, makes recommendations for maximum residue levels. On Pest Management, the Service support the establishment of Integrated Pest Management Programme, including the application of Biological Control and Weed Management.	
International Food Policy Research Institute (IFPRI), Washington, D.C. USA: http://www/ifpri.cgiar.org IFPRI mission is to provide Policy solution that cut hunger and malnutrition. IFPRI places high priority on activities that benefit the greatest number of poor people in greatest need in developing world. In carrying out its activities, IFPRI seeks to focus on vulnerable groups, as influenced by casts, class, religion, ethnicity, and gender. Genetic Resources Policy research of IFPRI focuses on developing policies to promote sustainable management of agricultural biodiversity by enhancing poor farmers' access to diverse crop genetic resources. By adapting economics research tools to identify the determinants and value of diverse crop varieties, researchers are able to more effectively target conservation strategies at the community level, particularly under circumstances of environmental and economic change. Research at the local level also helps uncover important potential applications of crop diversity, such as its use in combating pests and disease in small holder farming.	IFPRI will provide economics expertise to and advance methods to support the work of a locally identified economist (s) in the national project teams. The principal scientist from IFPRI is jointly appointed by IFPRI and IPGRI. IPGRI's Senior Economist, Dr. Melinda Smale manages the IFPRI's program on genetic resources policies.

ANNEX F - ANALYSIS OF EXISTING LEGISLATIONS AND POLICY

The partner countries have adopted a number of biodiversity conservation and development plans, including plant genetic resources management and use, sustainable agricultural production, Farmers' rights and benefit sharing mechanisms, reduction in pesticide consumption and environment protection, material transfer agreement, etc. These laws and policy framework are continuing to develop in each of these four countries. Preliminary analysis and implementation of these laws in the context of crop biodiversity conservation for sustainable food production and environmental protection was carried out for each of these countries during the PDF B phase, which indicated strong commitments by each of the four countries to conserve and use crop diversity for sustainable agriculture production and environment protections. The major ones are summarized below, for each country separately:

China:

National:

1. *National Biodiversity Strategy and Action Plan* – China has developed its national Biodiversity Strategy and Action Plan, including provision for conservation and use of crop genetic resources.
2. *Regulations on Plant Germplasm Resources Protection of the People's Republic of China* (1 October 2003).
3. *Agricultural Law of the People's Republic of China* (2 July 1993, 1 March 2003) – To promote the significant role that agriculture has played in the national economic development. Facilitate the agriculture modernization and its sustainable development. Protect the rights of farmers and agricultural industry and improve the living standard of farmers.
4. *Seed Law of the People's Republic of China* (1 December 2000) - Make reasonable use of seed resources; controlling the selection, production, business operation and use of seed; protect the legal rights of the producers, business operators and users of seed; promote seed quality, boost the industrialization process of seed; accelerate the development of the planting and forestry industries.
5. *Law of the People's Republic of China on the Entry and Exit Animal and Plant Quarantine* (30 October 1991) - This Law is formulated for the purpose of preventing infectious or parasitic diseases of animals, diseases, insect pests and weeds dangerous to plants, and other harmful organisms from spreading into or out of the country, protecting the production of agriculture, forestry, animal husbandry and fishery as well as human health, and promoting the development of foreign economic relations and trade.
6. *Safety Administration Implementation Regulation On Agricultural Biological Genetic Engineering* (9 May 2001) - Aimed at promoting research and development in the area of agricultural biological genetic engineering in China, strengthening safety administration, preventing possible hazards caused by

genetic engineered organism and its product to human health, environment on which human beings rely for existence and agricultural ecological equilibrium.

7. *Regulations of the People's Republic of China on the Protection of New Varieties of Plants* (20 March 1997) - Protect the rights in new varieties of plants, encourage the breeding and use of new varieties of plant, and promote the development of agriculture and forestry.
8. *Land Administration Law of the People's Republic of China* (1 Jan. 1999, 28 August 2004) - The law is formulated with a view to strengthening the administration of land, safeguarding the socialist public ownership of land, protecting and developing land resources, ensuring a rational use of and giving a real protection to cultivated land to promote sustainable development.
9. *Environmental Protection Law of the People's Republic of China* (26 December 1989) - The law is formulated for the purpose of protecting and improving the ecological environment, preventing and controlling pollution and other public hazards, safeguarding human health.
10. *Fisheries Law of the People's Republic of China* (1 July 1986) - This law is formulated for the purpose of enhancing the protection, increase, development and reasonable utilization of fishery resources, developing artificial cultivation, protecting fishery workers' lawful rights and interests and boosting fishery production in the country.
11. *Forest Law of the People's Republic of China* (20 September 1984) – This law was developed for protecting, nurturing and rationally utilizing the forest resources, bringing into play the roles of the forest in terms of storing water, saving soil, adjusting the climate, improving the environment and supplying forest products.
12. *Grassland Law of the People's Republic of China* (1 October 1985) - This Law is formulated with a view to improving the protection, management and development of grasslands and ensuring their rational use; protecting and improving the ecological environment; modernizing animal husbandry; enhancing the prosperity of the local economies of the national autonomous areas.
13. *Law of the People's Republic of China on the Protection of Wildlife* (8 November 1988) - This law is formulated for the purpose of protecting and saving the species of wildlife which are rare or near extinction, protecting, developing and rationally utilizing wildlife resources and maintaining ecological balances.
14. *Implementation Regulations on the Protection of Wild Aquatic Animals* (17 September 1993) - Protect and save the species of wild aquatic animals which are rare or near extinction in order to maintain ecological balances.
15. *Implementation Regulations of the People's Republic of China on the Protection of Terraneous Wildlife* (12 February 1992).
16. *Protection Regulations on Nature Reserves* - 9 October 1994 - Support ecological security, prevent adverse effects of economic and other activities to the natural ecological systems, conserve biological diversity, and organize rational nature management.
17. *Management System of Forest and Wild Animals in Nature Reserves* (6 July 1985).
18. *Regulations on Aquatic Resources Conversation* (13 March 2003).

19. *.Regulations on Wild Medicinal Resources Protection* (October 1987) - This is the first regulation in China specialized on protecting wild medicinal resources.
20. *Regulations on Wild Plant Protection of the People's Republic of China* (1 January 1997) - Protect, develop and rationally utilize wild plant resources to maintain biodiversity and ecological balance.

Regional and International:

1. *Convention of Biological Diversity (CBD)*: *1993* - China became member of CBD on 29 December 1993. The three goals of the CBD are to promote the conversation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources. China has actively participated in COP (The CBD Conference of the Parties).
2. *Global Plan of Action* : *1996* – China endorsed the Global Plan of Action developed by FAO for conservation and sustainable use of and its follow up activities in China.
3. *Convention on International Trade in Endangered Species of Wild* Fauna *and* Flora *(CITES)* - China signed the CITES on 3 March 1973 in Washington to join the globe in order to protect the endangered species of wild *Fauna* and *Flora*.
4. *The International Code of Conduct for Plant Germplasm Collecting and Transfer* - An integral component of the Global System on Plant Genetic Resources. It was adopted by the FAO Conference in 1993 and aims to promote: a) the rational collection and sustainable use of genetic resources; b) prevent genetic erosion; c) protect the interests of both donors and collectors of germplasm.
5. *The Global Crop Diversity Trust* - will serve as an element of the funding strategy of the International Treaty and will work under the overall policy guidance of the Governing Body of the Treaty.
6. *Integrated Pest Management (IPM)* - As part of CBD, government of China agreed to "increase food production in a sustainable way and enhance food security (Chapter 14 of Agenda 21). The Government endorsed IPM, acknowledging its role in sustainable agriculture and rural development. IPM involves choosing a range of appropriate pest control techniques such as resistant varieties, natural predators, and cropping techniques.
7. *Safe movement of germplasm and the Cartagena Protocol on Biosefety* **–** The Government of China is also committed to Article 19 of the Convention to develop protocols on biosafety, specially focusing on transboundary movement of any living modified organism resulting from modern biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity.
8. *Pesticide control and environmental and human health* - For the past two decade, the Pesticide Action Network (PAN) has worked to make voluntary codes and legally binding instruments more effective in reducing pesticide hazards. The International Code of Conduct on the Distribution and Use of Pesticides (FAO code) was adopted in 1985 and amended to include the principle of Prior Informed Consent (PIC) in 1989.
9. China has signed the Rotterdam Convention establishing PIC in International Law. China is also participating in the *Global Information Network on Chemicals (GINC),*

a world information network for safe use of chemicals and provide information for better protection of workers, public health, and the environment.

10. *Environmental Law programme* – China is members of IUCN Environmental Law programme to advance sustainability through the development of legal and policy concepts and instruments, and through building the capacity of societies to develop and implement environmental law and policy, in furtherance of the IUCN Mission, in the Country.

Ecuador:

National:

1. *National Biodiversity Strategy and Action Plan*: Ecuador has developed its national Biodiversity Strategy and Action Plan, including provision for conservation and use of crop genetic resources.
2. *National Policy on Agro biodiversity and Food Security in Ecuador- 2000*: The document concerns policies associated with *in situ* and *ex situ* conservation, environmental impact, food security and knowledge associated with agrobiodiversity. The document emphasizes the importance of agrobiodiversity in Ecuador, analyzes the cause and consequences of an increasing loss of the agrobiodiversity, identifies national legislation and entities that will be involved in such national policy.
3. *National Strategy and Policy on Biodiversity in Ecuador (NSPB-Ecuador)- 2001-2010* – NSPB: Ecuador identifies the conservation of agrobiodiversity as a priority, given its economic importance for the country. It highlights the need to promote the adoption of practices, technologies and processes of clean production and the progressive substitution of chemicals and the development of an organic production with emphasis in the biological control of pests and diseases.
4. *Intellectual Property Rights – 2005*: Legislation on intellectual property rights in Ecuador follows a pyramidal structure: (1) Political Constitution of Ecuador; (2) International Conventions such as Universal Convention, Bern Convention and Roma Convention *on Author and Conexus Rights*, Buenos Aires Convention, Paris Convention and the Treaty of Cooperation to Patents *on Industrial Property* and finally International Convention *to the Protection of Obtainer Rights of Plant Varieties*; and (3) Communitarian Legislation of the Andean Community Nations (CAN), Decision 351 *on Author and Conexus Rights*, Decision 486 *on Industrial Property* and Decision 345 of the *Obtainer Rights of Plant Varieties*.
5. *Biosafety and Genetic Engineering:* Ecuador is working on the national regulations for the Cartagena Protocol on Biosafety. The national group working on these regulations proposes to include the national regulation under the Convention on Biological Diversity law to avoid creating a new law regarding Biosafety.
6. *Strategic plan of INIAP – 2005*: The first strategic plant of INIAP was issued in 1993. It was reviewed in 2004 and presented in 2005. The strategy plan of INIAP prioritizes on food security, competitiveness and technological development for contribute to the sustainable agriculture. The strategy aims at avoiding natural resources degradation,

desertification, deforestation, water pollution, pest and disease resistance to pesticides, reduction of biodiversity and of species extinction.

7. *Global Plan of Action (GPA) follow up at INIAP – 2004-2005*: INIAP through DENAREF made an agreement with FAO to coordinate activities to establish and interchange mechanisms of information on the application of GPA to conserve and sustainable use biodiversity in Ecuador.

Regional and International:

1. *Convention on Biological Diversity (CBD) – 1993*: Ecuador adopted the Convention on Biological Diversity (CBD) agreements and ratified it on 23 February 1993. Since these dates, Ecuador, as signer of this convention, seeks to concrete three objectives: to conserve the biological diversity, to use sustainability its biological resources and ensure the equitable and distribution of the benefits derived of the genetic resources use.
2. *Global Plan of Action (GPA) in Ecuador – 1996:* Ecuador participated in the Declaration of Liepzig for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture. During the 2003, the implementation of the GPA in Ecuador was carried out and is being monitored through local meetings with Ecuadorian stakeholders (decision makers from Ecuadorian GOs and NGOs) and providing important information regarding amount and distribution of plant genetic resources in Ecuador.
3. *FAO International Treaty on Plant Genetic Resources for Food and Agriculture:* Ecuador ratified the treaty on 6 January 2004 and it is in operation since 29 August 2004. Treaty is about conservation and sustainable use of Plant Genetic Resources and the fair distribution of benefits in harmony with a sustainable agriculture.
4. *Decision 391 of the Andean Community of Nations (CAN) on the Cartagena Agreement – 1996:* Decision 391 of the Commission on the Cartagena Agreement, signed in Lima on 17 July 1996, promotes the creation of Standard Regulations on Access to Plant Genetic Resources, through the signing of Access Contracts between applicants and the country where the resource originates, conservation of the biological diversity is encouraged and the development of the scientific and negotiating capabilities of member countries of the Agreement is promoted. Ecuador, as member of the Andean Community of Nations (CAN) and signer of the Decision 391, is working on national regulations for the applications of these laws.
5. *Regional Biodiversity Strategy of the Andean Community Nations (CAN) - Issued in La Paz, Bolivia – 2001:* The document emphasizes the importance of traditional knowledge in conservation of biodiversity and the importance of local knowledge on biodiversity. CAN has established some legal basis for equal distribution of benefits. CAN ratified the Decision 391 to states the equal and just participation on benefits derived from the access to biodiversity the following conditions associated with intellectual property, defines the basis for recognizing and valuing genetic resources, their products and traditional knowledge, emphasizes the conservation and sustainable use of biological and genetic resources, and promotes the strengthening of scientific, technological and technical capacities at local, national and regional level.

6. *Declaration of Cancun – 2002*: In February 2002 in Cancun, Mexico, and Ecuador and other 11 main mega-diverse countries signed a declaration to constitute the Group of Mega-diverse countries related as instrument of common forehead with the objective to establish a mechanism of cooperation and consultation to promote their interests and priorities about conservation and sustainable use of the biological diversity. Later in Cusco, Peru, 15 main mega-diverse countries ratified the Declaration of Cancun through *Declaration of Cusco,* signed on November 2002. In Cusco the countries recognize the crucial importance of genetic resources to the main mega-diverse countries, who are diversity origin and centers of those genetic resources as well as of their applications in the technological, economic and socio-cultural areas. Declaration of Cusco includes the local knowledge and folklore as a substantial part to the preservation of such diversity.
7. *Decision 345 from the CAN*: Decision 345 is regional regulation from the Andean Community of Nations regarding intellectual property rights of plant varieties. The Ecuadorian Institute for Intellectual Property (IEPI, *Instituto Ecuatoriano de Propiedad Intelectual*) is currently applying this Decision at national level. The International Union for the Protection of New Varieties of Plants (UPOV) establishes the guidelines for conducting the tests for distinctness, uniformity and stability required previous to any new variety release. INIAP as a National Institution holds life samples of about 500 new registered varieties in Ecuador as a service provided to IEPI (under an inter-institutional agreement).
8. *Convention on International Trade in Endangered of Wild Fauna and Flora (CITES)* – Ecuador ratified the Convention.
9. *Integrated Pest Management (IPM)**:*** As part of CBD, government of Ecuador agreed to "increase food production in a sustainable way and enhance food security (Chapter 14 of Agenda 21). The Government endorsed IPM, acknowledging its role in sustainable agriculture and rural development. IPM involves choosing a range of appropriate pest control techniques such as resistant varieties, natural predators, and cropping techniques.
10. *Safe movement of germplasm and the Cartagena Protocol on Biosefety* **–** The Government of Ecuador is also committed to Article 19 of the Convention to develop protocols on biosafety, specially focusing on transboundary movement of any living modified organism resulting from modern biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity. In addition, Ecuador has endorsed the "International Plant protection Convention (IPPC)" to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control.
11. *Pesticide control and environmental and human health* - For the past two decade, the Pesticide Action Network (PAN) has worked to make voluntary codes and legally binding instruments more effective in reducing pesticide hazards. The International Code of Conduct on the Distribution and Use of Pesticides (FAO code) was adopted in 1985 and amended to include the principle of Prior Informed Consent (PIC) in 1989.
12. Ecuador has signed the Rotterdam Convention establishing PIC in International Law and is also participating in the *Global Information Network on Chemicals (GINC)*, a

world information network for safe use of chemicals and provide information for better protection of workers, public health, and the environment.

13. *Environmental Law programme* – Ecuador is members of IUCN Environmental Law programme to advance sustainability through the development of legal and policy concepts and instruments, and through building the capacity of societies to develop and implement environmental law and policy, in furtherance of the IUCN Mission, in the Country.

Morocco:

National:

1. *Environment protection: Dahir n° 1-03-59 of May 12, 2003* - Bearing promulgation of the law n° 11-03 relating to the protection and the development of the environment. The present law has the aim of enacting the basic rules and the general principles of the national policy in the field of the protection and the development of the environment.
2. *Policy for production, control and certification of seeds and seedlings of crop plants* - Twenty of Decrees of the Minister for Agriculture regulating the production, control, the conditioning and the certification of the cultivated plant species were published pursuant to the bearing Dahir law No1-76-472 of September 19, 1977, modifying the Dahir No 1-69-169 of July 25, 1969, which regulates the production and the marketing of the seeds and seedlings.
3. Always pursuant to the Dahir of 1977, two other decrees of the Minister for Agriculture were published; the first fixes the conditions of registration of varieties at the official catalogue of the species and the varieties of cultivable plants in Morocco. Second deals with the composition and attributions of the national Committee of the selection of the seeds and seedlings.
4. *Law on the protection of varieties* - Dahir of 21 January 1997 bearing promulgation of the law n° 9-94 on the protection of new varieties of plant (BO n° 4482 of May 15, 1997 P. 523). The national law on protection of selection and breeding products was promulgated in 1996. This opened the way for Morocco to become member of the International Union for the Protection of New Varieties of Plant (UPOV). This law aims at promoting the recognition of the merits of the breeders of the new plant varieties in their conferring a right of ownership.
5. *Plant health and crop protection* - In Morocco there is strong official support to IPM emphasizing the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. The legislation in force covers four fields: the administrative organization, the management of the pesticides, the sanitary police force and the control of the crop enemies. An imposing legal and lawful arsenal governs plant health protection.
6. *Decree nº 2730of the Minister for agriculture* - Concerning the importation and releasing exotic agents of the biological control. This decree allows the importation of the exotic agents of biological control, intended for release, which appear in appendix I of the decree, conditioned and marketed internationally. It fixes also the

requirements to be able to import the species other than those envisaged with appendix I, when they are of beneficial interest in the control of the enemies of the plants and the crop products.

7. A new pesticide law is currently coming into force in Morocco, loosely based on the French model. Temporary registrations granted under the new law are now valid for four years and full registrations for ten years. For products to be approved, they must also have a valid European or US approval. Under the previous legislation, the duration of pesticide approvals was unlimited. In the past, only the Ministry of Agriculture was directly involved in pesticide registration matters. In future, the Ministries of Health, Environment, Trade and Industry, Interior, Employment, Finance (Customs Department) and Equipment will also be involved in the decision-making processes.
8. *Development of Biodiversity Strategy Action Plan (NBSAPs) with component to conserve agro-biodiversity* – Morocco has developed its Biodiversity Strategy Action Plan, which is at the moment the most elaborate document on issues of genetic resources as a whole.

Regional and International:

1. *Convention on the Biological Diversity (CBD)* - Morocco signed the Convention on the Biological Diversity with the objectives of conservation of biodiversity, the sustainable use of its components and the just and equitable sharing of the advantages resulting from the exploitation of the genetic resources.
2. *Convention on the prevention of Desertification* - Morocco signed the Convention on the prevention of Desertification.
3. *International Treaty on the Plant Genetic Resources for the food and agriculture* - Morocco signed the “International Treaty on the Plant Genetic Resources for the food and agriculture." In this respect, a project of law was submitted to the parliament in order to proceed with the ratification of this treaty.
4. *Commission of Genetic Resources for the food and agriculture* - Morocco is also member of the FAO “Commission of Genetic Resources for the food and agriculture”.
5. *Protocol of Carthagene on the prevention of the biotechnological risks relating to Convention on the Biodiversity* – This treaty was adopted at Montreal during 2000 and Morocco also endorsed this in the same year.
6. *Amendment to the convention of 1976 for the protection of the Mediterranean against pollution* – This treaty was adopted at Barcelona during 1995 and Morocco also become to this in the same year.
7. *Protocol relating to the areas especially protected in the Mediterranean and biological diversity from the Mediterranean and its appendices* – This protocol was agreed at Barcelona during 1995 and was furthered endorsed at Montecarlo during 1996. Morocco become member during 1995.
8. *Convention creating organization for the protection of the plants in the Middle East* – This convention was agreed upon at Rabat during 1993 for which Morocco also become member during the same year.

9. *Maghrebian chart relating to the durable development and environmental protection* – This was adopted in Nouakchott during 1992 and Morocco is also a memebr to this agreement.
10. *Protocol concerning the areas especially protected in the Mediterranean* – This protocol was adopted at Geneva during 1982 and Morocco become a party to this during 1986.
11. *Amendment to the International Convention for the protection of the plants* – This amendment was agreed in Rome during 1979 and Morocco adopted this during 1991.
12. *African convention on the natural resource and nature conservation* – This convention was agreed upon in Algers during 1968, which was adopted by Morocco during 1969.
13. *Plant health convention for Africa* – this convention was adopted during 1968 at Kinshasa and was adopted by Morocco during 1974.
14. *International Convention on the protection of new varieties* – Morocco adopted this during 1968 and its amendent during 1981.
15. Convention on International Trade in Endangered of Wild Fauna and Flora (CITES) – Morocco ratified the Convention.
16. *Integrated Pest Management (IPM)* - As part of CBD, government of Morocco agreed to "increase food production in a sustainable way and enhance food security (Chapter 14 of Agenda 21). The Government endorsed IPM, acknowledging its role in sustainable agriculture and rural development. IPM involves choosing a range of appropriate pest control techniques such as resistant varieties, natural predators, and cropping techniques.
17. *Safe movement of germplasm and the Cartagena Protocol on Biosefety* – The Government of Morocco is also committed to Article 19 of the Convention to develop protocols on biosafety, specially focusing on transboundary movement of any living modified organism resulting from modern biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity. In addition, Morocco has endorsed the "International Plant protection Convention (IPPC)" to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control
18. *Pesticide control and environmental and human health* - For the past two decade, the Pesticide Action Network (PAN) has worked to make voluntary codes and legally binding instruments more effective in reducing pesticide hazards. The International Code of Conduct on the Distribution and Use of Pesticides (FAO code) was adopted in 1985 and amended to include the principle of Prior Informed Consent (PIC) in 1989. Morocco is participating in the *Global Information Network on Chemicals (GINC)*, a world information network for safe use of chemicals and provide information for better protection of workers, public health, and the environment.
19. *Environmental Law programme* – Morocco is members of IUCN Environmental Law programme to advance sustainability through the development of legal and policy concepts and instruments, and through building the capacity of societies to develop and implement environmental law and policy, in furtherance of the IUCN Mission, in the Country.

Uganda:

National:

1. The importance of biodiversity has long been recognized by the Government of Uganda and is reflected in key government development policies and legal frameworks; the Uganda' Constitution (1995), National Environmental Statute (1995), the Land Act (1998), Poverty Eradication Action Plan (PEAP), Plan for Modernization of Agriculture (PMA). These concerted efforts together with participation and implementation of international agreements on Global biodiversity such as; conservation on Wetlands of International importance as Waterfowl habitat (1971), conservation on the International Trade in Endangered Species of Wild fauna and Flora (1973) referred to as CITES and the Conservation on Biological Diversity (1993).
2. *Development of Biodiversity Strategy Action Plan (NBSAPs) with component to conserve agro-biodiversity* **–** Uganda has developed its Biodiversity Strategy Action Plan, which is at the moment the most elaborate document on issues of genetic resources as a whole. The goal of the NBSAP is to enhance biodiversity conservation, management and sustainable Utilization at all levels (Section 2.1).
3. *The Uganda Constitution 1995 - Objective XXVII* - Provides for the sustainable utilization of Uganda's natural resources i.e. "…….. to meet the development and environment needs of present and future generation of Uganda". Clause IV of objective XXVII empowers the state, including Local Government to "………. to ensure the conservation of natural resources and protect the biodiversity of Uganda…….".
4. Objective 22 and article 242 of The National Environment Statute - provides for the conservation of biological resources *In situ* and *Ex-situ* and for the regulation of access to genetic resources. The Act provides for the preservation of biological diversity in principle 3(1) (e), which can be read as covering PGRFA since it forms part of biological diversity.
5. *The National Agricultural Research policy Section: 2.2.8* - Sustainability of agriculture production largely depends on proper use of natural resources. Section: 2.1 The mission for agricultural research is "to generate and disseminate appropriate safe and cost-effective techniques, while enhancing the natural resource base.
6. *The National Environment Act* - Creates the National Environment Management Authority, which among other things is empowered to issue guidelines for the conservation of biological diversity.
7. *The National Forestry Policy (Policy 7)* - Provides for conservation of forest biodiversity and its management in support of local and national socio-economic development and international obligations.
8. *The National Forestry and Tree Planting Act Section. 2* - Provide for the conservation of forests and trees and their sustainable use and re-affirmed in several sections. Also

ss.14, 30 and 31 The National Forestry and Tree Planting Act (sec.37) provides for inventorying of all forests in Uganda.

9. *The National Forestry and Tree Planting Act sec. 30 and 31* - Provides for the Minister declaring a tree species of international or national importance a protected species and therefore subject to such control as the Minister may specify.

10. *The Forestry policy (Policy statement 6)* - Promotes tree growing on farm in all-farming systems. And the Forestry and Tree Planting Act provides for the same. These may include trees for firewood, poles timber, non-wood products and fruits. The Forestry and Tree Planting Act provides for establishment of forest reserves.

11. *The Forestry Policy (policy 6 and 7)* - Refer to relevant conventions and the *ex- situ* Conservation of specific plant genetic resources on farm and in botanic gardens and other means. The National Forestry and Tree Planting Act provides for agro-forestry and ownership of the trees and forest produce on private land.

12. *The Seeds and plant Bill 2003* - Section 8 of this bill, provides information for Seed certification, testing and standards.

13. *The Plant Protection Act 2000* **-** The purpose of this Act is to make provision for the prevention of introduction and spread of disease destructive to all plants, not necessarily plants for food and agriculture. However, Section 8 of the Act makes it an offence for someone to knowingly introduce any pest or disease into any cultivated land and provides a penalty of a fine of a paltry**.**

14. *The Plant Protection and Health Bill 2003* **-** The bill seeks to consolidate and reform the law relating to protection of plants against destructive diseases, pests and weeds, to prevent the introduction and spread of harmful organisms that may adversely affect Uganda's agriculture, the natural environment and livelihood to the people and for other related matters. The Bill also provides for enforcement of phytosanitary standards in relations to international trade. The Bill seeks to repeal the Plant Protection Act.

15. *The National Agricultural Research Policy* **-** Priority No.5 of the policy puts special focus on recent developments related to the agricultural sector including genetic resources conservation and biotechnology, globalization of world markets and Trade Related Intellectual Property Rights and their implications for the Plan for Modernisation of Agriculture.

16. *The National Agricultural Research Act 2003* - Act to provide for the development of an agricultural research system for Uganda for purpose of improving agricultural research services delivery, financing and management; establishment of National Agricultural Research Council, its powers, functions and administration, establishment of a new National Agricultural Research Organisation as the umbrella Organisation for all public agricultural research institutes; to repeal the National Agricultural Research Organisation Act, Cap 205 and to provide for other related and incidental matters.

17. *Legislation on the safe movement of plants (quarantine information, etc.) –*

18. *The Wildlife Act, 2000* - The Act gives a wider definition of wildlife than the old legislation by the inclusion of wild plants. It provides for the protection of an area of Local or National importance because of its biological diversity, landscape or Natural heritage. It opens the arena of conservation to the private sector by allowing the Executive Director of the Uganda Wildlife Authority to enter into any suitable commercial or collaborative arrangement with any person for the management of protected areas to provide services therein and manage species or a class of species of animals or plants.

19. *The Water Act's objectives include* - The regulation of the use, protection and management of Water resources and supply. The Act is relevant because some PGRFA may be found in or near water resources.

20. *The Land Act, 2000* - Provides for the different forms of land tenure i.e. Freehold, Mailoland, Leasehold and Customary tenure. In relation to the environment, the Act obliges the occupier of land to utilize it in all environmentally sound way and in accordance with the relevant laws e.g. The National Environment Act and the Wildlife Act. The Act therefore, reinforces these laws that protect our natural resources.

Regional and International:

1. *Convention on Biological Diversity* - Through policy interventions and integration, and networking to support implementation of international commitments Uganda has ratified and signed Convention on Biological Diversity.
2. *International treaty on Plant Genetic Resources programs for Food and Agriculture* – Uganda signed and ratified the treaty of FAO.
3. *Relevant principles of Agenda 21 of UNCED* – Uganda has agreed with the Agenda 21 of UNCED.
4. *Global Action Plan to which Uganda is party* – Uganda endorsed the Global Plan of Action for conservation and use of plant genetic resources and its follow up in the country.
5. *Farmers' rights* **-** Uganda ratified an International Treaty on PGR for food and agriculture which was adopted in the thirty first FAO conference by unanimity. However Uganda has not yet availed a specific law of relevance in place but efforts are underway to domesticate the treaty.
6. *Convention on International Trade in Endangered of Wild Fauna and Flora (CITES)* – Uganda ratified the Convention.
7. *Integrated Pest Management (IPM)* - As part of CBD, government of Uganda agreed to "increase food production in a sustainable way and enhance food security (Chapter 14 of Agenda 21). The Government endorsed IPM, acknowledging its role in sustainable agriculture and rural development. IPM involves choosing a range of appropriate pest control techniques such as resistant varieties, natural predators, and cropping techniques.
8. *Safe movement of germplasm and the Cartagena Protocol on Biosefety* **–** The Government of Uganda is also committed to Article 19 of the Convention to develop protocols on biosafety, specially focusing on transboundary movement of any living

modified organism resulting from modern biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity.

9. *Pesticide control and environmental and human health* - For the past two decade, the Pesticide Action Network (PAN) has worked to make voluntary codes and legally binding instruments more effective in reducing pesticide hazards. The International Code of Conduct on the Distribution and Use of Pesticides (FAO code) was adopted in 1985 and amended to include the principle of Prior Informed Consent (PIC) in 1989. Uganda is participating in the *Global Information Network on Chemicals (GINC)*, a world information network for safe use of chemicals and provide information for better protection of workers, public health, and the environment.
10. *Environmental Law programme* – Uganda is members of IUCN Environmental Law programme to advance sustainability through the development of legal and policy concepts and instruments, and through building the capacity of societies to develop and implement environmental law and policy, in furtherance of the IUCN Mission, in the Country.

ANNEX P – MONITORING, PROGRESS REPORTING, AND EVALUATION PLAN

The objective of monitoring and evaluation is to assist all project participants in assessing project performance and impact, with a view to maximizing both. Monitoring is the continuous or periodic review and surveillance by management of the implementation of an activity. Monitoring helps to ensure that all required actions are proceeding according to plan. Evaluation is a process for determining systematically and objectively the relevance, efficiency, effectiveness, and impact of the activities in light of their objectives. Ongoing evaluation is the analysis, during the implementation phase, of continuing relevance, efficiency, and effectiveness and the present and likely future outcomes, effects, and impacts.

The general and specific objectives of the project, and the list of its planned outcomes, have provided the basis for this M&E plan. The project will be evaluated on the basis of execution performance, delivery, and project impact (outcomes per the project logframe.)

EXECUTION PERFORMANCE

Execution monitoring will assess whether the management of project activities is efficient. It seeks to improve efficiencies when needed so as to improve overall effectiveness of project implementation. It is a continuous process, collecting information about the execution of activities programmed from the annual workplans, advising on improvements to methods and performance, and comparing accomplished with programmed tasks. This activity will be the direct responsibility of the Project Management Unit (PMU), under the supervision of the Steering Committee. See Table 1 for the execution performance indicators. The UNEP Project management officer will, in collaboration with the PMU, track these indicators.

Table 1: Indicators for evaluating whether the project implementation unit and steering committee are operating effectively

Indicator	Means of Verification[1]
Biannual and annual activity progress reports are prepared in a timely and satisfactory manner	Arrival of reports to UNEP
Quarterly financial reports are prepared in a timely and satisfactory manner.	Arrival of reports to UNEP
Performance targets, outcomes, and outcomes are achieved as specified in the annual work plans.	Semi annual and Annual progress reports
Deviations from the annual work plans are corrected promptly and appropriately. Requests for deviations from approved budgets are submitted in a timely fashion.	Work plans, minutes of SC meetings, timely submission of revised budget to UNEP for approval
Disbursements are made on a timely basis, and procurement is achieved according to the procurement plan. Report on the procurement of non-expendable equipment against the project budget filed in a timely manner.	IMIS system at UNEP and Bank Account statements of executing agency Inventory of Non-Expendable Equipment reports

[1] The responsible officer to track this will be the GEF project task manager in consultation with the project manager.

Audit reports and other reviews showing sound financial practices.	Audit statements
International Steering Committee (ISC) is tracking implementation progress and project impact, and providing guidance on annual work plans and fulfilling TOR.	Minutes of ISC meetings
ISC is providing policy guidance, especially on achievement of project impact.	Minutes of ISC meetings

DELIVERED OUTCOMES

Ongoing monitoring will assess the project's success in producing each of the programmed outputs, both in quantity and quality. Internal assessment will be continuously provided by the PMU, and mid-term and final evaluations of outputs will be carried out by external consultants contracted by UNEP. See Table 2 for a summary of expected outcomes by project component, and Annex G (Project Timeline) for a detailed list of project activities and corresponding outcomes.

Table 2: Description and timing of expected outcomes by project component

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Project Components	**Outputs (O) and Milestones (M)**
1. Criteria and Tools	**M** Global workshop on participatory diagnostic approach and data analysis for developing Farmers Group Discussion (FGD) and participatory assessment combined with laboratory and field assessment organised by *Month 6 Year 1* **M** National workshops in each of the four countries to refine and finalise the FGD and participatory assessment, based on target crops and local situations, by *Month 10 Year 1* **M** Field survey for gathering site specific baseline information relating to amount of crop diversity, use of pesticides, site environment, social and economic aspects of the farmers and farming communities, undertaken by *Month 10 Year 1* **M** Survey information compiled and analyses to understand farmers belief regarding the concept of crop diversity and using the diversity to manage pest and diseases problem in their farming system by *Month 12 Year 1* **M** Survey information compiled and analyzed to determine whether intraspecific diversity with respect to resistance exists within the site and to identify other sources of diversity to be used by *Month 4 Year 2* **M** Experimentation conducted and data analyses to understand the pattern of diversity in resistance mechanism in host and pests and their interaction by *Month 6 Year 3* **M** Mechanism for movement and transmissions of pest and diseases within and among sites fully understood by *Month 3 Year 4* **M** Guidelines information for Farmers Group Discussion to understand farmers' knowledge, practices, problems and needs for using diversity to control pests and diseases gathered and compiled from each of the four countries for publication by *Month 10 Year 2* **M** Feedback on the usability and modification of the participatory protocol, based on its testing at each of the project sites from all the four countries compiled and the protocol finalised for its publication by *Month 6 Year 3* **M** Methods and tools identified/developed and scientific experimentation undertaken in each of the four countries to estimate value of crop genetic

	diversity by *Month 7 Year 4* **O** Farmers Group Discussion guidelines to understand farmers' knowledge, practices, problems and needs for using diversity to control pests and diseases developed through consultation workshops and available by *Year 2*. **O** Participatory assessment protocols that combined farmers knowledge and laboratory and field analysis developed by *Year 3*. **O** A set of methods and tools to estimate the value of crop genetic diversity in reducing yield losses, yield variability, and in mitigating product quality losses from pests and diseases developed, tested and made available to project national partners and others by *Year 4*.
2. Practice and Procedures	**M** Information regarding use of intra-specific diversity to manage pests and diseases problem in the on-going farming system and its associated problems for each of the target crops from each of the project sites in the four countries fully understood and documented by *Month 9 Year 4* **M** Status of national crop improvement system for developing resistant varieties, its extension and associated problem and challenges fully understood and documented in each of the four countries by *Month 8 Year 2* **M** Field and laboratory experiments conducted and concluded on the value of intra-specific diversity use to manage pests and diseases problem for each of the target crops across sites and countries by *Month 12 Year 4* **M** Information generated from these experiments compiled and synthesizes for developing protocols, recommendations and publications by *Month 6 Year 5* **M** Feasibility study conducted for up scaling of the project protocols over space and time by conducting simulation modelling by *Month 10 year 4* **O** Diversity rich practice or option developed, made available and promoted to project partners and others for each of the project target crops by *Year 4*. **O** A set of recommendations, providing guidance about substituting diversity rich practices for pesticide use, developed in each country and submitted to agricultural and environmental development sectors by *Year 5*.

3. Capacity and Leadership	**M** Team building and participatory training workshops in each of the four countries organised by *Month 8 Year 2* **M** Key farmers, both male and female, identified and were trained at each site in each of the four country for their active participation in the project by *Month 10 Year 1* **M** Cross site visits of key farmers organised to learn from each others experiences across all sites in the four countries by *Month 3 year 5* **M** Training workshops organised for farmers, extension workers and staff from local institutions for seed cleaning, management and marketing across all sites in the four countries by *Month 6 Year 5* **M** Local seed system strengthen/developed at each of the project sites by *Month 12 year 5* **M** Farmers Field Schools set up in each of the four countries at the project site Provincial level and curriculum for these schools developed by *Month 8 Year 4* **M** Necessary training facilities at national and site level provided to all four countries by *Month 5 Year 2* **M** Support provided for Degree programmes, both at Masters and Doctoral level, from each of the four countries and studies concluded by *Month 12 Year 5* **M** Several national and international thematic training/workshops organised for project partners from the four countries by *Month 12 Year 5* **M** Expert visits organised for national experts from all four countries to share experiences by *Month 6 Year 5* **M** Full support provided to the establishment of International Agrobiodiversity Training Centre in China and made operative for training of project partners by *Month 6 Year 3* **O** Farmer associations established or enhanced per site in each country to support the use of crop genetic diversity to manage and pest and disease pressures by *Year 4*. **O** Male and female farmer representatives in each site have participated in national committees/decision making fora for planning and evaluation of diversity rich methods to manage pest and diseases by *Year 5*. **O** Researchers within partner teams have in-house expertise on all disciplines to enable project outputs in the country by *Year 4*. **O** Site Coordination Committees are established in each county and operating to coordinating and link intra-site, thematic and multidisciplinary activities within each country by the end of *Year 1*. **O** Researches with expertise on participatory approaches in respect to pest and disease management available in each country by *Year 2*. **O** Participatory research training programme developed at the provincial level in each country by *Year 3*. **O** International Agrobiodiversity Training Centre is operative at Yunnan Agricultural University, Kunming, China to provide training national partners and others on agrobiodiversity management for pest and disease pressures by *Year 3*. **O** International Ph.D. sandwich programmes are set up between universities from the partner countries by *Year 4*.
4. Mainstreaming and Replication	**M** Project success stories documented, published and disseminated by *Month 6 Year 5* **M** Seed fairs, field demonstration and cross site visits were organised and several farmers, researchers and policy makers participated by *Month 10*

	Year 5 **M** Global and National project web sites established, both in English and local languages for information sharing and e-discussion by *Month 4 Year 2* **M** Links established with local educational institutions and curriculum on the value of crop diversity for pests and diseases management provided by *Month 8 Year 5* **M** Radio and TV programmed developed in local languages and their broadcasting ensured by *Month 12 Year 4* **M** National conference on diversity use and pest and disease problems organised in each country by *Month 9 year 4* **M** Three regional conferences on diversity use and pests and disease management organised by *Month 12 Year 5* M Assistance provided for developing benefit sharing mechanisms among farming communities and national programmes by *Month 6 Year 5* **O** Agricultural extension packages in each country include diversity rich options to manage pest and disease pressures in *Year 5*. **O** Policy briefs and extension manuals demonstrating the economic value of using diversity rich options in practical terms, for policymakers and farmers developed and made available to partners by *Year 5*. **O** National teaching courses in plant breeding, pathology, and entomology include the use of intraspecific diversity to manage pest and diseases in *Year 4*. **O** Four national and three regional conferences on diversity and pest and disease management organized by *Year 5*. **O** Educational materials on the use of diversity rich methods to manage pest and diseases made available to national education sectors for inclusion in their respective curriculum in each country in *Year 5*. **O** Recommendations on the establishment or improvement of benefit sharing protocols submitted to policy makers by *Year 5*. **O** Agreements for benefit sharing mechanisms among farmer communities and national programmes developed for adoption in each country by *Year 5*.

PROJECT IMPACT

Evaluation of the project's success in achieving its outcomes will be monitored continuously throughout the project through semi-annual progress reports, annual summary progress reports, a mid-term and final evaluation, all of which will use the project logframe as a monitoring, evaluation, and reporting tool (See Project Logframe, Annex B). Table 3 presents the key performance indicators. Methods of data collection must strive to ensure that reliable baseline data is collected and that data is collected regularly throughout project implementation. The list of performance indicators should also include interim indicators and numerical targets with timeframes. The UNEP project management officer will work closely together with the project coordinator to complete this task.

Table 3. List of Key Performance Indicators

	Key performance indicator	**Baseline (if baseline is not known, please identify how and when baseline will be established)**	**Method of data collection/Data collection strategy (including frequency)**
Development Objective: Conserve crop diversity in ways that increase food security and improve ecosystem health	• 10% of the families from 31 local and indigenous communities show increased and more reliable food supply through the use of crop genetic diversity to minimize crop loss. • Diversity rich practices replace pesticide use on in local and indigenous communities.	• No complete baseline information available on the use of diversity for food supply at the project sites in the four countries. Some information relating to socioeconomic aspects and poverty level available from national census data. Some data available from preliminary focus group discussions at some sites • Site and crop specific information on the consumption of pesticides are not available. Information is available is on the use of total pesticides consumption at national and province level for some of the target crops. Some information is available on the percentage of farmers using local crop diversity at province level, but not for all the target crops, and not necessarily for the management of pests and disease problems.	• Site specific data on food consumption, and production will be collected during the first year of the project and will be made available during second year of the project. This information will be gathered through focus group discussions and household interviews. A final survey will also be done during the fifth year of the project to measure change. • During the first year of the project, site specific baseline information relating to use of crop diversity for pest and disease management and total use of pesticides per crop per site will be gathered through participatory approach. This information will be available during second year of the project. Similar information will again be gathered during the fifth year of the project to measure the expected impact.

***Immediate objective*:** Enhanced use of crop genetic diversity by farmers, farmer communities, and local and national institutions to minimize pest and disease damage on-farm.	• At least 356,000 ha of land contribute to the conservation and sustainable use of crop genetic diversity in respect to minimizing pest and disease damage. • At least 2 departments of agriculture and the environment in each country have incorporated crop genetic diversity rich practices to minimize pest and disease pressures into their extension plans.	• Information is available from some of the sites in the four country on the numbers of local crop varieties maintained on farm. However, information is lacking on the percentage of this diversity used to manage pests and disease problem of the target crops. • Extension plans for promotion of conservation and use of crop diversity available in each of the four countries. However, so far these do not include the advantage of crop diversity to control pest and disease problem and address the environmental protection and health issues	• Baseline information will be generated during the first year of the project and will be validated at mid-term and end of the project for impact assessment against this indicator. • Extension and public awareness materials and tools, including newspaper articles, radio and TV programmes, will be developed and made available to national agencies during year four and five of the proejct.

Outcomes	Key performance indicator	Baseline (if baseline is not known, please identify how and when baseline will be established)	Method of data collection/Data collection strategy (including frequency)
Outcome 1: Rural populations in the project sites benefit from reduced crop vulnerability to pest and disease attacks	1.1 Food insecurity is reduced for 10% of the families in 31 local and indigenous communities. 1.2 Crop yields are increased by 10% from reduced crop losses from disease and pest damage for at least 20% (equivalent to 52,600 ha) of the farms in project site regions. 1.3 Diversity rich practices replace pesticide use to minimize crop damage for 20% of project site regions (equivalent to 106,900 ha)	• General information on food insecurity is available from project sites, however, there is no quantification of this information and the magnitude of information available across sites and countries are not of the same order. • Province and district level information on average crop yield and the losses caused by pests and disease incidents are available with different level of precision across sites and countries. However, no such information is available at village or community level. • Crop-wise consumption of pesticides at national level in all the four countries and at Province level in China and Morocco is only available. No precise information available at project site levels.	• A field survey will be carried out in first year of the project to collect information from focus group discussions and at household level. Similar information will again collected during the year five of the project to estimate change. • During the first and fifth year of the project, estimates for total yield and losses due to pests and diseases for site specific target crops will be estimated at household , community and village levels to measure the impact for diversity rich options for pest and disease management. • During the first year of the project information will be generated through participatory field survey at community and household levels and from other governmental, pesticides companies and local market records on supply and sale of pesticides. The same information will again be collected during the fifth year of the project to measure impact against this indicator.
Outcome 2: Increased genetic diversity on farm in respect to pest and disease management	2.1 Diversity for resistance is increased by 10% on 30% of farmer fields in the project sites (equivalent to 78,900 ha).	• Information is available at some sites on the number of local crop varieties grown on farm. Some measurements of the amount of genetic diversity of target landraces is available at project sites for faba bean in Morocco and banana and plantain in Uganda, but it is not complete. Information on the availability of resistance diversity on farm for various	• Baseline information on the magnitude of resistant diversity for host and variation in pathogens will be established during the first year of the project through field survey and experimentation of the samples of host and pathogens collected from each sites. Surveys will be conducted on number of different landraces with different resistance,

		pests and pathogens of the target crops at project sites are not available, except for one of the sites in China for rice.	breeding desirable characters into resistant varieties; and number of varieties which are now more resistant through breeding or mixture planting.
	2.2 Use of crop genetic diversity to manage pest and disease pressures occurs on 20% of the farms (equivalent to 142,600 ha) in the project sites in four countries.	• No such baseline information available on the use of crop genetic diversity for sustainable management of pest and disease problems on farm, except for rice blast control in southwestern China at one of the project sites.	• Baseline information will be generated across all sites and countries during the first year of the project and again during the third and fifth year of the project. This information will be generated using participatory rural appraisal and from records available from local agricultural institutions.
Outcome 3: Increased capacity and leadership abilities of farmers, local communities, and other stakeholders to make diversity rich decisions in respect to pest and disease management	3.1 At least 20% of the farmers of the project site regions (equivalent to 6,200) implement diversity rich methods developed in the project to increase use of crop genetic diversity to manage pest and disease pressures on-farm. 3.2 At least two male and female farmer representatives in each site have participated in national committees or decision making fora for planning and evaluation of diversity rich methods to manage pest and diseases.	• No baseline available across sites in each of the four countries, except for rice from one site in southwestern of China, where farmers use mixtures of local crop diversity with high yielding varieties. • Individual farmers, both male and female, were invited to participate in the national planning meetings in each of the four countries during the PDF B phase.	• This information will be generated through regular survey starting from third year of the project. • Indicators for identification of the key male and female farmers will be developed and key farmers from each site will be identified during the first year of the project. These farmers will be facilitated for cross site visits within the country on regular basis starting from third year of the project. Training in leadership and decision making will be conducted.

Outputs[1]	Key performance indicator	Baseline (if baseline is not known, please identify how and when baseline will be established)	Method of data collection/Data collection strategy (including frequency)
Outputs: *1. Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting crop damage caused by pests and diseases.*	1.1 Guidelines for Farmers Group Discussion to understand farmers' knowledge, practices, problems and needs for using diversity to control pests and diseases developed, published and used by year two.	• Research Protocols for Farmers Group Discussion is available in each country. A draft guideline for FGD-PRA to better understand farmers' knowledge, beliefs and practices for use of crop diversity was developed during the PDF B phase. This need refinement and testing for crop specific and site specific use.	• Through global and national workshops, the guidelines for FGD will be developed and published during second year of the project.
	1.2 Protocols for participatory assessment combined with laboratory and field analysis to determine when and where genetic diversity of the four target crops can be recommended to manage pest and diseases published and made available to concerned stakeholders by year three	• Different methods and tools for participatory monitoring and evaluation, community based assessment for pesticide consumption, and poverty assessment are available in each of the four country. However, no participatory protocols combining field and laboratory analysis to determine suitability of diversity based option for pest and disease management is available.	• During PDF B phase, a draft protocol, based on global and national workshops and field survey was developed. This protocol will be further refined during the first year of the project and will be tested and published during the third year of the project.
	1.3 A set of methods and tools to estimate the value of crop genetic diversity in reducing yield losses, yield variability, and in mitigating product quality losses from pests and diseases tested and made available by year four in each country	• Some methods and tools for estimating crop production economics and estimation of losses due to biotic and abiotic factors are available for use. Economic tools also have been developed to quantify both market and non-market values of crop genetic diversity maintained on farm. However, such tools and methods have rarely been tested for estimating losses due to crop specific pest and diseases for yield and income under site specific environmental and socio-culture conditions.	• Based on field and laboratory experimentation for diversity rich options and use of economic models, a set of country/site specific protocols to estimate yield losses will be made available to partners during to fourth year of the project.

[1] All four project outputs contribute to the achievement of each of the three project outcomes and are therefore listed together after the project outcomes.

2. Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressure	2.1 At least one diversity rich practice or option developed for each of the four target crops, which synthesizes project experiences and provides guidance to farmers on using diversity rich options to manage pest and disease by year four. 2.2 A set of recommendations that provide guidance about substituting diversity rich practices for pesticide use produced in each country and submitted to agricultural and environmental development sectors by year five	• Except for rice varietal mixtures for controlling rice blast, there are no scientific tested diversity rich practices (use of intra-specific diversity) available in any of the four country for any of the target crops. • Several alternate uses for pesticide consumption are now available, including IPM, however, no such guidelines/ recommendations or protocols are available any where indicating diversity rich practices for pesticide substitution.	• Diversity rich protocols will be developed and validate for all the target crops and will be made available to farmers and farming communities at project sites and elsewhere. • Guidelines, recommendations and protocols will be developed from year two through year five of the project and will be made available to national project partners and others.
3. Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures	3.1 At least one farmer associations is established or enhanced per site in each country to support the use of crop genetic diversity to manage pest and disease pressures by year four 3.2 At least two male and female farmer representatives in each site have participated in national committees/ decision making fora for planning and evaluation of diversity rich methods to manage pest and diseases by year five 3.3 At least four researchers within Partner teams have in-house expertise on all disciplines to enable project outputs in the country by year four of the project.	• Farmers associations exist in some project sites but are concerned with marketing of agricultural products. Farmer Field Schools exist in Ecuador and China but have not used local crop genetic resources in their practices. At present there is no farmers association promoting diversity rich option for pest and disease management. • Individual farmers, both male and female, were invited to participate in the national planning meetings in each of the four countries during the PDF B phase. • Each of the four countries partners has some expertise in agronomy, entomology, and pathology. However, there are gaps in knowledge to fully understand the host-pest-environment interaction, use of GIS,	• A review of current farmers' association capacity and needs will be done during the first year of the project. Related associations in project sites will be enhanced to enable the promoting diversity rich option for pests and diseases management. • Indicators for identification of the key male and female farmers will be developed and key farmers from each site will be identified during the first year of the project. These farmers will be facilitated for cross site visits within the country on regular basis starting from third year of the project. Training in leadership and decision making will be conducted. • National partners will be supported for advance training within their own countries, among participating countries and in developed countries and will also established sandwich Ph.D. programmes

		diversity assessment and population genetics, advance molecular tools for host-pest reaction, economics, law and policy analysis and participatory approaches..	with Universities in USA and Germany.
	3.4 Site Coordination Committees are established in each county and operating to coordinating and link intra-site, thematic and multidisciplinary activities within each country by the end of year one.	• No such committees exist at any of the project sites. The constitution of these committees together with their roles and responsibilities were identified during PDF B phase of the project.	• These committees will be established during the first year of the project per.
	3.5 At least two researches in each country with expertise on participatory approaches in respect to pest and disease management available in each country by year two.	• Some capacity exists in all four countries in participatory approaches. However, this capacity lies in persons without background in pest and disease management or genetic diversity assessment,	• Researchers from each country will be trained in the use of participatory protocols so that they can applies these protocols to achieve the project objectives. Partners will participate in global and national workshops. These trainers will then train other national team members
	3.6 At least one participatory research training programme developed at the provincial level in each country by year three.	• Each country has some capacity in participatory rural appraisal, participatory technology development and extension of agricultural technology. However, no participatory training programme catering to the needs of the use of crop diversity for conservation in general and specifically use of intra-specific diversity to manage pests and disease problems have been developed in any of the four countries.	• Participatory research training modules will be developed and will made operational by year four in ach country at least at provincial level.
	3.7 An International Agrobiodiversity Training Centre is operative in China which includes a training curriculum on agrobiodiversity management for pest and disease pressures by year three.	• The Chinese government has allocated funds and materials to set up this training center	• Facilities will be built and equipped during the first two years of the project. National partners from all four countries will participate in development of the training curriculum
		• None of the countries have linkages with	• Support will be provided during the

	3.8 At least two International PhD sandwich programmes are set up with universities from the partner countries by year four.	advance laboratory/institution for sandwich Ph.D. programmes. Efforts were made during PDF B phase to establish such Ph.D. programme links between universities in Ecuador and University of Kassel in Germany; and between partners from Morocco and Uganda universities with the Washington State University, Oregon State University and Cornell University in USA.	project period for partners from Ecuador, Morocco and Uganda.
4. Actions that support the adoption of genetic diversity rich methods for limiting damage caused by pests and diseases.	4.1 Agricultural extension packages include diversity rich options to manage pest and disease pressures in year five in each country. 4.2 Policy briefs and extension manuals developed that demonstrate the economic value of using these options in practical terms, for policymakers and farmers in year five. 4.3 Breeding, pathology, and entomology programmes in the country include the use of intraspecific diversity to manage pest and diseases in year four. 4.4 Four national and three regional conferences on diversity and pest and disease management organized by year five. 4.5 National education sectors have available materials on the use of diversity rich methods to manage pest and diseases for inclusion in	• Each country has extension packages for boosting agriculture production. However, these packages do not include any information on the use of crop diversity to control pests and diseases, except for rice blast control in China. • Policy briefs and public awareness materials are available regarding the conservation and use of crop diversity. However, its use for the reduction in the use of pesticides and income generation is not available so far. • Breeding, pathology and entomology programmes exist in each of these countries. However, these programmes are limited in the use of local crop genetic diversity and farmers' knowledge to control the pests and diseases problem. • During PDF B phase, support was provided for the organization of International Conference on the use of crop diversity to manage pests and diseases problem. • No such curriculum available.	• Information and recommendations will be developed and made available for diversity rich option for pest and disease management by year fifth of the project. • Publication, radio and TV programmes will be prepared during third year through fifth year of the project and will be made available to policy and extension workers. • A survey will be conducted at the beginning and the end of the project to determine the amount of increased use of local crop diversity in breeding, pathology and entomology programmes. • The project will support at least one such national conference in each of the four country and three regional conferences, linking to regional networks meetings for mainstreaming of the project activities. • Materials that can be used for curriculum will be developed, based on scientific validation, and will be promoted during fifth year of the project.

	curriculum in each country in year five. 4.6 At least two recommendations on the establishment or improvement of benefit sharing protocols are submitted to policy makers by year five. 4.7 At least two agreements for benefit sharing mechanisms among farmer communities and national programmes developed and adopted in each country by year five.	• Initial analysis of national related policies and lawas for biodiversity protection and its conservation in the four countries was done during the PDF B • No benefit sharing mechanisms exist for materials maintained by farmers.	• Benefit sharing mechanisms developed by project partners and by others will be reviewed and suitably modified during fifth year of the project. • Agreements with farmer communities will be drafted in each country.

Table 4: Monitoring, Reporting, and Evaluation Responsibilities

UNEP	Global level Project Management Unit (PMU)	National-level Project Management Unit	National Steering Committee (NSC)	International Steering Committee (ISC)	Site Teams	National Site Coordination Committee
Monitor the agreed M&E plan in accordance with the terms of agreement with GEFSEC. Receive biannual progress and quarterly financial reports and annual summary progress reports and copies of all substantive reports from Regional-level PIU. Project management officer to attend and participate fully in meetings of ISC. Project management officer to conduct annual supervision missions (on need basis) with member(s) of the PMU to selected	Establish reporting guidelines for all partners in the project, ensure that they meet reporting dates, and provide reports of suitable quality. Prepare biannual progress, quarterly financial and annual summary progress reports for UNEP, and forward substantive and quarterly financial reports, with supporting documentation as appropriate, in a timely manner to UNEP. Carry out regular visits to project sites to supervise activities, and pay special attention to those sites with serious implementation problems.	Prepare biannual progress, quarterly financial and annual summary progress reports for the Global-level PMU, and forward substantive and quarterly financial reports with supporting documentation, as appropriate. Carry out a program of regular visits to project sites to supervise activities and attend local and on-site meetings. Provide guidance and advice for adjusting tasks and activities as needed in different sites.	Receive biannual progress and annual summary progress reports and all substantive reports and outcomes and use them to annually review the project progress at national level . Advise PMU on implementation problems that emerge, and on desirable modifications to the work plan for the succeeding year. Monitor progress in the capacity-building aspects of the national project component, and advise the PMU on steps to enhance this aspect of the project.	Receive and review biannual progress and financial reports, annual summary progress reports and all substantive reports, and provide policy guidance to the project on any matters arising from a reading of these reports. Assist the PMU in developing linkages with other projects, thus ensuring the wider impact of project work. Provide overall guidance for the project implementation.	Provide the framework within which different stakeholder groups cooperate at the local level. Assist in implementation of the project activities. Provide assistance in conducting survey missions. Involve farmers conserving local varieties of fruit species in project activities. Assist in organizing demonstration plots and establishing nurseries. Establish relationships between project implementers and households with	Links Site Teams within the country, ensuring that lessons learned are shared among the sites and with national and regional level operations. Hold two meetings each year at least two weeks prior to NSC meetings to ensure delivery of all recommendations and suggestions of SCC to NSC.

project sites, identify implementation problems, and suggest remedies to annual meeting of the ISC. Engage and prepare terms of reference for independent M&E consultants to conduct the mid-term and final evaluations. Carry out other monitoring as is determined in collaboration with the project ISC.	gardens and provide feedback from farmers.

Notes for Table 4:

National-level Project Management Unit consists of: National Project Directors, Project Manager, Program Assistant, and National Technical Advisors. Each country has identified the Institute that will serve as the national-level Project implementing agency.

National Steering Committees (NSC) will be established in each participating country to provide general oversight and guidance to the project, facilitate interagency coordination, and monitor national-level activities. NSCs will hold their meetings two times per year.

A Global Project Management Unit (PMU) will support project implementation at the global level. The Global PMU will be headed by IPGRI's Project Coordinator for Agricultural Biodiversity and Ecosystems who will serve as Global Project Director. The PMU will include a Project Manager and a Programme Assistant hired for this project, and Technical Advisors.

An International Steering Committee (ISC) will be established to oversee project implementation. It will include representatives from all implementing agencies at the national level (National Project Directors), the Global Project Director, as well as IPGRI and UNEP/GEF. The ISC will hold its meetings once per year.

Site Teams will be established for each project site and will include representation from all key stakeholder groups, including farmers, forest residents, and local authorities.

National Site Coordination Committees in each country will link the Site Teams within that country, ensuring that lessons learned are shared among the sites and with national and regional level operations. The Site Coordination Committee will include one representative from each Site Team, and one member will sit on the National Steering Committee, and technical expertise. The Site Coordination Committee will hold two meetings each year at least two weeks prior National Steering Committee meetings to deliver all recommendations and suggestions of SCC to NSC.

Table 5: Monitoring and progress reports

This table describes the key content required in the quarterly progress and financial reports.

Report	Format and Content	Timing	Responsibility
Progress Reports Document the completion of planned activities, and describe progress in relation to the annual operating work plan. Review any implementation problems that impact on performance. Summarize problems and proposed solutions. Provide adequate substantive data outcomes	Reports will use standard UNEP Progress Report format. The project logframe will be attached to each report and progress reported against outcomes and outcome indicators.	Half-yearly, within 30 days of end of each reporting period.	Global-level PMU.

for inclusion in consolidated project quarterly and annual progress reports. Highlight achievements.			
	Format and Content	**Timing**	**Responsibility**
Project Implementation Review (PIR) reports	Per GEFSEC format.	Yearly (after project has been under implementation for one year)	UNEP Project Management Officer
	Format and Content	**Timing**	**Responsibility**
Consolidated Annual Summary Progress Reports			
Presents a consolidated summary review of progress in the project as a whole, in each of its activities and in each outcome. Provides summary review and assessment of progress under each activity set out in the annual workplan, highlighting significant results and progress toward achievement of the overall work program. Provides a general source of information, used in all general project reporting.	Reports will use a standard format to be developed following the UNEP Progress Report model. The project logframe will be attached to each report and progress reported against outcome and outcome indicators. A consolidated summary of the half-yearly reports. Summary of progress and of all project activities. Description of progress under each activity and in each outcome. Review of delays and problems, and of action proposed to deal with these. Review of plans for the following period, with report on progress under each heading.	Yearly, within 45 days of end of the reporting period.	Global-level PMU.
	Format and Content	**Timing**	**Responsibility**
Co-Financial reports Report on co-financing that has been provided to project as originally estimated in project proposal approved by GEF.	The required format is provided in Table 6	Annual	Global-level PMU.
	Format and Content	**Timing**	**Responsibility**

	Format and Content	Timing	Responsibility
Financial reports			
Details project expenses and disbursements.	Standardized UNEP format as found in project document. Disbursements and expenses in categories and format as set out in standard UNEP format, together with supporting documents as necessary.	Quarterly	Global-level PMU.
	Format and Content	**Timing**	**Responsibility**
Financial audits			
Annual audit	Audit of accounts for project management and expenditures	Annual	Global-level PMU.

Table 6: Format for Report on COFINANCING

Title of Project:	Conservation and use of crop genetic diversity to control pests and diseases in support of sustainable agriculture				
Project Number:	PMS: GF/		IMIS: GFL-		
Name of Executing Agency:	Yunnan Agricultural University, Kunming, Yunnan, China; Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP), Quito, Ecuador; Institut Agronomique et Vétérinaire (IAV) Hassan II, Rabat, Morocco ; National Agricultural Research Organisation, Entebbe, Uganda; International Plant Genetic Resources Institute (IPGRI), Rome, Italy				
Project Duration:	**From:** 2006		**To:** 2011		
Reporting Period:					
Source of Cofinance	**Cash Contributions**		**In-kind Contributions**		**Comments**
	Budget original	Actual received to date	Budget original	Actual received to date	Received to date
China	**1,013,232**		**1,391,733**		**US$ 1,391,733 in-kind contribution** from government of China include staff time participation in the project activities, including project management; providing office space and related laboratory and field facilities. More specific in-kind contribution will support: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 149,253; **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$426,353; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$465,685; **Output 4**: Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$248,842; and **Project Management**: US$101,600 The estimated **cash contribution of US$ 1,013,232** from China

					includes for establishing International Training Center at the China National Center for Agriculture Biodiversity at Kunming; and part cost towards supporting project activities. More specific cash contribution will support: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 86,152; **Output 2**: Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures – US$106,778; **Output 3:** Enhanced capacity of farmers and other stakeholders to us local crop genetic diversity to manage pest and pathogen pressures – US$732,122; **Output 4**: Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$57,057; and **Project Management**: US$31,123;
Ecuador	**43,800**		**601,680**		US$ **601,680 as in-kind contribution**, include the estimated cost for salaries of scientists spending time for the project activities and assistance, office space utilization, laboratories facilities, services (electricity, portable water and telephone) and logistic expenses for field experiments. More specific in-kind contribution will support: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 128,875; **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$125,080 ; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$132,330; **Output 4**: Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$135,395 ; and **Project Management**: US$80,000 The estimated **cash contribution of US$43,800**, which will include

					laboratory supplies, logistic expenses as well as transportation costs for field experiments of projects with complementary activities. More specific cash contribution will support: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 3,000; **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$20,800; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$10,000; **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$10,000.
Morocco	**143,050**		**867,605**		Morocco **in-kind contribution of US$867,605** will include cost towards part salaries of staff participation in the project activities, including project management unit staff; providing office space and facilities; use of additional vehicles required for field visits and operations; use of laboratory facilities. More specific in-kind contribution from Morocco will support: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 124,790; **Output 2**: Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$205,109; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$118,773; **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$210,951; and **Project Management**: US$207,982 The **cash contribution from Morocco will be US$ 143,050** and

					will include cost for laboratory experiments; fuel cost for site visits and office operational work. More specific cash contribution will support: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 23,874; **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$32,864; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$15,988; **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$53,015; and **Project Management**: US$17,309
Uganda	**25,000**		**513,904**		Uganda **<u>in-kind contribution of US$ 513,904</u>** includes the estimated cost for salaries of NARO staff who will have part of their time invested in this project. The in-kind contribution will also cover the laboratory infrastructure, extra vehicle used for the project, office space and related utilities. More specific in-kind contribution will support: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 100,494; **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$93,347; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$163,433; **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$85,155; and **Project Management**: US$71,475

					The estimated **cash contribution of US$25,000,** and will support the following activities: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 5,000; **Output 2**: Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$5,000; **Output 3**: Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$5,000; **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$5,000; and **Project Management**: US$5,000.
IPGRI	**1,195,000**		**1,080,000**		IPGRI **in-kind contribution of US$ 1,080,000**, will be towards estimated salary cost for IPGRI staff, both from its headquarters and the regional offices, who will participate in carrying out the project activities and includes: cost for 40% of one full time international staff to act as Global Project Director to overall supervise the project activities at global as well as national level and also to supervise the Global Project Management Unit; technical support to the project through IPGRI's expertise in terms of economics, ethnobotany, and genetic diversity assessment; office space and other logistic facilities. More specific in-kind contribution will support: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 180,000; **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$50,000; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$50,000; **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$90,000; and

					Project Management: US$710,000; The **cash contribution of US$1,1950,000** will be used to the following activities related to the following outputs of the project: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 250,000; **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$270,000; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$295,000; **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$230,000; and **Project Management**: US$150,000
SDC	**750,000**				The SDC **cash contribution of US$750,000** to IPGRI for project implementation will be used to the following activities related to the following outputs of the project: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 340,000; **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures **–** US$60,000; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$100,000; and **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$250,000
FAO			**150,000**		FAO **in-kind of US$ 150,000** will contribution for its staff time to provide scientific backstopping for activities related to Integrated Pest Management and setting up of Farmers Field School at the project sites. FAO staff will also provide technical support on

					pathological and entomology aspect of the project and will contribute its staff time to serve on International Steering Committee of the project. More specific in-kind contribution estimates will support: **Output 2:** Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures – US$50,000; **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$50,000; **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$50,000
US University Consortium lead by WSU			**309,124**		The **in-kind contribution of US$ 309,124** from the three US University Consortium (WSU, OSU and Cornell) lead by Washington State University, Pullman, will for its staff time, who will supervise the Ph.D. sandwich programme students from Morocco and Uganda. In-kind contributions also include tuition waivers for out-of –state tuition costs and more specifically will include: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 77,281; and **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$231,843
University of Kassel			**52,500**		University of Kassel will provide **in-kind contribution of US$ 52,500** for its staff time who will supervise M.Sc. and Ph.D. students from Ecuador. The university will also contribute its staff time to serve the International Steering Committee of the project and for scientific backstopping to project partners and visits to the partner countries. More specifically this will include the following project component: **Output 3:** Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures – US$52,500

CSIRO			**40,000**		CSIRO will contribute for its **<u>in-kind contribution of US$ 40,000</u>** to the project by allowing its staff to serve as Technical Advisor to the project, providing scientific backstopping and participation in international meetings and workshops; and will contribute to the following output of the project: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 40,000
UPWARD-CIP			**100,000**		UPWARD will provide **<u>in-kind contribution of US$ 100,000</u>** through participation of its staff for assisting project in developing participatory tools and protocols; providing training to partners and visit to project countries during field survey. This will include the following project component: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 100,000
IRRI			**45,000**		IRRI **<u>in-kind estimated contribution of US$ 45,000</u>** is for its staff time to assist the project in developing communication strategies and scientific backstopping for rice entomology, and developing environmental sustainability indicators for the project and more specifically will be for the following project output: **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases – US$45,000
IFPRI			**150,000**		IFPRI **<u>in-kind contribution of US$ 150,000</u>** form IFPRI will be to provide support for the joint supervision of M.Sc. and Ph.D. students for degree courses in economics and socio-economics aspects of the project; and to provide support for developing tools and protocols for economical studies. More specifically this will contribute to the following project output: **Output 1:** Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases – US$ 100,000 **Output 4:** Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases –

					US$50,000
Additional Cofinance:-					
Total	**3,170,082**	0	**5,301,546**	0	
All amounts in US dollars					

Name: Dr. Devra Jarvis	
Position: Senior Scientist, IPGRI	
Date: 10.10.2005	

ANNEX O – TRAINING AND CAPACITY BUILDING STRATEGY

INTRODUCTION

Developing and carrying out a training strategy that will support resource poor rural populations to reduce crop loss to pest and disease attacks through increased use of genetic diversity on-farm, requires more that resources and the expertise to collect and assimilate research data. It requires the building of capacity and leadership abilities at all levels, from farmer to research to policy maker; it requires partnerships among many individuals and institutions, and it requires the promotion of equity at all project levels, from farmer participation in research, project management and decision making, to providing opportunities to increased gender equity in project management and training.

The Training Strategy was developed by national partners during pre-project workshops and during the PDF-B phase. Development of the strategy included review of the current state of existing government and non-government education systems, and trained personnel working in the areas of genetic diversity management, plant population genetics, pathology and entomology, economics, participatory approaches, law and policy. Training needs span across activities in all five components of the project work listed in Annex B – Logical Framework and workplan. Needs were identified through a consultative process during national planning meetings, where representatives of all major project stakeholders participated in each country. The strategy is driven by a clear appreciation by all project partners of the central role of the farmer in managing crop genetic diversity and the importance of adopting working practices that are fully participatory and start from a desire to reflect farmers' needs and concerns in diversity management.

CURRENT CAPACITY

During the PDF-B phase each country identified national experts and institutes that would support project implementation. Based on this information, a national roster of experts from each country together with a list of international experts was compiled, which contains names and institutions and major areas of specialization (Annex K) and public involvement plans (Annex E) were formulated which describe the current capacity of each participating institutions and their planned role within the project. In addition, across the four countries there are 41 universities and institutions, both at national and local level, including technical schools, which can provide training to their respective partners at national level in the field of: agronomy, crop protection, crop physiology, crop breeding and biotechnology, environmental sciences, extension techniques, documentation and communication, social sciences, economics and participatory approaches (Table O-1).

TRAINING AND CAPACITY BUILDING STRATEGY

Training and capacity building are needed to support achievement of all three project outcomes and range across the activities of all five components of the project logical framework and workplan (Annex B). The national partners decided that the training and capacity building strategy would include five main components:

I. Establishing and enhancing collaborative frameworks,
II. Refining and standardizing global and national protocols,
III. Training and capacity building aimed at four main target groups:
    i. farmers and farmer communities
    ii. personnel of local national institutions, including primary, middle, and technical schools, local research organizations, local extension workers, non-government and community based organizations
    iii. personnel of national education and research institutes
    iv. personnel of government agencies at national and local levels

IV. Establishing collaborative national and international training programmes
V. Equity in participation and decision making and research ethics

I. Establishing collaborative frameworks

Not all institutions are used to working in a multi-institutional, multidisciplinary way, and at many times the framework for this type of collaboration is non-existent. In these instances, time and energy must be set aside to develop collaborative project frameworks. The hierarchy and administrative bureaucracy involved in this process can be cumbersome and time-consuming. Conscious effort has already begun during the PDF-B phase to garner political support and goodwill through a series of high-level meetings with policy-makers. Time is also assigned throughout the full project implementation period for such efforts, so that the result leaves all formal and non-formal institutes satisfied in terms of their scientific, administrative and financial responsibilities and benefits. Project partners have begun the process of developing a collaborative framework to increase current linkages among farmers and researchers institutions. This is a two-way connection, in which each side (local farmers and researchers) can provide valuable resources for the other. Activities are planned for community and researcher sensitization to each others' beliefs and practices is an integral part of the protocols being established for project implementation.

Team building among farmers, field technicians, researchers, educators, and policy makers will be enhanced through joint workshops and training in participatory approaches. These workshops will also promote information exchange among the different stakeholders and help to enhance existing and build need networks for information and material flows. This will include increasing collaboration between agricultural extension services and local NGOs to promote access of locally adapted farmer seeds across villages and regions with similar agroecosystem.

II. Refining and standardizing global and national protocols

During earlier planning phases of the project, national partners began the join development of global participatory diagnostic protocols which will standardize research protocols. A draft protocol for participatory diagnosis for: (i) farmers' beliefs and practices and (ii) field and laboratory assessment, was produced (Annex G). Decisions were made on types of information to come from Focus Groups Discussions (FGD), Individual Surveys, Secondary Sources, and Technical assessment (field and laboratory) for the target crops, pests and pathogens. In each site there will be a minimum of five FGD sessions, one each for a) older farmers, b) male farmers, c) women farmers, d) community leaders and e) extension and development workers. Individual surveys will be disaggregated by gender.

National partners agreed that before full implementation of the participatory diagnosis, global and national workshops would be held to (1) refine existing participatory protocols, (2) agree on standardized methods of analysis, and (3) standardize technical assessment methods to characterization of hosts, pests, pathogens and surrounding abiotic environments.

III. Training and capacity building of different target groups

(i) Farmers and farmer communities

Farmers and farmer groups will be targeted for capacity-building to manage their production systems with diversity rich options to manage pests and diseases. This includes training in biological sciences, diversity assessment, and seed management for pest and diseases. The seed activities of local farm organisations will be strengthened to integrate pest and disease considerations. Cross site visits will be organized for male and female farmers. This has proved extremely successful in earlier projects in Morocco in enhancing farmer capacity and knowledge exchange.

Part of participatory research and training involves making sure that data are of some use to the communities from which they are being elicited and returning these data in a user-friendly format. Farmers' capacity in information management will be enhanced, and useful tools such as Community Biodiversity Registers and other local knowledge documentation systems will be made available. Skills will be developed within farmer communities and local institutions to produce posters or displays in vernacular languages can present written information.

(ii) Personnel of local education, research and development institutions

The capacity of local institutions to sustain project activities will be enhanced through training and inputs to local extension, NGOs, middle and technical schools and local colleges. Teachers at primary schools will also be involved in the process through training which could improve understanding at community level. Thematic and technical focal persons will be trained at site and local levels in the major disciplines listed below. Cross institutional exchanges will be organized for local educators and local research staff. Short, medium, and long term training will also be organized during project implementation.

(iii) Personnel of national education and research institutions

Capacity will be built in research institutes to analyse local crop diversity in respect to pests and pathogens. Capacity will also be build to apply new econometric methods and tools in assessing the value of crop genetic diversity, and manage the information. The project will build capacity to analyse national and international legal and economic policies related to project objectives. National capacity to implement project activities will be built through: (1) short, medium and long term training (see list of agreed subjects below), (2) interchange of national experts within and among the four participating countries, (3) organization of thematic network meetings by crop and by discipline, and sandwich degree programmes and courses among national and with international institutions.

(iv) Personnel of government agencies at national and local levels

Capacity will be built within the country to enable the analyses of legal and economic policies related to project objectives, including an analysis of potential barriers to adoption of the best practice demonstrated in the project and the development of benefit sharing protocols for the use of local resistant materials identified. Workshops will be held with policy makers to build recognition that the project methodologies provide an effective and efficient approach to managing pest and disease pressures. Capacity will be build to develop a strategy and quarantine regulations for germplasm exchange and testing based on national and international treaties and agreements. Field visits will be organized for policy makers and the press

IV. Establishing collaborative national and international training programmes

National partners agreed that capacity could be developed in each of their four countries in the following disciplines;

- Participatory approaches
- Host pest/pathogen interactions
- Crop genetic diversity assessment
- Plant population genetics
- Safe movement of germplasm and quarantines
- Participatory selection and participatory breeding
- Ethnobotany
- Agricultural and Environmental Economics
- Law and policy analysis

- Seed cleaning and management
- Leadership enhancement
- Information management (national, local, and farmer information management systems)

In addition, a National Research Center for Agriculture Biodiversity (NRCAB) is being established at the Yunnan Agricultural University (YAU), Kunming, China. This center will focus on three key areas: agriculture biodiversity and pest and disease control; agriculture biodiversity and its conservation and use; and crop modeling, technology development and extension activities for the use of agriculture biodiversity for sustainable economic development. During PDF B phase, it has been agreed that this center will provide training at global level for use of crop diversity to manage pests and diseases problems in traditional farming systems, using both local and high yielding varieties. National partners from the four countries will also participate in the curriculum development and course teaching for the center.

During the full project "sandwich" Ph.D. programmes will be designed between Washington State University, Oregon State University and Cornell with the Institut Agronomique et Vétérinaire Hassan II, Rabat, Morocco, and Makarere University, Kampala, Uganda. Washington State University is taking the lead in providing a collaborative arrangement among the three US universities. A sandwich Ph.D. programmes is also being designed between University of Kassel, Germany and universities in Ecuador. Students who enter the sandwich programmes will complete their course work in the US or European University and return to their respective countries to complete of their research work at the project sites. A feature of the programmes is that the student's thesis research will focus major research questions of the project logframe. Another important dimension of the sandwich programmes will be the appointment of qualified respective national university faculty as adjunct faculty in relevant departments at WSU and the appointment of qualified WSU faculty as adjunct at the respective national universities. Further details of are listed in the Public Involvement Plans (Annex E).

International training facilities and expertise will also be available for: participatory approaches at the Users' Perspectives with Agricultural Research and Development (UPWARD), for economics at the International Food Policy Research Institute (IFPRI), for plant population genetics, genetic diversity analysis and plant improvement at the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and for rice entomology, environmental sustainability indicators, and communication strategies at the International Rice Research Institute (IRRI).

III. Equity in participation and decision making and research ethics

Different knowledge of women and men, and the importance to ensure equitable benefits from the project outputs requires not only that information be disaggregated by gender but that training and management opportunities be equitably distributed. Activities in the project include not only enhancing farmer’s leadership ability to take decisions concerning the management of pest and diseases but also actively ensuring women’s participation in technical and university training programmes and decision making fora.

A basic tenet of ethically sound field research is the principle of informed consent, which holds that all participants should fully understand the purpose and process of the research before agreeing to participate. National partners agreed that it is the responsibility of researchers to ensure that participants understand the possibilities for positive or negative repercussions of their participation in research. In addition, researchers must be able to guarantee some degree of privacy to informants. This may take the form of a guarantee of anonymity (in which all participants’ names are removed from data) or confidentiality (in which researchers must retain farmers’ names for research purposes, but data linked to individuals or households will not be revealed publicly).

In addition, before starting any research to document farmers’ knowledge and perceptions of crop genetic diversity, researchers must think carefully about the implications of their work for local benefit sharing. In the case of plant genetic resources, intellectual property refers to the knowledge associated with a particular landrace or allele that may be an economic resource. Researchers must be aware that in researching local indigenous knowledge, they are inevitably accessing local intellectual property. Their research may serve as an important record of local indigenous, which should be documented and respected accordingly.

Table O-1: Universities/ Institutes/ Technical schools/ Colleges providing training in related fields of project activities

Name	Subject of specialisation for training
China	
1. China National Center for Agriculture Biodiversity (CNCAB)	Principles and practices on agrobiodiversity management, agrobiodiversity for food security, field experimental design and analysis, advanced GIS for PGR, simulation modeling
2. Yunnan Agriculture University	Plant pathology, entomology, plant genetics, food sciences, seed sciences
3. Kunming Institute of Botany	Indigenous knowledge documentation, genetic diversity, ethnobotany
4. Fudan University	Population genetics, molecular biology
5. Guizhou University	Plant pathology, entomology, resistance mechanism
6. Yunnan Academy of Social Sciences	Social science and socio-economic studies
7. Centre for Biodiversity and Indigenous Knowledge	Participatory technology development, Indigenous Knowledge
8. Regional Development Research Center	Participatory Rural Appraisal, community leadership development, social and economic impact assessment
9. Integrated Rural Development Center	Participatory Rural Development, community based conservation
10. Guizhou Academy of Social Sciences	Community-based natural resource management, Participatory Rural Appraisal
Ecuador	
1. Plant protection Dep.-INIAP	Entomology, plant pathology
2. Nucleus of Technical Support-INIAP	Participatory approaches
3. Coordinadora Ecuatoriana de Agroecologia	Agroecology, information systems and result validations in the communities
4. Nutrition and quality of foods department-INIAP	Food nutrition and quality analysis
5. Indigenous agronomists association	Practices for agrobiodiversity

of Cañar (Asociacion de Agronomos Indigenas de Cañar)	conservation
6. Universidad Catolica de Ecuador	Economics to assessment of environmental services
7. Fulbright, Ecuador	English courses
Morocco	
1. Hassan II Institute of Agronomy and Veterinary Medicine (IAV)	Agronomy, crop production and related disciplines (plant pathology, entomology, crop protection, rural economy, sociology, soil sciences, agronomy, crop physiology, etc.), plant genetics, crop breeding and biotechnology, seed physiology, seed technology, agrobiodiversity, forestry, ecology, agroecology, environmental sciences, rural engineering and machinery, animal sciences, veterinary medicine and all related disciplines and specialties, natural resource management
2. National Agricultural School Meknès (ENA)	Crop production, extension techniques, animal sciences
3. Institut des technologies appliquées Sahel Boutahar, Taounate	Biology, crop management, plant health, quality of production
4. Complexe Horticole d'Agadir	Horticulture, plant protection, virology, bacteriology, zoology, post harvest diseases and pests
5. University Ben M'Sik, Casablanca	Biology, biotechnology, plant pathology
6. University of Fez	Biology, plant pathology
7. Local High School (Lycées agricoles Taounate et Taza)	Biology, ecology, and natural sciences, agro-chemistry
8. Ecole Nationale d'Information	Communication, documentation
9. Institut National de Statistiques et d'Economie Appliquée	Statistics, applied economy, data base management
Uganda	
1. Kawanda Agricultural Research Institute	Banana and plantain improvement, post-harvest losses, genetic resources
2. Namulonge Agricultural Research Institute	Integrated Pest Management, Agro-meteorology, genetic resources and crop improvement
3. Forestry Resources Research Institute	Environmental conservation

4. Food Science and Technology Research Institute	Processing, storage and marketing, nutrition
5. Agricultural Research and Development Centers	Participatory Rural Appraisal, extension, Participatory Technology Development and transfer
6. Makerere University	Economics, extension and education, mass communication, environment information management, information and communication technology
International	
1. Washington State University	Plant pathology, pathogen population genetics, agronomy, social sciences
2. Oregon State University	Varietal mixtures, host genetic diversity and disease epidemics
3. Cornell University	Molecular techniques, plant pathology, genomics
4. University of Kassel	Population biology, ecology and genetics of host-pathogen interactions
5. Users' Perspectives with Agricultural Research and Development (UPWARD)	Participatory approaches, participatory on-farm experimentation
6. International Food Policy Research Institute (IFPRI)	Economics
7. Commonwealth Scientific and Industrial Research Organisation (CSIRO)	Plant population genetics, genetic diversity analysis, plant improvement
8. International Rice Research Institute (IRRI)	Rice entomology, environmental sustainability indicators, communication strategies

ANNEX N - GLOBAL, REGIONAL AND NATIONAL IPM INITIATIVES AND STRATEGIES

During the PDF B phase of the project, review of Organisations and databases were looked by the partners of the project that support the management of pest and disease issues in the context of sustainable agriculture. These organizations will be linked to complement project activities and the database will be used as and when the information will be required by the project partners. These are listed below:

1. FAO coordinates the Global IPM Facility whose mandate is to assist interested Governments and NGOs to initiate, develop and expand Integrated Pest Management (IPM) programmes that aim to reduce pesticide use and associated negative impact on health and environment, while increasing production and profits through improved crop and pest management (www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/IPM/gipmf/textonly/home.htm).

2. The CERES/Locustox Foundation is a national training institution with a regional mandate (CILLS countries) for ecotoxicology, co-sponsored by FAO.

3. The Pesticide Policy Project (PPP) of the German Technical Cooperation (GTZ) and the Hanover University provides services in policy analysis. This involves awareness raising, training and capacity building in conducting economic valuation in crop protection policies in developing countries.

4. CABI has worldwide operations through its regional centres and expertise on ecologically-based solutions to pest management problems. In 1997, CABI started an IPM programme called Farmer Participatory Training and Research.

5. The Center for Integrated Pest Management http://ipmwww.ncsu.edu/cipm/ is a virtual Center for IPM based on the National Science Foundation sponsored Industry/University Cooperative Research Center for IPM.

6. Cornell International Institute for Food, Agriculture and Development (CIIFAD) http://www.nysaes.cornell.edu/ent/hortcrops/ contains the Global Crop Pest Identification and Information Services in IPM (English & Spanish) and participated in the formulation of the PDF-B document.

7. The Database of IPM Resources (DIR) http://www.ippc.orst.edu/cicp/ contains world-wide IPM information resources.

8. Entomology and Forest Resources Digital Information Work Group (The Bugwood Network) http://www.bugwood.org/ gathers, creates, maintains, promotes the use of, and economically distributes digital information.

9. The Entomology Index of Internet Resources http://www.ent.iastate.edu/List/ is a directory and search engine of insect-related resources on the Internet.

10. The integrated Pest and Crop Management, University of Wisconsin http://ipcm.wisc.edu/ database contains information on Nutrient management for crops, IPM practices, Education for pesticide users.

11. IPM Access http://www.efn.org/~ipmpa/index.shtml is a networking and information service website of the IPM Practitioners Association (IPMPA) to find, share, and develop effective, economical, and environmentally sound approaches for IPM.

12. IPM Online, University of California http://axp.ipm.ucdavis.edu/ develops and promotes the use of integrated, ecologically sound pest management programs in California.

13. The National IPM Network (NIPMN) http://www.reeusda.gov/agsys/nipmn/index.htm is a public-private partnership dedicated to making the pest management information available.

14. Pest CabWeb http://pest.cabweb.org/ is a Web site that covers entomology, nematology, weed science, biological control, plant pathology and many other aspects of pest management.

15. The University of Minnesota manages Radcliffe's IPM World Textbook, http://ipmworld.umn.edu/, an electronic textbook of IPM (English & Spanish).

16. The Consortium for International Crop Protection (CICP) http://www.ipmnet.org/, formed in 1978, is a group of U.S. universities to assist developing nations reduce food crop losses caused by pests while also safe-guarding the environment.

17. Database for IPM Textbooks (DIT) – http://www.ippc.orst.edu/IPMtextbooks/about.html DIT is being developed at Integrated Plant Protection Cebter of Oregon State University, Corvallis, Oregon, USA in collaboration with Consortium for International Crop Protection (CICP), N.Y. Agricultural Experiment Station, Geneva, New York and National IPM Network (NIPMN), North Carolina State University, Raleigh, North Carolina, USA. This database provides listing of and useful information about IPM textbooks from all over the world. This database also provides the whole contents of the books. For some books detailed contents and synopsis are also available.

18. The European Group for Integrated Pest Management in Developing Cooperation (http://www.Ipmeurope.org/About%20IPME/AboutIPME.htm). A Network for coordinating European support to Integrated Pest Management (IPM) in Research and Development. The information system of The European Group for Integrated Pest Management in Developing Cooperation consists of IPMEurope's Information system – which comprise: (1) website, which contain references and signposts to all information generated by the Group through its activities; and (2) Documentation, which comprise IPMEurope reports, records of meetings, information sheets and

flyers. The IPMEurope Project database (IPD) provide details information on past, current and planned IPM development projects funded and/or implemented by European countries.

19. Pesticide Action Network (PAN) - http://www.pan-international.org/ : Pesticide Action Network (PAN) is a network of over 600 participating nongovernmental organizations, institutions and individuals in over 90 countries working to replace the use of hazardous pesticides with ecologically sound alternatives. Its projects and campaigns are coordinated by five autonomous Regional Centers (PAN North America, PAN Latin America, PAN Europe, PAN Africa and PAN Asia and the Pacific). For the past two decade, the Pesticide Action Network (PAN) has worked to make voluntary codes and legally binding instruments more effective in reducing pesticide hazards.

20. The International Code of Conduct on the Distribution and Use of Pesticides (FAO code) - http://ecoport.org/Resources/Refs/Pesticid/Code/PM_Code.htm - was adopted in 1985 and amended to include the principle of Prior Informed Consent (PIC) in 1989.

21. Global Information Network on Chemicals (GINC) - http://www.nihs.go.jp/GINC/ - a world information network for safe use of chemicals and provide information for better protection of workers, public health, and the environment.

22. The PAN Pesticides Database (http://www.pesticideinfo.org/Index.html) - is one-stop location for current toxicity and regulatory information for pesticides.

23. Pesticide Action Network North America (http://www.panna.org/index.html) – Engaged in advancing alternatives to pesticides worldwide

ANNEX M – REVIEW OF ISSUES ON MANAGING CROP DISEASES IN TRADITIONAL AGROECOSYSTEMS USING CROP GENETIC DIVERSITY

Managing crop disease in traditional agroecosystems: the benefits and hazards of genetic diversity[1]

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Introduction

For millenia, farmers have had to contend with pest and disease outbreaks that threaten their crops and livelihoods. Their legacy of domesticated varieties or landraces is notably diverse genetically, both between and within populations. The question that naturally arises is whether the maintenance of diversity on-farm, particularly for genes that affect host-pathogen interactions, has given farmers an effective strategy against disease, or, on the contrary, whether it has provided the opportunity for the evolution of adverse diversity in pathogen populations. In other words, is crop genetic diversity a benefit in reducing disease in time, or is it a hazard in giving scope for the emergence of pathogen super-races?

Two conflicting hypotheses summarize the essential issue to be resolved for the best management of genetic diversity on-farm. They can be starkly spelt out in terms of whether a farmer relies on a diverse planting achieved as a mixture of genotypes differing in resistance structure[2] or plants a monoculture of a crop variety[3] that is protected by one form of resistance.

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[1] Chapter 11 in "Managing Biodiversity In Agricultural Ecosystems." 2005. (DI Jarvis, C Padoch, and D Cooper, eds.) in press. Columbia University Press, New York USA

[2] *For simplicity, we do not include multiple species as a strict diversity strategy because a component species of a multicrop system may be genetically homogeneous and be host to entirely different diseases, yet immune to others that afflict the other component. Resistance benefits from such a strategy arise from physical effects (e.g. spore trapping, host density) rather than genetic effects (e.g. differential resistance).*

[3] *The term 'monoculture' usually refers to the continuous use of a single crop species over a large area. For the pathologist, however, 'monoculture' alone is inadequate since it can apply at the level of species, variety or gene. If all the varieties available within the species possess the same resistance gene, then the system is effectively a resistance-gene monoculture (Finckh and Wolfe 1997).*

Under the first or **diversity-benefit** hypothesis, a diverse genetic basis of resistance is beneficial for the farmer because it allows a more stable management of disease pressure than a monoculture allows. This is because theory and experience indicate how readily the resistance of a monoculture can break down and the whole population succumb. The genetically diverse field will require the much less likely event of different types of resistance to break down in the same place for comparable disease damage.

The alternative or **diversity-hazard** hypothesis argues that a monoculture of a variety that carries multigenic, or indeed a combined form of several genetically different major-gene resistances is the better, more stable option because pathogen populations are kept very low. The joint double or multiple mutation required to overcome all resistances should be extremely rare. In stark contrast, this hypothesis predicts that mixed host populations that have genotypes differing in resistance to different sets of pathotypes will allow diverse pathogen populations to build up, and the potential of new super-race pathotypes to arise by single-step mutation, or recombination. The theory behind these arguments is subject to much discussion (Mundt 1990, 1991; Kolmer et al. 1991) and it is difficult to determine experimentally the threat from super-races.

In this chapter we discuss the evidence that bears on whether local crop cultivar diversity reduces genetic susceptibility to pathogens. The ultimate aim of such research is to discover when and how the use of local crop varieties and genotypes has a beneficial effect for farmers on pest and disease incidence. We discuss what type of research is necessary to decide between the two hypotheses and determine the optimal use of diversity to manage pathogen pressures. Finally, we note that the farmer is at the center of the host - pathogen - environment triangle, and that local crop cultivars (landraces) managed in long extant, low-input agricultural systems are reservoirs of genetic variation resulting from a dynamic interaction between host, pest, environment and farmer.

Genetic vulnerability and genetic uniformity

As early as the 1930s, agricultural scientists recognized the potentially damaging consequences of planting large areas to single, uniform crop cultivars (Marshall 1977). This situation is known as increased genetic vulnerability because it increases the risk of disease epidemics[4]. The expected reduction in vulnerability due to genetically heterogeneous plantings is in line with the diversity-benefit hypothesis. On the other hand, diseases severely affect production, especially in developing countries. Much of the 30% of the world's annual harvest lost to disease and pests occurs in developing countries (Oerke et al. 1994). Superficially, the diversity-hazard hypothesis would predict that traditional varieties are prone to such losses and explain the severity of disease in developing countries. However, inappropriate or limited strategies of resistance gene deployment that ignore environmental and agronomic complexities in traditional systems may lie at the root of these generalizations.

[4] *Genetic vulnerability is defined as "the condition that results when a widely planted crop is uniformly susceptible to a pest, pathogen or environmental hazard as a result of its genetic constitution, thereby creating a potential for widespread crop losses." (FAO 1998). Thus vulnerability reflects a "potential for damage" rather than "actual damage."*

The Irish potato famine in the wake of the introduction of the late blight pathogen (*Phytophthora infestans*) in the 1840s is a dramatic example of genetic vulnerability accompanying genetic uniformity and leading to the devastating loss of the crop (Schumann 1991). Another is the1979–80 rust attack on Cuba's sugarcane (caused by *Puccinia melanocephala*), where one cultivar covered 40% of the sugar cane area, which resulted in US$500 million in losses (FAO 1998:32). The southern corn leaf blight (caused by *Cochliobolus carbonum*) destroyed one billion dollars worth of corn in the US in the 1970s (Ullstrup 1972). Susceptibility of the five major commercial cultivars of banana to the fungal disease black sigatoka (caused by *Mycosphaerella fijiensis*) resulted in Central American countries losing about 47% of their banana yield (FAO 1998). While controls over the disease are available, over the course of eight years they cost Central America, Colombia and Mexico US$350 million as well as causing serious human health problems through exposure to pesticides. Cassava mosaic virus causes yield losses of up to 40% in some parts of Africa, where many depend on cassava as an important nutritional resource (Otim-Nape and Thresh 1998). Most rubber clones grown throughout the world derive from crosses based on very limited genetic variation (Oldfield 1989). South American leaf blight, caused by *Microcyclus ulei*, has a history of devastating rubber plantations in South America and remains the main obstacle to the development of rubber there, because of the high variability of leaf blight (Rivano 1997). The real threat of rubber tree leaf blight is in Asia, where 90% of rubber is produced. At present this region is free of the disease but clones are considered very susceptible (Compagnon 1998; Kennedy and Lucks 1999).

Much damage is due to the evolution of new races of pests and pathogens that overcome resistance genes currently deployed over large areas. When new cultivars are produced that carry new resistance genes, these resistances may protect for only a few cropping seasons as new pathotypes emerge. However, gene deployment can also increase pathogen complexity. For instance, in a scenario more suggestive of the diversity-hazard hypothesis, some landraces of quinoa in Ecuador were resistant to low-virulence isolates of downy mildew that were frequent before gene deployment. However, subsequent to the increased planting of resistant landraces, pathogen strains virulent to all the hypersensitive resistance deployed were developed (Ochoa et al. 1999; see Box 11-1). The real epidemiological consequences of this interference are difficult to establish because the extent of cultivation of resistant landraces is unknown.

Adaptation of landraces to the pathogen environment

Different types of resistance appear to be widespread in local crop landraces (Teshome et al. 2001). This is attributed to the long-term co-evolution between pest and host species in primary and secondary centers of diversity. For many crop species, it is likely that centers of crop genetic diversity and those of pest or pathogen diversity coincide (Leppik 1970; Allen et al. 1999).

As humans have moved around the globe with their crops, so have resistant germplasm and virulent races of pathogens. Resistance genes evolve in response to new pathogens but there may also be remnants of resistance already present in a region if the crops had historically been in contact with the disease. This phenomenon has resulted in the occurrence of resistance outside the primary center of diversity, an example being resistance to chocolate spot (caused by *Botrytis fabae*) in faba bean (*Vicia faba*) in the Andes (Hanounik and Robertson 1987). This crop first reached the Americas several hundred years ago; its center of diversity is the Fertile Crescent.

Marked geographic patterns of host resistance in relation to pest and disease presence can suggest the operation of co-evolution. In a screening of world barley collections, Qualset (1975) found resistance to barley yellow dwarf virus (BYDV) to be highly localized in Ethiopia, a center of diversity. Qualset concluded that the mutation for BYDV resistance happened in Ethiopia and the presence of the disease is reason to believe that natural selection favored resistant barleys. Subrahmanyam et al. (1989) screened a global peanut collection for resistance to rust caused by *Puccinia arachnidas* and to leaf spot caused by *Phaeoisariopsis personata*. They found that 75% of the resistant accessions came from the Tarapoto region of Peru. Peru is a secondary center of diversity for peanut that developed from the primary center of domestication in southern Bolivia.

There is considerable evidence that landraces are adapted to their biotic environment, which includes pests and pathogens. Leppik (1970), Harlan (1977) and Buddenhagen (1983) noted that the greatest numbers of disease resistance genes usually come from landraces where host and pathogen have co-existed for long periods of time. Although some of these populations may be low yielding, the genetic variability for resistance within and between them has provided some degree of insurance against the hazard of epidemics.

Other selective forces combine with pathogen pressure and the relative importance of a disease in the host's environment to determine the intensity of selection for resistance. For example, occasional epidemics of rice blast (caused by *Pyricularia grisea*) can be devastating at the high altitudes of Bhutan, locally eradicating whole crops. This suggests that blast is a strong selective pressure. Yet, cold resistance is a vital trait and may in fact be the dominant selective force in the system (Thinlay 1998).

Box 11-2 discusses recent research on local varieties of faba bean in Morocco as sources of resistance to the crop's major foliar diseases: chocolate spot and ascochyta blight. Of key interest in this work is that much of the screening was done with local isolates of the pathogens under both laboratory and field conditions. The host populations were found to be polymorphic for resistance, which genetic analysis has indicated is multigenic and partial in the case of chocolate spot of faba bean.

In addition to resistance genes themselves, the resistance responses in landraces can be due to morphological differences, correlated traits or indirect effects. For example, the solid-stemmed types in Turkish wheat landraces were resistant to sawfly whereas the hollow-stemmed types were not (Damania et al. 1997). In East Africa, response to selection for tolerance to heavy rain was correlated with resistance to anthracnose (Trutmann et al. 1993).

Composite crosses or bulk populations which are highly variable genetically are interesting experimental systems that can portray how host populations evolve to meet pressures from varying pathogen populations (Brown 1999). Allard (1990) analyzed temporal trends in resistance to scald (caused by *Rhynchosporium secalis*) in barley composite crosses and inferred that not all resistance alleles are useful, some being detrimental to yield, reproductive capacity and adaptability. He also concluded that pathotypes differ in their ability to overcome various resistance alleles, to infect and damage the host. Several aspects of the pathosystem are interrelated in ways that affect population dynamics of host and pathogen, including frequencies of resistance alleles in the host population and virulence alleles in the pathogen population.

Several mechanisms may contribute to changes in disease incidence or severity (usually a reduction) in host populations that are diverse for resistance (Wolfe and Finckh 1997). Seven such mechanisms are listed below, the first four of which apply to all mixtures and variable populations irrespective of whether pathogen specialization to the host in question is present. The last three apply to host-pathogen systems with specific resistance.

(1) The **increased distance** between plants of the more susceptible genotypes in the population reduces spore density and the probability that a virulent spore will land on a susceptible host.
(2) Resistant plants acts as **barriers** to pathogen spread.
(3) **Selection in the host population** for the more competitive or more resistant genotypes can reduce overall disease severity.
(4) **Increased diversity of the pathogen population** *per se* can in some cases decrease disease (Dileone and Mundt 1994).
(5) Where pathogen specialization for host genotypes occurs**,** the **resistance reactions** that avirulent spores induce may prevent or delay infection by adjacent virulent spores (e.g. for powdery mildew of barley mixtures (Chin and Wolfe 1984) and for yellow rust of wheat (Lannou et al. 1994; Calonnec et al. 1996).
(6) **Interactions among pathogen races** (e.g. competition for available host tissue) may reduce disease severity.
(7) **Barrier effects are reciprocal**, i.e. plants of one host genotype will act as a barrier for the pathogen specialized to a different genotype and plants of the latter will act as a barrier for the pathogen specialized to the first genotype.

The above mechanisms apply to air-borne, splash-borne and some soil-borne diseases. Thus, mixtures of host genotypes that vary in response to a range of plant diseases will tend to show an overall response to those diseases that is correlated with the disease levels on the more resistant components in the population. In addition, when particular genotypes are affected by disease, the yields of the other more resistant individuals generally compensate for them.

Pathogen evolution in response to host resistance management

The biotic environment of landraces differs in degree from the abiotic environment in at least two ways. First, it is potentially a responsive "moving target" able to change to meet new evolutionary opportunities and match changes in the host. Second, the pathogen component is "partially hidden" because potential diseases that currently are under control in the population may not be evident as threats. Thus, the presence of a serious pathogen requires disease developed on specific host plants to be evident, whereas edaphic or climatic stresses are apparent in an area from either physical or biological data.

A serious concern is the potential for genetically heterogeneous host populations to select for resistance to super-races, which could lead to the simultaneous loss of all resistances. However, the approach to dominance of a pathogen race able to attack all genotypes will slow with increasingly complex host populations because the selective advantage of being able to attack one more host will decrease as the number of different genotypes increases (Wolfe and Finckh 1997). On the other hand, increasing the diversity of resistance responses may lower the adaptation, or the use or value of the crop population to the farmer. Therefore there is likely to be an optimum in host complexity.

There are other strategies to delay the evolution of super-races. For example, some researchers suggest that "the optimum evolutionary strategy may be development, within local populations, of complementary patterns of genetic variation for resistance in the host and virulence in the pathogen" (McDonald et al. 1989). A substantial theoretical and empirical literature exists investigating such strategies for deliberate mixtures; much less is known about this question in traditional landraces.

The long-term effects of resistance gene deployment on the genetic structure of pathogen populations are widely debated. Many studies directed towards co-evolutionary models in agricultural systems have stressed the importance of fitness costs associated with resistance and virulence. However, such costs are hard to document. If virulence does have a fitness cost to the pathogen, then mixtures carrying different resistance genes will slow the rate of evolution of the pathogen and simple races will dominate the pathogen population. Recent models indicate, however, that mechanisms other than the cost of virulence might act to the same effect (Lannou and Mundt 1996; Finckh et al. 1998).

As farmers have manipulated genetic diversity in their crops, how have the pathogens responded? This important question probably has as many answers as there are cropping systems, but one overriding generalization is that evolutionary shifts in the pathogen are the rule. Box 11-1 gives some examples from recent research in Ecuador that emphasize the complex situations that arise in resistance gene deployment. Suboptimal use of resistant varieties can cause unintended and untoward shift in pathogen virulence that must be met with the use of further resistance sources.

Using genetic diversity to manage diseases

Both farmers and plant breeders have selected for and used genotypes that are resistant to the pests and pathogens of their crops (Frankel et al. 1995; Finckh and Wolfe 1997; Thinlay et al. 2000a), and have developed farming systems that reduce the damage they cause. Here we discuss three kinds of use, namely direct use by farmers, use of resistance in mixtures and use in breeding programs.

Direct use by farmers

Traditional farmers are often aware of and exploit intervarietal differences in susceptibility to major pathogens. Box 9-3 provides an example of farmer use of genotypic diversity to cope with a suite of diseases and pests in bananas in Uganda. Disease susceptibility often joins a complex list of criteria that determine farmers’ choice of seed. The choice either reflects a compromise between conflicting criteria, or that farmers may select several varieties to meet distinct needs.

Multilines and mixtures for disease control

In many regions of the world, farmers have local preferences for growing mixtures of cultivars that provide resistance to local pests and diseases, and enhance yield stability (Trutmann et al. 1993). Thus within-crop diversity (through variety mixtures, multilines or the planned deployment of different varieties in the same production environment) can reduce damage by pests and diseases (see Box 11-4).

Another approach available to farmers is to use mixtures of traditional and resistant modern varieties to achieve reduced pest and disease damage and thus retain and use traditional varieties on-farm (Zhu et al. 2000; Chapter 12, this volume). Pyndji and Trutmann (1992) and Trutmann and Pyndji (1994) showed over three seasons that adding a resistant variety to 25–50% of a local bean mixture that was susceptible to angular leaf spot (ALS) (caused by *Colletotrichum lindemuthianum*) both protected the susceptible components in the local mixture and increased yields significantly above expected. However, no yield benefit accrued without disease pressure. Thus, ALS is an important factor limiting yield, and new sources of resistance can have a major impact on yields of traditional mixtures. Such new resistances and their use in mixtures can help conserve traditional varieties and reduce their displacement by monocultures.

Yet the story is more complex. In multilocation trials, the yield benefits from new resistant mixtures were not as clear cut as severity ratings had indicated. In these sites the probable interacting factor was another disease, floury leaf spot (caused by *Ramularia phaseoli*), to which the ALS-resistant variety was susceptible. These results underline the typical difficulties that breeders meet as they have to select for multiple disease resistance among other traits. Wolfe (1985) has proposed that cultivar mixtures might help to achieve this goal more efficiently as it will suffice if different components in the mixture are resistant to different diseases.

Multilines are mixtures of genetically similar lines or varieties that mainly differ only in their resistances to different pathotypes. They are in use in cereals in the USA (Finckh and Wolfe 1997) and in coffee (*Coffea arabica*) in Colombia. There the variety 'Colombia' is a multiline of coffee lines differentially resistant to rust (caused by *Hemilera vastatrix*) and grown on more than 360,000 ha (Moreno-Ruiz and Castillo-Zapata 1990; Browning 1997).

Epidemiological studies of pathogen populations in experimental varietal mixtures and multilines provide an empirical test of whether the resistance heterogeneity in a landrace population might also act to reduce the spread of disease. Wolfe (1985) reviewed over 100 observations from such experimental evidence and found that the infection rate in the more susceptible component in binary mixtures was only 25% of the infection rate in pure plots. The overall infection rate in varietal mixtures approached that of the resistant component grown alone. Also, he found that mixtures are generally more effective than multilines owing to their higher level of genetic heterogeneity.

Another line of argument that supports the adaptive properties of multiple resistance is its prevalence in wild plant populations. Burdon (1987) reviewed the evidence from eight herbaceous and forest tree species as well as *Avena, Glycine* and *Trifolium* showing that natural plant populations are often polymorphic in their response to pathogens. In the wild *Linum marginale – Melampsora linii* system, the more resistant natural plant populations harbor more virulent rust populations (Thrall and Burdon 2003). Yet in this system, disease is generally less prevalent in host populations with greater genetic diversity of resistance. Very similar observations were made for rice landraces and rice blast (Thinlay et al. 2000b).

Competition and compensation are the most important intergenotypic interactions occurring in plant populations, both of which influence yield and yield stability. In the absence of disease, mixtures tend to yield around the mean of the components, and overall average slightly more than the mean (Finckh and Wolfe 1997). Yield increases in genotype mixtures may arise partially from niche differentiation among the components (Finckh and Mundt 1992). Allelopathy and synergisms of unknown origin might also play a role.

Disease levels in mixtures are almost always lower than the average levels of their components (Burdon 1987; Burdon and Jarosz 1989). In the presence of disease, mixtures of cultivars frequently yield more than the mean of the components grown as pure stands (Finckh and Wolfe 1997). Although the correlation between disease severity and yield is often clear in pure stands, it is not always so in mixtures (Finckh et al. 1999). This is because the correlation between disease severity and yield of the individual component plants of a mixture is often poor. One important reason for this is the effects of disease on the competitive interactions among cultivars (Finckh and Mundt 1992; Finckh et al. 1999).

Breeding

Because of the value of resistance genes to breeding programs, many researchers have screened genebank samples of landraces and wild crop relatives as well as newly collected samples from the field. When interpreting the results of such studies it is important to keep in mind when the genebank samples were originally collected, and what pathotypes were used to test resistance (Teshome et al. 2001). The temporal factor is important because pathogen and host populations change over time in the field. Comparison collections made at different times may show a diversity of response that is misleading as to what level of diversity may be present at any one time. While the use of non-local pathotypes in testing for resistance response in landraces is relevant to specific breeding goals, data of this type may not be useful for the study of co-evolutionary processes *in situ*.

Since landraces are often diverse for resistance, it is also important to use sufficiently large samples for screening against multiple pathogen races. Frequently only a certain fraction of a landrace carries resistance (e.g. Thinlay et al. 2000b). In addition even predominantly inbreeding crops will outcross to a certain degree when maintained as diverse landraces and thus may be segregating and show changes in resistance over time (Finckh 2003).

Breeders' use of resistances in landraces typically begins with germplasm screening. For example, Negassa (1987) screened Ethiopian wheat landraces for response to leaf rust (caused by *Puccinia recondita*) and found moderate resistance to an isolate that was virulent on six genes. Subsequently Dyck and Sykes (1995) tested whether such resistance was transferable in a wheat breeding program. In tests using crosses and backcrosses, they demonstrated that resistance in Ethiopian tetraploid and hexaploid wheat to leaf rust and to stem rust (caused by *P. graminis* f. sp. *tritici)* was useable.

In Ethiopian landraces of barley, Alemayehu and Parlevliet (1996) found a near absence of race-specific, major resistance and a high frequency of moderate levels of partial resistance to *Puccinia hordei*. Breeding with quantitative, partial or multigenic resistances poses considerable difficulties in modern plant breeding, which sometimes can be helped with linked genetic markers. Alternatively, dispersed breeding efforts in participatory schemes that involve farmers selecting in their fields are encouraging, as Box 11-5 reports.

Resistance whose genetic basis is complex can be handled in ways other than by pedigree breeding. Ever since pathogens were recognized as “shifting enemies” (Stakman 1947), many breeders have advocated the use of resistance gene diversity to cope with, if not to forestall, evolving pathogen populations (e.g. Suneson’s (1956) “evolutionary plant breeding” approach; Le Boulc’h et al. 1994). Among other breeding concepts, population selection, composite crosses, top crosses and multilines all make use of within-crop diversity (Finckh and Wolfe 1997).

Farmers’ role in shaping co-evolved genetic diversity

Farmers manipulate the genetic composition of their crops and the biotic and abiotic environment in and around their fields, creating distinct selective pressures in agricultural systems. Four kinds of impacts are notable:

(1) Selection of crop genetic diversity. The choices of planting materials that farmers make clearly have a major effect on pathogen populations (see Chapter 3). Crops differ in the extent to which farmers’ selection criteria for seed explicitly or effectively include the avoidance of pathogen damage. For many (e.g. faba bean Box 11-2, banana Box 11-3, phaseolus beans Box 11-4) disease response criteria rank highly in farmers’ decisions. In other crops without obvious disease symptoms, resistance selection is indirect via pragmatic selection for yield.

The effect of farmers’ decisions as to seed selection will depend on their access to genetic resources, and the history of cropping in the region. Landrace crops growing in regions where the species was domesticated still can interact with their wild progenitors and relatives along with weeds and shared pests, pathogens and beneficial organisms. On the other hand, crops that have traversed continents and are separated from their origin may retain less genetic diversity and display a variety of relationships with their pests. Outcomes for any particular situation are difficult to predict. Most crops, away from the constraints of their co-evolved pests, can flourish. In some cases, crops have developed resistance outside of their center of domestication (e.g. *Vicia faba*), presumably involving farmer selection.

(2) Field size and position. Field location affects the interaction of crop species with populations in other farmers’ fields and wild alternative hosts in the surrounding natural vegetation. Small, isolated fields are more likely to diverge from one another than larger fields so that in many traditional systems small fields become mosaics of diversity that may reduce the chance of large-scale epidemics. Adjacent fields have increased opportunity for geneflow between populations of both host and pathogen. Natural populations of wild relatives can support pathogen evolution and the potential of pathogens to overcome crop resistance (Allen et al. 1999). An extreme example is the movement of virulent rust strains from wild relatives of wheat in the Himalayas to cultivated wheat in India and Pakistan, resulting in epidemics (Joshi 1986).

(3) Within-field spatial arrangement of crop genetic diversity. Farmers may grow their crops as varietal monocultures, or as species mixtures and in various intercropping patterns. Each of these strategies affects the rate and level of host-pathogen interaction as discussed above.

(4) Temporal variables: Seasonality in temperature and rainfall in relation to harvest and planting affects plant-pathogen interactions. Farmer practices like fallowing, rotation, adjustment of sowing date, use of cultivars of different duration, use of trap crops, and temporal deployment of specific resistances can build on seasonality for managing pests (Thurston 1992).

Crop rotations are fundamental in improving crop health in various ways (Finckh 2003). These can be divided into (1) time effects to outlast residual pathogen propagules in soil or on crop residue, (2) indirect effects via soil microbial activity, and (3) direct suppressive effects of certain crops on certain pathogens. While the presence of a pathogen is required to cause disease, the absence of a pathogen is not necessarily required for a healthy crop. In fact, the balance between beneficial and detrimental organisms usually determines the outcome.

Yet, as the above discussion has shown, the need is to complement and extend such integrated pest management (IPM) strategies as rotations by using and managing the **intraspecific diversity** of local crop cultivars as a key resource. For resource-poor farmers in developing countries, local crop diversity and its management may be one of the few resources and options available to combat pest and disease pressures. Thus, biodiversity benefits that will accrue through application of this approach, in addition to the conservation of agrobiodiversity, will include less environmental damage, conservation of insects, fungi, soil microorganisms and aquatic biodiversity of adjacent ecosystems.

Discussion and research challenges

While it is known that crop genetic diversity can be used to reduce pest and disease pressures; it is also known that this approach is not appropriate in all circumstances. The challenge is to develop criteria that determine when and where diversity can play or is playing a key role in managing pest and disease pressures. These criteria will form the basis for tools and decision-making procedures for farmers and development workers to enable the appropriate adoption of “diversity-rich strategies” to manage pests and diseases.

The key questions for research to yield such guidelines in the use of crop genetic diversity are:

1. Host resistance diversity — Among and within traditional crop cultivars, what genetic variation for resistance exists against the pathogen populations they harbor?
2. Diversity and field resistance — Does the resistance diversity present in a crop actually reduce pest and disease pressure and vulnerability, at least in the short term?
3. Biotype diversity — How does the population structure of pathogens vary across systems and in space?

The answers to these questions will require that data be collected to characterize hosts, pests, pathogens and surrounding environments from direct field measurements in conjunction with information from farmers.

In general, the development of disease in plant populations and the co-evolution of resistance and virulence is the outcome of interaction between three factors: the host (H), the pest or pathogen (P), and the environment (E), and is depicted as the disease triangle (Burdon 1987). Host-pathogen co-evolution in traditional cropping systems can also be portrayed as a triangle in common with both natural communities, or with composite crosses. However, for landraces in traditional systems, it is important to add the farmers to this model because of the crucial role that they play in selection (Finckh and Wolfe 1997).

Conclusion

Understanding the interconnecting forces at work between farmers, their crops, the environment and host and pest species in agroecosystems is critical to developing effective mechanisms for combating diseases based on optimal maintenance and management of crop genetic diversity in highly variable environments. Resource-poor farmers depend on the diversity of local crop cultivars to cope with all the factors that lower yield. Alternative strategies to meet their needs, such as highly bred homogeneous varieties that combine several resistances ("pyramid breeding"), require large resources to develop. They are unlikely to be adapted to marginal or highly variable environments. Inevitably, such varieties will need to be replaced as new diseases or pathotypes arise to attack them. Most developing countries are not able to finance such continued "maintenance" breeding well. The public sector is shrinking, the environments are often very variable, and the climate is optimal for most pathogens. It is therefore of major importance that resistance diversity be both maintained and used optimally on-farm to ensure present production and future options for farmers. Cases of inappropriate deployment do not rule out this fundamental principle. Diversity is not a hazard in itself, nor necessarily a benefit. Rather the task is to determine the key genetic, environmental and agronomic parameters that will affect when farmers will benefit from its use and reduce the vulnerability of their crops to disease and pests.

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Box 11-1. Deployment of new resistant varieties and shifts in pathogenicity in Ecuador.
Evolution in the wheat-yellow rust, the quinoa-downy mildew, the bean rust and anthracnose pathogens has been followed in some detail in Ecuador.

The population structure of the yellow rust pathogen, *Puccinia striiformis* f. sp. *tritici*, was very simple in the early 1970s, including a fraction avirulent on all the differential cultivars used for race characterization (INIAP 1974). In a 1991 survey, Ochoa *et al*. (1998) identified virulence to the yellow rust resistance genes (Yr1, Yr2, Yr3, Yr6, Yr7, YrA). Since then, virulence to Yr9 and other genes has been identified in the Ecuadorian population. Currently all major resistance genes available to breeders have been overcome by pathogens.

Quinoa breeding based on line selection began in the early 1980s and continued until the early 1990s. Local and introduced germplasm from Peru and Bolivia was tested at several locations and four cultivars were released: 'Cochasqui', 'Imbaya', 'Tunkahuan' and 'Ingapirca'. Resistance to downy mildew caused by *Peronospora farinosa* f. sp. c*henopodii* was a major selection criterion in this program. In a study of the population structure of *P. farinosa* during 1994–95, four groups of pathotypes were found, apparently differing in virulence by successive single-steps. The avirulent isolate (V1-group) was found only once in a local landrace in Otavalo. Such avirulent isolates were probably more frequent in the former subsistence quinoa system before breeding began. Cultivar 'Imbaya' apparently carries resistance factor R1, cultivar 'Ingapirca' carries resistance factor R2 (Peru and Bolivia origin) and the most recently released cultivar 'Tunkahuan' lacks any resistance factor. Resistance factor R1 is frequent in landraces and R3 is more frequent in advanced lines. Germplasm screening for resistance to pathogen isolates in the V4 group has so far been unsuccessful (Ochoa et al. 1999).

A rapid evolutionary process has taken place in the quinoa – downy mildew pathosystem in this short period of breeding improvement. Isolates of low virulence and apparently less aggressive and less complex are postulated to have been frequent in traditional agroecosystems. In contrast, virulent isolates are more frequent in modern quinoa, which might be due to higher levels of aggressiveness. In the quinoa – downy mildew pathogen, adaptation appears as quickly and efficiently as in other biotrophic specialists.

Bean rust (*Uromyces appendiculatus*) and anthracnose (*Colletotrichum lindemuthianum*) are serious constraints of bush bean cultivation in Ecuador. Pathogen structure and host resistance have been studied for both these diseases. From 21 isolates selected for their variability, 17 different rust pathotypes were identified. Fourteen out of twenty differentials were susceptible. However, local cultivars and landraces were more useful in discriminating between pathotypes, which indicates co-evolution of host plant and pathogen. Most of the modern commercial cultivars were found to be susceptible to rust (Ochoa et al. 2002).

Akin to the results for rust, the formal differentials were less efficient in discriminating among anthracnose pathotypes. Six races were found using the differential set. However 12 different patterns were discriminated when local cultivars and landraces were included. In common with bean rust, most of the commercial cultivars were found susceptible (Falconi et al. 2003).

Although resistance to rust and anthracnose is an important bean breeding objective, grain quality is the predominant objective at time of release. The most widespread variety ('Paragachi') is very susceptible to both rust and anthracnose. The rust-resistant cultivar 'Gema' is not adapted to the low valleys where rust is a constraint but it is grown in areas prone to anthracnose to which it is susceptible. This apparent contradiction is because bean breeding and selection for resistance have been done outside the country and only adaptation and yield potential were tested before cultivar release. Instead, breeding programs are needed that develop multiple resistances in varieties suitable to local conditions.

Box 11-2. Local Moroccan varieties as sources of multigene resistance.

Chocolate spot, caused by the fungus *Botrytis fabae*, is the most destructive leaf disease of faba bean (*Vicia faba* L.) crops in Morocco. This pathogen can reduce yields by up to 80% annually under optimum conditions for the disease development. Sources of resistance were identified and reported in the local germplasm by Bouhassan et al. (2003a). Hence, screening of 136 faba bean local accessions for resistance to *B. fabae* was conducted. Response under field conditions and on detached leaves was tested with artificial inoculation using a local strain of *Botrytis*. Significant differences were detected among genotypes for reaction to the disease in both tests. Nine accessions were clearly resistant in both the field and *in vitro*, and two were highly resistant. However, no complete resistance was observed and the authors concluded that these genotypes have partial resistance, presumably under multigenic control.

Bouhassan et al. (2003b) analyzed the components of this partial resistance to chocolate spot using five of the local faba bean lines that showed different levels of field susceptibility to the disease. The latent period (LP), the number of punctures (NP), the lesion diameter (DL), and the number of spores/leaflet (NS) were determined. The traits DL, LP and NS were used in combination to characterize the partial resistance. In the first 20 hours after inoculation, NS became significant. Line FRY167 showed the most important resistance with the lowest DL, the longest LP and the lowest NS. At the other extreme, FRY30 expressed the highest level of susceptibility with the highest values being DL and NS and the shortest being LP. All this work was based on local isolates of the fungus.

Ascochyta blight, caused by *Ascochyta fabae* Speg., is one of the major fungal diseases of faba beans worldwide. The fungus can damage all aerial parts of the plant and cause severe loss in both quality and quantity of the product. Genetic resistance is one of the major components of integrated control of the disease. Through a collaborative network (FRYMED), the local germplasm of North Africa was screened for sources of resistance to this pathogen in order to develop a resistant genepool (Kharrat et al. 2002). In total, 309 accessions (of which 106 originated from Morocco) have been screened in the field under inoculation with the local pathogen isolate FRY AFT04. The most resistant lines have been retested for confirmation in the field and in the growth chamber under artificial conditions against two virulent isolates (FRY AF T 04 and FRY AF T 37). These tests resulted in the identification of 18 resistant faba bean accessions. Some accessions showed better resistance on stems than on leaves and were retained to keep the genetic basis of the resistance as broad as possible. Almost all accessions identified as resistant or partially resistant belong to small and medium-seeded types, but they have a large variability for cycle length and some other morphological traits. These resistant genotypes were introduced in the Ascochyta Disease Specific Gene Pool (A-DSGP) collection held by IAV Hassan II Institute, Rabat, Morocco.

Box 11-3. Managing leaf spot diseases in East African highland banana production systems.

Banana cultivar diversity in the Great Lakes region of East Africa is estimated at 100–150 cultivars (Karamura and Karamura 1995). Banana cultivation is so closely intertwined within the sociocultural fabric of the communities that literally every part of the plant is utilized in the households: different cultivars are utilized as medicine as well as in the execution of cultural functions such as birth, death and marriage. In an ethnobotanical study, Karamura et al. (2003) reported seven criteria farmers use for their selection breeding and five of these were related to pest and diseases. In addition, cultural practices such as desuckering, deep planting and the uprooting of post-harvest stumps are measures practised to manage pest and diseases in subsistence banana systems.

The East African highland bananas, AAA-EAHB (Karamura 1999) are a group unique to the Great Lakes region of East Africa which is now regarded as a secondary center of banana diversity (Karamura et al. 1998). While this group dominates the crop in the region (78%), other banana groups including bluggoes (ABB), dessert bananas (AAA-Gros Michel) and AB (Sukali Ndiizi) and plantain (AAB-Gonja) are grown in mixtures with the AAA-EAHB, ranging from 30 to 40 different cultivars per farm.

In this region a host of viral, fungal and bacterial diseases as well as pests attack the crop, all of which elicit a variety of responses from the crop. Chief among these stresses is a complex of leafspots: black sigatoka caused by *Mycosphaerella fijiensis* Morelet, Cladosporium speckle caused by C*ladosporium musae* Mason, and the yellow sigatoka caused by *M. musicola* Leach. Occasionally, in areas of warm and humid conditions, the crop may be attacked by the Eye spot disease (*Drechslera* sp.).

Tushemereirwe (1996) studied the incidence and distribution of the leaf spot diseases in the Great Lakes region with specific emphasis on the highland bananas. His results showed a range of responses across plant populations with respect to different leaf spot diseases. The table summarizes those for *M. musicola*, for which the AAA-EAHB varieties in the trial (Entundu, Mbwazirume and Nakitembe) had the lowest incidence while the “beer” banana, Kayinja cultivar, had the highest. In an average farm in areas where the disease is prevalent, this cultivar normally constitutes less than 5% of the stand (Karamura and Karamura 1995). This may help keep the disease inoculum low in the garden and minimize the farmers’ losses. The response for black sigatoka disease (*M. fijiensis*) contrasts with yellow sigatoka. The ABB cultivars display a high level of resistance whereas AAA-EAHB appears to be very susceptible.

Incidence of yellow sigatoka and reaction to black sigatoka of banana genomes.

Cultivar	Genome	*M. musicola* incidence		Black sigatoka response[†]	
Kayinja	ABB	72%	susceptible	7.1 ± 0.1	resistant
Gros Michel	AAA	19%		5.2 ± 0.3	
(3 cvs.)	AAA-EAHB	7%	resistant	–	
(Many cvs.)	AAA-EAHB	–		4.7 ± 0.0	susceptible
Sukali Ndiizi	AB	–		5.4 ± 0.1	
Plantain	ABB	–		4.8 ± 0.2	

Source: Tushemereirwe (1996).

[†] Response measured as the youngest spotted leaf (± standard error of mean), counting the last funnel or unexpanded leaf as zero. In susceptible cultivars, symptoms appear quickly on young leaves, whereas in resistant cultivars only the older leaves show symptoms.

The results described above imply that intraspecific diversity can contribute to the management of the leaf spots in bananas. By growing several cultivars, farmers guard against total yield losses that may result from variability or change in the pathogen population, thereby ensuring food security and household income. In the Great Lakes region, farmers address the disease problem at two levels. First they take advantage of the variation between genomes. The ABB cultivars are susceptible to yellow sigatoka but resistant to black sigatoka. The opposite is true for the East African highland bananas. The ranges of the two diseases are also modified by temperature, with the cooler highlands heavily infested by yellow sigatoka and the warmer lowlands by black sigatoka.

Second, farmers may use the variation within the subgroup such as Lujugira-Mutika, where the most susceptible ones are also the early maturing ones (9–12 months), while the most resistant tend to be big-bunched and late maturing (12–15 months). Early maturing cultivars will escape at least one humid season during which leaf spots tend to proliferate, and yields are higher than expected. At a cropping system level, farmers in high altitudes tend to grow susceptible but early maturing cultivars while lowland farmers largely grow resistant or tolerant cultivars.

Box 11-4. East Africa: Farmers' use of common bean genetic diversity to reduce disease.

The Great Lakes Region in Africa constitutes a secondary center of diversity of a major local food crop, the common bean (*Phaseolus vulgaris*). Beans are grown as genetic mixtures, which are preferred for reasons of higher yield and greater stability of production (Voss 1992). Farmers play a central part in developing and manipulating the available genetic diversity to optimize production in highly variable environments. Traditionally, a mixture for each field is selected and kept separately, each unique for the slope, sun exposure, soil exposure to rain, etc. At first, when settling an area or cultivating a new field, a mixture is developed by sowing as many variable sources of seed as possible in each field and harvesting the survivors and repeating the process over seasons and years. Eventually, other selection criteria are added to satisfy other targets such as family tastes, color and cooking preferences. New varieties are only selectively added to mixtures at a later stage, and only after testing them separately. Without farmer selection, the composition of mixtures rapidly changes . Therefore, the make-up of farmer mixtures is partly the result of natural selection and partly of farmer management. Substantial levels of resistance to local pathogens are inherent in these mixtures, and the level of resistance increases in zones more favorable to pathogens (Trutmann et al. 1993). In particular, under controlled conditions varieties have resistance to local races of *Colletotrichum lindemuthianum*, the causal agent of an often lethal disease called anthracnose. Yet the farmer mixtures vary in both the number of different seed types (the "richness" diversity of the mixture) and the percentage of component types ("evenness" diversity), depending on the zone. Resistance to local pathotypes of *C. lindemunthanum* of varieties from zones with more favorable conditions for anthracnose increases with altitude, as do the number of varieties with high levels of resistance. Additional ways that farmers manage resistance to diseases include the use of plant architecture, the removal of blemished seed during selection, and varying the use of genetic diversity in temporal and spatial settings.

Varieties have to resist rain. Resistance to rain and yield are the most important farmer criteria for varietal selection. Although diseases on the whole are usually not recognized individually, they are related to rain. Rain is associated with the rotting of leaves or roots (as seen from the farmers' perspective) and with causing floral abortion (Trutmann et al. 1996). Plant architecture that enables plants to escape the effects of rain are preferred, and certain types of plant vigor are selected depending on the conditions. Farmers also deploy their genetic diversity, using different mixtures in the first and second rainy season. Traditionally, seed for each season is kept for each field. This strategy is interwoven with rotations. In addition, fields are kept small, and beans are often intercropped with other crops like banana, sweet potato and maize. The overall effect is that genetic variation to manage diseases is enhanced by varying its placement, frequency or density, and timing. In these ways local farmers enhance the use of the available genetic diversity beyond the within-crop deployment of genes that directly confer resistance to local pathogens.

Box 11-5. Response of local varieties to participatory recurrent selection in Morocco.

In Morocco, germplasm enhancement based on recurrent selection has proved to be an efficient approach for the improvement of faba bean populations, particularly for quantitative traits (Sadiki et al. 2000). This strategy is attractive as a method of participatory plant selection for improving local germplasm of faba bean. Three cycles of half-sib family multitrait selection were completed for yield components and resistance to *Botrytis fabae* under natural infestation in a broadly based population developed from local varieties (Sadiki et al. 2000). Evaluation of response to selection showed that significant gain was achieved for yield, and that resistance to *Botrytis* improved by 54%. The first cycle induced the largest response to selection for all traits. This approach demonstrates that local farmers' varieties may be improved locally by increasing the frequency of the disease-resistant genotypes that combine resistance genes. Nevertheless the improved populations are still appreciably diverse for visible traits and for the reaction to disease itself. The improved populations are selected against local populations of the pathogen.

ANNEX K - NATIONAL AND INTERNATIONAL ROSTER OF EXPERTS

Each country identified national experts, from whom advice can be drawn during the implementation of the project. These experts will be called upon for input into the steering committees (international and national) and national planning team meetings. The information generated so far have been developed into a database structure in MS Excel and will be made available at the project web site. Identification of roster of experts is a continue process and the partners are committed to upgrade this information from time to time. A summary of this database for national and international experts is presented below:

National Roster of Experts:

China:

Name	Institution	Major Area of Specialization	Minor Field of Specialization
Bo Zhi Wu	Teaching Affairs Office, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Agronomy	Cropping Systems, Upland sustainable development
Ya Wen Zeng	Biotechnology and genetic resources Institute, Yunnan Academy of Agricultural Science (YAAS), Kunming, Yunnan Province, China	Crop genetic resources	Crop Breeding
Zhu Yi Liu	Guizhou Academy of Agriculture Sciences (GAAS), Guiyang, Guizhou Province, China	Agronomy	Biotechnology
Guang Jun Ren	Sichuan Academy of Agriculture Sciences (SAAS), Sichuan, China	Agronomy	Crop Breeding
Zong Hong Huang	Guizhou Academy of Agricultural Sciences (GAAS), Guiyang, Guizhou Province, China	Agronomy	Rice Breeding, Rice Physiology
Ren Chao Ruan	Guizhou Academy of Agricultural Sciences (GAAS), Guiyang, Guizhou Province, China	Agronomy	Rice Variety Resources, Rice Breeding
Fu Quan Yang	Yunnan Academy of Social Sciences (YASS), Kunming, Yunnan Province, China	Anthropology	

Xi bin Zhu	Faculty of Humanities and Social Sciences of Yunnan Agriculture University, Kunming, Yunnan Province, China	Sociology and Philosophy for Science and technology	Anthropology, History of Science and technology
Chun Lin Long	Kunming Institute of Botany, Chinese Academy of Sciences, Kunming, Yunnan Province, China	Biodiversity, Ethniobotany	Plant Germplasm Resources
Min Shi	Newspaper Corp. Yunnan Province, Kunming, Yunnan Province, China	Communication/ media	Mass Media
Ye Xu	Guang Ming Daily	Communication/ media	Mass Media
Yan Hong Huang	School of The Foreign Languages, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Communication/ media	Linguistics, English Writing
Hai Ming Li	Guizhou Academy of Agricultural Sciences (GAAS), Guiyang, Guizhou Province, China	Communication/Media	Linguistics, English Writing
Zhi Ling Dao	Kuming Institute of Botany, Chinese Academy of Sciences (KIB-CAS), Kunming, Yunnan Province, China	Ecology	Plant Germplasm Resources, Botany
Yuan Li	Faculty of Resources and Environment, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Ecology	Environmental Ecology
Yong Mei Li	Faculty of Resources and Environment, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Ecology	GIS and Soil Nutrient Management
Xu Cheng	China Agriculture University (CAU)	Ecology	Agricultural Ecology
Shen Yuan Lei	Sichuan Agricultural University (SAU), Sichuan, China	Ecology	Agricultural Ecology and Field Ecology
Di Dong	Institute of Economy, Yunnan Academy of Social Sciences (YASS), Kunming, Yunnan Province, China	Economy	Rural Economy, Resource Management

Jun Zhuo Zhang	Center for Community Development Studies (CDS), Kunming, Yunnan Province, China	Economy	Good Governess based on Rural Development
Hao Kun Song	Regional Development Research Center (RDRC), Yunnan University, Kunming, Yunnan Province, China	Economy	Natural Resource Management, Development Management
Xing Lu	Regional Development Research Center (RDRC), Yunnan University, Kunming, Yunnan Province, China	Economy	
Ya Qin Huang	School of Economics and Trade, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Economy	Rural Economics
Ya Mei Wang	Sichuan University (SU), Sichuan, China	Economy	Rural Economics
Yong Ping	Guizhou Academy of Agricultural Sciences (GAAS), Guiyang, Guizhou Province, China	Economy	Rural Development
Li Zheng Yue	School of Plant Protection, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Entomology	Ecological Control on Pest Insects, IPM and Pollution Free Vegetables
Li Qiang	Yunnan Agricultural University, Kunming, Yunnan Province, China	Entomology	Insect Taxonomy, Pest Management
Qing Li	Sichuan Agricultural University (SAU)	Entomology	Pest Control
Shu Lin He	Sichuan Academy of Agricultural Sciences (SAAS), Sichuan, China	Entomology	Rice IPM
Zhi Mo Zhao	Department of Plant Protection, South-West Agricultural University (SWAU)	Entomology	Systematic Ecology and Insect Ecology
Ming Guang Feng	Research Institute of Micrology, Zhejiang University (ZU)	Entomology	Microbiological Control on Suck-mouth Insects and Mites
Ming Sheng You	Fujian Agriculture and Forestry University (FAFU)	Entomology	Ecological Control on Pest Insects, IPM and Food Security,

			Living Beings' Invasion and Safety
Fang Hao Wang	Chinese Academy of Agricultural Science (CAAS), Beijing, China	Entomology	Insect Community, Ecology, Biological Control, IPM, Assessment of the Environmental and Agronomic Appropriateness of Transgenic Crops & Ecological Agriculture
Qing Wen Zhang	College of Agronomy and Biology, China Agricultural University (CAU)	Entomology	Plant Resistance to Insects, IPM, Insect Genetics and Insect Gene Engineering
Ji Wen Xiong	College of Agriculture, Guizhou University, Guiyang, Guizhou Province, China	Entomology	Insect Ecology, Pesticide Sciences and Biostatistics
Feng Liang Li	Guizhou Academy of Agricultural Sciences (GAAS), Guiyang, Guizhou Province, China	Entomology	Insect Toxicology, Plant Protection
Yi Zheng	School of Resources and Environment, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Nutrition	Plant Nutrition; Intercropping System
Li Tang	School of Resources and Environment, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Nutrition	Plant Nutritional Physiology; Intercropping System
XiaoLong Yan	College of Resources and Environment, South China Agriculture University (SCAU)	Nutrition	Crop Nutritional Genetics; Plant Root Morphology

Fu Suo Zhang	College of Resources and Environment, China Agricultural University (CAU)	Nutrition	Nutrient Management in Intercropping System
Long Li	College of Resources and Environment, China Agricultural University (CAU)	Nutrition	Nutrient Management in Intercropping System
Guo Hua Xu	College of Resources and Environment, Nanjing Agricultural University (NAU)	Nutrition	Plant Nutritional Genetics
You Yong Zhu	Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Plant Pathology	Agricultural Biodiversity for Pest and Disease Management
Yun Yue Wang	School of Plant Protection, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Plant Pathology	Agricultural Biodiversity for Pest and Disease Management
Cheng Yun Li	School of Plant Protection, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Plant Pathology	Molecular Plant Pathology,
Jie Yuan	Institute of Plant Protection, Guizhou Academy of Agricultural Sciences (SAAS)	Plant Pathology	Rice IPM
Zhong Quan He	Institute of Plant Protection, Sichuan Academy of Agricultural Sciences (SAAS)	Plant Pathology	Phytopathology, Rice IPM
Hua xian Peng	Institute of Plant Protection, Sichuan Academy of Agricultural Sciences (SAAS)	Plant Protection	Rice IPM and Biological Control
Lian Hui Xie	Fujian Agriculture and Forestry University(FAFU)	Plant Pathology	Plant Virus Disease, IPM
Yu Chen Dong	Institute of Crop Germplasm Resources, Chinese Academy of Agricultural Sciences (CAAS)	Plant Genetics	Plant Genetic Resources
Xu Liu	China Academy of Agriculture Science (CAAS)	Plant Genetics	Plant Genetic Resources
Bao Rong Lu	Fudan University (FU), Shanghai, China	Plant Genetics	Plant Genetic Resources
Lu Yuan Dai	Institute of Biological Technologies & Crop Germplasm Resources, Yunnan Academy of Agricultural Sciences (YAAS),	Plant Genetics	Crop Genetic Resources and Indigenous Knowledge

	Kunming, Yunnan Province, China		
Li Juan Chen	Rice Research Institute, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Plant Genetics	Crop Genetic Resources and Breeding
Zong Hong	Guizhou Academy of Agricultural Sciences (GAAS), Guiyang, Guizhou Province, China	Plant Breeding	Rice Physiology
Shi Gui Liu	Sichuan University (SU), Sichuan, China	Plant Genetics	Plant Biotechnology
Xiao Shan Du	Rural Development Institute, Chinese Academy of Social Sciences (CASS)	Policy	Politics
Bao Quan Wen	Policy Research Office, Government of Yunnan Province, Kunming, Yunnan Province, China	Policy	Agricultural Policy
Shi Yong Zhao	Department of Agriculture of Sichuan Province (SDOA)	Policy	Politics
Jian Hua Wang	Yunnan Department of Science and Technology (YDST)	Policy	Engineering
De Yang	Faculty of Horticulture, Yunnan Agricultural University (YAU), Kunming, Yunnan Province, China	Simulation modeling	Plant Quantitative Genetics
Yong Zhou	Institute Information Engineering, Huazhong Agricultural University (HZAU)	Simulation modeling	GIS in Agriculture
Zhou Shi	Institute of Agricultural Remote Sensing & Information System, Zhejiang University (ZU)	Simulation modeling	GIS in Agriculture
Heng Rui Qiao	Yunnan Academy of Social Sciences (YASS), Kunming, Yunnan Province, China	Sociology	Rural Development
Qiu Sun	Integrated Rural Development Center (IRDC)	Sociology	Rural Development
Zhi Nan Li	Center for Biodiversity and Indigenous Knowledge (CBIK), Kunming, Yunnan Province,	Sociology	Sustainable Agriculture, Rural

	China		Development
Ke Ren Tang	Department of Agriculture of Yunnan Province (YDOA), Kunming, Yunnan Province, China	Technology Transfer	Plant Protection
Jin Xiang Fan	Honghe prefecture Plant Protection Station	Technology Transfer	Plant Protection
Yang Fu	Kunming Plant Protection Station, Kunming, Yunnan Province, China	Technology Transfer	Agricultural Technology Transfer
Ji Min Tu	Science and Technology Popularity Association of Yunnan Province (STPA)	Technology Transfer	Agricultural Technology Transfer
Xing Jin	Guizhou Plant Protection Station,	Technology Transfer	Plant Protection
Lin Ming Luo	Plant Protection station, Sichuan Agricultural Department	Technology Transfer	Plant Protection. Training Agricultural Techniques

Ecuador:

Name	Institution	Specialization
Edmigio Valdivieso	Andean Center of Rural Technology (CATER). National University of Loja. Loja-Ecuador	Plant Genetic Resources Specialist
Cesar Tapia	Department of Plant Genetic Resources and Biotechnology, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Quito, Ecuador	Plant Genetic Resources Specialist
Albaro Monteros	Department of Plant Genetic Resources and Biotechnology, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Quito, Ecuador	Plant Genetic Resources Specialist
Morales Rafael	Faculty of Agronomy, National University of Loja, Loja, Ecuador	Plant Genetic Resources Specialist
Jorge Vega	Faculty of Agronomy, Technical University of Ambato, Ambato, Ecuador	Plant Genetic Resources Specialist
Gorki Díaz	Technical University of Quevedo, Quevedo, Ecuador	Plant Genetic Resources Specialist
Carlos Becilla	Boliche Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Guayaquil, Ecuador	Plant Genetic Resources Specialist
Antonio Matamoros	Direction of Biodiversity Unite, Minister of Environment, Quito, Ecuador.	Biodiversity Specialist
Wilson Rojas	Direction of Biodiversity, Minister of Environment, Quito, Ecuador	Biodiversity Specialist
Castillo Raúl	Sugar Cane Research Center (CINCAE), Guayaquil, Ecuador	Biodiversity, Breeder Specialist
Eduardo Peralta	Legume and Andean Grain Program, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research, INIAP, Quito, Ecuador	Agronomist
Ricardo Guaman	Legume Program, Boliche Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Guayaquil, Ecuador.	Agronomist
Carlos Nieto	Desde el Surco Foundation, Quito, Ecuador	Agronomist. Alternative Technology

Manuel Suquilanda	Faculty of Agricultural Science, Central University of Ecuador, Quito, Ecuador	Agronomist. Alternative technology
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Maribona Rodolfo	Ecuadorian Centre for Biotechnological Research, Quito	Biotechnologist
Maria de Lourdes Torres	Department of Biotechnology, San Francisco University of Quito, Quito, Ecuador	Biotechnologist
Venacio Arana	Department of Biotechnology, San Francisco University of Quito, Quito, Ecuador	Plant Molecular Biologist
Alexandra Narvaez	Department of Biology, Catholic University of Ecuador, Quito, Ecuador	Plant Molecular Biologist
Ivan Reinoso	Program of Potato and Andean Tubers, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Quito, Ecuador	Agricultural Economist
Hugo Navarrete	Faculty of Biology, Catholic University of Ecuador, Quito, Ecuador	Botanist
Mario Caviedez	Faculty of Agronomy. San Francisco University of Quito. Quito-Ecuador.	Maize breeder
Carlos Yanez	Maize Program, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Quito, Ecuador	Maize Breeder
José Luis Zambrano	Maize Program, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Quito, Ecuador	Maize Breeder
Santiago Crespo	Pichilingue Tropical Experimental Station, National Autonomous Institute of Agricultural Research, Quevedo, Ecuador	Tropical Maize Breeder
Angel Murillo	Legume and Andean Grain Program, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Quito, Ecuador	Bean Breeder
Miguel Rivadeneira	Cereal Program, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Quito, Ecuador	Cereal Breeder
Victor Barrea	Technology Transfer Unit, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP),	Technology Transfer Specialist

	Quito, Ecuador	
Max Ochoa	Natural Resources Management of the Northern Region (MAGRENA), Ibarra, Ecuador	Technology Transfer Specialist
Edison Silva	Fondo Ecuatorianun Populorum Progresium (FEPP), Guaranda, Ecuador	Technology Transfer Specialist
Cristóbal Padron	Technology Transfer Division, Minister of Agriculture, MAG, Cañar, Ecuador	Technology Transfer Specialist
Maria Teresa Ramon	Technology Transfer Division, Minister of Agriculture, MAG, Loja, Ecuador	Technology Transfer Specialist
Mauricio Proaño	Randi-Randi foundation, Quito, Ecuador	Technology Transfer Specialist
Susan Poats	Randi-Randi foundation, Quito, Ecuador	Anthropologist
Kia Ambross	ECOPAR foundation, Quito, Ecuador	Anthropologist
Rober Hospeden	ECOPAR foundation, Quito, Ecuador	Anthropologist
Carmen Suarez	Pichilingue Tropical Experimental Station, National Autonomous Institute of Agricultural Research, Quevedo, Ecuador	Tropical Plant Pathologist
Ramiro Velastegui	Faculty of Agronomy, Technical University of Ambato, Ambato, Ecuador	Plant Pathologist
Clara Iza	Plant and Animal Health Service, Minister of Agriculture, MAG, Quito, Ecuador	Plant Pathologist
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Carmen Triviño	Plant Protection Department, Boliche Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Guayaquil, Ecuador	Nematologist
Hugo Orellana	Faculty of Agricultural Science, Central University of Ecuador, Quito, Ecuador	Plant Pathologist
Geovany Onore	Faculty of Biology, Catholic University of Ecuador, Quito, Ecuador	Entomologist
Patricio Gallegos	Plant Protection Department, Santa Catalina Experimental Station, National Autonomous Institute of Agricultural Research (INIAP), Quito, Ecuador	Entomologist

Morocco:

Name	**Organisation / Institute Name**	**Major field of specialization**	**Minor field of specialization**
Mohammed Sadiki	Hassan II Institute of Agronomy and Veterinary Medicine	Plant Genetics and Agrobiodiversity	Genetic diversity and Genetic resources
Brahim Ezzahiri	Hassan II Institute of Agronomy and Veterinary Medicine	Plant Pathology	Epidemiology
Loubna Belqadi	Hassan II Institute of Agronomy and Veterinary Medicine	Plant Breeding and Genetics	Plant Biotechnology
Mohammed Bouhach	Hassan II Institute of Agronomy and Veterinary Medicine	Agroecology	Parasitic weeds
Ghita Chlyeh	Hassan II Institute of Agronomy and Veterinary Medicine	Entomology	Population dynamics
Yasmina Imani	Hassan II Institute of Agronomy and Veterinary Medicine	Plant breeding and Genetics	Plant resistance to diseases
Amar Tahiri	Plant Protection and variety registration Department (DPVCTRF), Ministry of Agriculture	Plant breeding and Genetics	Seed technology and quality
Asma Hamzaoui	Plant Production Department (DPV); Ministry of Agriculture	Agronomy	Production systems
Habib Abdelali	Regional Development District (DPA); Ministry of Agriculture	Agronomy	Production systems
Aicha Bouhassan	University of Casablanca Ain Chock	Plant Physiology	Plant-pathogen interaction
Ahmed Taibi	Centre de Travaux (CT) Ourtzgah	Horticulture	Crop management
Majid Benabdellah	Hassan II Institute of Agronomy and Veterinary Medicine	Agroeconomy	Agroeconomy
Noureddine Chtaina	Hassan II Institute of Agronomy and Veterinary Medicine	Phytopharmacy	Pesticides
Zain El Abidine Fatemi	INRA	Plant breeding	

Uganda:

Name	Institution	Specialization
Adipala Ekwamu	Makerere University; Faculty of Agriculture	Pathologist
Edem Richard	Makerere University; Faculty of Agriculture	Pathologist
Enid Katungi	NARO- KARI	Socioeconomist
Esegu J.F.	NARO- FORRI	Breeder
Hafashimana David	Ministry of Land Water and Environment; Forestry Department	Taxonomist
Kangire K.	NARO- CORI	Pathologist
Karamura Deborah	IPGRI/ INIBAP International Network for Improvement of Banana and Plantain.	Taxonomist
Karamura Eldad	IPGRI/ International Network for Improvement of Banana and Plantain.	Entomologist
Kasesene J.M.	Makerere University; Botany Department	Plant Ecologist
Kayiwa Male	NARO- PGRP	Breeder
Kiwuso Peter	NARO- FORRI	Entomologist
Kubiriba Jerome	NARO- KARI	Pathologist
Kyamunywa Samuel	Makerere University; Faculty of Agriculture	Entomologist
Kyetere Denis	NARO- CORI	Breeder
Mujuni Denis	NARO- FORRI	Breeder
Mukabalanga J.	NARO- NAARI	Technician
Mulumba John Wasswa	NARO (Plant Genetic Resources Program)	Plant Genetic Specialist
Mutumba G.M.	Makerere University; Faculty of Agriculture.	Plant Physiology
Namaganda Josephine	NARO- KARI	Nematologist
Namayanja Annet	NARO- NAARI (Namulonge Agricultural, Animal production and Research Institute)	Breeder
Nankinga C.	NARO- KARI	Entomologist
Nora Odoi	NARO- KARI	Communication expert
Nyeko Philip	Makerere University; Faculty of Zoology	Entomologist
Nyeko Philip	Makerere University, Faculty of Forestry	Entomologist
Odong Naboth	NARO- KARI	Breeder
Okaasai. S. Opwot	MAAIF; Commissioner Crop resources	Crop protection
Opio Finah	NARO- NAARI	Pathologist
Osiru D.S.O	Makerere University; Faculty of Agriculture	Agronomist
Otala epila	NARO- FORRI	Entomologist
Otim Nape	NARO- Secretariat	Pathologist
Patrick Okori	Makerere University, Faculty of Forestry	Pathologist
Paul Nampala	Makerere University; Faculty of Botany,	Entomologist
Sali Tendo R.	NARO- NAARI	Breeder

Ssekabembe Charles	Makerere University; Faculty of Agriculture	Agronomist
Ssekamatte Ben	USAID- APEP Agricultural Productivity Enhancement Programme.	Entomologist
Ssekimpi P.S.N.A.	Makerere University; Faculty of Botany	Genetics
Ssenyonga F.	NARO- KARI	Anthropologist
Talwana Herbert	Makerere University; Faculty of Agriculture	Entomologist
Tumwine James	NARO- KARI	Pathologist
Tushemerierwe W	NARO KARI	Pathologist
Ugen Michael	NARO- NAARI	Agronomist

Regional and International:

Name	**Organisation / Institute Name**	**Field of Specialization**
Maria Finckh	Professor and Head, Department of Ecological Plant protection, University of Kassel, Weitzenhausen, Germany	Ecological plant protection, IPM, use of cultivar and species mixtures to control pests and diseases
Melinda Smale	International Food Policy Research Institute, Washington, D.C. headquarters 2033 K Street, N.W. Washington, D.C. 20006, U.S.A.	Agriculture Economic, crop diversity
Tony Brown	Chief Research, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Canberra, Australia	Organization of genetic variation within natural or agricultural plant populations, systematic and evolutionary relationships, population genetics
Dindo Campilan,	Coordinator, Users' Perspectives With Agricultural Research and Development (UPWARD), c/o IRRI, DAPO 7777, Metro Manila, Philippines	Social Scientist, Participatory Protocols
Cris Mundit	Botany and Plant Pathology Department, Oregon State University (OSU), Corvallis, Oregon, USA	Breeding disease-resistant, host genetic diversity, population genetic, computer modeling
Chris Pannkuk	Head, International Programme/Research and Development, Washington State University, Pullman, Washington, USA	Plant Pathology
Timothy Murray	Department Chair of Plant Pathology, Washington State University (WSU), Pullman, Washington, USA	Ecology, epidemiology, genetics of disease resistance, mapping and tagging disease resistance genes with molecular markers
Tobin Peever	Associate Professor, Department of Plant Pathology, Washington State University	Population genetics and evolutionary

	(WSU), Pullman, Washington, USA	biology of plant-pathogenic fungi.
Michael Milgroom	The Institute of Genomic Diversity, College of Agriculture and Life sciences, 130, Biotechnology Building, Cornell university, Ithaca, NY 14853 2703, USA	Population genetics of fungal plants, integration of population genetics and epidemiology
Rebecca Nelson	The Institute of Genomic Diversity, College of Agriculture and Life sciences, 130, Biotechnology Building, Cornell university, Ithaca, NY 14853 2703, USA	Rural development, pathogen population biology, genetics and deployment of host plant resistance
Stephen Kresovich	The Institute of Genomic Diversity, College of Agriculture and Life sciences, 130, Biotechnology Building, Cornell university, Ithaca, NY 14853 2703, USA	Genetic diversity, plant genomics and biodiversity conservation
K.L. Heong	Entomologist, Entomology and Plant Pathology Division, International Rice Research Institute (IRRI), P.O. Box 933, 1099 Manila, Philippines	Communication strategies, rice taxonomy and biology of insects/pests, ecological research, monitoring systems
Peter E. Kenmore	Senior IPM Officer, Plant Production and protection Division, Global IPM Facility, IDWG Biodiversity, Agriculture Department FAO, Rome, Italy	Integrated Pest Management, farmers Field School, Entomology
Marjon Fredrix	IPM/Technical Officer, Plant Production and protection Division, Global IPM Facility, IDWG Biodiversity, Agriculture Department, FAO, Rome, Italy	Integrated Pest Management, Plant Pathology
Peter A.C. Ooi	FAO Regional Office, Maliwan Mansion, 39 Phra Atit Road, Bangkok 10200, Thailand	Integrated Pest Management, Farmers Field school
Linda Collette	Senior Officer (Crop Biodiversity), Seed and Plant Genetic Resources Services, Plant Production and protection Division, Agriculture Department, FAO, Rome, Italy	Crop Biodiversity
Zeyaur R. Khan	Principal Scientist, International centre of Insect Physiology and ecology, ICIPE-Mbita, P.O. Box 30, Mbita Suba District, Kenya	Entonomology, Insect physiology
Robin A. Buruchara	Pathologist and Coordinator, Pan-Africa	Bean Pathology

	Bean Research Alliance (PABRA), Kwanda Agricultural Research Institute, P.O. Box 6247, Kampala, Uganda	
James R. Steadman	Professor and head, Department of Plant pathology, University of Nebraska, 406-H Plant Sciences Hall, Lincoln, USA	Plant Pathology
Scott M. Swinton	Professor, Department of Agricultural economics, Michigan State University, 304 Agriculture Hall, East Lansing, MI 48824-1039, USA	Agriculture Economics
Toshimi Minoura	Associate Professor, department of Computer Science, 303 Dearborn Hall, Corvallis, Oregon 97331.3202, USA	Database, GIS
George S. Abawi	Professor, Department of plant pathology, Barton Laboratory, New York State Agricultural Experiment Station, Cornell University, Geneva, NY 14456-0462, USA	Plant Pathology
James D. Kelly	Professor, Crop and Soil Sciences, 370 Plant and Soil Sciences Bldg., Michigan State University, East Lansing, MI 48824	Bean resistance breeding
Luigi Guriano	Secretariat of Pacific Community, Suva, Fiji Islands	Diversity assessment, GIS
Susan Bragdon	Lewis and Clark College, Portland,Oregon	Law and policy on agricultural biodiversity
Gragan Tilt	International Potato Center (CIP), Quito, Ecuador	Anthropologist

ANNEX J - RELATED NATIONAL, REGIONAL AND INTERNATIONAL PROJECTS AND INITATIVES

During PDF B phase of the project, related and complementary initiatives undertaken and/or are under operation within the four participating countries were compiled by each of the national programme. Links will be established from the outcomes of the project activities to complement project activities. Initiatives identified to date are listed below country-wise and at regional and global levels.

China:

1. Ministry of Agriculture implemented UNDP-GEF Comprehensive Agriculture Development and Biodiversity Conservation Programme.
2. UNDP/GEF project on “Conservation and Sustainable Utilisation of Wild Relatives of Crops” which is concerned with protected areas wild relatives rice among other crops.
3. UNDP/GEF project on “Multi-agency and Local Participatory Cooperation in Biodiversity Conservation in Yunnan's Upland Ecosystem.
4. Rice Genetic Diversity for Sustainable Pest Management
5. Biodiversity for Sustainable Crop Pest and Diseases Management
6. Micro-organism Diversity for Sustainable Plant Soil-borne Disease Management
7. Agroecosystem Change and Threats to Agrobiodiversity Ethnobotanical project, Kunming Institute of Botany and IPGRI
8. Identification and Promotion of Profitable Agrobiodiversity-rich Management Systems and Techniques, at sites in sub-tropical southern Yunnan and mountainous western Yunnan, Xishuangbanna Tropical Botanical Garden and GEF/UNU/PLEC
9. Diversification with Traditional and Modern Crop Varieties for Pest Control, Yunnan Agricultural University and IRRI
10. Participatory Approaches to Community Biodiversity registration, YAAS and IPGRI;
11. Exploiting Biodiversity for Sustainable Pests and Diseases Management, YAU and IRRI (ADB funded project)
12. Molecular Detection and Bio-control for Soil Borne Diseases in Vanilla, YAU (Yunnan provincial government’s project)
13. Construction and Application of Molecular Monitoring Technology System for Rice Blast, YAU (Yunnan provincial government’s project)
14. Research and Exploitation on Bio-Control Engineering Microorganisms for Soil-Borne Diseases in Agricultural Crops, YAU (Yunnan provincial government’s project)
15. The Mechanism and Technology on Genetic Diversity for Rice Blast Control, YAU (Yunnan provincial government’s project)
16. Demonstration and Extension of Genetic Diversity for Rice Blast Control, YAU (Yunnan provincial government’s project)
17. Investigation, Exploitation and Application of Bio-control Agents for Cash Crop and Root Rot Control, YAU (Yunnan provincial government’s project)
18. Use of Agrobiodiversity for Main Diseases Control in Crops, YAU (Yunnan provincial government’s project)

19. The Mechanism of Biodiversity in Crop Disease Control, YAU (Yunnan provincial government's project)
20. Investigation of Interaction between Rice Variety and Rice Blast Pathogen, YAU (Yunnan provincial government's project)
21. The Application of Molecular Marker Techniques in Rice Production, YAU (China national 863 project)
22. Demonstration and Extension of using Intra-specific and Inter-specific Biodiversity for Wheat Rust Control, YAU (Yunnan provincial government's project)
23. Mechanisms of Using Agrobiodiversity for Crop Disease Control, YAU (Yunnan provincial government's project)
24. Demonstration and Extension of Applied Agrobiodiversity Technology, YAU (Yunnan provincial government's project)
25. Integrated Practices of Biodiversity for Crop Diseases Control, YAU (Yunnan provincial government's project)
26. Genetic Diversity for Disease Control in Rice (National 863 Plan), YAU
27. Demonstration and Extension of Using Genetic Diversity for Rice Blast Control (National Plan of Agriculture Development), YAU
28. Use of Rice and Wheat Genetic Diversity for Pest Management (National 863 Plan project), YAU
29. On-farm Conservation of Rice Landraces in Yunnan, YAU (Yunnan provincial government's project)
30. Rice Genetic Diversity for Sustainable Pest Management, YAU (Yunnan provincial government's project)
31. Biodiversity for Sustainable Crop Pest and Diseases Management, YAU (Yunnan provincial government's project)
32. Micro-organism Genetic Diversity for Sustainable Plant Soil–borne Disease Management, YAU (Yunnan provincial government's project)
33. Agroecosystem Change and Threats to Agrobiodiversity Ethnobotanical Project, Kunming Institute of Botany and IPGRI
34. Participatory Approaches to Community Biodiversity Registration, YAAS and IPGRI
35. Identification and Promotion of Profitable Agobiodiversity–rich Management Systems and Techniques, at sites in sub-tropical southern Yunnan and mountainous western Yunnan, Xishuangbanna Tropical Botanical Garden and GEF/UNU/PLEC
36. Multi-agency and Local Participatory Cooperation in Biodiversity Conservation in Yunnan Upland's Ecosystem (GEF/UNDP)
37. Yunnan Comprehensive Agricultural Development and Biodiversity conservation Project, GEF/UNDP
38. Conservation and Sustainable Utilization of Wild Relatives of Crops, GEF/UNDP
39. Investigation of Genetic Variation and Variety Resistance of *Magnaporthe Grisea* in Guizhou Province, GAAS (Guizhou provincial government's project)
40. Demonstration of Integrated Management for Rice Blast in Guizhou Province, GAAS (Guizhou provincial government's project)
41. Investigation of Genetic Population Structure and Diversity of *Magnaporthe grisea* in Guizhou Province, GAAS (Guizhou provincial government's project)
42. Investigation of Resistance of *Phytophthora capsici* Leonian to Fungicides in Guizhou Province, GAAS (Guizhou provincial government's project)

43. Bio-control of Disease and Insect of High Quality Rice in Guizhou Province, GPPS-GDOA
44. Bio-control of Disease and Insect of Floral Vegetable in Guizhou Province, GPPS-GDOA
45. A Survey on Social and Economic Status of the Marginal Groups in Laojun Mountainous Areas, YAAS
46. Effects of Implementing the Western Development Strategy in Yunnan, China, YAAS
47. Investigation of Economic and Ecological Policies in 12 Provinces in the Western China, YAAS. Balancing Biodiversity with Rural Livelihoods Security, CDS Forest Resource Conflict Management in Southwestern China, Ford Foundation and FAO, CDS, Yunnan Forestry Department
50. Yunnan Village-based Forestry Resources Sustainable Management, Ford Foundation, CDS, Yunnan Forestry Department
51. Voices from the Poor: Participatory Poverty Assessment (PPA) in Yunnan, Guizhou, Guangxi, Ningxia and Qinghai, World Bank, DFID, ADB and AUSAID, CDS
52. Research of Land Tenure to Develop an Effective Legal and Policy Framework for Non-Arable Land in Southern China, Rockefellers Brothers Fund, CDS
53. Research of Community-based Pesticides Management and Monitoring, FAO, CDS
54. Yunnan Fire Long-term Site Research Project, Ford Foundation, CDS
55. China Southwest Sustainable Forest Management, Ford Foundation, CDS
56. Governance and Empowerment: Strengthening Grassroots Institutions for Biodiversity Conservation through Community Management of National Resource Systems in Northwest Yunnan, C1, CDS
57. In situ Conservation of Yunnan Wild Rice Genetic Resources, The Ministry of Agriculture, YAAS
58. Influence of Indigenous Knowledge on Utilization and Conservation of Wild Rice (*Oryza meyeriana*) in Yunnan Province. National Fund for Science, YAAS
59. Study on Controlling Rice Main Diseases and Pests, National Ministry of Science and Technology, SAAS
60. Study on Sustainable Control of Summer Maize Main Diseases and Pests in Southwestern Hilly Region, Chinese Academy of Agric. Sciences, YAAS
61. Resistance Appraisal of Maize to Main Diseases and Pests, SAAS
62. Indigenous Knowledge and Biodiversity, GTZ, CBIK
63. Culturally-base Natural Resources Management, ICCO, CBIK
64. Community Education, Ford Foundation, CBIK
65. Enhancing the Livelihoods of Agro-pastoralists in NW Yunnan, International Development Research Center, CBIK
66. Upland Community Livelihoods in Yunnan, Misereor, CBIK

Ecuador:

1. Proyecto de Resistencia Duradera para la Zona Andina (PREDUZA), project on durable resistance for the Andean Region (Ecuador, Peru and Bolivia), aims to improve durable resistance to the major diseases of common bean, maize, barley quinoa and potato in the Andean region.
2. Reactivación de las Colecciones de Germoplasma del INIAP. Rescate, conservación, generación de conocimiento, intercambio de información y uso de agrodiversidad, funded by GTZ Corporación Técnica Alemana.
3. Programa Colaborativo de Biodiversidad de Raíces y Tubérculos Andinos, a collaborative regional programme on Andean root and tubers biodiversity, Consorcio Andino para el Manejo de Cuencas, Centro Internacional de la Papa, funded by Cooperación Suiza para el Desarrollo.
4. Diversidad de Frutales Nativas Comestibles Solanaceae y Caricaceae, Fonología, Usos y Recolección de Germoplasma en el Sur del Pais, addressing diversity of Solanaceae and Caricaceae food plants in south of Ecuador: phenology, uses and collection, Programa de Modernizacion del Sector Agropecuario (national foundation working in development of agriculture in Ecuador).
5. Agrobiodiversity Management of Local Roots and Tubers, INIAP and CIP.
6. Dynamics of Cassava Genetic Diversity, PUCE, IRD, University of Montpellier, France.
7. "ECOSALUD" (ecological health) project to quantify the negative effects and assist farmers in the reduction of pesticide use through implementing of IPM programs
8. McKnight funded project entitled "Cover agriculture in the highland Andes, Enabling Seed Systems: The biological foundation of food security in the Andes".
9. McKnight funded project entitled "Food security with Andean grain in Cotopaxi-Ecuador".
10. FAO supported Ecuador Farmers Field School (FFS)
11. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) supported project to promote gender equity in policy makers in the region

Morocco:

1. IPGRI supported global project on “Strengthening the Scientific Basis of *In Situ* Conservation On-farm”.
2. UNDP-GEF supported project to promote the maintenance and better use of the data palm diversity present in North Africa.
3. UNDP/GEF project on “Conservation and Sustainable Management of Globally Important Ingenious Agricultural Heritage Systems (GIAHS).
4. Faba Bean Research Network Maghreb (REMAFEVE), linkages to be facilitated by institutes and scientists participating in the REMAFEVE network and working on the proposed pest and disease project;
5. Aménagement et Conservation de l’Arganeraie, GTZ-funded project on the conservation and management of Argane trees in the Agadir/Essaouira region;
6. FRYMED project, supported by the EU, development of methodologies and approaches for improving *Vicia faba* cultivars for resistance to major diseases and better adaptation to the Mediterranean conditions. Based on co-operating activities among countries from southern Europe and northern Africa, 1998-2001;
7. Amélioration de la culture des légumineuses alimentaires (ACLA), Morocco-Germany bilateral cooperation;
8. Sélection de la fève et la féverole pour la tolérance à la sécheresse. PARS project CNR-IAV, Ministry of Higher Education and Scientific Research;
9. Increasing the Relevance of Breeding to Small Farmers, INRA, ICARDA;
10. FYSAME/FABAMED. Mediterranean Network on Nitrogen Fixation. Improvement of nitrogen fixation in grain legumes in stressed environments through plant selection and crop management practices, EU/West Mediterranean Countries.
11. National Programme of Technology transfer in Agriculture (PNTTA). Set up since1994/95.
12. Research, training, and teaching in the area of selecting for resistance to diseases, host-pest resistance mechanisms, and agricultural biodiversity. A national programme supported by Ministry of Agriculture, Rural Development and Fisheries, Morocco.
13. Conservation and use of biodiversity and environmental protection programme. Grain legumes and cereal germplasm collecting, conservation, characterisation, and evaluation for resistance to diseases. The programme coordinated by national PGR programme organizations under the Ministry of Agriculture, Rural Development and Fisheries, Morocco.
14. Breeding for developing high yielding resistance varieties of barley and grain legumes. A national programme supported by Ministry of Agriculture, Rural Development and Fisheries, Morocco.
15. Public awareness activities in different services and departments on less use of pesticides, importance of biodiversity conservation and environmental protection. A national programme under the Department of Plant Protection and supported by Ministry of Agriculture, Rural Development and Fisheries, Morocco.
16. Program of rehabilitation of the food legumes sector in Morocco established by the Ministry of Agriculture, Rural Development and Fisheries. The programme is articulated around the improvement of the productivity of the legumes crops and

extension of the area of food legumes crops by targeting the potential zones of production of these cultures based on the charts of agricultural vocation.

17. Promoting high yielding resistance varieties and promotion of IPM for rainfed crops
18. Promotion on technologies for less use of pesticides. Supported by Ministry of Agriculture, Rural Development and Fisheries, Morocco.
19. Actions for improvement of cropping practices and technology transfer and farmers support in Oued Amlil CT district. This national programme is supported by Ministry of Agriculture, Rural Development and Fisheries, Morocco.

Uganda:

1. UNEP-GEF project on “Conservation and sustainable management of below ground biodiversity” to collaborate on measurements of below-ground biological diversity to measure the impact of substituting diversity rich practices for pesticide.
2. Farmer-participatory testing of IPM options for sustainable banana production in Eastern Africa (DFID)
3. Banana Baseline Information Project (Rockefeller Foundation)
4. Impact of banana improvement on livelihoods in East Africa (USAID, Rockefeller Foundation)
5. Strengthening the post-harvest and marketing capacity in the banana sector in Eastern and Southern Africa (Rockefeller Foundation)
6. Community-based management of Plant Genetic Resources In Arid and Semi-Arid Areas of Sub-Saharan Africa. UNEP-GEF regional project to improve the effectiveness of traditional farming systems for conservation of crop landraces of local and global importance.
7. Neglected and under-utilized crops (BMZ)
8. Cross-border biodiversity project. This project is a UNDP/GEF funded regional project for three East African countries, including Uganda.
9. Conservation, Characterization and Evaluation of Plant Genetic Resources (Government of Uganda, World Bank)
10. Crop Protection Research Programme (CPP): This programme supported by DFID is committed to the development and promotion of socially and environmentally acceptable technologies to reduce crop losses caused by pests.
11. Crop Post Harvest Research Programme: This programme supported by DFID, generates and promotes pro-poor post harvest innovations. A wide range of policies, technologies, protocols, and policy recommendations address post harvest problems developed, validated and promoted.
12. The cotton insect pest control: This is an initiative spearheaded by APEP. Taking advantage of natural methods of pest control, wherever, practicable by not killing useful parasites and predators of pests.
13. Promotion of improved mango production in Uganda: This is NARO-KARI implemented project supported by the Department of International Development, this was done using the farmers’ field schools (FFS) approach.
14. Agro-biodiversity project in Uganda: This project addresses the status, trend and potential uses for economic growth, poverty eradication, social equity and environmental quality**.** The on going initiatives of National Agricultural Research Organization (NARO) targeting traditional agriculture and plant breeding being integrated with use of plant genetic resources; conservation and use of crop genetic diversity to control insect pests and diseases in support of sustainable agriculture, coupled with use of tissue culture techniques.
15. Commercialization of New Banana: The (FHIA 25) varieties are developed for Juice and dessert (Kabana 3H) in Uganda. Farmers locally extract juice and deliver to the factory processing and packing at the Jakana foods Ltd.
16. Indigenous knowledge policy: NARO is integrating IK in agricultural research and technology development as well as training programmes. This effort is still in its

initial stages and therefore little has been done to document and validate IK in the agricultural sector.

17. Banana program mandated by NARO-Kawanda Agricultural Research Institute: The program has on going work, focusing on safe guarding and conserving bananas and plantain from huge food loss in the country.
18. Bean program under NARO-NAARI: Namulonge Agricultural and Animal Production research institute has conducted several bean researches in the country using a stakeholders' participatory assessment to validate its findings.

ANNEX. I - PROJECT CROPS, PESTS, DISEASES, SITES DESCRIPTION AND RELATED NATIONAL PUBLICATIONS:

PROJECT CROPS, PESTS AND DISEASES:

National partners selected crops, pests and diseases to cover a range of systems and circumstance so that the methodologies developed could be replicated and applied to other systems. The project crops, rice (*Oryza sativa*), maize (*Zea mays*), barley (*Hordeum vulgare*), common bean (*Phaseolus vulgaris*), faba bean (*Vicia faba*), banana and plantain (*Musa spp),* cover a range of breeding systems (inbreeding, outcrossing, partical outcrossing, and clonal) and farmer management systems (managed as populations versus managed as single plants). Pest and pathogens cover those that are determined by major and minor genes (one gene or a complex of genes provide resistance), seed-borne, soil-borne and air-borne diseases, and pathogens or pests affecting different plant organs (aerial and roots). All four countries, China, Ecuador, Morocco and Uganda, contain areas of important crop genetic diversity for these crops, including different types of resistance to major pests and pathogens in their local crop cultivars maintained in traditional farming systems. The countries have at least two target crops in common with another partner country, linking diversity of primary centres of diversity to secondary centres of diversity, in-country initiatives exist upon which the project can build, and each country's demonstrated commitment to conservation of agrobiodiversity. In addition, the life cycles of major pest and disease that affect these crops are well studied. Detailed criteria for crop selection and general informationon target host, pests and pathogens are listed in Annex H and L. The details of this information synthesis are summarised below:

China:

National partners from China agreed to work on rice, maize, faba bean and barley. The details of baseline information available at national and project site level regarding crop genetic diversity and associated pests and diseases problem are as under:

Rice

- Rice is the staple food for half the world population. Southwestern China along with Nepal, Bhutan, Assam, Myanmar, Laos and northern Thailand lies in the center of diversity and domestication of Asian cultivated rice (*Oryza sativa* L.).
- More than 50,000 germplasm accessions of rice landraces have been collected from all over China, belonging to *indica* and *japonica* sub-species. Both of these include paddy and upland rice and glutinous and non-glutinous rice. Many of the landraces possess useful characteristics such as disease resistance, stress tolerance, early maturity, high yield and high quality, important economic traits for crop improvement and production.
- About 60% of these accessions have been evaluated for the resistance to different diseases and pests (e.g. leaf blast, neck blast, brown plant hopper, white-backed plant hopper, *etc*.).
- A total of 5,128 rice germplasm accessions have been collected from 100 counties within Yunnan Province and conserved at the Genebank of Yunnan Academy of Agricultural Sciences. Based on morphological and genetic classifications, Yunnan local rice consists of 2402, 2726, 3951, 1177, 1351, 3777 accessions of indica, japonica, paddy, upland, glutinous and non-glutinous, respectively, which account

for 46.84 %, 53.16%, 77.05%, 22.95%, 26.34%, 73.66% of the total collections from Yunnan province, respectively. Yunnan local rice includes six ecological types of indica and japonica. Javanica, nuda and communis are japonica types found in Yunnan and account for 3.6%, 18.1% and 32.1%, respectively, of the total rice resources. Molecular marker studies revealed that allelic variations at the isozyme loci increase from north to south in Yunnan and genetic diversity is greatest in varieties from the southwestern regions of the province. Both indica and japonica rice are genetically highly diverse, and the levels of genetic diversity in japonica rice were higher than those in indica rice based on RFLP analysis. The average diversity indices of the six ecological types are: 1.23 (Javanica), 1.17 (Aman), 1.17 (Communis), 1.16 (Nuda), 1.14 (Aus), and 0.99 (Boro). There were substantial differences in diversity index between indica and japonica rice. The diversity index of japonica (1.21) was higher than that for indica (1.15). Diversity of Yunnan rice is distributed mainly over the upland belt, including Licang, Xishuang-banna, Dehong and Simao prefectures in the southwest.

- Resistance mechanism (high resistance HR, resistance R, medium resistance MR, and susceptible S) to cold, drought, blast, bacterial blight, white-backed plant hopper and brown plant hopper in accessions of indica, japonica, paddy, upland, glutinous and non-glutinous types of Yunnan native rice was evaluated at laboratory under controlled conditions and in the field. Among them, most of japonica and 5 indica accessions were fount cold resistant. Whereas, 396 accessions were identified as cold resistance at the seedling stage, accounting for 13.35% of the total accessions screened. Distribution of blast resistant varieties was different among groups of indica and japonica in paddy as well as upland.
- There are over 8000 accessions of rice germplasm including more than 5000 accessions of local rice that were conserved in the Genebank of Guizhou Academy of Agricultural Sciences. Of these, more than 4000 accessions of local rice were evaluated for the blast, bacterial blight, and sheath blight resistances. The number of accessions with resistances (HR, R and MR) to blast, bacterial blight, and sheath blight were 742, 401, and 32, respectively and account for 18.55%, 10.02%, and 0.8% of the total accessions tested, respectively. A total of 267 and 352 accessions are identified to be resistant to brown plant hopper and white-backed plant hopper of the total of 1633 and 1045 accessions of Guizhou local rice. Based on evaluation on cold and drought resistances at seedling stage in 4125 and 4098 of Guizhou local rice, 1594 (838 R and MR, 756 HR) and 1776 (558 HR, 1218 R and MR) accessions are resistant and account for 20.32% and 43.34% of the total tested, respectively. Additionally, 29 accessions out of 215 accessions are cold resistant (HR) at both seedling and flowering stages, 300 accessions out of 1200 accessions are drought resistant (HR) at panicle development stage. It was further identified that there are 27 indica accessions with cold resistance, 131 accessions with 2 types of resistances (cold and drought), 16 accessions with 3 types of resistances (cold, drought, and blast), and 3 accessions with 4 types of resistances (cold, drought, blast, and bacterial blight) at seedling and flowering stages.
- There are 3,580 germplsm accessions, including traditional landraces and modern varieties, being maintained at the genebank of Sichuan Academy of Agricultural Sciences. Both indica and glutinous rice are cultivated in the province. Most of the varieties for indica cultivation are hybrid. There are about 12 landraces of glutinous rice being cultivated in Sichuan province and some of the important landraces are: Gaogandajiugu, Huangkenuo, Zhuyagu, Tuojiangnuo 1, Xiangnuo, Chuanxinnuo Gaogannuo, Beibeinuo, and Xiangnuo.

- About 50 fungal diseases, 4 bacterial diseases, 8 virus or virus-like diseases and 10 nematode diseases of rice in China have been recorded. Rice Blast (*Magnaporthe grisea*), Rice Bacterial Leaf Blight (*Xanthomonas oryzae pv. oryzae*), and Rice sheath Blight (*Rhizoctonia solani*), are the most destructive diseases, causes severe damage. The virus and virus-like diseases such as rice yellow dwarf, rice dwarf and rice stripe disease distributed mainly in the southern part of China.
- At least 83 species of insects can cause economic losses to rice production or storage in China. Of these, rice stem borer (*Chilo suppressalis*), rice paddy borer (*Scirpophaga incertulas*), grass leaf roller (*Cnaphalocrocis medinalis*), brown plant hopper (*Nilaparvata lugens)*, white backed plant hopper (*Sogatella furcifera)* and green rice leafhopper (*Nephotettix cincticeps*) are the important pests of rice. Usually, 10-20% of yield loss was due to diseases and insects.
- Host plant resistance is an important tool for rice disease control and has played a key role in sustaining rice productivity, especially in China. Deploying resistance varieties as a means of disease control is attractive because it requires no additional cost to farmers and is environmentally safe. Furthermore, resistant varieties can be easily disseminated as seeds, leading to wide adoption. Seeds treatment has also developed rapidly for the control of seed borne disease. Controlling the rice blast using genetic diversity in rice, which was developed by Zhu and colleagues, are extensively exploited in China, especially in Yunnan, Sichuan and Guizhou provinces during recent years. Applying mixed planting of traditional glutinous rice with modern hybrid rice as a means to control blast disease through the deployment of genetic diversity on a large scale is being promoted. As a result of this, farmers' income increases through yield gains and reduced pesticide use. More importantly, it also suggests a way to conserve traditional varieties sustained by economic incentives.
- For insect control, China has made extensive use of IPM in rice production and a lot of valuable experience has been accumulated in last three decades. In IPM practice, the approaches, such as agricultural control, biological control, rational use of chemical insecticides, conservation and utilization of natural enemies, were used in combination and arranged in a coordinative way.

Maize

- Maize is one of the three most important cereals in China. There are 15,800 accessions of maize collected and conserved in China national genebank. The annual total planting area of maize reached 23,520,000 ha with total yield 4,854.4 kg/ha and total economical production of 114,175,000 ton.
- There are 2150 accessions of maize including traditional landraces and modern varieties conserved in Yunnan genebank. The annual total planting area of maize in Yunnan is normally 1,000,000 ha.
- There are 1300 corn accessions, including 1200 accessions of local verities and 100 accessions of introduced entries are available in Guizhou genebank. After identification on resistances to corn leaf spot, head smut, sheath blight, bacterial wilt, corn borers, corn army worm, tolerances to drought, cold, and quality analysis (protein and fattiness content), it was found more single resistant resources and less multiple resistant resources.
- There are 1870 accessions of maize germplasm including traditional landraces and modern varieties conserved in Sichuan. The annual total planting area of maize reached 1,160,000 ha with total economical production 6,205,000 ton in 2004. A number of 191 and 95 accessions of local maize were evaluated for the dwarf leaf

mosaic virus and northern leaf blight resistances. The number of accession with resistances (HR, R and MR) to dwarf leaf mosaic virus and northern leaf blight were 0 and 4, which account for 0 and 5.22 % of the total accessions tested, respectively.

- Corn northern leaf blight (*Helminthosporium turcicum*)、Corn southern leaf blight (*Bipolaris maydis*),Corn head smut (*Sphacelotheca reiliana*), Corn Downey mildew(*Peronosclerospora maydis*)□Corn Anthracnose□*Colletotrichum graminicola*, Corn stemborers (*Ostrinia furnacalis*)□aphis (*Rhopalosiphum maidis*), Beet army worm (Spodoptera exigua) are major diseases and pests of maize in southern parts of China.

Barley

- Barley (*Hordeum vulgare*) is the fifth largest cultivated cereal crop in the world. It is grown as landraces in marginal, low-input, drought-stressed environments both for grain and straw. The crops domestication is believed to be the Fertile Crescent and Morocco. In China, Yunnan Province is the genetic diversity centre for barley.
- There are 17,000 accessions of barley collected and conserved in china genebank. The total planting area of barley reached 876,000 ha with yield 3,555.9 kg/ha and total economical production 3,115,000 ton.
- Yunnan is the genetic diversity centre for barley in China. Studies indicate that genetic variability of barley is still high. There are about 408 accessions being conserved at Yunnan genebank. The cultivated area of barley in Yunnan covered 200,000 ha with total production 439,200 ton.
- A total of 69 accessions of barley were collected in Guizhou province and are being conserved at genebank of Guizhou Academy of Agricultural sciences.
- In Sichuan, 380 accessions of barley are being maintained at provincial genebank, which includes both traditional germplasm and landraces.
- Main barley diseases are powdery mildew (*Blumeria graminis f .sp. hordei*), rust (*Puccinia graminis Pers .f. sp. tritici*) and loose smut (*Ustilago nuda*) in China. Main barley pests are the grain aphid (*Macrosiphum avenae*), Army worm (*Mythimna separate)* and Barley maggot (*Chlorops hordei*). Host resistance is used for control the powdery mildew in case of need and mixture planting is used for rust and barley loose smut.

Faba bean

- Faba Bean (*Vicia faba*) is an important old world food legume along with chickpea, peas and lentils. A near eastern center of origin has been postulated with four radii (1) to Europe (2) along the north African coast to Spain, (3) along the Nile to Ethiopia, and (4) from mesopotamia to China.
- A total of 3,780 germplasm accessions of faba bean were collected and conserved in china national genebank. The total planting area of faba bean covered 895,800 ha with yield 2,077.0 kg/ha and total production 1,861,000 ton.
- A total of 270 faba bean landrace accessions were collected and conserved in Yunnan genebank, consisting of 70-80% of total landraces, one third is winter type variety and two thirds spring-winter medium type variety. The total planting area of faba bean in Yunnan reached 342,700 ha with total production 702,000 ton. Faba bean is an important cash crop in Yunnan, as part of rice-wheat (faba bean) cropping system, wheat and faba bean are planted during winter. Faba bean yield often declines because of serious foliar disease caused by *Botrytis fabae*, and root and stem damage caused by bean fly maggots (*Ophiomyia phaseoli*) in Yunnan.
- A total of 22 accessions of faba bean were collected in Guizhou and are being

conserved at genebank of Guizhou Academy of Agricultural Sciences.

- A total of 119 germplasm accessions, including traditional germplasm and landraces, were collected from Sichuan province and are being maintained at genebank of Sichuan Academy of Agricultural Sciences.
- Main faba bean diseases are Ascochyta blight (*Stagonospora carparthica*), Chocolate spot (*Botrytis Fabae*), rust (*Uromyces fabae*) and *Fusarium* wilt (*Fusarium oxysporium, F. fabae)*. However, the disease epidemics are not very high, because of the growing season in Yunnan and Sichuan provinces, which is dry-season. Thus, the chemical control is less used for these diseases.
- Main insects of faba bean are Leaf miner (*Liriomyza huidobrensis*), Vetch aphid (*Megoura viciae*) and Pea aphid (*Acyrthosiphon pisum)* in China. Leaf miner was introduced during early of 1990's, and became main constrain of faba bean cultivation in Yunnan Province. Excessive pesticide applications to control the insect at the beginning years, and replacement planting of faba bean with oil rape, wheat were recommended. Researchers at Yunnan Agricultural University introduced intercropping by planting wheat in blocks of 1x20 m and planting two rows of faba bean between the blocks. Results from five locations in Yunnan showed that the intercropping reduce the incidence of wheat rust by 24% and damage caused by bean fly maggots by 19%. The intercrop maintained the same yield of wheat (4,791.5 kg/ha) as in monoculture but gained an extra harvest of 656.6 kg/ha of faba bean. The intercropping between wheat/faba, oil rape/ faba bean and barley/faba bean works well to control the pests and diseases. The technology of intercropping has adopted in 2002 up to 3300 ha in South-west of China .

Percent arable area of important crops from Southwest China, including the target crops are represented in the following charts.

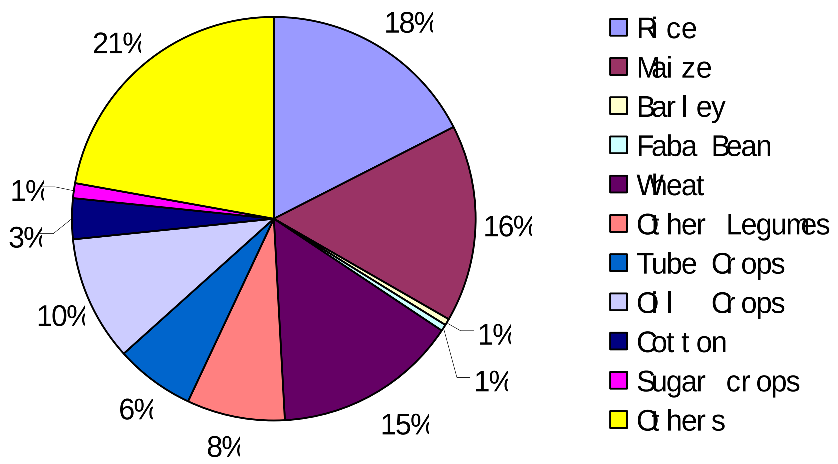


Fig. I-1. Percent of arable area (ha) for target and other important crops in China during 2003.
(Source: FAOSTAT data, 2004; China Statistical Data, 2003; China Agricultural Information, 2003)

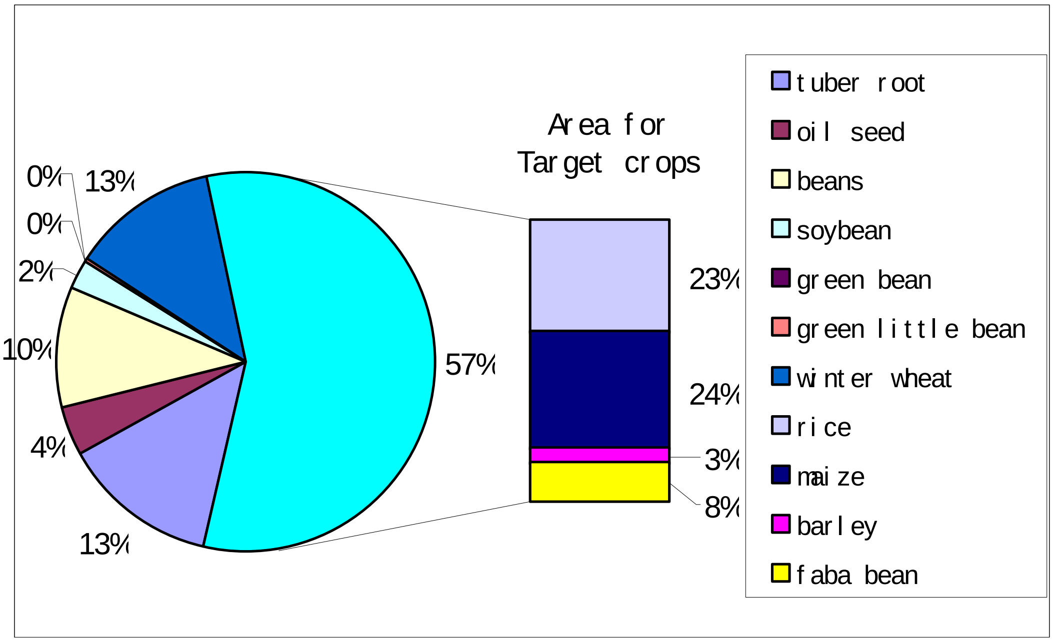


Fig. I-2. Percent of planting area (ha) for target and other important crops in Yunnan Province during 2003

(Source: Yunnan Statistical Data, 2003; China Agricultural Information, 2003)

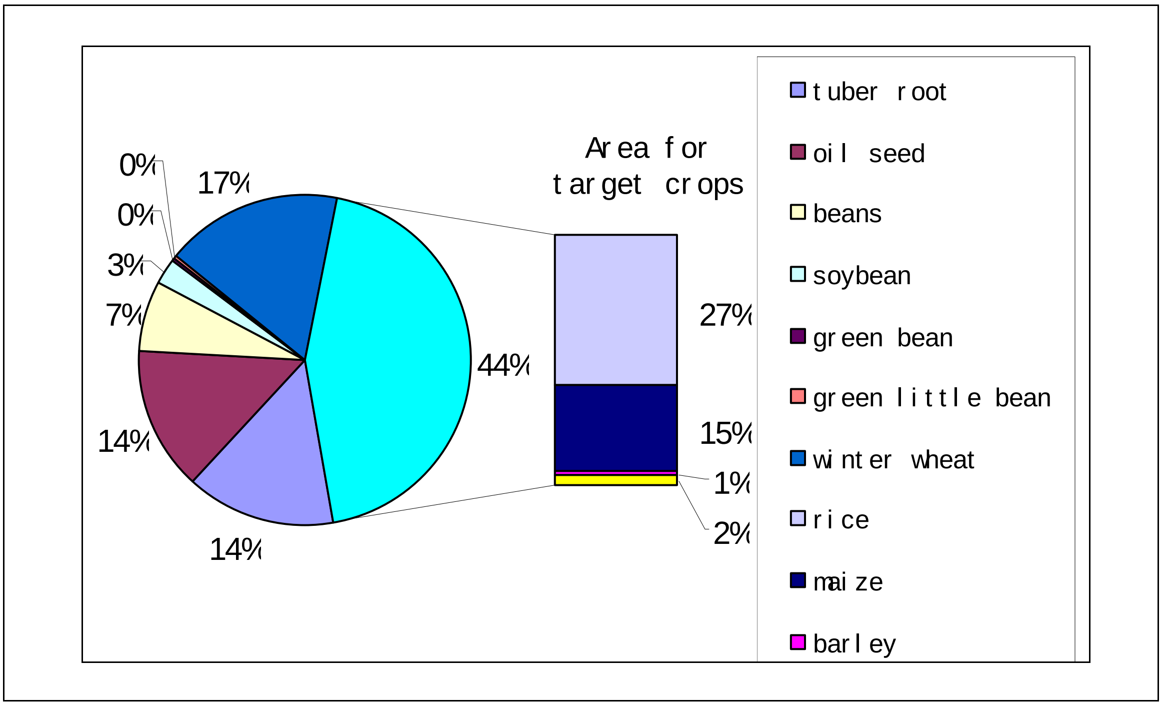


Fig. I-3. Percent of planting area (ha) for target and other important crops in Sichuan Province during 2003

(Source: Sichuan Statistical Data, 2003; China Agricultural Information, 2003)

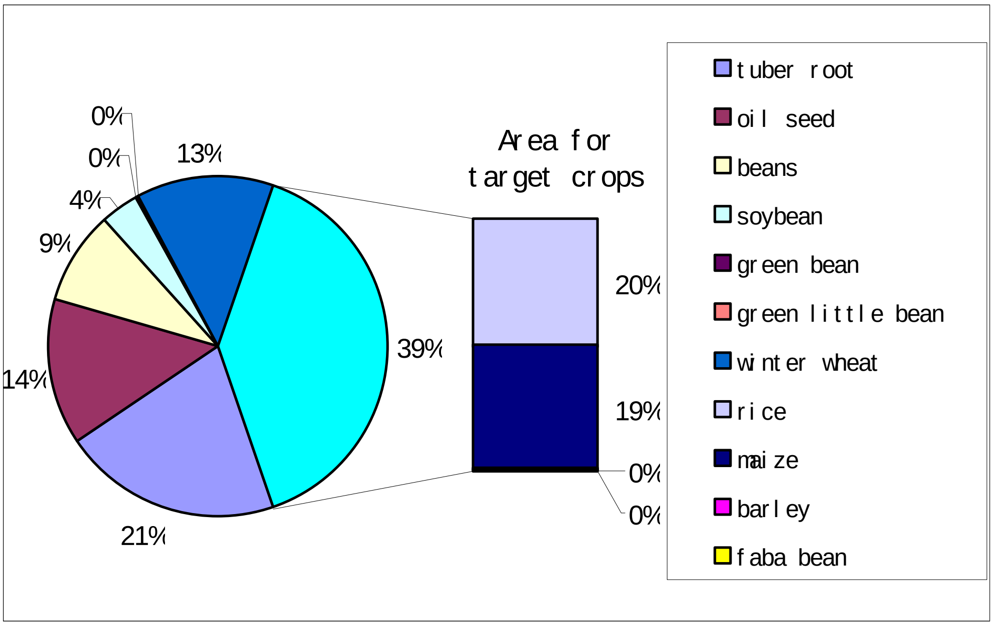


Fig. I-4. Percent of planting area (ha) for target and other important crops in Guizhou Province during 2003

(Source: Guizhou Statistical Data, 2003; China Agricultural Information, 2003)

Ecuador:

Maize

- Studies indicate that genetic variability of maize is still high, 19 races still exist of the 22 races identified in 1968. Maize variability is conserved *ex situ* by DENAREF-INIAP and 760 accessions are available in the gene bank. Maize variation is high between and within regions mainly due to differences in cultural and consumption customs, varietal adaptation and agoecosystem stability. In Imbabura, Bolivar and Loja, 25, 13 and 4 types of maize varieties were identified respectively. However, farmers also described 5, 15 and 2 types in Imbabura, Bolivar and Loja, respectively that have disappeared.
- Cob rot (*Fusarium moniliforme*), rust (*Pucccinia sorghi*), turcicum leaf blight (*Helminthosporium turcicum*) and tar spot (*Phyllachora maydis*) are the most prevalent diseases of maize in Ecuador. Rust appears to be especially important in Imbabura and Bolivar, turcicum leaf blight in Bolivar and Loja and tar spot in Loja.
- Main pests of maize are the cob worms *Euxesta eluta* and *Heliothis zea* and the stalk borer (*Agritys ypsilon*).
- Maize disease epidemics are not high and chemical control is not necessary. High levels of resistance especially to foliar diseases were found in different maize varieties of the three regions. Resistance appears to be associated with the seed selection methods that farmers apply, that ensure a wide genetic base. On the other hand maize insects are controlled with insecticides in commercial maize production when insect incidence is high.

Common bean

- Both bushy and climbing types of common bean are grown in Ecuador. The bushy types are regularly grown for commercial purposes while climbing types are grown for self consumption in association with maize, faba bean and cucurbits. As in maize, high variability between and within regions exist in common bean. Varietal mixtures are common in climbing types which farmers associate with other cropping systems. Gene banks of common beans hold 1353 accessions.
- The main common bean diseases in the country are rust and anthracnose, the latter being especially important for climbing types. Bean Common Mosaic Virus (BCMV) is important in the southern part of the country.
- The main bushy bean insect pest is white fly (*Trialeurodis vaprariorum*) while in climbing beans insects are not important.
- In bushy types, for commercial purposes, rust is controlled chemically with at least three fungicide applications, while in climbing beans chemical control is not practiced for any disease.
- Similarly white fly in bush beans is wrongly and inefficiently controlled with insecticide application. Rational insecticide application, taking into consideration the insect life cycle, has been difficult to implement.

Faba bean

- Faba bean is the second most important legume of Ecuador after common bean and grown in potato cultivation areas, where its profitability is decreasing. Faba bean collections consist of 118 accessions having high variability among them. However, in the fields, the total cultivation area and genetic variability of the crop is decreasing. Pests and diseases are the main constraints resulting in the loss of productivity.
- Main faba bean diseases are associated with seed and soil borne pathogens such as *Fusarium oxysporum*, *Rhizoctonia solani*, *Phythium spp*, Broad Bean Stain Virus (BBSV) and the Bean Yellow Mosaic Virus (BYMV). Chocolate spot is another important disease attracting lots of fungicide applications in faba bean. Alternaria spot and rust are comparatively less frequent diseases.
- Main insect pests of faba bean in Ecuador are leaf miner (*Liryomisa huidebrensis*) in Carchi and Cañar and thrips (*Franklinella tuberosi*) in Bolivar. Leaf miner in Carchi is the main constraint of faba bean cultivation. An excessive pesticide application to control pest and diseases in potato have seriously affected natural enemies and appears to be the main reason for the high incidence of leaf miner in Carchi. A similar explanation might be applied for thrips in Bolivar.
- Faba bean farmers in Carchi use around 19 fungicides and 25 insecticides. Similarly, around 17 fungicides and 9 insecticides are applied in Bolivar. In both the regions, high pesticide applications are due to the adoption of potato pest control technologies to faba bean.

Plantain

- In plantain, little is known of farmers’ awareness about plant-pathogen-environment relationships and whether some cultural practices in use have direct impact on plant susceptibility and disease and pest spread.
- The increasing demand for plantain for export purposes is also increasing the demand for alternatives to control pest and diseases and greater use of technology is required to counter the high pesticide technology being used in banana.
- In Manabì, El Carmen region, limited knowledge is available from farmers groups on methods to improve disease management through selection of landraces.

- Ecuador cultivates commercially around seven varieties of plantain, but landraces or ecotypes of pathogens have been detected within them, especially *M. fijensis*. Adaptive trials carried out in Ecuador with FHIA (INIBAP) are under study and have developed varieties that have produced accessions with resistance to Black Sigatoka and commercial characteristics.
- Surveys within the region showed variations in types of plantain being cultivated that are potentially useful for export. However local and national consumption have a wider range of preferences that gives space to include mixtures in the system to cope with the problem of pest and diseases. *Mycosphaerella fijensis* apparently has replaced *M. musicola* throughout the region, and pathogenicity tests of fungal isolates have shown high diversity.

The area under cultivation for the important crop, including the target crops, in Ecuador are indicated in the following graphs/charts.

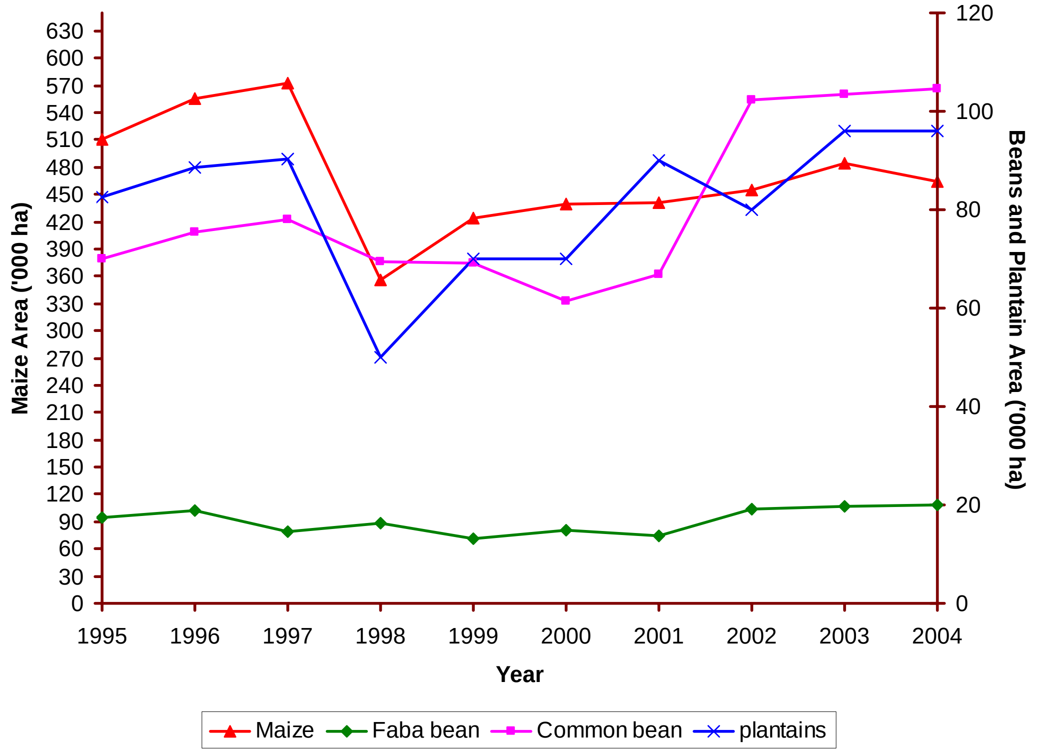
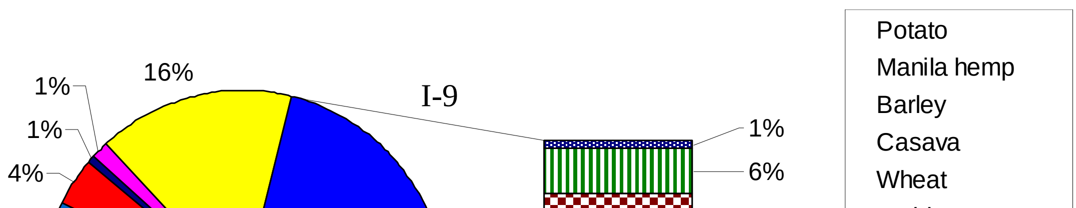


Fig. I-5. The cropped area (ha) for target crops in Ecuador over last decade (Source: FAOSTAT data, 2004).



Area under
Target crops

Fig. I-6. Percent of arable area (ha) for target and other important crops in Ecuador during 2004.
(Source: FAOSTAT data, 2004).

Morocco:

Faba bean

- Grain legumes are important crops in the Mediterranean basin ranking second after cereals. Morocco is one of the largest Mediterranean producing countries of these commodities. In Morocco, grain legumes occupy between 400,000 and 600,000 hectares (about 9 %) of the total national cultivated area. These crops include: faba bean (Vicia faba L.), field pea (*Pisum sativum* L.), chickpea (Cicer arietinum L.), lentils (*Lens culinaris* L.), dry bean (*Phaseolus vulgaris* L.) and lupine (*Lupinus* sp.).
- Faba bean is grown primarily for human consumption. It particularly prevails at the level of small farmers who possess little technology and scarce resources, and holds an essential socio-economical role. It is a basic component in traditional diets, consumed either as fresh pods or as dry grain in various dishes. During the early production it can be used as a green vegetable where the whole pod is eaten in different dishes. Approximately half of the production is consumed as dry seeds. The second use of faba bean is for animal feed as dry grains. About 30 % of the total faba bean production is used for animal feed.
- Although faba bean is grown throughout the country the greatest production is concentrated in the northern part of Morocco.
- Yield reductions can be caused by drought in the spring, diseases, and the parasitic
- Biotic stress causes important losses in faba bean, thus reducing the potential of the crop and causing yield instability. Faba bean suffers the attacks of parasitic weed (*Orobanche*), fungal diseases (*Botrytis*, *Ascochyta)*, and nematodes (*Ditylenchus,* Pratylenchus), which cause heavy losses leading farmers to abandon the crops in many situations. Broomrape (Orobanche) is a real danger in rain-fed areas. Lack of highly productive and disease resistant cultivars is the main constraint to the development of faba bean crop in this region.
- Disease surveys conducted in Morocco showed that chocolate spot (*Botrytis faba*) and Ascochyta blight (*Ascochyta faba* Speg.) are by far the most prevalent and severe

diseases on faba bean. *Botrytis fabae* affects seriously the crop yields and can reduce yields by more than two third.

- The parasitic weed broomrape (*Orobanche* ssp.) is equally important biotic stress threatening the crop in many growing zones. The parasite was observed for the first time in Fez region in 1943. However, it is only in the beginning of the seventies that the problem became serious threat to faba bean production in Morocco. Since then heavy infestations were reported in Meknès, Khémisset and Rommani areas. Now broomrape is found throughout the country and in many areas (mainly Fez and Taza) the parasite forced some farmers to abandon the crop. The average annual yield loss is estimated to 33%.
- On-farm conservation of crops genetic diversity in Morocco was developed in the frame of the global project ‘Strengthening the scientific basis of *in situ* conservation of agricultural biodiversity’ initiated by IPGRI in cooperation with partners in nine countries to strengthen the scientific basis of *in situ* conservation of crop plants. The Morocco project component, started in 1997, concentrates on faba bean, barley, durum wheat, and alfalfa as model crops. Local varieties of these crops, important genepool sources for many traits and tolerance to many stresses, are still widely grown by farmers in the various agroecosystems. The project is implemented in three regions (provinces of Taounate, Azilal, Errachidia) selected for the large use of landraces by farmers and for the keenness of partners to effectively collaborate.

Barley

- Barley (*Hordeum vulgare* L.) is an important crop in Morocco. It occupies more than 2.4 million hectares annually, mainly distributed in areas receiving between 80 and 350 mm of rainfall annually, and represents more than 40% of cereal lands. This crop accounts for 45% of the total cereal production in Morocco, and is a dual purpose crop grown for livestock and human consumption.
- Barley is a major staple food in Morocco, where it is generally found in regions where other cereals do not grow well due to altitude, low rainfall, or soil salinity. It remains the most viable option for dry areas (< 300 mm of rainfall).
- Only six rows varieties are currently cultivated, except for limited number of farms which cultivate varieties with 2 rows generally intended for the breweries. Biotic factors, such as foliar diseases, contribute dramatically to reduced yields of barley.
- Average national consumption of barley in Morocco is around 53 kg/person/year. Food barley use is associated with local knowledge on preparation, health and nutritious attributes. Local knowledge and unique genetic material are under risk of being lost for future generations.
- Net blotch is one of the important barley diseases, which is caused by *Pyrenophora teres* Drechs; teliomorph, *Drechslera teres* (sacc) Shoem. Under field conditions, yield losses may reach 30%. This disease is usually endemic in areas where the adopted cultural techniques for barley production are still primitive. Lack of adequate disease resistance in adopted Moroccan varieties and the great variability within *P. teres* isolates have increased disease prevalence to epiphytotic levels. Sources of resistance to net blotch have been identified in Morocco and elsewhere. However, the epidemiology of net blotch has not yet been studied in sufficient detail to develop adequate control measures.
- Powdery mildew is another major diseases of barley, caused by the fungus *Erysiphe graminis* DC. f. sp. *hordei* Em Marchal (synamorph *Blumeria graminis* (DC.) Golovin ex Speer f. sp. *hordei*). It is a serious foliar disease that affects the crop in many major production regions around the world and is of great economic

importance.

- The naked coal disease (*Ustulago nuda*), only transmitted by the seeds, is extremely frequent and important in Morocco. The fungus is preserved in the form of mycelium in the embryos of the seeds. Surveys showed that 40 % fields are infected with a rate varying between 0.3% and 2 %, rates which are definitely higher than the tolerated limits established for the 2nd generation certified seeds.
- The covered coal of the barley, transmitted by the seeds, was found in most of major barley production areas. The incidence of the disease varies between 0.3 and 20 %. This disease causes losses that can vary between 63000 qx and 4 200 000 qx. With an average yield on 10 qx/ha these losses would respectively represent the production of 6300 ha to 420 000 ha

The area under cultivation for the major crops, including the target crops, in Morocco is described in following charts:

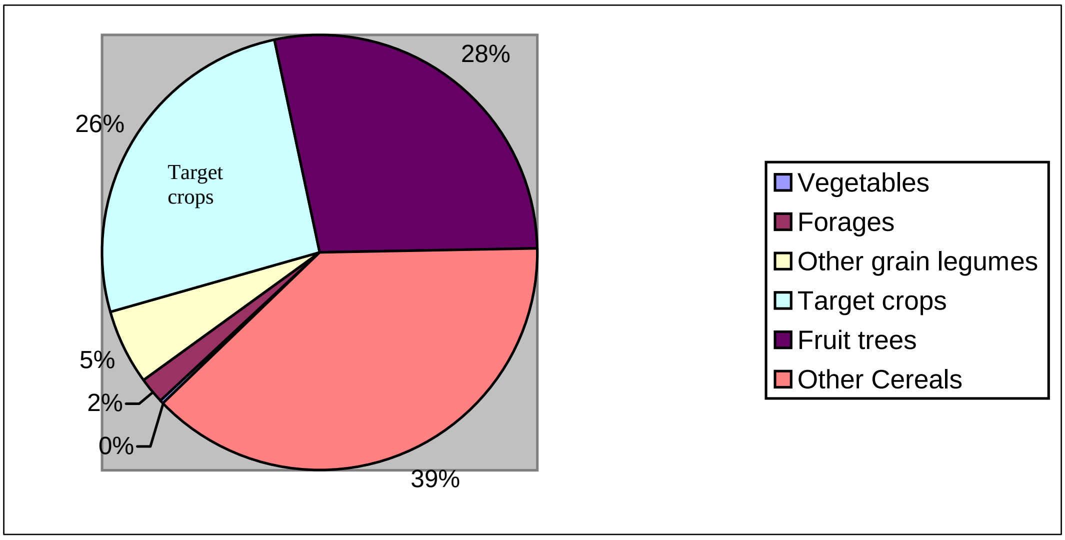


Figure I-7. Percentage of total area under cultivation for important crops at Taounate region.

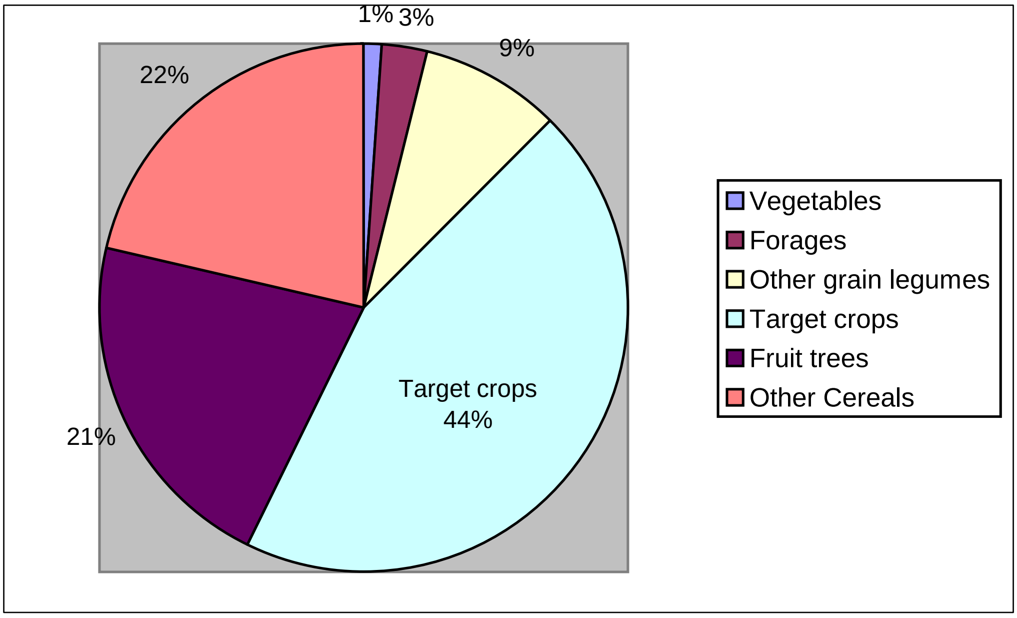


Figure I-8. Percentage of total area under cultivation for important crops at Taza region.

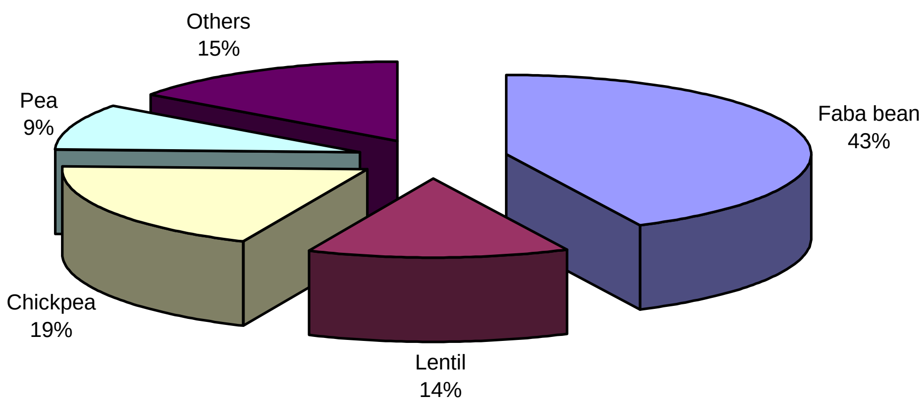


Fig. I-9. Relative importance of different grain legumes, based on production in Morocco expressed as percentage (average of 1997-2001)
(Source: MADREF, 2002)

Uganda:

Banana and plantain:

- Banana have a greatest number of old cultivars still maintained and used by farmers in Uganda. However, the current Government policy in support to increase food production is to encourages growing of higher yielding improved banana/plantain varieties, which is leading to loss of traditional banana cultivar diversity. The on going banana and plantain research activities indicate:

- Endemic diversity of banana cultivars
- East African Highland bananas (Matooke or Musa AAA-AE) found at altitudes between 1000 - 2000 m ASL. Probably about 80 to 120 different highland banana cultivars are still available.

- The Exotic diversity has two groups depending on time of introduction and includes:
  - Introductions of the 1950's – African plantains (8 cultivars), Apple banana (2 cultivars), Bluggoes and Pisang awak (7 cultivars), Gros Michel (3 cultivars), Cavendish(7 cultivars)
  - Early 1990's – Recent introductions or latest introductions (FHIAS) (Triploids and tetraploid hybrids)

- The Major constraints for banana and plantain production in Uganda are:
  - Diseases (Banana bacterial wilt, black sigatoka. *Fusarium* wilt)
  - Pests (Weevils and nematodes)
  - Low soil fertility
  - Processing and utilization
  - Socio-economic factors

- Following are the identified sources of resistance for the major pests and diseases of banana in Uganda:

Disease/Pest	**Sources of resistance**
Fusarium wilt	Matooke cultivars (AAA-EA), Cavendish, KABANA 3H (FHIA 17), KABANA 4H (FHIA 23), KABANA 5H (Yangambi Km 5), FHIA 25, Williams, Saba, Pisang Mas, Calcutta 4
Black Sigatoka	KABANA 3H (FHIA 17), KABANA 4H (FHIA 23), KABANA 5H (Yangambi Km 5), FHIA 25, Calcutta 4
Banana Bacterial Wilt	Only *Musa balbisiana* has shown some tolerance
Banana Weevil	KABANA 1H (FHIA 01), KABANA 5H, Saba, Pisang Mas, Pisang Ceylan, Calcutta 4
Nematodes	KABANA 5H, Pisang Jari Buaya, TMB2x9128-3, Calcutta 4

- Following are the priority areas of research for banana improvement in Uganda:
  - Collection of Germplasm
  - Screening of exotic germplasm for resistance to diseases and pests
  - Screening of improved male parents and Matooke hybrids developed by the National Banana Research Programme in collaboration with IITA for resistance to diseases and pests to continue

Common bean:

- The survey undertaken revealed that commercial bean seeds may not be pure varieties and on-farm bean seed is a mixture of improved and local farmers' varieties. Therefore, many farmers still grow their bean varieties and according to the farmers, this may due to lack of access to improved bean technologies (improved seeds), better palatability of farmers' bean varieties, better adaptability of farmers' bean varieties and a mere traditional conservation and lack of consciousness of new varieties.

- The various concluded and on going research in Uganda by NAARI show that bean diversity comes from 2 major gene pools:
  - The Andean gene pool (large seeded)
  - The Mesoamerican gene pool (small seeded)

- The Land races and local germplasm in Uganda include: Kanyebwa, Kahura, yellow beans, Rushare, black beans. The Positive attributes of these collections are the seed quality but many bean varieties are susceptible to pests and diseases. In addition to this there are about 1500 accessions as introductions from regional and international centers; and 15 released varieties of bush and climbing beans. The other domesticated *Phaseolus* spp. are: *Bigaga*, *Buyindiyindi*.

- The Major common bean production constrains in Uganda include:
  - Lack of access to improved bean technologies by local farmers
  - Prevalence of diseases and insect pests (field and storage pests).
  - Low soil fertility/poor soil fertility management/ poor cropping system and agronomic practices
  - Socio-economic factors which hinder adoption of improved bean production technologies
  - Processing, consumption and utilization constraints/Post harvest handling
  - Marketing constraints; price fluctuations due to the limited and unpredictable market.

- Following are the identified resistance sources for major pests and diseases of common bean in Uganda:

Disease	Resistant sources
Angular leaf spot (ALS)	Mexico 54, BAT 332, AND 279, AND 272, A 222, A 240, A 286, BAT 332, CAL 143, Cornell 49242, DFA 59, DRK 14, EMP 534, FM 94003, G 2852, G 5686, LM 9320321, MAR 1, MAR 2, MAR 3
Root rots	SCAM 80cm/15, RWR 719, MBL 49-89A, AND 1055, AND 1062, RWR 1946, RWR 1873, RWR 2075
Bean common mosaic virus (BCMV)	MCM 1015 (NABE 2), MCM 2001 (NABE 3)
Black root	UBR(92)25ml (NABE 6)

- The current national priority for plant genetic resources activities are:
  - Screening of local germplasm for proper documentation of existing available resistance
  - Germplasm collection from unexplored areas

- Following are the observed losses due to major pests and diseases of banana and plantain and common bean in Uganda:
  - Banana weevils – More damage on the local East African highland banana
  - Nematodes – losses increases according to number of ratooning: 61% (4^{th}) to 100% (5^{th}) yield loss

- *Fusarium* wilt in banana – up to 100% loss
- Black sigatoka – Bunch weight reduction of 37%
- Banana bacterial wilt – up to 90% yield loss
- Bean stem maggots – 30 to 100% loss
- Bean aphids – 37% loss on an average
- Bruchids – 30 to 100% loss
- Bean root rot – 100% yield loss
- CBB – 26 to 62% yield loss
- ALS – 50 to 60% yield loss
- Anthracnose – up to 100% yield loss
- Halo blight – 45% yield loss

The area under cultivation of major crops, including the target crops, in Uganda is shown in the following graphs and charts:

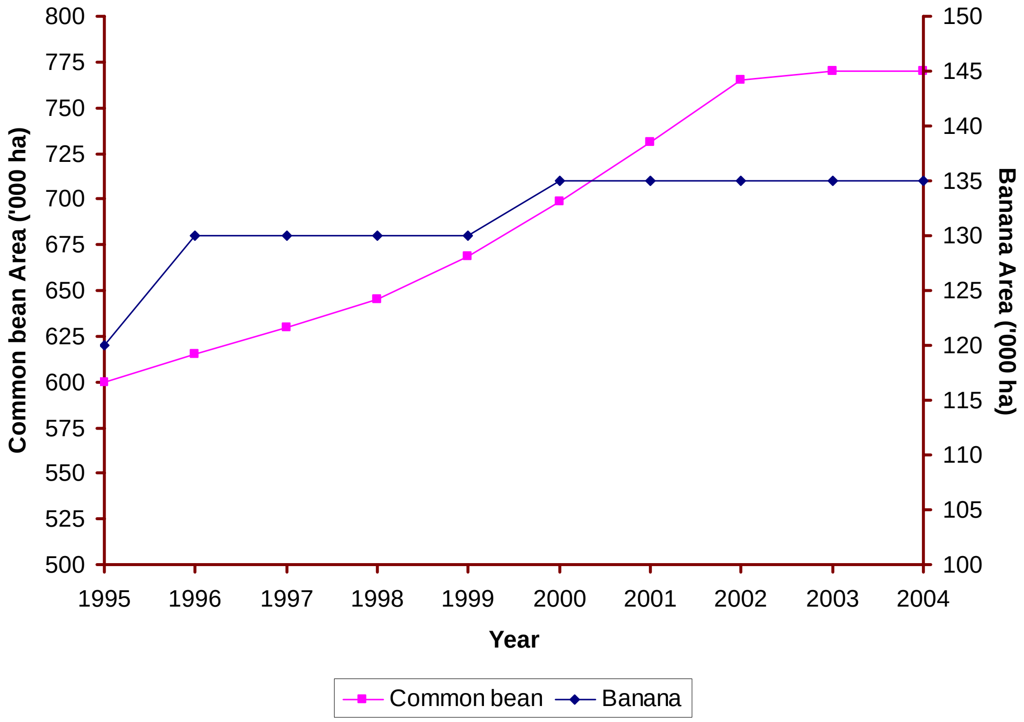


Fig. I-10. Cropped area (ha) under target crops in Uganda over last decade (1995-2004)
(Source: FAOSTAT data, 2004).

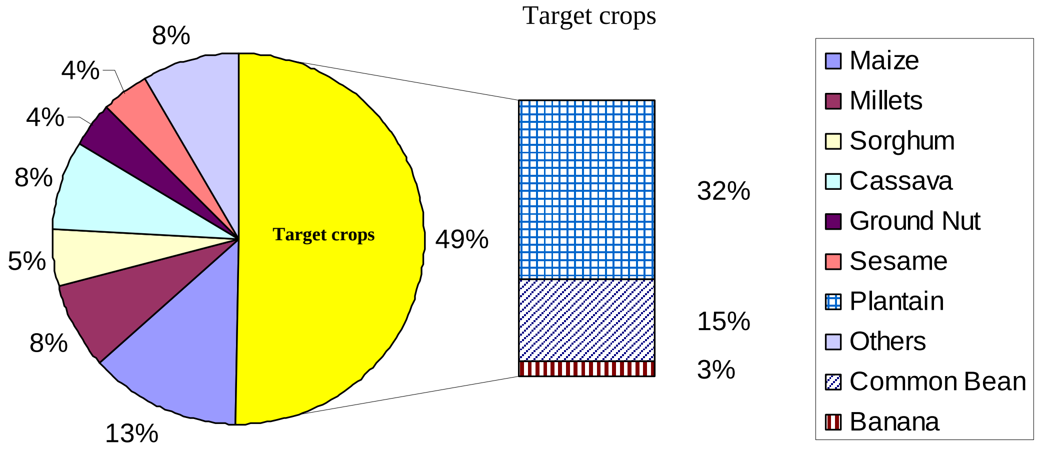


Fig. I-11. Percent of arable area (ha) under target and other important crops in Uganda during 2004

PROJECT SITE DESCRIPTION:

Based on the site selection criteria, as described in ANNEX H, national partners identified project sites and these sites were visited during the PDF B phase of the project to generate site related information. These are described below and the project site maps are also shown below for each of the four countries.

China:

The following six sites across three provinces of Southwest China were identified:

- Yuanyang Yunnan Province
- Kunming Yunnan Province
- Zhongdian Yunnan Province
- Menghai Yunnan Province
- Qionglai Sichuan Province
- Meitan Guizhou Province

The locations of these sites are presented in the following map (Fig. I-12)

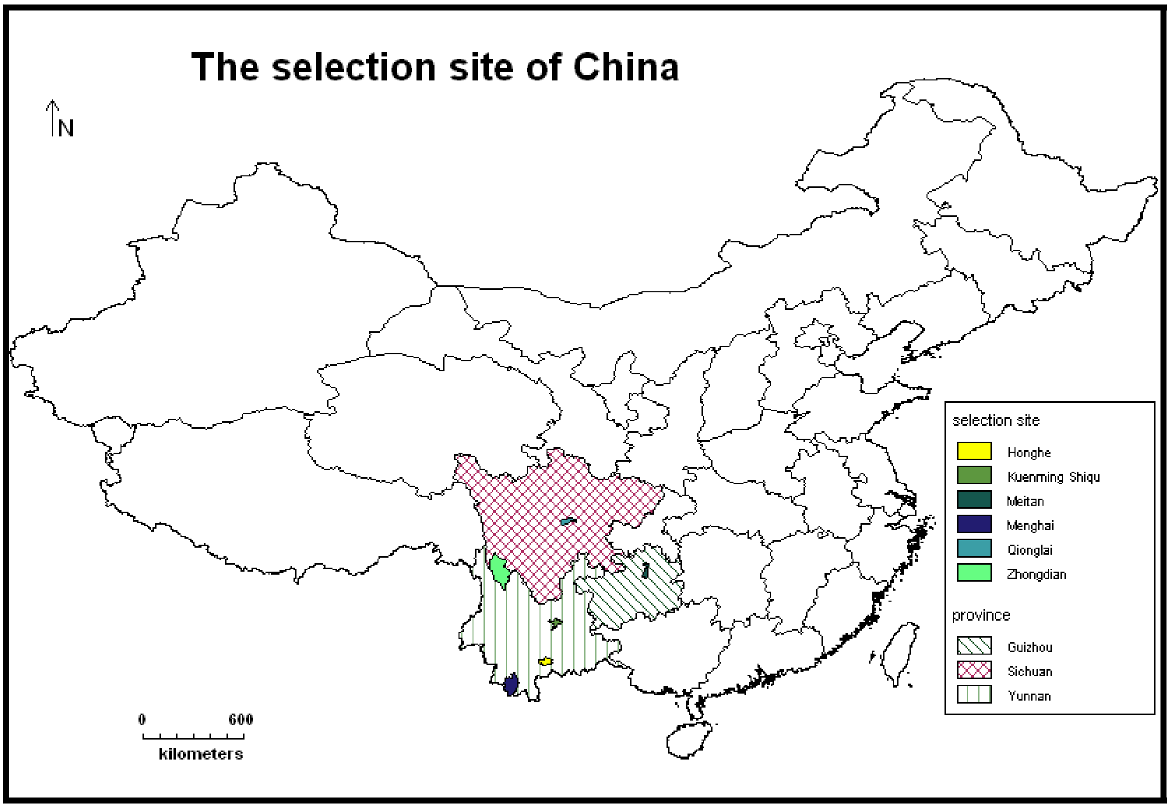


Fig. I-12. Map indicating location of six projects sites in China

Site description: The description of the three provinces of Southwest China, where the project sites are located are described below:

Yunnan Province:

Geography: Yunnan Province is in Southwest of China, a mountainous province, which international borders with Laos, Vietnam and Myanmar (Burma) and the national provinces of Tibet, Sichuan, Guizhou and Guangxi. The Province covers 394,000 km^2, of which 109,800 km^2 belongs to the Upper Yangtze basin. The population of the Province was 40.0 million in 1996. Agriculture is the main source of income for most people.

Topography*:* Yunnan is highly varied, with environments ranging from glaciers and snow-capped mountains near the Tibetan border, to tropical forests in Xishaungbanna. Altitude varies from 6740 metres at Mount Kagebo to 76.4 m on the Honghe River, averaging between 1000 and 3000 m. About 95% of land is moderately to steeply sloping, thus only 6.8% of Yunnan's land area can be used for agricultural activities. Compared with the total uplands in China, Yunnan Province has more steep upland.

Climate: Yunnan has been described as "four different seasons existing simultaneously in one mountain and different weathers beyond 10 km". Yunnan encompasses a wide range of environments, including tropical rainforest, temperate uplands and cool highlands. The Province is actually influenced by four different branches of the atmospheric circulation. Annual rainfall varies between 600 mm in dry valleys and 1700 mm in the mountains. Generally, the distinct rainy season is summer and autumn, with more than 80% of annual rainfall falling between May and September. Winter and spring are very dry.

Soil: Diverse natural environments and parent materials increase soil variations. According to the Chinese classification system, most of the soils in Yunnan are Red Earths (Ultisols), in which adequate levels of fertilizers and lime are applied, and are quite productive for a wide range of crops.

Biodiversity: Yunnan is known as the kingdom of plants, animals and home of medicinal herbs. The province not only has more plant species of tropical, subtropical, temperate, and frozen zones than any other province in the country, but also has many ancient, derivative plants, as well as species introduced from foreign countries. Among the 30,000 species of plants in China, 18,000 can be found in Yunnan, which is also home to 3,000-plus kinds of rare animals (55 percent of the national total), 31 kinds of birds (64 percent of the national total), and 130 kinds of reptiles (42 percent of the national total).

Cultural Diversity**:** Yunnan has the highest number of ethnic groups in China. Among the country's 56 ethnic groups, 25 are found in Yunnan, including the Yi, Bai, Hani, Zhuang, Dai, Miao, Lisu, Hui, Lahu, Va, Naxi, Yao, Tibetan, Jingpo, Blang, Pumi, Nu, Achang, Jino, Mongolian, Drung, Manchu, Shui, and Bouyei. Ten ethnic minorities living in border areas and river valleys include the Hui, Manchu, Bai, Naxi, Mongolian, Zhuang, Dai, Achang, Bouyi and Shui, with a combined population of 4.5 million; those in low mountainous areas are the Hani, Yao, Lahu, Va, Jingpo, Blang and Jino, with a combined population of 5 million; and those in high mountainous areas are Miao, Lisu, Tibetan, Pumi and Drung, with a total population of 4 million.

Agricultural crop diversity**:** In Yunnan, the terrain is dominated by hill, with little flat land. Agriculture is poor with extensive systems and low productivity. Grain production is mainly for subsistence. Varying climatic conditions enable a wide variety of crops to be grown. Rice, wheat and maize are the main staples, followed by tubers, legumes (bean and pea) and buckwheat. Tobacco, tea, sugar cane, aromatic and oil-bearing plants are grown as cash crops. Cropping systems vary throughout the Province. In some areas, one crop is grown per year, while in others two or three are grown.

Sichuan Province:

Territory: The total area in Sichuan is 485 thousand km2, which takes 5.1 % and ranks fifth in area in China. Towards East is the Sichuan basin, Southwest is mountainous region and west is the alp canyon high plateau. The area of plain accounts for 7.84%, hilly land, 10.06%, high plateau, 32.08%, mountainous region 49.44% and water area, 0.58 per cent.

Land: The area of cultivated land in Sichuan is 4.28 million ha, which accounts for 4.5% and 14.4%, respectively and ranks fifth and the first in whole and west China. The area of paddy field is 2.22 million ha, dry farmland is 2.06 million ha. Per capita cultivated lands in Sichuan are 0.05ha. The effective irrigated area in whole cultivated land is 2.48 million ha, which accounts for 58 per cent.

Climate: The climate of east basin belongs to semitropical humid climate. Annual average temperature is above 16^0. Non-frost period is 240-300 days. Annual rainfall is 1000- 1400 mm. In southwest mountainous region, there are no evident seasonal change because of the warm winter and the cool summer, though there is significant difference between the dry season and the humid season.

Soils: Most of the soils in Sichuan are rice soils, purple soil, loess, alluvial soil, and lime.

Agriculture: In 2001, the whole crops-sowing area was 9.49 million ha. In which the cereal crops-sowing area was 6.62 million ha (69.8%). Industrial crop sowing area was 1.41 million ha (14.8%). In basin the index of multiple cropping is high. Farming system of three harvest in one year, which has summer-harvest crop, autumn-harvest crop and late-autumn crop, had come into being. In 2001 the Index of Multiple Cropping of whole province reached 221.5%. Rice, wheat, maize and sweet potato occupied the prominent place in grain crop. The area and yield of rice took 30.7% and 47.5% of whole grain area and yield, respectively. Wheat, 22.7% and 16.9%. Maize, 18.1% and 16.1%. Sweet potato, 13.2% and 10.9%. Industrial crop includes cotton, oil crops, sugarcane, fruit, tea, tobacco, hemp and Chinese medicine. In Sichuan, Rice, wheat, rape and maize are the major crops, followed by sweet potato, tubers, bean, pea, buckwheat, rye, oats, highland barley, tea, peanut, potato, tobacco, sugar cane, barley, faba bean, small red bean, mung bean. In most of areas two harvests in year can be obtained, and in some areas only either one or three harvest per year is possible.

Guizhou Province:

Geography: Guizhou province has also been called for its short forms as “Qian” or “Gui”. Located in the east part of Southeast China, Guizhou borders the Chinese provinces of Hunan, Guangxi, Yunnan, Sichuan and Chongqing to the east, south, west and north, respectively. The province covers 176,100 km^2 and has 1.8% of the national total area. The population of the province by the end of 2003 was 38,696,600, including 33,086,400 living in rural areas. Guizhou is a mountainous and inland province where agriculture is main activity.

***Topography*:** Situated on the slope of the east Yunnan-Guizhou, the province is high in west (1500-2800m) and low in east (500m), declining from central part to three directions of north, east and south. The average elevation is 1100 meters. Maoling Mountain is the watershed of Yangtze and Pearl River valleys. Mountains and hills constitute 92.5% of the province's total land area and the limestone landform takes up 61.9%, making Guizhou one of typically developed Karst regions in the world, thus only 7.5% of Guizhou's land area can be used for agricultural activities. At the end of 2002, the total infield area is 1,769,400 hectares among the whole province. Compared with the average infield of each person in China, Guizhou Province has less cultivable and quality land.

***Climate*:** The climate is subtropical monsoon and the weather is normally mild, neither frigid nor scorching. The annual average temperature reminds around 15^0 in most place, with mean temperature ranging from 3^0 to 6^0 in the coldest January and that between 15^0 and 23^0 in the hottest July. The annual rainfall is 1000-1400 mm and much rain falls in the months of June, July and August, usually 450-600 mm. The frost-free period is 250-300 days. In Guizhou, the amount of cloudy day is over 150 days in common and the relative humidity remains above 70% each year.

Soils: Guizhou has 159,100 km^2 soils which is 90.4% of the whole provincial land areas. The type of soils varies along with the distribution of land. Most of the soils in Guizhou are Red and Yellow Earths. Compared with other provinces, the amount of soil resources, which can be used for the agricultural activities, is obvious short.1.5 Biodiversity

***Biodiversity*:** Biological resources are ample and distinct in Guizhou. Among the list of national protected animals, fifteen are on the list of first-class and seventy-two belong to the second-class. The varieties of rare plants and wild-grown economic plants amount are more than 4,000, including 15 first-class conserved plants and 59 second-class nationally protected plants. Guizhou is also abundant in medicinal herbs with a total number of 3,924 varieties. Among the nationwide surveyed 363 key medicinal herbs, Guizhou has 326. More than 30 belong to the rare and precious ones.

***Cultural Diversity*:** Guizhou is a multiracial province. The whole province contains 49 ethnic groups and the number of ethnic groups is only next to Yunnan and Xinjiang. Nine ethnic minorities each with a population over 100,000 are the Miao, Bouyei, Dong, Tujia, YI, Gelao, Shui, Bai and Hui. Those with a population between 10,000 and 100,000 are the Yao, Zhuang, She, Maonan, Mogolian, Mulao and Manchu. Minority population accounts for 37.8% of the provincial total. 55.5% of the total provincial area is under ethnic groups' autonomy.

Ecuador:

Country geography and climates**:** Ecuador is located in the North West South America and is crossed by the equator. Ecuador has common borders to the north with Colombia, to the south and east with Peru and along the west with the Pacific Ocean. The three main continental regions of Ecuador are the coast along the Pacific Ocean, the Andean region which crosses the country from north to south and the Amazon basin. Galapagos Islands are the fourth region of Ecuador.

Climates at the coast are defined by two air currents, a cold current called Humboldt coming from the southern pole and a hot current called “Niño” coming from the Caribbean region. The Niño current creates a hot-humid climate in the northern areas with up to 3000 mm of rainfall while the Humboldt current creates a dry climate in the central west coast with only 300 mm of rainfall. Different micro-climates between these two extreme climates are found along the coat of Ecuador. The rainy season in the coast regularly starts in December and end in June and the average temperature in this season is 28 °C. The dry season is present in the rest of the year with an average temperature of 25 ºC. The rainy season is caused by the “Niño” warm air current coming from the Caribbean region while the dry season is created by the cold Humboldt current.

In the highlands the rainy season starts in October and continuous until June, being the January-May period highly humid. Climates in the highlands depend on the altitude. Tropical Andean climate of the low valleys of Catamayo, Macará, Puyango, Chota, Guayllabamba and Yunguilla with average altitudes of 1500 masl posses a dry hot climate with average temperatures between 20 and 25 °C. The subtropical climate is present at altitudes between 1500 to 2500 masl with an average temperatura of 20 °C. Valleys of Ibarra, Los Chillos, Paute and Loja are located at these altitudes. Temperate climate is present at altitudes from 2500 to 3500 masl with an average temperature of 17 ºC. At these altitudes are located the most important cities of Ecuador. The cold climate is present at altitudes from 3500 to 5650 masl. At these altitudes temperatures vary from 1 to 10 °C. Climate conditions are cold and rainy along the year at this altitudes. Páramos of El Ángel, Mojanda-Cajas, Chasqui, Llanganatis and Buerán are representatives of this climate. The glacial climate is regularly the top of the high mountains at altitudes higher than 5650 masl. Temperatures at thise altitudes are lower than 0 °C and these areas have regularly permanent snow.

High variation in climates has created conditions for development of high biodiversity for which Ecuador is one of the mega diverse countries. Biodiversity is protected in the natural reserves of Cayapas-Mataje, Mache-Chindul, Machalilla, Manglares Churete in the tropical area; El Angel, Cotacachi-Cayapas, Cayambe Coca, Antisana, Sumaco-Napo-Gal, Pululahua, Pasochoa, Cotopaxi-El Boliche, Ilinizas, Llanganates, Sangay, Chimborazo, Cajas, Podocarpus and “Bosque. Petrificado Puyando” in the highlands, Cuyabeno, Limoncocha, Yasuní in the Amazon basin and Galapagos Nacional Park and the Galapagos Marin Reserve.

The national gene bank at the National Autonomous Institute of Agricultural Research (INIAP) together with many insitu projects is also conserving the agricultural biodiversity of Ecuador. The very variable agricultural ecosystems composed by traditional cropping systems guaranty conservation of crop genetic diversity in Ecuador.

***Agriculture of the country*:** Main tropical crops of Ecuador regarding to cultivated area are cacao (434418 ha), rice (349726 ha), coffee (320911 ha), maize of durum type (275145 ha), banana (266124 ha), plantain (183599 ha), African palm (162202 ha), sugar cane administrated by refineries (82821 ha), sugar cane for other uses as unrefined sugar and alcohol (49028 ha), soy bean (55980 ha) maracuya (31639 ha) and mango (19395 ha). Banana is intensively produced specially in the central and southern coastal area by mainly large companies. This is the most economically important crop of Ecuador. African palm a high input crop is also very important in the humid areas. Maize and soybean are also intensively produced by large farmers. Most of sugar cane is produced in large areas by sugar refineries. The sugar cane used for unrefined sugar and alcohol are produced by small scale farmers. Rice is a very important crop grown by small and medium scale farmers. Cacao, coffee and plantain are grown primarily by small scale farmers mainly in tropical cropping systems. Most of plantain production is oriented to self consumption and local market, however exportation is presently increasing. Other crops as rubber three, papaya, palmito, piña among others are grown in less than 5000 ha.

In the Andean highlands the main food crops are climbing bean in association with soft type maize (105127 ha), potato (49719 ha), faba bean (43174 ha), barley (48874 ha) and bush bean (16464 ha). Other crops as pea, quinoa, chocho and Andean roots and tubers are grown less extensively. The Andean solanaceous fruits three tomato (4062 ha) and naranjilla (7903 ha) are very important crops for the local market. Horticultural crops are grown intensively by small scale farmers for self consumption except broccoli which is grown intensively by medium scale farmers for exportation. Fruits as avocado, black berry are grown also less extensively for local market. Flowers for exportation have become the main agricultural industry in the highlands of Ecuador. Roses are grown in greenhouses in 2519 ha and others different types of flowers are grown in 962 ha.

In the Amazon area the main crops are coffee (54967 ha), sugar cane (19542 ha), plantain (18685 ha), African palm (13887 ha), cocoa (9374 ha), rice (3783 ha) and maize (14496 ha). Others crops grown in small areas in the Amazon basin are citrus, tea and cassava.

Cattle is a very important activity in Ecuador. In the coastal area 1563494 ha are being grown with grasses while 212879 ha are covered with wild grasses. In the highlands 971656 ha are grown with cultivated grasses and 888958 ha are covered with wild grasses. In the Amazon basing 767576 ha are cultivated with grasses while 24695 ha are wild grasses.

Project sites:

Project will be carried out in the provinces of Carchi, Imbabura, Bolivar, Cañar and Loja in the highland valleys and in Manabi in the coastal area. Maize and common bean will be studied in Imbabura, Bolivar and Loja while faba bean will be studied in Carchi, Bolivar and Cañar. Plantain will be studies in Manabi the most traditional plantain area of Ecuador.

Province of Carchi:

Carchi is located in the northern of Ecuador with a common border with Colombia. The province is divided in the municipalities of Tulcán, Huaca, El Angel, San Gabriel, Bolivar and Mira. “El Ángel” and “Reserva Forestal y Étnica AWA” are the natural reserve at this province. Main economical activity of Carchi is agriculture. The high input potato production has created serious problems of soil erosion, environmental and farmer’s health. Potato production is constantly decreasing in Carchi due to increase in production costs as well as potato importation from Colombia. Faba bean has been the main crop for rotation with potato and its importance is increasing.

Project will be conducted in la Libertad in the municipality of El Angel, la Matriz de Huaca in the municipality of Huaca, Julio Andrade in the municipality of Tulcan and Chamiso in the municipality of Montufar. Altitudes of these sites vary from 2800 to 3000 m.a.s.l. Average temperature at sites is 11 ºC. Most of the people at this place are mestizos. In these areas the UVTT of Carchi from INIAP has experience working with farmers mainly on potato IPM initiatives. Many international projects have taken place in these sites mainly to reduce pesticide use. Farmers at these places are organized and have been educated by different technology transfer approaches as participatory research as well as farmers field schools.

Province of Imbabura

Imbabura has a common border with Carchi at northern of Ecuador. Municipalities of Ibarra, Atuntaqui, Urcuqui, Otavalo and Cotacachi belong to Imbabura. The ecological reserve of Cotacachi-Cayapas is located at this province. The most important economical activities of Imbabura are agriculture and tourism. Traditional agriculture associated with the culture of Otavalos, the main indigenous group is the foundation of the socioeconomy at this province. Maize is the core of a very variable and traditional cropping system composed mainly by bean, chocho, quinoa, faba bean and cucumbers.

The project will be conducted in Morocho, Perafan, Chilcapamba in Cotacachi and San Pablo in Otavalo. These are the most important maize areas of the province of Imbabura. In these places the NGO UNORCAC is carrying developing projects and farmers are also well organized. City of Cotacachi is located at 2440 m.a.s.l with an average temperature of 15ºC. The percentage of indigenous people in this area is 60 %, mestizos 35% and black people 5%. In Cotacachi besides of agriculture, artesian, tourism and trade are important activities. Otavalo is located at 2480 m.a.s.l. with an average temperature of 14 ºC. Most of farmers in this site are indigenous and besides agriculture artesian and trade activities are also important.

Province of Bolívar

Bolivar is located in the west central part of Ecuador. Main municipalities are Guaranda, Echandia, Caluma, Chillanes, San Miguel, Cumanda, San José de Chimbo. Main economical activity of Bolivar province is agriculture and production of dairy products is an important at this province. The maize-climbing bean association is predominant in the municipalities of Bolivar. Faba bean, chocho and quinoa are also important crops in the maize-climbing cropping system in Bolivar.

Project will be executed in the Alto Guanujo in Guaranda, Santiago in San Miguel and La Matriz en Chillanes. Guaranda is located at 2667 m.a.s.l with an average temperature of 14ºC, San Miguel is located at 2450 m.a.s.l with an average temperatura of 15ºC and Chillanes is located 2300 m.a.s.l with an average temperatura of 15.5ºC. In Guaranda maize and faba bean are main crops while in San Miguel and Chillanes the main crop is maize. As Bolivar is geographically close to Guayaquil the most economically important city of Ecuador, corn has become a commercial crop and it is apparently the main reason of maize genetic erosion in Bolivar.

Main development organizations working at site implementation are the Technology Transfer Unite of Ministry of Agricultura, "Promoción Humana Diocesana" (PHD), Provincial Government of Bolívar (GPB), "Fondo Ecuatoriano Populorum Progressìo" (FEPP), Bolívar State University (UEB), Technological Institute of Agricultural Education San Pablo (ITSA), Technology Transfer and Validation Unite (UVTT) of INIIAP and Food and Agricultural Organization (FAO).

At the "Alto Guanujo" two farmer organizations are implementing development activities: The Corporation of the Peasant Organizations for the Integral Development of the Alto Guanujo(COCDIAG) and The Indigenous and Peasant Committee for Integral Development-Union and Progress (CICADI-UP).

Province of Cañar

Cañar is located in the central part of Ecuador. Municipalities of this province are Azogues, Cañar, Biblian, Tambo, Suscal, Deleg and la Troncal. Agriculture is the main activity of Cañar although trade is also an important activity in this province. The project will be executed in Honorato Vásquez in Cañar, Matriz de Suscal in Suscal and matriz Tambo in Tambo. These are high altitudes of Cañar province where main crops are faba bean, barley, potato and wheat. Most of farmers in these sites belong to the ethnic group Cañaris and their main economical activity is agriculture.

Main developing programs taking place in Cañar are Agro-forestall Ecuadorian System (RAFE), Forestation Program phase–Ecuador (PROFAFOR), "Fondo Ecuatoriano Populorum Progressio" (FEPP). Municipalities of Cañar, Tambo and Suscal. Swiss Development Cooperation (SDC), Swiss Foundation for Development and Cooperation for the Andean Region (INTER COOPERACIÓN), Food and Agricultural Organization (FAO).

Corporation of Indigenous and Peasant Organizations of Cañar "Tucuy Cañar Ayllucunapac Tandanacuy" (TUCAYTA) and the Agronomist Association of Cañar (AAC) are the main farmers organizations at highlands of Cañar.

Province of Loja

Located in southern of Ecuador Loja province has a common border with Peru. Main municipalities are Loja, Saraguro, Catamayo, Catacocha, Gonzanama, Quillanga, Cariamanga, Zapotillo, Celica, Pindal, Alamor, Olmedo, Quillanga, Chaguarpamba and Macará. Loja is geographically very diverse varying from tropical areas as Macara to high altitudes as Saraguro. The project will take place at sites of San Lucas, Tenta,

Selva Alegre and llushpa in Saraguro at altitudes of around 2620 m.a.s.l with an average temperature of
16 ºC. Most of farmers at Saraguro belong to the Salasaca ethnic group. Saraguro is mainly an agricultural town with maize being the main crop together with barley and potato. Maize in this location is grown traditionally and although variability is still high there are evidences of genetic erosion.

The main developing projects at Saraguro are the Spanish Corporation for Agricultural Development working with INIAP and the "Fondo Ecuatorianum Populorum Progressio". The main developing farmer organizations at Saraguro are the Saraguro Farmer Federation (FIS), The Indigenous Association of Tenta, (AIPT) and The Indigenous Association of Lagunas (AIL).

Project sites are indicated in the map below (Fig. I-13).

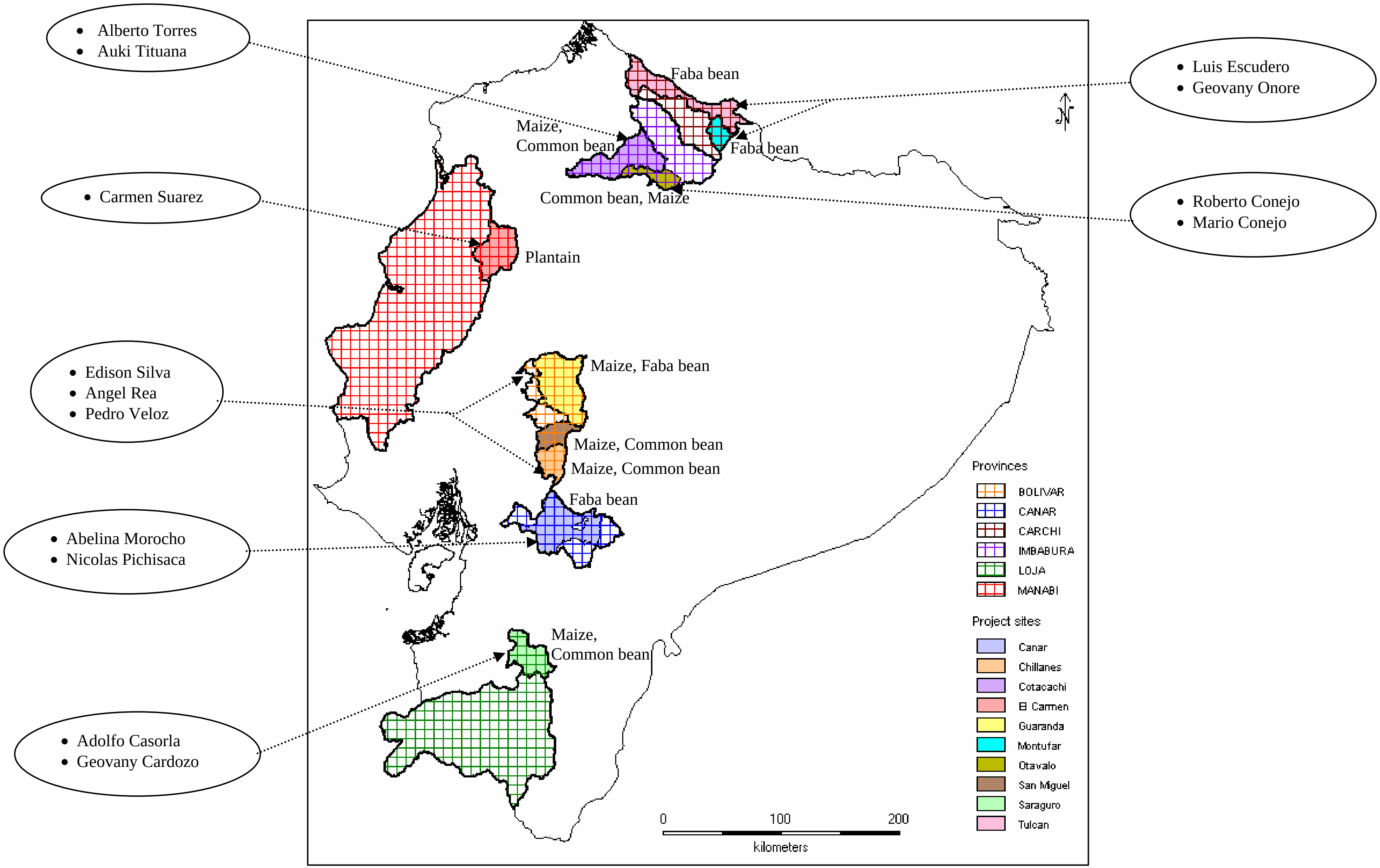


Fig. I-13. Project sites in Ecuador

Morocco:

Located at the north-western angle of the African continent between 21° and 36° of northern latitudes and between the 11th and the 17th degree of western longitudes, Morocco enjoys a privileged position at the intersection of 3 distinct blocks: the Mediterranean sea in the north, the Atlantic ocean in the west (total coast of 3446 km) and the Sahara desert in the south - east. The Atlas Mountains represent a natural barrier between the sea and saharan environmental influences. The territory of Morocco is 715.000 km² .

This particular geographical position confers to Morocco an exceptional range of very diverse bio-climates varying from humid and sub-humid, semi-arid, arid, Saharan and desert, and climate of high mountain in Rif, Mid Atlas, and High Atlas, where altitudes exceed 2 500, 3 000, and 4 000 m respectively. Climate of Morocco is typically Mediterranean. But it is subject to the oceanic, mountainous and Saharan influences. It is characterized primarily by two well marked seasons: a hot and dry summer and a winter runs to brutal and concentrated precipitations. It has a long period of hot, dry weather from April to October, although temperatures at higher elevations during the night can be very cool. The rainy season during November to March may only bring occasional light rain and water sources are heavily dependent on the meltwater originating high in the mountains or on non-replenishable underground water sources in the south. Variable according to areas', the climate of Morocco is also marked by a strong annual and inter-annual irregularity of climatic factors. Generally, rainfall decreases from the north to the south. Precipitations are only more important on the mountainous regions where they reach 2000 mm in Rif. They are lower than 150 mm in the pre-Sahara and less than 50 mm is Sahara areas.

Morocco, only ten miles from the southern tip of Europe, is very much a country of northern Africa but, unlike most other nations, it has largely been occupied by one group of people. The Berbers date back to the original population in the region, and they continue to dominate small-scale agriculture in the country. The Arabic influence in Morocco can be strongly experienced in the souks (weekly markets) of the cities but it is in the rural and mountainous regions that the simple lifestyle of the Berbers can be observed. The population of Morocco reached 30 million inhabitants in 2003 (Census in 2003) against 27.6 million in 1994, 23,9 million in 1988, and 15,4 million in 1971. The Moroccan rural population passed below 50% for the first time in 1994 (51 % of urban inhabitants vs. 49 % of rural).

Population growth in Morocco is 1.74%. Agriculture remains one of the determining sectors of the economic activity in Morocco, it contributes 17% of the Gross Domestic Product (GDP) and occupies near to the half of the active labor force. However, the production varies with the climatic conditions. The land classification in Morocco shows that 78% of the area (56 millions ha) are located in desert and dry zone (<250 mm/year), 15% (10 millions ha) are in the semi and zone (250 to 500 mm/year) and 7% are in the sub-humid to humid zones (> 500 mm/year).

Morocco forms part of the Mediterranean basin, one of the centers of origin of the species described by Vavilov (St-Pierre, 1988; Hawkes, 1998; Damania, 1997). With its ecological, ladscape, and climate diversity, Morocco stores a rich biodiversity with a large numbers of ecosystems and rich flora. This counts for over 4500 species of higher plants (with 135 plant families, 940 genera and over 600 plant taxa as endemic), with about 200 species considered as rare or threatened species. Increasingly, the country is considered as centre of diversity for a number of cultivated crop plants and wild relatives. Indeed, Morocco constitutes one of the most important areas of diversity in Mediterranean medium. It is an important centre of diversity for such world-wide crops as barley, faba bean and wheat (Neal-Smith, 1955; Nègre, 1956; Perrino & al, 1984). The country's crop diversity results from long-term adaptation to various local environmental conditions such as drought, cold and salinity (Sauvage, 1975; Graves 1985; Francis 1987). This plant diversity is the most important source of raw material that provides products necessary for food and industry and livelihood security. In many traditional cropping systems very frequent in Morocco, genetic diversity may be the only resource available to resource-poor farmers to cope with the environmental conditions and optimise their crop production.

The national project planning team selected two large priority agroecological target regions to host the project activities within Morocco. These are Taounate and Taza provinces located in the Centre North of the country and are indicated in the following map (Fig. I-14).

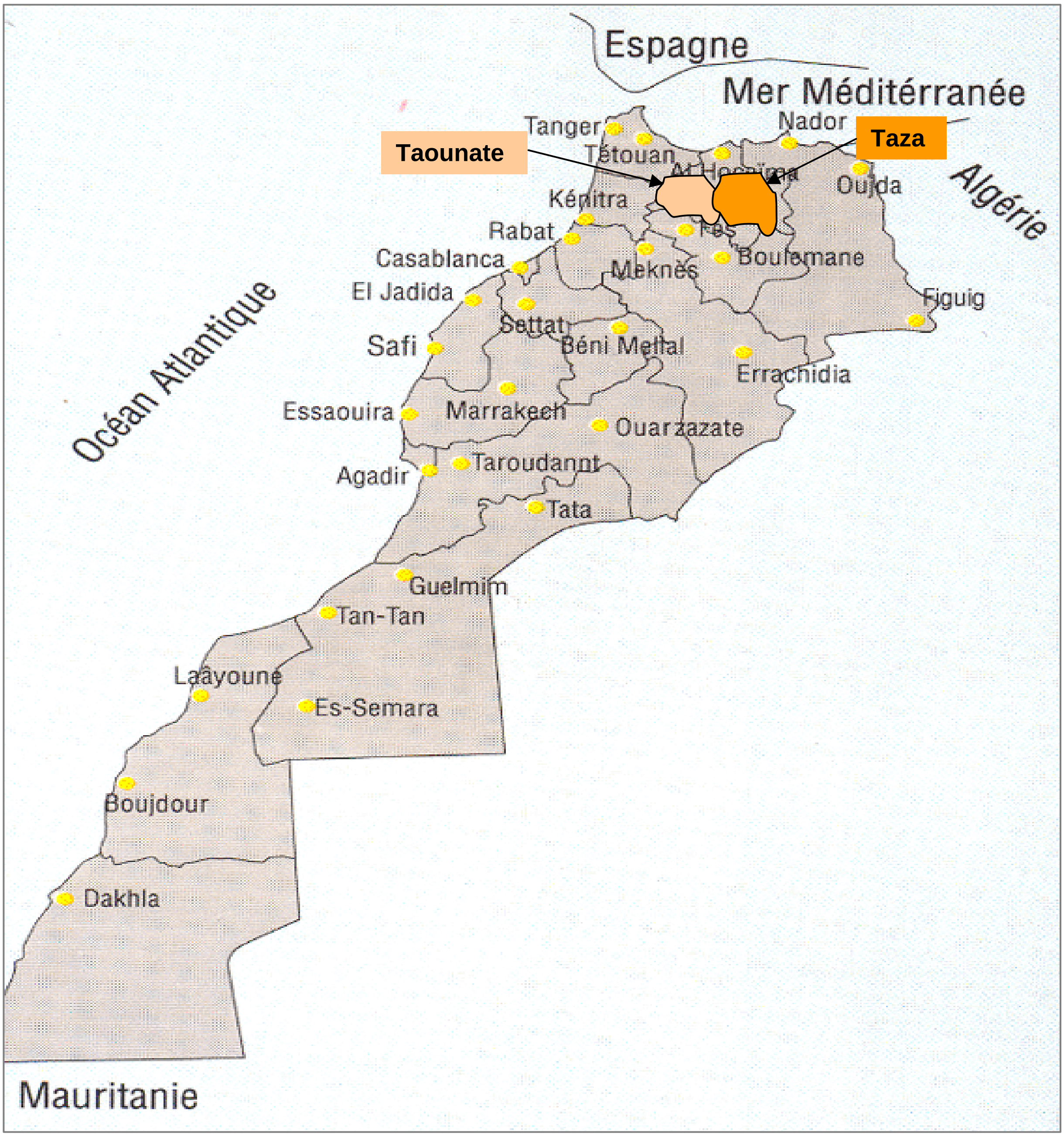


Fig. I-14.. Location of the Taounate and Taza provinces hosting the project sites.

Faba bean and barley are among the most ancient crops and highly imbedded in the traditional cropping systems of these provinces. They are cultivated in rotations and are main components of the cropping systems of the whole region. These two provinces concentrate the largest part of the national faba bean production. These provinces present a significant genetic diversity of these crops in the form of local traditional cultivars evolving in diverse agroecosystems under the pressure of environnemental factors and the effect of agricultural practices. Indeed, local varieties of these crops, important genepool sources for many traits and tolerance to different stresses, are widely grown by farmers in the various agroecosystems. Previous work on collection and characterisation of local crop populations has identified and delimited these zones as ones of high diversity for these crops. These provinces concentrate the largest local faba bean diversity and high variation of barley local populations for most of agromorphological traits.

Project ecosites:

Within the 2 provinces, project pilot sites and participating villages were selected through an interactive process between scientists, extension workers, and farmer communities. Hence, four focal pilot ecosites were selected for hosting the major activities of the project: Ourtzagh, Ghafsai, and Tissa in Taounate and Oued Amlil in Taza. These sites were identified based on the existence of genetic diversity and richness of agrobiodiversity in general, particularly the importance of landraces use by farmers, extent of agro-ecological variation, the status of on-farm conservation by farmers, the previous identification of resistance to diseases in the local germplsam, the physical and technical capacities available in the regions, year-round accessibility to different agro-ecological localities and villages, technical capacities available in the regions (number of extension agents, degree of co-operation of local agricultural bureaux, NGO's) and existence of traditional agricultural systems, and on the keenness of local and regional partners (farmers communities, local and regional institutions, NGO's) with which the project team should establish a firm effective partnership, and where there is an effective demand for research-development services. Table 7.2 lists the 4 ecosites with the focal villages.

Table 7.2. Project ecosites and corresponding villages.

Province	**Community/district**	**Villages**	**Crop**
Taounate	Ourtzagh	Ain Kchir Boubiad Sidi Senoun Ksibat	Faba bean Barley
	Ghafsai	Ain Mjoud Bouajoul	Faba bean Barley
	Tissa	Ras El Ould Outaboubane	Faba bean Barley
Taza	Oued Amlil	Oued Amlil Ghiata-Al-Gharbia	Faba bean Barley

***Taounate agroecological region*:**

Taounate province extends on a f 5585 km², the total arable area is 356 689 ha (with only 2.6 % irrigated). The legume crops cover 77 500 ha of which 45 500 ha are planted to faba bean. The current population of this province totals with 632 000 inhabitants dispersed through more than 1600 villages (douars) including nearly 70905 farms according to the 1996 census. The province economy is based primarily on crop and animal productions. The province of Taounate is located in the centre north part of Morocco, within the centre-north economic region. It is delimited by:

- Provinces of Elhoceima and Chefchaouen in the north.
- Wilaya of Fez in the South.
- Province of Taza to the east.
- Province of Sidi Kacem to the West.

This region is characterised by a mountainous topography. Soil nature is highly variable, with dominance of clay texture, and highly eroded. Cropping systems in this are massively based on cereals/legumes rotations. Taounate province is divided by the Ourgha River into two distinct zones for landscape and climate:

- The first zone located at the North of Ourgha river is characterized by a broken relief and important precipitations that may exceed 1000mm per year, which enables a permanent vegetative cover made up mainly of forests and fruity plantations dominated by the olive-trees. Ghafsai community is located in this zone.

- The second zone located at the South of Ourgha River, characterized by a flat relief (plateaux) with precipitations that vary between 400 and 600 mm per year leading to a biotope very favourable to annual crops. Outzagh community and Tissa sites are located in this zone.

The climate of the Taounate province is continental with hot and dry summer (40°) and cold and wet winter (5°). The annual precipitations averages 559 mm in the South of the provinces and 800 mm in the Northern part (Fig. I-15), generally distributed between October and April (Fig. I-16).

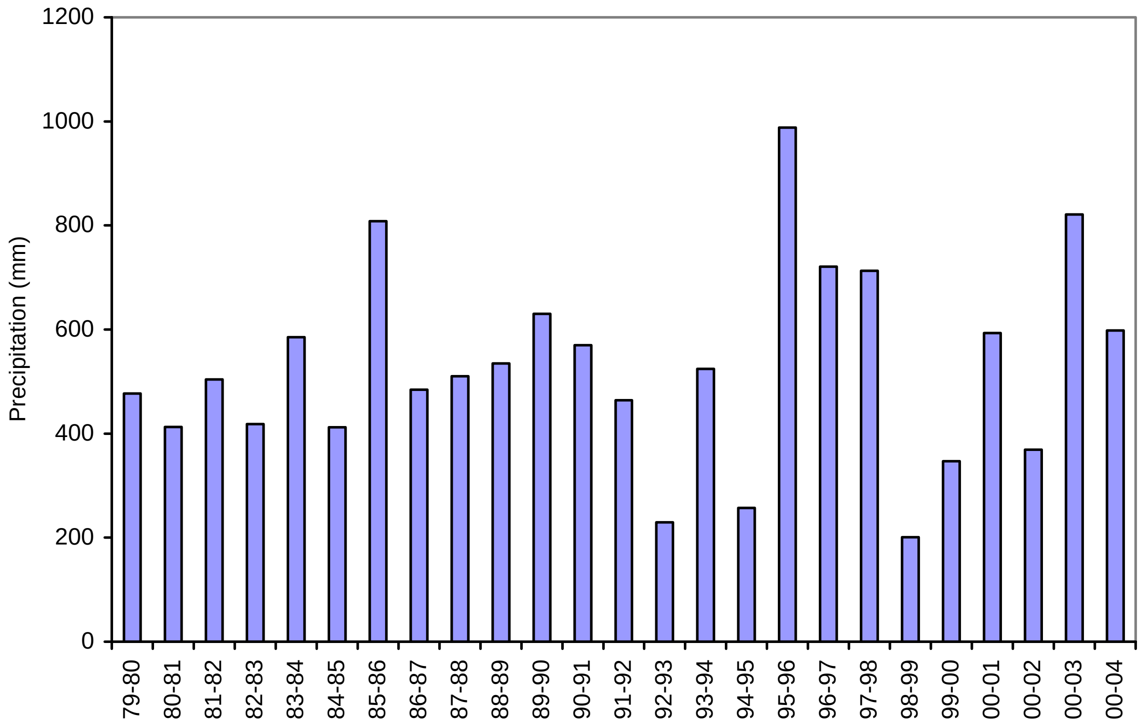


Figure I-15. Average annual rainfall in the province of Taounate.

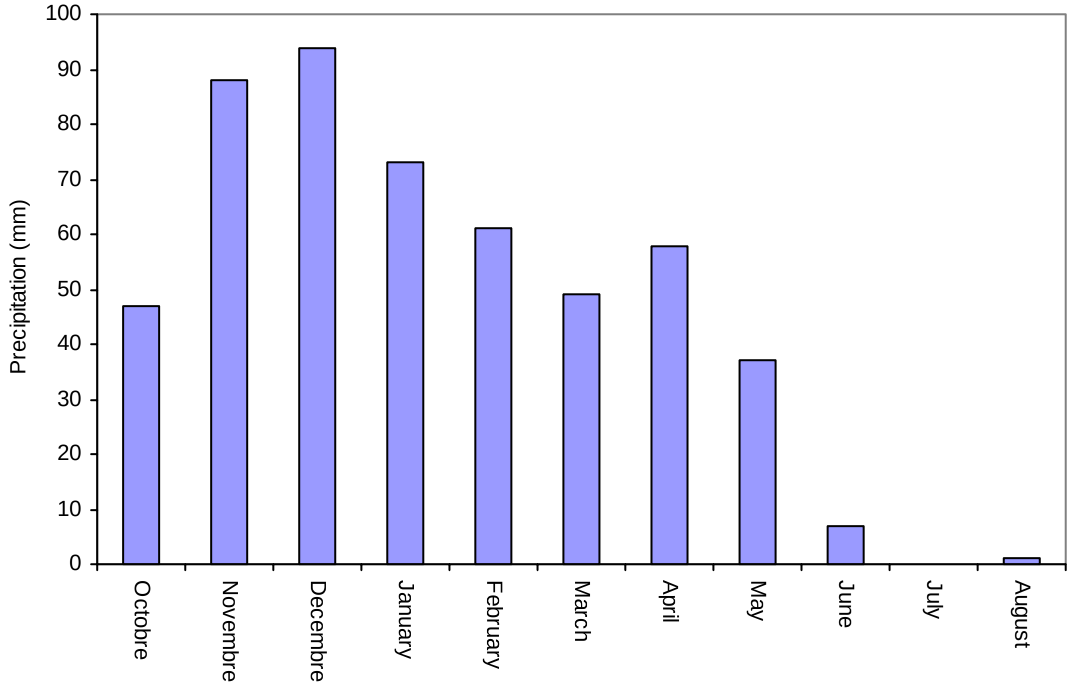


Figure I-16. Average monthly rainfall in Taounate province.

Project-focused districts:
Taounate province is subdivided into five municipalities and 49 rural communities. Following Table shows the description of the CT districts. The project sites in this region are located in two different districts under the authority of two different local development centres (CT) under DPA of Taounate which extends on all the territorial commandment of the province (governorate). These are:

- Ourtzagh CT district with two communities, namely Ourtzagh (with Sidi Sennoun as focal village) and Ghafsai (with Bouajoul as focal village) Tissa CT district. These sites were covered by the project on *in situ* conservation of agrobiodiversity on-farm.
- Tissa CT district with two communities: Ras El Ould and Outaboubane (Oulad Riab), these communities were included in a study on relationship between diversity the diatery and crop diversity.

The 13 rural communities of the CT district Ourtzagh totals 56 786 ha arable area (Table 7.3). Cereals cover 27 273 ha (average 1990-2000). The legume crops cover the second most important part with an area of 6384 ha (average 1990-2000) of which faba bean covers 4605 ha (average1990-2000) which represents 72 % of the total grain legumes area.

Table Structure of development services in the province of Taounate.

CT	Number of communities	Population	Urban Population	Rural Population	Arable area (ha)	Total area (ha)
32-01 Taounate	9	124616	24677	99941	59000	72244
32-02 Karia	10	151455	13270	138185	120511	147565
32-07 Tissa	13	162124	7059	155065	135000	163500
32-08 Ouartzagh	13	163751	6740	157011	56786	136800
33-07 Tahar Souk	4	47388	3312	44076	14303	2565J

Important crops:

The mains crops found in Taounate region are:
- Cereals : durum wheat, wheat, barley
- Grain legumes : faba bean, peas, chickpeas, letils, common bean
- Forages : bersim, alfalfa, mixture, medicago, mais
- Vegetables : potatoes, tomatos, onions
- Fruit trees : olives, almonds, figs

***Taza agroecological region*:**

Taza is located east of Taounate province and Fez wilaya, limited by Taourirt province in the east, pronvinces of El Hoceima and Nador in the North, and province of Boulmane in the south. The province accounts 47 rural communities of nearly 708300 inhabitants. The province accounts 58 000 farms. The province total area is 1 412 282 ha of which only 23 % is arable land devoted to annual crops and trees. The topography of the region is mountainous with plateux in the east part. Temperature varies between 0 and 38°C on average. Rainfall is unequally distributed with high humidity in the North West (more than 500mm/year) and aridity east of the province (100 to 200 mm/year). Three major soil types dominate in the region. In the Rif Mountains, vertisols are the most common with high favorale potential. The part on the Atlas Mountains is caracterised by a low aptitude because of the strong slopes. The valleys of the main rivers where predominate alluviant soils with high production potential.

Focused districts:

In Taza agroecological region, the project activities will be implemented in the district of Oued Amlil. Oued Amlil district covers 6 communities totaling 110035 inhabitants and extending over 58118 ha arable area which represents about 20 % of the province total area are presented in the following Table.

Table Structure of development services in the province of Taza.

CT	Number of communities	Population	Urban Population	Rural Population	Arable area (ha)	Total area (ha)
33-01 Aknoul	7	67029	3324	63705	25190	170700
33-02 Had Msilla	8	87160	0	87160	62481	92861
33-03 Taza	9	209073	121271	87802	71250	115800
33-04 Tahla	8	84834	25168	59668	44250	214710
33-05 Guercif	9	150168	41997	108171	1I3014	729793
33-09 Oued Amlil	6	110035	6524	103511	58118	88418
Total	47	708299	198284	510017	261289	1412282

Important crops:

The crops found in the Taza region are basically the same as in Taounate region but with different propotions of area occupation (Figure 7.7).

Faba bean is the major legume crop in the province as well as in the Oued Amlil district where it represents more than 73 % of the area devoted to grain legumes (60 000 ha). Cereals occupy 151 000 ha, that is the first share of the arable area with barley representing nearly 60 %. Plantations of fruity trees such as olive trees and figs are very frequent with a total of 63 800 ha. They usually found in association with annual crops, particularly faba bean and cereals. Figures 7.8 and 7.9 show the evolution of the area and yield of faba bean and barley in the Taza region.

UGANDA:

Uganda is located in East Africa and towards west of Kenya. The geographic coordinates for Uganda are between 1 00 N, 32 00 E. The total land area is 236,040 sq km, which includes 36,330 sq km of water and 199,710 sq km of land. The land boundries of the country is 2,698 km and the boardering countries are Democratic Republic of the Congo, Kenya, Rwanda, Sudan and Tanzania.

***Climate*:** The climate of Uganda is tropical, generally rainy with two dry seasons (December to February, June to August), and semi-arid in north-west.

***Terrain*:** Terrain is mostly plateau with rim on mountains.

***Elevation extremes*:** Lowest point is at 621 m at Lake Albert, and highest point is at 5,110 m at Margherita Peak on Mount Stanley.

Land use pattern: The land use pattern is: Arable land = 25%; Permanent crops = 9%; and others = 66%. The total land under irrigation is only 90 sq km.

Ethnic groups: Uganda has several ethnic groups and includes: Baganda (17%), Ankole (8%), Basoga (8%), Iteso (4%), Bakiga (7%), Langi (4%), Rwanda (6%), Bagisu (5%), Acholi (4%), Lugbara (4%), Batoro (3%), Bunyoro (3%), Alur (2%), Bagwere (2%), Bakonjo (2%), Jopodhola (2%), Karamojong (2%), Rundi (2%), etc.

Details of site description:

Bushenyi:

Located in South western Uganda. The region receives two rain seasons, one from March to May and the second from August to October. The average temperature is 25^{0} C to 30^{0}CThe major ethinic tribe is the Banyankole. Other tribes in the region include, Bakiga and Banyarwanda. Banyankole are traditionally agro-pastrolists. In the wetter parts of the region where the project site is located, farmers are more oriented to growing bananas for the market in the capital city of Kampala. The major food crops are bananas and beans. The farmers here are very articulate in the management of their banana crop that a drive through the area will give you the impression that it is a single plantation. There is high intra-specific diversity in both the bananas and the beans. Over forty cultivars of bananas have been recorded. In addition crops such as coffee, cassava, peas , pumpkins, potatoes, yams and vanilla are part of the farming system.

About 40% of the f arms range between 1 and 2.5 ha, 35% range between 2.6 and 5 ha. Only about 6% of the farms are over 10ha. The average family size is 6-10 persons. About 50% of the population in the area has primary education level.

Luwero:

Located in Central Uganda. This area has a history of civil strife during the period of the 1980s. During this period communities were displaced, many home heads, teenagers and children dyed. This lad to a general set back from which the families are still struggling to pull out from. Two rain seasons are experienced one from March to May and the second from August to October. The average temperature is 25^{0} C to 30^{0}C. The main ethnic group is Baganda. Bananas and beans are the traditional staple for this area but the pest/disease, soil nutrition and perhaps other factors not yet well understood have led to very poor banana production. Root crops such as cassava and sweet potatoes have replaced bananas although the yields are also not that impressive. There is no single enterprise that you may call the major and well organized cash earner. However, crops such as passion fruits, pineapples, vegetables, vanilla and coffee are grown. Coffee used to be the major cash crop but due to he coffee wilt disease most of the plantations have been seriously affected..

Location of these two project sites in Uganda are indicated in the following map (Fig. I-16).

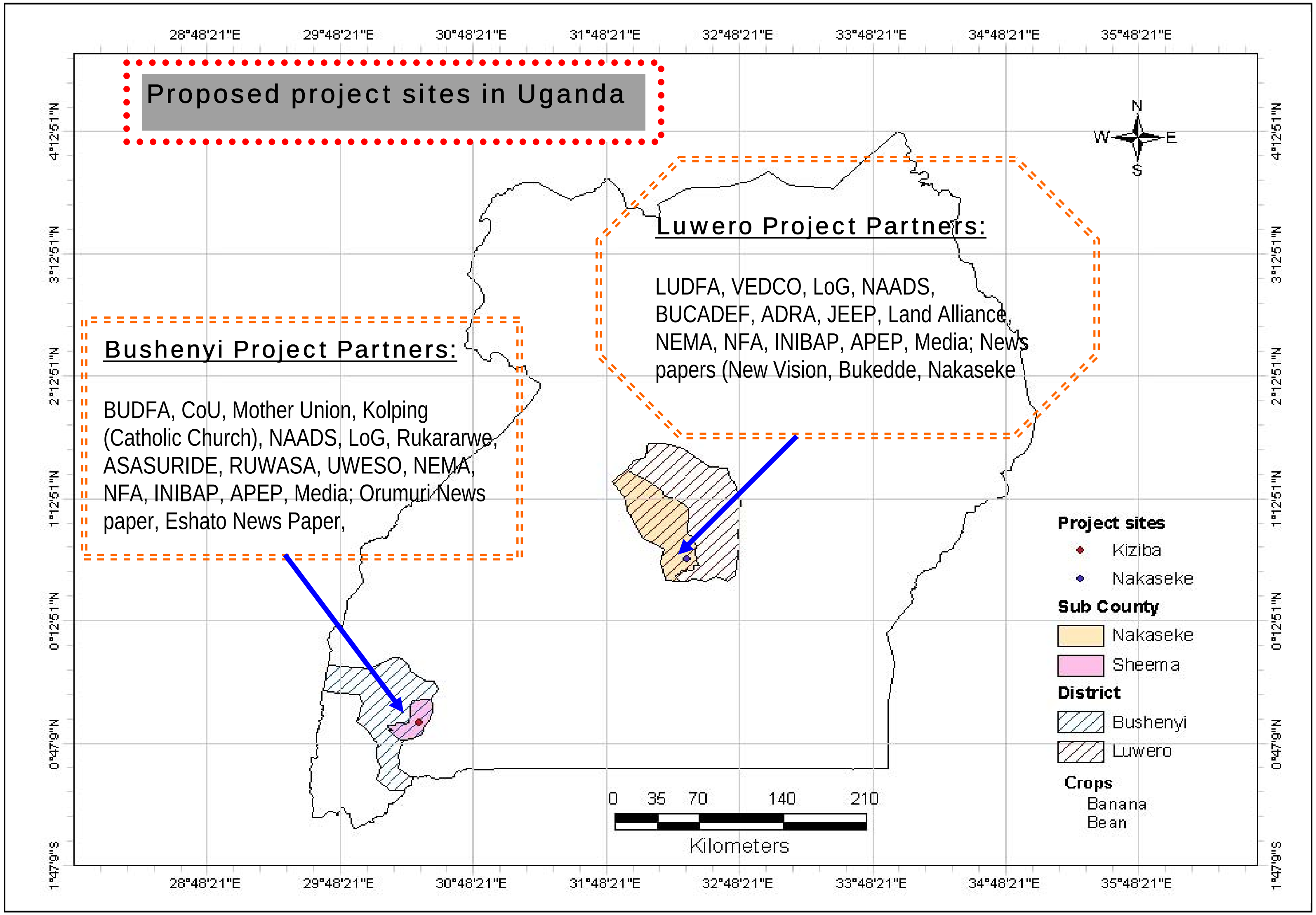


Fig. I-16. Map showing the proposed project sites and associate project partners

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ANNEX. H. - CRITERIA FOR SELECTION OF CROPS, PESTS, PATHOGENS AND PROJECT SITES

Criteria for host (crop), pests and diseases selection:

Crops were selected to cover a range of breeding and farmer management systems. Pest/Pathogens were selected to cover those that are determined by major and minor genes (one gene or a complex of genes provide resistance), seed-borne, soil-borne and air-borne diseases, and pathogens/pests affecting different plant organs (aerial and roots). Countries were selected based on the significance of the disease, the capacity within the country to cover the selected systems, existing in-country initiatives upon which the project can build, and each country's demonstrated commitment to conservation of agrobiodiversity. The details of these criteria are described below:

Host (crop) properties	Host pest and host-pathogen interaction	Pathogen or pest properties
Variation for reaction to pest and disease exists among local varieties	Critical in on farm management of intra-specific diversity	Species are genetically diverse. Variation in pathogenity exists for target area
Yield losses due to pest or diseases are significant	Differential responses known to occur	

Long term benefits	Farmer benefits	Conservation benefits
Reduced risk of production loss over time	The system is a best point for integrating disease control. Yield increased and income for farmers	Increased likelihood of maintaining a number of local cultivars
Reduced yield loss due to pests and disease	Farmer profits will be increased	Reduced use of chemical controls
Reduced variation year to year fluctuation in disease losses	Farmer livelihood options improved	Improved environment: ecological service functions benefit

Habitat and abiotic environment	Basic information already available	Basic Principles
Environmental heterogeneity temporal and spatial is present (= variable selection pressure)	Diversity detection techniques and markers are available or easily developed and have widespread application	Pests and diseases that are of economic importance and have already been characterized.
Cropping system has been in place for a long	Farmers have long term knowledge and	Production systems that use minimum or no

time with the identified pathogen or pest pressures	management base	pesticides.
	Knowledge of diversity and its significance already exists	Subsistence food crops (as opposed to cash crops)
		Work to take place in developing countries.
		Host or pest systems where diversity management is a viable strategy.
Single vs. multiple systems	**Logistics and practicalities**	Traditional varieties used in production
Possibility of targeting multiple pest and diseases with multiple mechanisms to achieve long-term stability	Institutional resources are appropriate and available	Participatory approaches can be implemented at all stages
Possibility of working jointly with single host – pathogen systems and with multiple systems	Sites can be identified with reasonable access	Products (methods and technologies) can be developed for farmer adoption

Selected host (crop)/pest/pathogen systems for China, Ecuador, Morocco, and Uganda:

Crop	Breeding system	Pest/ Pathogen	Gene	Seed borne (yes or no)	Tissue damaged	Country
Maize *(Zea mays)*	Outcrossing	Leaf blight	Major and minor	No	Leaf	China, Ecuador
		Stem borer	Minor	No	Stem	China, Ecuador
Faba bean *(Vicia faba)*	Partial Outcrossing	*Botrytis fabae*	Minor	Yes	Leaf, stem	Morocco, China
		Ascochyta	Major and minor	Yes	Leaf, stem, seed	Morocco
		Soil borne diseases	Major and minor	Yes	Root	Ecuador
		Rust	Major	No	Leaf	Ecuador, China, Morocco
Rice (*Oryza sativa)*	Inbreeding	Blast	Major and minor	Yes	Leaf, node, panicle	China
		Brown plant-hoppers	Major	NA	Leaf, foliage	China
		Leafhoppers	Major and minor	NA	Leaf, foliage	China
		Stem borer	Major and minor	No	Stem	China
Common Bean (*Phaseolus vulgaris*)	Inbreeding	Rust	Major and minor	No	Leaf, stem	Ecuador, Uganda
		Anthracnose	Major	Yes	Leaf, stem, pod	Ecuador, Uganda
Barley (*Hordeum vulgare*)	Inbreeding	Yellow rust	Major and minor	No	Leaf, head	China, Morocco
		Brown rust	Major and minor	No	Leaf, head	Morocco
Banana/ Plantain *(Musa* spp*)*	Clonal	Black Sigatoka	Major and minor	No	Leaf	Uganda Ecuador
		Banana Streak Virus	Interpr. sequences	Yes	Leaf & Stem	Uganda Ecuador
		Nematodes	Unspecified	No	Root	Uganda Ecuador

Criteria for site selection within selection countries and host-pest/pathogen systems

Each site constitutes a "community" representing a village or contiguous villages determined by local geographic and socio-political contexts.

Site selection criteria used are as follows:

Environment
Magnitude of diversity Diversity and agroecological variables
Crop
Intraspecific diversity Local adaptations Continuum of diversity from resistant to susceptibility Crop to be a main component of the system at the site
Pests and Pathogens
Distribution Diversity of types Environmental responses
Farmers and Communities
Knowledge from farmers of disease management (e.g. able to identify the symptoms) Knowledge from farmers of old and new varieties Sociocultural and diversity Livelihoods diversity Market opportunities Diagnostic on farm information on biological constraints
Partners
Community cooperation Conservation interventions Institutional capacity Expertise available near on site on pest and disease management (e.g. entomologist, pathologist etc)
Logistics
Year-round access Resource availability Availability of experimental stations

ANNEX G - DRAFT PROTOCOLS FOR PARTICIPATORY DIAGNOSIS FOR (I) FARMERS' BELIEFS AND PRACTICES AND (II) FIELD AND LABORATORY ASSESSMENT

Based on the outputs of the participants of the Spoleto, Italy (2002) Initial Planning Workshop, and the Kunming, China (September 2004) and Meknes, Morocco (March 2005) Workshops on Diagnostic Tools to Understand Farmers' Knowledge, Beliefs and Practices (List of Participants attached).

Prepared by Devra I Jarvis and Dindo Campilan

1. PARTICIPATORY DIAGNOSIS: GENERAL OVERVIEW

1. Project Background

The project “Conservation and Use of Crop Genetic Diversity to Control Pests and Disease in Support of Sustainable Agriculture” supports conservation of crop genetic diversity *in situ* and helps enable farmers to use this to reduce pest and disease pressure and enhance sustainable agriculture production

A key starting point for the project is understanding farmers’ knowledge, practices, problems and needs for using diversity to control pests and diseases. Through participatory assessment combined with laboratory and field analysis, the project seeks to determine when and where genetic diversity of the target crop can be recommended to manage pest and diseases available.

This set of protocols provides the project team with methodological guidelines in planning and implementing participatory diagnosis. It contains the general framework and procedures for undertaking participatory diagnosis, including tools for data collection and analysis.

2. Participatory Diagnosis

Participatory diagnosis aims to take the “view from below”, by exploring how user groups understand and act on problematic situations. Outputs of participatory diagnosis help define the agenda for subsequent project phases such as in: 1) identifying and evaluating technology options that build on local knowledge and resources, 2) ensuring that technical innovations are appropriate for local socio-economic, cultural and political contexts, 3) setting up mechanisms for wider sharing and use of agricultural innovations, and 3) monitoring and evaluating agricultural improvements resulting from the research and development process.

Participatory diagnosis is useful when the purpose of the project team is to examine problems, needs and opportunities as perceived by user groups. It complements, but does not necessarily substitute for, other research methods in which the project team directly observes and interprets the biophysical or social situations (e.g. researchers collecting soil samples for laboratory analysis).

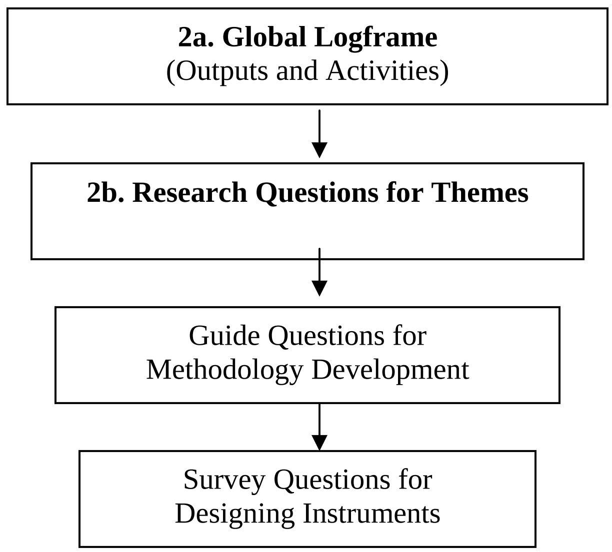
Diagnostic studies, in general, seek to generate information about the agricultural systems being targeted for improvement through R&D. These information could be broadly grouped into those that enable research and development workers to study the: 1) biophysical dimensions of particular agroecosystems, 2) social profile of users in these agroecosystems, and 3) users’ own knowledge of the biophysical and social dynamics of agroecosystems. The third category which refers to knowledge in its broadest sense – concepts, perceptions, beliefs, values, decisions, and actions – is where participatory diagnosis can be most useful.

Participatory diagnosis focuses on problem identification and prioritization. It may also cover issues/themes associated with: needs and opportunities assessment, stakeholder/gender analysis, livelihood systems assessment, documentation of local knowledge and baseline studies.

2. KEY RESEARCH QUESTIONS

1. The global logframe contains the key research questions which serve as key reference for determining the scope and focus of data collection.

2. The research questions are formulated into guide questions for data collection. The latter are categorized under the seven themes of the project's research agenda.



2a. Global logframe summary of Outputs and Activities

OUTPUT 1 –Tools to determine when and where intra-specific genetic diversity can provide an effective management approach for reducing crop vulnerability production systems under pest and disease pressures.

Activities involved participatory determination/diagnostics of:

- whether pest and diseases are the limiting factor for the farmers
- whether intraspecific diversity with respect to the pest and diseases exist within project sites and if not, whether other sources of intraspecific diversity with respect to the stress from earlier collections or from similar agroecosystems within the countries exist
- whether diversity with respect to pests and diseases exists but is not accessed or optimally used
- whether in the case of disease there is diversity in virulence and aggressivenes of pathogens, and
- understanding how and if pests and disease moving in and out of sites/systems

OUTPUT 2 - Practices and procedures that determine how to optimally use crop genetic diversity to reduce manage stress

Activities can be grouped in the development and testing of four types of practices/procedures:

- examining farmers on-going practices using intra-specific diversity to manage pest and disease pressures
- planting intra-specific mixtures (experiments with farmers)
- integrate national stress/resistance breeding procedures with farmer selection practices and local material
- simulation modeling across temporal and spatial scales

OUTPUT 3 - Enhanced capacity of farmers, local and national institutions and others to use local crop genetic diversity to manage stress in productions systems

Activities for capacity building will be at three levels:

- farmers and farmer communities
- local institutions, local schools, local research stations, and
- national research and development institutions in agricultural and the environment

OUTPUT 4 - Actions that support the adoption of genetic diversity rich methods for managing stress in production systems

Activities will include promoting the following actions:

- documentation of successful procedures

- comparison to non-diversity rich options
- economic analysis of benefits to farmers and to ecosystem health
- collaboration/integration into extension packages with agricultural extension and NGO
- support seed cleaning activities and institutions (local and others)
- adapt national breeding strategy to include farmer's knowledge and local materials
- work with education sectors
- agree on protocols for benefit sharing of new varieties and methods of diversity management

2b. Guide thematic questions

Types of Information	Guide Thematic Questions	Sources of Information	
		Title of Documents/ Name of Persons	*Research Methods Used in Data Gathering*
1. General Perception of Pest and Disease Problems	How do farmers view the importance of pest/disease problems in their crops? How do they assess their likelihood of effectively managing these pests/diseases?		
2. Landraces Identification and Characterization	What landraces are found in the local farming community? What are their key characteristics as described by farmers and/or scientists? What is the amount and distribution of these landraces and populations?		
3. Farmers' Knowledge on the Link Between Pests/Diseases and Intra-Specific Diversity	What do farmers know about host diversity with respect to pests/diseases? What do farmers know about the link between pests/diseases and the lack of crop diversity and related factors? What do scientists know about these based on the local situation and in similar agroenvironments?		
4. Farmers' Access and Use of Intra-Specific Diversity to Manage Pests/Diseases	To what extent do farmers use the available intra-specific diversity to manage pests/diseases? What are the ways through which farmers access these intra-specific materials, including information about them? What are the key constraints faced by farmers in the optimal access and use of intra-specific diversity?		
5. Farmers' Knowledge of Pathogen and Pest Variation?	What do farmers know about pathogen and pest variation? How do farmers assess diversity in virulence and aggressiveness? What is the experimental assessment of virulence and aggressiveness		
6. Pest/Disease Movement and	What mechanisms are responsible for movement and transmission of		

Types of Information	**Guide Thematic Questions**	**Sources of Information**	
		Title of Documents/ Name of Persons	*Research Methods Used in Data Gathering*
Transmission	pests/diseases within and among communities? Which persons or groups are involved in the movement and transmission? What is the level of farmers' awareness and understanding of these movements/ transmissions?		
7. Building on Farmers' Knowledge and Practices	What existing farmers' knowledge and practices in the use of intra-specific diversity to manage pests/diseases can be tapped, enhanced and/or promoted more widely?		

3. SELECTION OF METHODS

For each of the guiding themes above, specific guiding questions are developed. For each question a decision is made on the method to be used to collect the information as per the example below:

Question	**FGD** *(Focus Group Discussion)*	**PRA** *(Participatory Rural Appraisal Methods)*	**Individual Interviews**	**Secondary Data**	**Technical assessment**
Theme 1					
Question 1					
Question 2					
Question 3					
Question...					
Theme 2					
Question 1					
Question 2					
Question 3					
Question...					

3a. Guiding questions for methodology development

(Based on the output of China & Morocco Farmer Diagnostic Meetings)

LIST OF GUIDING QUESTIONS BASED ON THE SEVEN GUIDING THEMES

(Note order of themes has been changes to better reflect order of the questions.)

	FGD Focus Group Interview	PRA	Individual Interview	Secondary Informa-tion	Technical Assessment
Theme 2: Landrace identification and characterization (*includes farmer and researcher characterization of traits and genetic diversity of local varieties)*					
Theme 2.1 Community Level					
1. What varieties do you grow in your village and in your community	X			Reports	Review of *ex situ* collections
2. Of this varieties which are local and which are introduced/modern	**X**			Technical Reports)	
3. How are these varieties distinguished from each other?	X	Visual tools		Reports	On-farm trial (as support tool for FGD)
4. Do you know other varieties in your village/community, which ones	X			Reports and *ex-situ* collections	
5. Do you know other varieties that are no longer cultivated in your village/community (e.g., were cultivated before but not now), Why are they no longer cultivated	X			Reports and *ex-situ* collections	Review of *ex situ* collections
6. Are there particular persons in your village who are known to have many different varieties? Who?	X	key informants		Reports	
Theme 2.2 Farm level					
7. What are the varieties that you are growing now , 7a. what varieties have you grown in your field for the last five years?			X		Sample collection and diversity assessment
8. Why to you plant each variety?		Matrix Ranking	X		
9. What proportion of each of these varieties is planted in your farm in this season?		Matrix Ranking +Mapping	X		Sample collection
10. Why did you plant this much/these		Matrix	X		

proportions for the different varieties?		Ranking			
Theme 1: General Perceptions of Pest and Diseases *(includes farmers' perceptions and experimental documentation)*					
11. How do you distinguish a healthy plant from a non-healthy plant?	X	Collect specimens by farmers			Sample collection, pest and disease characteri-zation
12. How important are pests and diseases in affecting the health of your crop?	X				Site evaluation of the rate of infestation
13. What are the characteristics of a diseased plant?	X	Collect specimens by farmers			
14. What causes a sick plant?	X	Diagrammi ng			
15. What diseases and pests do you find in your crop (names and descriptions of pests and diseases)?	X	Collect specimens by farmers	X	Reports	Field inspection with farmers; pest and pathogen collection, and characteri-zation
16. How do you recognize the affect/damage of each one (what are the symptoms of each)?	X	Collect specimens by farmers			Field identifica-tion
17. What are the effects of each disease on the crop (yield loss, others)	X	Matrix ranking	X + Key informants	Reports and documents	Yield loss trials
18. What part of the plant is affected	X	Specimens collected by farmers		Scientific literature	
19. When is the plant affected (seedling, at harvest, during storage)?	X	l			
20. Is there a use for the affected parts of plants (animal feed, others, cooking)?	X				
Theme 5: Knowledge of pathogen and pest					

variation (Includes farmers' knowledge and biotype variation from experimentation) • *Does the population structure of pest and pathogen vary across systems and in space*					
21. Do you know of any variety that became susceptible?	X			Reports and documents	
22. Why do you think the variety became susceptible? *(Note: Question for development of belief statements)*	X		X Belief statements[1] based on FDG	Reports and documents	
23. What are the consequences of the continuous pesticide use year after year on pests or diseases? *(Note: Question for development of belief statements)*	X		X Belief statements		
24. Has the effectiveness of the pesticide been lost due to a change in the pathogen or pest? *(Note: Question for development of belief statements)*			X Belief statements		
25. How much does the genetic make up of pest and pathogen populations vary among farms and over time					Plant variability assessment, Pest and pathogen collection and characteri-zation
Theme 3: Link between pest/diseases and intraspecific diversity (*includes farmer knowledge and experimental information on host resistance and diversity and field resistance)* • *Host diversity – among and within traditional crop cultivars what genetic variation for resistance exists again the pathogen populations they harbour* • *Diversity and field resistance – does the resistance diversity present in a crop actually reduce pest and disease pressure and vulnerability, at least in the short-term.*					
Theme 3.1 Diversity of resistance of local varieties					

[1] **Belief statements allow quantification of changes in farmers' beliefs over time. Belief statements will be developed based on FGD outputs. The statements will then be used to monitor, at the beginning and end of the project, changes in farmer's beliefs within the different thematic questions.**

26. Are there differences in resistance between varieties? At what growth stage of the plant?	X	Matrix ranking		Reports and documents	Assessment of Resistance interaction/ Epidemiolo gy
27. Are there differences in tolerance or resistance of varieties to post harvest (storage) pests?	X	Matrix ranking		Reports and documents	Assessment of plant variability
28. What criteria do you use to distinguish varieties based on resistance?	X	Matrix ranking			
29. How do the varieties differ in degree of resistance/tolerance?	X	Matrix ranking			Assessment of plant variability and resistance mechanism s
Theme 3.2 Changes in diversity over time and space					
30. Does growing the same variety for a long time will make the rice crop vulnerable to pest and disease attacks *(Note: Question for development of belief statements)*			Belief Statement		
31. Do varieties differ in durability of resistance? *(Note: Question for development of belief statements)*			Belief statement		
32. How many years have you been growing the same varieties in your farm?			X		
33. What happens if you continue to grow the same varieties for a long time? *(Note: Question for development of belief statements)*			Belief statements		
34. What are the reaction(s) to the pathogen of the same varieties planted in different locations or different years? (e.g., Varieties more resistant than other varieties in drought years, varieties more resistant than other varieties on certain soils + management variables)			X		Characteriz ation of the environme nt, assessment of field resistance and epidemiolo gy
Theme 3.3 Distribution					
34b. Map of target crops in the village. Within your village how are the target crops distributed?	X A walk with a group of people	Mapping (communit y walk)			Satellite photo-graphy

35. How do you distribute or deploy your varieties among plots (mosaics)? 35a. Why?		Mapping	X		Plot characterization
36. How do you distribute or deploy your varieties within plots?		Mapping	X		
37. How do you distribute or deploy your varieties over time?		Mapping	X		Annual sampling
Theme 4a. Practices for managing pest and diseases					
38. How do you manage your crops for pest and diseases ?	X				
39a. Do you use pesticides, 38b.how much on each plot.		Mapping	X		
Theme 4a.1 -- Management of pest and diseases with intraspecific diversity					
39. Does changing varieties help to control pests and diseases? *(Note: Question for development of belief statements)* Examples: Changing where you plant varieties reduces pest and diseases. Changing proportions of different varieties reduces pest and disease pressures.			X Belief statement		
Theme 4a.2 – Mixtures					
40. Do you use mixtures of varieties?	X		X		
41. Why do you use mixtures? Why not? *(Note: Question for development of belief statements)* 42. Planting mixtures gives me more income from production? 43. Planting mixtures is more costly than uniform planting? 44. The best way to reduce disease in the rice crop is by using mixtures?			X Belief statements		
45. Which varieties do you grow in the mixtures?			X		
46. How are the mixtures arranged? How could they be arranged?		Diagram	X		Trials
47b. Did you use mixtures in the past, how where they arranged?	X		X		
47c. What is the effect of mixtures on reducing pest and diseases					Field assessment
Theme 4a.3 -- Selection for resistance					
47. How do you compare the resistance of selected or certified varieties vs traditional/local varieties?	X				

Under what conditions?					
48. Are there any specific varieties you chose for tolerance or resistance to pest and disease attacks? 49b. What criteria do you use to choose these varieties?	X	From Matrix ranking	X		Plant variability assessment, and resistance interaction/ Epidemiolo gy
49. Within a variety do you select (note – not necessary select for resistance -- could be indirect selection)? What criteria do you use? When do you practice selection (what stage of the plant)? Where do you practice selection: in the field, in the house? Which part of the field or plot? Which part of the plant do you select? Are any of these practices related to disease/tolerance?	X		X		Compare to breeder selection practices
Theme 4b: Access and Barriers to diversity use					
50. Where to you get your seeds (from whom)?		Diagram		Reports Document s	
51. How often do you change seeds for each variety?		Diagram	X		
52. Do you have problems getting seeds you have heard about? (Social barriers, economic barriers) from your village, community, region)	X	Diagram	X		
Theme 6: Pest and disease movement and transmission					
53. Where do pest and diseases come from? *(Note: Question for development of belief statements)*	X (add this question to FGD)		X (beliefs based on FDG)		
54. Are there persons in your village who often sell/distribute/exchange seeds to farmers in the village? Who?	X		X		
55. Do your usually have the same disease damage as your neighbours? Why or why not?	X Reason why or why not		X		Field visits
56. Seeds obtained from other farmers are prone to pest and disease attack? If you exchange seeds with other farmers, pest and disease will increase? *(Note:*			X Belief		

Question for development of belief statements)					
57. Do your neighbours usually get more disease damage than you? Why (same as 55.)		Direct observation	X		
58. Farmers should use clean seeds every season to prevent pest and disease attack? *(Note: Question for development of belief statements)*			Belief X		
59. What precautions do you take in storing your seeds to avoid pest and disease damage?	X				
60. Do practice selection or cleaning or screening to obtain healthy seed? Methods and criteria?	X	Direct observation	X		
Theme 7: Building on farmers' and researchers knowledge and practices					
61. How can the control of pest and diseases be improved in your community? (options)	X				
62. How can the control of pest and diseases be improved in your farm?			X		
63. What are the practices you would advise others to use, or you would use more widely if you could?	X		X		
64. Are you aware of other practices that farmers use (outside of the community)?	X				
65. What are the practices that should be avoided?	X		X		

4. Criteria and selection of host (crop), pest and diseases, sites and participants/respondents

4.1 Criteria for host (crop), pests and diseases

Crops were selected to cover a range of breeding and farmer management systems. Pest/Pathogens were selected to cover those that are determined by major and minor genes (one gene or a complex of genes provide resistance), seed-borne, soil-borne and air-borne diseases, and pathogens/pests affecting different plant organs (aerial and roots). Countries were selected based on the significance of the disease, the capacity within the country to cover the selected systems, existing in-country initiatives upon which the project can build, and each country's demonstrated commitment to conservation of agrobiodiversity.

Host (crop) properties	Host pest and host-pathogen interaction	Pathogen or pest properties
Variation for reaction to pest and disease exists among local varieties	Critical in on farm management of intra-specific diversity	Species are genetically diverse. Variation in pathogenicity exists for target area
Yield losses due to pests or diseases are significant	Differential responses known to occur	

Long term benefits	Farmer benefits	Conservation benefits
Reduced risk of production loss over time	The system is a best point for integrating disease control. Yield increased and income for farmers	Increased likelihood of maintaining a number of local cultivars
Reduced yield loss due to pests and disease	Farmer profits will be increased	Reduced use of chemical controls
Reduced variation year to year fluctuation in disease losses	Farmer livelihood options improved	Improved environment: ecological service functions benefit

Habitat and abiotic environment	Basic information already available	Basic Principles
Environmental heterogeneity temporal and spatial is present (= variable selection pressure)	Diversity detection techniques and markers are available or easily developed and have widespread application	Pests and diseases that are of economic importance and have already been characterized.
Cropping system has been in place for a long time with the identified pathogen or pest	Farmers have long term knowledge and management base	Production systems that use minimum or no pesticides.

pressures		
	Knowledge of diversity and its significance already exists	Subsistence food crops (as opposed to cash crops)
		Work to take place in developing countries.
		Host or pest systems where diversity management is a viable strategy.
Single vs. multiple systems	**Logistics and practicalities**	Traditional varieties used in production
Possibility of targeting multiple pest and diseases with multiple mechanisms to achieve long-term stability	Institutional resources are appropriate and available	Participatory approaches can be implemented at all stages
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Partners
Community cooperation Conservation interventions Institutional capacity Expertise available near on site on pest and disease management (e.g. entomologist, pathologist etc)
Logistics
Year-round access Resource availability Availability of experimental stations

4.3 Participant selection within sites

Respondents for Sample Survey

1. In each site, the questionnaire survey will include a sample of 10 percent of farming households growing the crop for the current season. Sample size may be adjusted to ensure that total number of respondents is at least 60.

2. Cluster sampling by village/sub-village will be used to ensure geographic representation across the community.

3. For the farming households in the sample, random sampling will be done to identify who within the household will serve as respondent. Fifty percent of households will be interviewed through an adult male member as respondent; the other half will be through a female adult member.

Participants for FGD

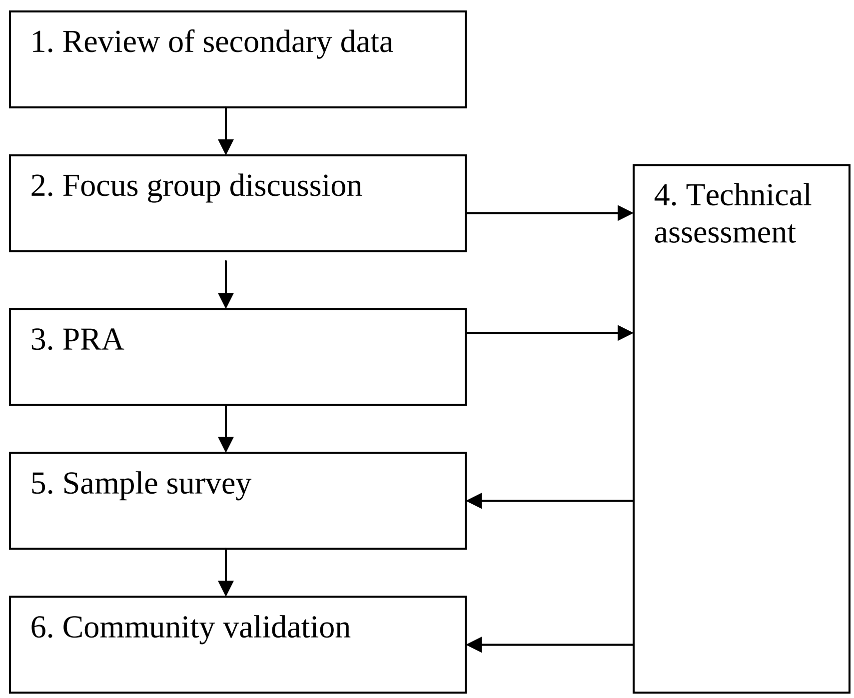
1. In each site, there will be a minimum of 5 FGD sessions, one each for: a) older male farmers, b) younger male farmers, c) women farmers, d) community leaders, and e) extensionists.

2. Each FGD group must have a minimum of 10 participants. They will be purposively selected to ensure representation across the villages/sub-villages.

3. Additional FGD groups may be identified depending on local social, cultural and economic heterogeneity.

5. PHASES IN DATA COLLECTION

Phases	**Data**	**Tools**
1. Review of secondary data	Technical and background socio-economic info	Data checklist
2. Focus group discussion	Community/group-level data, Suggestions for formulating questions for sample survey	FGD guide with PRA tools
3. PRA	Community/group-level data	PRA tools
4. Technical assessment	Biophysical data	Protocols for technical assessment
5. Sample survey	Farm/household-level data	Questionnaire with PRA tools
6. Community validation meeting	Feedback on preliminary analysis	FGD guide



6. REVIEW OF SECONDARY DATA

Guide Question	**Data Set**	**Data Source**
Theme 1		
1.		
2.		
3.		
Theme 2		
1.		
2.		

7. GUIDELINES FOR FGD-PRA

The main purpose of the FGD is to explore and understand farmers' knowledge, perceptions, beliefs and practices. It is an opportunity for the research team to listen and learn, and not to lecture or provide team members' interpretation of the local biophysical and social system.

I. Designing the FGD

1. A team with at least two members agree on various task assignments including: a) facilitator/ interpreter, b) rapporteur, c) logistics in-charge.

2. Develop an FGD-PRA guide based on the pre-identified guide questions. Refer to Protocols section 3b.

3. Depending on the type of data to be collected, the FGD-PRA may consist of a) group interview methods, and b) PRA methods which are more suitable in generating particular data.

II. Developing the FGD-PRA Guide

4. The guide outlines the session structure, data set and methods. Follow a simple format that is easy for the team to use. Refer to Protocols section 5b.

5. Based on the FGD guide, a set of task guides will be developed. The task guides correspond to sections in the FGG guide, providing specific procedures and instructions (e.g. exercises, documentation).

6. For each guide question, indicate the method to be used. When using PRA tools, provide description/instructions.

7. Use questions as guide and check, but adapt to flow of discussion.

8. Devote time to prepare and pre-test the FGD-PRA guide.

III. Arranging Logistics

9. Choose the FGD venue where the atmosphere is less formal, and preferably close to the field to have direct visual reference during the discussion. Minimize distractions, such as noise from passing vehicles and mobile phone calls.

10. Each team member must have a copy of the FGD-PRA guide. The list of themes to be discussed may be written on the board to serve as guide for participants on the scope and progress of the discussion.

11. Prepare supplies and materials in advance (e.g. meta-cards, pens, writing boards). Inform participants in advance if the FGD-PRA session requires that they bring with them specimen from their farms (e.g. samples of diseased plants).

IV. Facilitating the Session

12. Begin by introducing participants and facilitators, then provide an overview of the FGD-PRA session.

13. Familiarize yourself with local terminologies/names to avoid misunderstanding of what farmers say.

14. Keep an open mind and listen more. Do not push your own agenda (e.g. a new variety you have developed which you think will solve farmers' problems).

15. Make the farmers feel that you are truly interested in learning about what they think and do with regard to the topic at hand.

16. Be conversational. The FGD-PRA is a form of directed story telling where you probe and pursue issues that come during the conversation.

17. Empathize. Try to be on equal footing with farmers in order to establish rapport and build trust.

18. Although you have more expertise. Never engage the farmers in a debate nor pass judgment on their views or practices. Always remember your objective in talking to the farmers – to learn what they are doing, find out their problems, identify the root causes, and perhaps explore how your own knowledge could find a way into the management and decision-making about their agricultural system.

19. Avoid questions that yield Yes or No answers.

20. Avoid leading questions. Examples: Don't you think that variety X is an excellent variety?

21. Be sensitive to local norms and customs.

22. Remember that farmers' time is valuable to them. Strive to complete the FGD within the time period that you mentioned to participants.

23. Don't forget to thank participants and local leaders after the conduct of the FGD.

V. Documenting the FGD-PRA Process and Outputs

24. The project team needs to assign 1-2 rapporteurs to record the FGD-PRA process and outcomes. Specific documentation tasks could be assigned to different project team

members, e.g. background information on participants, notes on the discussion, and observations on non-verbal communication.

25. Document the profile of the participants. Record names and basic demographic information.

26. While the FGD relies mainly on oral discussion, the facilitator (or another team member) could write key points on the board for everyone to keep track of progress and outputs.

27. The basic documentation of an FGD are the notes recorded by assigned rapporteurs, preferably organized by discussion themes.

28. Since FGD data are mainly qualitative, participants' responses may be analyzed according to themes and by seeking to establish any of the following: trends, categories, typologies, concepts and definitions, reasons and explanations, identification of actors and groups, relationships and processes.

29. Some quantitative data may be generated through the PRA methods used. Rapporteurs need to collect and/or record the outputs of PRA exercises.

30. Data from each FGD-PRA session or exercise is treated as a single unit of observation. Comparative analysis is possible across groups within an FGD-PRA session, and across FGD-PRA sessions.

31. The project team meets immediately or a day after the FGD activity. The rapporteurs consolidate the records and share these with the team. During the discussion meeting, the project team analyzes the data by grouping them according to the key themes.

32. Following the meeting, an FGD report is prepared which will become part of the project's general database.

7a. FGD- PRA data analysis protocols

7b. FGD-PRA Guide (Sample)

Date and Location____________________

FGD Team _________________________

1. Purpose of the FGD (approx time)

2. Introduction of Participants and Facilitators (approx time)

3. Discussion Themes

Theme 2 Pest and Disease Problems: (30 min)

*Task 1 (Farmer's Understanding of Pests and Diseases): S*pecimen collection, matrix ranking, diagramming and group discussion for questions X to X *(refer to Task Guide 2-1)*

Task 2...

7c. Task Guide – Landrace diversity at village level

Task Guide 7-1 :
Topic : Landrace diversity at village level (Questions 1-6)
Facilitator :

Protocols for data analysis to be added during first year of project.

7d. Task Guide – Farmer knowledge of pest and diseases

Task Guide 7-2 :
Topic : Farmers' Knowledge of Pests and Diseases Questions 11-20
Facilitator :

1. Before the meeting we asked that you bring some examples of healthy and non healthy faba bean. On this side of the room, please put the healthy plants and on the other side put the non-healthy plants.
Facilitator: Let participants come forward and make two piles of the plant specimen. Put label "healthy" or "non-healthy" in each pile.

2. We would like to know why you consider these plants as healthy and non-healthy. Let's look at the first group, why do you consider these as healthy plants?
Rapporteur: List the characteristics of healthy plants enumerated by participants. (Data for Question X)

3. Now, for the group of non-healthy plants, divide them further into two groups. Form one group those caused by pests and diseases, and another group those caused by other factors
Facilitator: Let participants divide the "non-healthy plants" into two piles.

For this first group, describe to us how you know these are caused by pests and diseases?
Rapporteur: List the characteristics of "non-healthy plants caused by pests and diseases", as enumerated by participants. (Data for Question X)

4. Now for this group of non-healthy plants caused by pests and diseases, group them further according to the disease and pest that caused them to be non-healthy.
Facilitator: Let participants divide the "non-healthy plants caused by pests and diseases" into several piles of individual pests and diseases.

5. What are the names or descriptions that you can tell us for each of these diseases or pests?
Facilitator: Label each pile with the name or description provided by participants.
Rapporteur: On a large sheet of paper displayed in front, list the diseases and pests identified by participants based on the groups of specimen (Data for Question X).

6. Besides these in the list, are there other diseases and pests of [name of crop] in your village that you know?
Rapporteur: Add names of other pests and diseases identified by participants (Data for Question X). Then draw additional columns, parallel to the list of pest/disease names, to indicate plant parts affected (e.g. leaves, roots, and stems).

Pests/Disease	Plant Parts Affected (examples)		
	Leaves	*Roots*	*Stems*
1.			

2.			
3.			

7. Now for each pest and disease, which part of the plant is usually affected?
Rapporteur: For each disease/pest name, put X mark on the column/s of plant part/s affected (Data for Question X).

8. Now tell us at what stage of growth is the plant affected.
Facilitator: Begin by asking farmers to identify what they consider as key stages of growth. These stages will determine the columns for the matrix.
Rapporteur: Draws additional columns to indicate stages of plant growth as identified by participants (e.g. germination, flowering, harvesting). Alternatively, prepare a separate sheet for these columns. For each disease/pest name, mark the column/s of plant growth (Data for Question X).

Pests/Disease	Stages of Plant Growth (examples)		
	Seedling	*Flowering*	*Harvesting*
1.			
2.			
3.			

Facilitator: At this point, show the photos of common pests and diseases of the [name of the crop].

9. Please take a look at these photographs if you have these other pests and diseases in your [name of crop]. If so, what names do you give to these pests and diseases?
Rapporteur: Add names of other pests and diseases identified by participants to the matrix/matrices prepared earlier (Data for Question X).

For these additional pests and diseases, tell us the plant parts affected and the growth stages during which the plants are affected.
Rapporteur: Mark columns of plant parts and growth stages as mentioned by participants (Data for Question X).

10. Since we have identified the pests and diseases affecting your [name of crop], let us identify the damage caused by them.
Facilitator: Begin by asking farmers to identify types of damage . These types of damage will determine the columns for the matrix.
Rapporteur: Transfer the list of pests and diseases to another large sheet displayed in front. Draws columns based on types of damage caused.

Pests/Disease	Types of Damage (examples)		
	Yield loss	*Fruit Shape*	*Seed Size*
1.			

2.			
3.			

Now let's look at the first type of damage (e.g. yield loss). Rank the pests and diseases according to the extent of damage caused.
Facilitator: Participants can opt not to assign ranks to all diseases, if these are considered as causing insignificant damage. After ranking the first type of damage, move to the other columns.
Rapporteur: For each type of damage, write the rank assigned by participants to individual pests/diseases (Data for Question X).

11. On the whole, how do you rank the importance of these pests and diseases based on the damage caused to the crop?
Rapporteur: Draw another column labelled "Overall Importance", then writes the rank given by participants (Data for Question X).

Pests/Disease	Types of Damage (examples)			Overall Importance of Diseases
	Yield loss	*Seed Size*	*Fruit Shape*	
1.				
2.				
3.				

12. Even if plants are diseased, do you still use them? Can you tell us how?
Rapporteur: Lists the uses of diseased plants as enumerated by participants (Data for Question X).

13. Finally, we would like you to tell us where you think these diseases come from. We will ask you to work in small groups (or pairs) and make a drawing of a disease or pest. Draw a plant and illustrate the factors that cause the disease.
Facilitator: Divide participants into groups corresponding to the number of pests and diseases. Depending on the number, each group can make a drawing of 1 or 2 pests/diseases. Discuss with participants which group draws which pests/diseases. Give a large sheet and pens to each. Ask them to draw a plant and through various symbols indicate the causal factors of diseases. Let a representative from each group present and explain the drawing. In cases where participants are not comfortable in making the drawings themselves: 1) facilitators can be assigned to assist in the drawing, or 2) indigenous materials can be used to construct models instead of drawing.
Rapporteur: Note the key points mentioned as participants explain the drawing. Collect the drawings and/or take a photo documentation of the models. Ensure that the drawings/models include a guide to the symbols used. Cross-refer them to your written notes (Data for Question X).

NOTE: Protocols for data analysis to be added during first year of project.

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7e. Task Guide - Assessing resistance of varieties

Task Guide 7-3 :
Topic : Practices that use intra-specific diversity (Questions 26-29)
Facilitator :

1. What are the key characteristics of a resistant variety?
Facilitator: Write each characteristic on a card and displays on the board (Data for Q28).

2. Now we would like you to group these characteristics in terms of the stages in the crop production cycle.
Facilitator: Let participants group the cards and label the groups, e.g. seedling, field establishment, post-harvest, etc (Data for Q26).

3. Please rate the degree of resistance of each variety during different stages in the crop production cycle.
Facilitator: Give participants some seeds. Tell them to rate degree of resistance of each variety using matrix scoring: 1 seed-low resistance, 2-medium resistance, 3-high resistance. Ask them to place the seed on top of the cell that corresponds to the variety name and the stage in the crop production cycle (Data for Q26).
Rapporteur: Make a matrix on a large sheet of paper (see below) and place on the ground. Alternatively, draw a matrix on the ground. Count the seeds placed by participants in each cell, and indicate the total in the rightmost column (Data for Q27).

Variety	Resistance During Stages in Crop Prodn			Overall Resistance
	Seedling	*Postharvest*	*Etc...*	

NOTE: Protocols for data analysis to be added during first year of project.

7f. Task Guide – Practices that use intra-specific diversity

Task Guide 7-4	**:**
Topic	**: Practices that use intra-specific diversity (Questions 38,40,41,47,48,49)**
Facilitator	**:**

NOTE: Protocols for data analysis to be added during first year of project.

7g. Task Guide – Seed sources

Task Guide 7-5 :
Topic : Seed systems (Diagramming) (Questions 50-55)
Facilitator :

NEEDS FACILITATOR INSTRUCTIONS

Questions being answered include how much seed did you get this season, where did you get the seeds and how much from each source, did other farmers obtain seeds from you, what problems did you have. Were any seeds gave you un-healthy plants.

Draw a circle for each variety (as per question 1) and put in the amount of seed obtained. And write the name of the variety in each circle.

Draw other circles representing the sources of each variety with arrows pointing the first center circle. Write the amount of seeds coming from this source. Indicate if you had any problems getting these seeds.

Indicate if any of these seeds you obtained (and from who) gave you unhealthy plants by circling with a red pen.

Draw squares of other farmers obtaining seeds from you with an arrow pointing to the source. Write the amount of seeds going to each source

Make triangles of any source of seed that you know but couldn't get seeds from that source and mark with a dotted arrow.

Are there persons in your village who often sell/distribute/exchange seeds to farmers in the village? If yes Who _____?

NOTE: Protocols for data analysis to be added during first year of project.

7h. Task Guide – Seed storage and seed cleaning

Task Guide 7-6 :
Topic : Seed storage and seed cleaning (questions 59-60)
Facilitator :

NOTE: Protocols for data analysis to be added during first year of project.

7i. Task Guide – Adoption of practices

Task Guide 7-7	**:**
Topic	**: Adoption or practices Questions 61-63-64-65)**
Facilitator	**:**

NOTE: Protocols for data analysis to be added during first year of project.

8. GUIDELINES FOR PRA

In addition to PRA methods integrated in the FGD and sample survey, a separate PRA session will be undertaken as additional data collection activity.

The main purpose of the PRA is for a group of key informants to provide community-level information. It supplements the FGD through methods that require data collection that is more appropriately done after the FGD session.

The PRA will be conducted with a group of 5-6 key informants. During the FGD sessions, the research team and participants identify who would be the most suitable individuals to serve as PRA informants.

8a. Map of target crop in the village (Question 34)

Instructions needed for walk through village

8b. Protocols for data analysis of participator maps

9. CHECKLIST OF DATA & TECHNICAL ASSESSMENT METHODS

Guide Question	**Data Set**	**Technical Assessment Method**
Theme 1		
1.		
2.		
3.		
Theme 2		
1.		
2.		

9a. Technical Assessment (diversity and field resistance; biotype diversity; resistance diversity)

9a.1. Diversity and field resistance:

Does local crop cultivars diversity reduce pest and disease pressure?

1.1 Literature and data survey for background information (e.g. traditional banana genotypes and their reactions to pests and diseases)

1.2 On-farm surveys – from the selected sites

Format for on-farm survey

Field or Farm	Environment/Plot Data	Field structure and size	Genetic makeup	Disease incidence	Insect incidence
	e.g., soil, aspect, rainfed	e.g. mixed crop?, fragmented?, etc.	Local varieties, improved c.v. Mixtures,	Disease, presence, damage, yield loss	Pest, presence, damage, Biocontrol agents
Farm 1					
Farm 2					
Farm 3					
Farm 4					
Farm 5					
….					
…..					
…..					
Farm x…					

This survey should be conducted in conjunction with that dealing with farmers' perspectives to get information on different management practices.

Note: The above table for on-farm survey can be expanded further, if required, to gather further information in more detail e.g. Disease progress curves, etc.

- Pilot field screening experiments (ideally statistically designed field trials):
  - To standardized methods
  - To compare disease and insect incidence between different diversity options (e.g. Multi cropping, mixtures, traditional varieties, introduced varieties)

Note: This pilot effort would prepare for more formal experiments that examine different deployment strategies (e.g. major genes, mixtures, cropping systems, etc.). Joint evaluation by farmers and researchers is key.

9a.2. Biotype Diversity:

How does the population structure of pest and pathogen vary across systems and in space?

1.3 Preliminary survey for pathogen variation (e.g. screening samples of isolates against a range of host genotypes).

The ideal setup would consist of samples of **pathogen isolates from local landraces** and samples of **host genotypes from the same populations**. The tests for disease response would include **standard host genotypes** (e.g. differential sets, modern cultivars of known resistance, universal susceptible) and **tester pathotypes**.

	Sub-lines from donor landrace population	Standard host genotypes
Isolates from local landrace		
Testers or known isolates		These data include known control responses

9a.3. Resistance diversity

What different kind of resistance exists among and within local crop cultivars?

1.4 Look for genebank characterization data and farmer knowledge that includes information on disease and pest response shown by landrace samples

1.5 For preliminary identification of resistance response in landraces the following experiment may be useful:

	Landrace population
Isolates from local landrace	
Testers or known isolates	

NOTE: Protocols for data analysis to be added during first year of project.

9a.4. Environmental (Plot) characterization

Information is plot specific to understand whether there is diversity in resistance for varieties planted under different environmental conditions. This information is compared with farmer's information of whether there are differences in resistance when varieties are planted in different plots.

9b. Indicators* of crop vulnerability and change in pest & pathogen pressure

[*]All "indicators" should be measurable by definition

Defining "vulnerability"

- It reflects a "potential for damage" rather than "actual damage"
- Both vulnerability and pest pressure relate to "interactions" between host and pest in specific environments
- The appropriate spatial scale is not clear
- Both "vulnerability" and "change" have an inescapable time dimension

Simplest indicators of vulnerability

- Actual number of varieties, or variety "richness"
- "Effective" number of varieties, or "evenness" of frequency
- Relatedness, or inter-population F-coefficient
- Resistance genotype diversity

Measuring pest pressure on-farm

- Prevalence in an area
- Damage and yield loss
- Response to pesticide application
- Response of tester host genotypes of known resistance

Basic methods

- Monitoring disease or pest impacts
- Taking samples of both host plant and pest for tests of response to local biotypes
- Comparing local and exotic host for diversity in their biotype response
- Assessing diversity for traits affecting host response (e.g. morphology) and diversity for neutral markers

NOTE: Measures of genetic diversity in hosts, and of the prevalence and damage of pests or disease are only partial indicators of vulnerability and pressure.

MAIN QUESTION: ***When and how*** does the distribution and management of local crop varieties and genotypes have a beneficial effect for farmers on pest and disease incidence?

Key questions:

A. Host

1. Resistance diversity:
   - What diversity for resistance exists among and within local crop cultivars?
2. Diversity and field resistance:
   - Does local crop cultivar diversity actually reduce pest and disease pressures?
   - Use crop genetic diversity itself to reduce genetic vulnerability, together with management practices by farmers

B. Pest

1. Biotype diversity:
   - How does the population biotype structure of pest and pathogens vary among systems & in space?

C. Farmer management

1. Farmers minimize pressure:
   - How do farmers use genetic resources available to them to reduce pest and pathogen pressures?
   - Do farmers manage genetic diversity to meet multiple pest and pathogen systems?

9c. Protocols for technical assessment - maize

Draft to be provided in first six months of full project implementation

9d. Protocols for technical assessment – rice

Draft to be provided in first six months of full project implementation

9e. Protocols for technical assessment - barley

Draft to be provided in first six months of full project implementation

9f. Protocols for technical assessment - banana and plantain

Draft to be provided in first six months of full project implementation

9g. Protocols for technical assessment - faba bean

Draft to be provided in first six months of full project implementation

9h. Protocols for technical assessment – common bean

Draft to be provided in first six months of full project implementation

10. GUIDELINES FOR INDIVIDUAL INTERVIEWS

I. Developing the Questionnaire

4. Make use of the results from the FGD-PRA session in formulating interview questions. Refer to Protocols Section 4a.

5. Interview questions may be formulated as: a) closed-ended or fixed alternative, b) open-ended, c) scale. Where appropriate, belief statements can be used.

6. Avoid the following: a) leading questions, b) double-barreled questions, c) embarrassing questions, and d) negative questions.

7. Make sure questions are clear.

8. Do not use technical or scientific jargon that respondents may not understand.

9. When a general question and a related specific question are to be asked together, ask the general question first.

10. Organize the questionnaire in some logical sequence. Group together items that use the same response options or categories.

11. Provide brief, clear instructions to the interviewer.

II. Refining the Questionnaire

12. Translate the questionnaire into the language to be used in the actual interview.

13. Note that the instruments will be most precise if question is read in same language as it is written.

14. Pre-test the instrument by interviewing a small group of respondents, to determine their reactions to draft questionnaire.

III. Conducting the Interview

15. Be friendly, courteous and conversational.

16. Ask each question exactly as it is worded in the questionnaire.

17. Be extremely careful not to suggest a possible reply.

18. Never show that the respondent is wrong when asking questions on their knowledge.

19. Ask questions in the same order as they appear on the questionnaire.

20. Do not let your respondent bring you away from the subject

21. Never engage the farmers in a debate or pass judgment on their views or practices.

IV. Processing Interview Responses and Data Analysis

22. Write down responses accurately

23. Edit responses well to facilitate data processing and analysis.

24. At the end of the interview, check if responses are complete before moving to the next respondent.

25. Encode responses to a database (e.g. spreadsheet) using a coding guide.

26. Data analysis may consist of: scoring scale responses, frequency distributions, computation of indices, attitude/beliefs, reliability analysis of scales, mean comparisons, correlations and non-parametric statistics.

10a. Draft Individual Interview form – to be asked by crop

1. *What are the varieties you are growing this season of crop ____? (Questions7)*

   What are the varieties you have grown in your field for the last five years?

(Note to team- the list of varieties should include all varieties, both modern and traditional, but the focus of the rest of information is on the potential of traditional/local varieties and diversity rich practices)

Varieties *(List of varieties comes from FGD)*	This year?	Last five years?	For the current varieties, how many years have you been growing them? (Question 32 and feeds into question 21)

2. *Why do you plant each variety?*

(This question answers 48, 8, 9, 10)

Matrix ranking (see page in PRA guide)

Nom of varieties	Ranking area planted			
Variety A	3			
Variety B	4			
Variety C	1			
Variety D	5			
Variety E	2			

Establish a matrix to collect the information on the questions 8, 9 10, for each of these varieties

(Reason for ranking is to get the consistency of farmers in variety traits; from beginning to end of the project to see change)

3. (*Questions 15, and 17 from survey… this stems from questions 11-14 to be dealt with in the FDG (questions 5 and 6)*)

		Importance of each damage type				
Name of diseases	Exist *(mark with X)*	No damage	Yield	Lodging	Taste	Etc. (from FGD)
1						
2						
3						
4						
5						

First get the list of disease/pest names from the farmer.
Then confirm with the farmer, using the photos and list of traits from FGD, to ensure the consistency of the names.
Mark with X the type of damage the farmer cites for each disease/pest?

4. (Seed system here – 50,51, and 52 – ie, how much seed did you get this season, where did you get the seeds and how much from each source, did other farmers obtain seeds from you, what problems did you have. Were any seeds gave you un-healthy plants. + 55 health of seeds gotten.

Draw a circle for each variety (as per question 1) and put in the amount of seed obtained. And write the name of the variety in each circle.

Draw other circles representing the sources of each variety with arrows pointing the first center circle. Write the amount of seeds coming from this source. Indicate if you had any problems getting these seeds.

Indicate if any of these seeds you obtained (and from who) gave you unhealthy plants by circling with a red pen.

Draw squares of other farmers obtaining seeds from you with an arrow pointing to the source. Write the amount of seeds going to each source

Make triangles of any source of seed that you know but couldn't get seeds from that source and mark with a dotted arrow.

Are there persons in your village who often sell/distribute/exchange seeds to farmers in the village? If yes Who _____? (Question 54)

5. (*Question 53 in original question list*) ***Origins of diseases/pests***

There are many beliefs statements about diversity management to control diseases/pests. I have a list of them; I want to know if you agree with the following statements or not.

(Note to research team: formulate at least 3 belief statements for the following topic; source of belief statement comes from theme Task guide X, N° 13)

Diseases/pests come from dew.

- *____1) Strongly agree*
- *____2) Slightly agree*
- *____3) Undecided*
- *____4) Slightly disagree*
- *____5) Strongly disagree*

6. (*Variety by disease/pest -- 15*)

Name of varieties	Disease/pest 1	Disease/pest 2	Disease/pest 3	Disease/pest x
Variety A	3			
Variety B	4			
Variety C	1			
Variety D	5			
Variety E	2			

How do you rank these varieties based on their susceptibility/resistance to each disease? In filling the table ranking is done by the most resistant/least susceptible being = 1

7. (*Question 32 in original question list + 33 +34*)

List of varieties and years grown *(chose max. 3 varieties grown the longest from table of question 1 of this document)*	Have there any changes in resistance/ tolerance to any disease/pest? (*information from this question could lead to key informant interview that capture information on durability*)	Differences between dry and wet year (or cold and hot year) in resistance/tolerance to diseases/pests

8. (*Questions 22, 30, 33 in original question list*)

There are many beliefs statements about diversity management to control diseases/pests. I have a list of them; I want to know if you agree with the following statements or not.

(Note to research team: formulate at least 3 belief statements for the following topic)

Reasons why a variety becomes susceptible

Modern varieties become more susceptible if you grow them year after year

- *____1) Strongly agree*
- *____2) Slightly agree*
- *____3) Undecided (no fixed belief)*
- *____4) Slightly disagree*
- *____5) Strongly disagree*

Local varieties do not become more susceptible if you grow them year after year

- *____1) Strongly agree*
- *____2) Slightly agree*
- *____3) Undecided*
- *____4) Slightly disagree*
- *____5) Strongly disagree*

Varieties become susceptible if you grow them next to susceptible varieties

- *____1) Strongly agree*
- *____2) Slightly agree*
- *____3) Undecided*
- *____4) Slightly disagree*
- *____5) Strongly disagree*

Varieties are attacked more often by insects if you grow them year after year

____1) Strongly agree
- *____2) Slightly agree*
- *____3) Undecided*
- *____4) Slightly disagree*

____5) Strongly disagree

9. (*Questions 35, 36, 37, 40, 45, 46 in original question list + 38A…amount of pesticides)*

(First map)
Farmer with interviewer to draw line around your land and then divide the farm into plots (write the plot name or label if applicable). Please give total area of your farm.
Please give the area of each plot. Now mark where what crops was planted in each plot. In the plots where you plant Faba bean show where the different varieties are planted. Write figures of how much pesticide was put in each plot (if any) this year.

What are the reasons you arranged the different faba bean varieties? *(List of reasons from FGD, questions 45 and 46)*

_____ reason 1
_____ reason 2
_____ reason 3

_____ reason x

[Note to interviewer, if the same variety is planted in different plots ask the question: Is there differences in disease/pest attacks between the plots]

(Second map)
Now what about last year? Please mark what crops where in each plot last year.
(Note for interviewer: where possible, do the mapping near or on the plots)
(Note Provide one page for each map)
(Note for interviewer: if farmer is not able to draw by himself interviewer can do the mapping guided by the farmer)

What are the reasons you changed the crop allocation to plots? *(list of reasons from FGD, questions 45 and 46)*
_____ reason 1
_____ reason 2
_____ reason 3
_____ reason x

10. (*Questions 41 in original question list)*

Multiple varieties vs. crop vulnerability belief statements.

If you grow only one variety you will have more insect attack than if you grow more than one variety

____1) Strongly agree
- *____2) Slightly agree*
- *____3) Undecided*
- *____4) Slightly disagree*
- *____5) Strongly disagree*

Planting more than one variety per plot gives me more income from production.

____1) Strongly agree
- *____2) Slightly agree*
- *____3) Undecided*
- *____4) Slightly disagree*
- *____5) Strongly disagree*

Planting more than one variety per plot is more costly than uniform planting

____1) Strongly agree
- *____2) Slightly agree*
- *____3) Undecided*
- *____4) Slightly disagree*
- *____5) Strongly disagree*

Selection for resistance

11. (*Question 49 in original question list)*
(Note to the Team - Questions have to be formulated adequately from FGD)

Which of these practices do you follow:
- Do you practice selection at particular stage of the plant growth? If yes, what stage______________
- Do you practice selection in particular place of your farm (the field, in the house…?)? If yes, where _____________
- Do you select a particular section of the field or plot? If yes, which section _______________
- Do you select a particular part of the plant? If yes, which part _______________

Are any of these practices related to disease/tolerance?
- Do you at for tolerance/resistance to pest and disease attacks?

12. ***Control of diseases/pests*** *(Question 55)*
Do you usually have the same disease damage as your neighbors, If so why or why not? (reasons from FDG)
______Reason 1
______Reason 2
______Reason 3
______Reason 4

Questions 58, 59, 60, in original question list to form belief statements)
There are many beliefs statements about diversity management to control diseases/pests. I have a list of them; I want to know if you agree with the following statements or not.

(Note to research team: formulate at least 3 belief statements for the following topic from FGD)

Farmers should use clean seeds every season to prevent pest and disease attack.
____1) Strongly agree
- *____2) Slightly agree*
- *____3) Undecided*
- *____4) Slightly disagree*
- *____5) Strongly disagree*

What criteria do you use to choose high quality seed?
(List of possible criteria from FGD, question 60 of original question list)

13. (*Questions 62 in original question list)*

There are many beliefs statements about diversity management to control diseases/pests. I have a list of them; I want to know if you agree with the following statements or not.

(Note to research team: formulate at least 3 belief statements for the following topic from FGD)

Farmers should use clean seeds every season to prevent pest and disease attack.

How can the control of pest and diseases be improved in your farm

14. (*Questions 63 in original question list)*

What are the practices (among those identified in FGD) you would advise others to use, or you would use more widely if you could?

______ practice 1
______ practice 2
______ practice 3
______ practice x

What are the practices that should be avoided?

______ practice 1
______ practice 2
______ practice 3
______ practice x

10b. Data analysis protocols

NOTE: Protocols for data analysis to be added during first year of project

List of Participants -- Kunming, China (2004)

Workshop on Diagnostic Tools to Understand Farmers' Knowledge, Beliefs and Practices, September Kunming, China.

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List of Participants -- Meknes, Morocco (2005)

Workshop on Diagnostic Tools to Understand Farmers' Knowledge, Beliefs and Practices, 16 - 22 Mars 2005.

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Chavez-Servia Jose Luis
Belqadi Loubna
Ezzahiri Brahim
Hamzaoui Asmae
Abdelali Habib
Taibi Ahmed
El Ouatil Maria

ANNEX Q - TRACKING TOOLS FOR GEF BIODIVERSITY FOCAL AREA STRATEGIC PRIORITY TWO

Ia. Project General Information (CHINA)

1. Project name: Conservation and Use of Crop Genetic Diversity to Control Pests and Diseases in Support of Sustainable Agriculture

2. Country (ies): **China** (also separate sheets for Ecuador, Morocco, and Uganda)

National Project:_______ Regional Project:_______ Global Project:_____X___

3. Name of reviewers completing tracking tool and completion dates:

	Name	**Title**	**Agency**
Work Program Inclusion	**Devra Jarvis**	**Senior Scientist**	**IPGRI, Rome**
Project Mid-term			
Final Evaluation/project completion			

4. Funding information

GEF support: 2,197,080
Co-financing: 3,144,965
Total Funding: 5,342,045

5. Project duration: ***Planned*** ____5___ years ***Actual*** _______ years

6. a. GEF Agency: □ UNDP ☒ UNEP □ World Bank □ ADB □ AfDB □ IADB □ EBRD □ FAO □ IFAD □ UNIDO

6. b. Lead Project Executing Agency (ies):

Yunnan Agricultural University, Kunming, Yunnan, China
Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP), Quito, Ecuador
Institut Agronomique et Vétérinaire (IAV) Hassan II, Rabat, Morocco
National Agricultural Research Organisation (NARO), Entebbe, Uganda
International Plant Genetic Resources Institute (IPGRI), Rome, Italy

7. GEF Operational Program:
□ drylands (OP 1)
□ coastal, marine, freshwater (OP 2)
□ forests (OP 3)

☐ mountains (OP 4)
☒ agro-biodiversity (OP 13)
☐ integrated ecosystem management (OP 12)
☐ sustainable land management (OP 15)

Other Operational Program not listed above:_________None________________

8. Project Summary (one paragraph):

The outcome of the project will be that resource-poor rural populations will benefit from reduced crop vulnerability to pest and disease attacks through increased use of genetic diversity on-farm. By providing farmers and NARS researchers with the tools and practices needed to manage local crop (intra-specific) genetic diversity, farmers' options to combat pest and disease on-farm will be expanded, food security will be increased, genetic diversity conserved, and ecosystem health improved. The project will develop tools to determine when and where intra-specific crop diversity can be used to manage pest and disease pressures by integrating existing farmer knowledge, belief and practices with advances in the analysis of crop-pest/disease interactions. Unlike Integrated Pest Management (IPM) strategies, which have focused on using agronomic management techniques to modify environment around predominantly modern cultivars, this project is unique in that it concentrates on the management of the local crop cultivars themselves as the key resource, making use of the intra-specific diversity among cultivars maintained by farmers.

9. Project Development Objective:

The *development objective* of this project is to conserve crop genetic diversity in ways that increase food security and improve ecosystem health.

10. Project Purpose/Immediate Objective:

The *immediate object* of the project is to enhanced conservation and use of crop genetic diversity by farmers, farmer communities, and local and national institutions to minimize pest and disease damage on-farm.

Key project outputs are: *Output 1*: Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases; *Output 2*: Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures; *Output 3*: Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures; and *Output 4*: Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases.

11. Expected Outcomes (GEF-related):

The project has three anticipated outcomes:

Outcome 1: Rural populations in the project sites benefit from reduced crop vulnerability to pest and disease attacks;

Outcome 2: Increased genetic diversity of target crops in respect to pest and disease management;

Outcome 3: Increased capacity and leadership abilities of farmers, local communities, and other stakeholders to make diversity rich decisions in respect to pest and disease management.

12. Production sectors and/or ecosystem services directly targeted by project:

12. a. Please identify the main production sectors involved in the project. Please put "**P**" for sectors that are primarily and directly targeted by the project, and "**S**" for those that are secondary or incidentally affected by the project.

Agriculture____P____
Fisheries_________
Forestry__________
Tourism__________
Mining_______
Oil__________
Transportation_________
Other (please specify)___________

12. b. For projects that are targeting the conservation or sustainable use of ecosystems goods and services, please specify the goods or services that are being targeted, for example, water, genetic resources, recreational, etc

1. _Conservation of crop genetic resources (rice, maize, barley and faba bean)
2. _Conservation of associated biodiversity in farming system

II. Project Landscape/Seascape Coverage

13. a. What is the extent (in hectares) of the landscape or seascape where the project will directly or indirectly contribute to biodiversity conservation or sustainable use of its components?

Targets and Timeframe **Project Coverage**	**Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
Landscape/seascape area directly covered by the project (ha)	167,320 ha		
Landscape/seascape area indirectly covered by the project (ha)	501,960 ha		

Explanation for indirect coverage numbers:

The indirect benefits will be through the project output 3 and 4 activities relating to training programmes for farmers and farming communities; increasing public awareness; field demonstration visits by policy makers and communication media; farmers exchange visits. Based on these project activities, the diversity rich practices may be adopted by farmers in other provinces outside the project sites regions. The figures provided are based on the estimates during field survey by the national partners during PDF B phase of the project. However, more accurate baseline estimates for individual crops and each of the project sites will be derived during the first year of the project and some of these figures indicted above may change.

13. b. Are there Protected Areas within the landscape/seascape covered by the project? If so, names these PAs, their IUCN or national PA category, and their extent in hectares.

Not Applicable

	Name of Protected Areas	**IUCN and/or national category of PA**	**Extent in hectares of PA**
1.			
2.			
3.			
4…			

III. Management Practices Applied

14.a. Within the scope and objectives of the project, please identify in the table below the management practices employed by project beneficiaries that integrate biodiversity considerations and the area of coverage of these management practices? Note: this could range from farmers applying organic agricultural practices, forest management agencies managing forests per Forest Stewardship Council (FSC) guidelines or other forest certification schemes, artisanal fisherfolk practicing sustainable fisheries management, or industries satisfying other similar agreed international standards, etc.

Targets and Timeframe **Specific management practices that integrate BD**	**Area of coverage foreseen at start of project**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Use of intra-specific crop diversity for rice (*Oryza sativa*), maize (*Zea mays*), barley (*Hordeum vulgare*), and faba bean (*Vicia faba*) to manage pests and diseases problem in farming system	167,320 ha		

14. b. Is the project promoting the conservation and sustainable use of wild species or landraces?

__X__Yes ____ No

If yes, please list the wild species (WS) or landraces (L):

Species (*Genus sp*., and common name)	Wild Species (please check if this is a wild species)	Landrace (please check if this is a landrace)
1. Rice (*Oryza sativa*)		X
2. Maize (*Zea mays*)		X
3. Barley (*Hordeum vulgare*)		X
5. Faba bean (*Vicia faba*)		X

14. c. For the species identified above, ***or other target species of the project not included in the list above (E.g., domesticated species)***, please list the species, check the boxes as appropriate regarding the application of a certification system, and identify the certification system being used in the project, if any. **Not Applicable**

Certification / **Species**	A certification system is being used	A certification system will be used	Name of certification system if being used	A certification system will not be used

14. d. Is carbon sequestration an objective of the project?

☐ Yes ☒ No

If yes, the estimated amount of carbon sequestered is: ______________________

IV. Market Transformation and Mainstreaming Biodiversity

15. a. **For those projects that have identified market transformation as a project objective**, please describe the project's ability to integrate biodiversity considerations into the mainstream economy by measuring the market changes to which the project contributed. The sectors and subsectors and measures of impact in the table below **are illustrative examples, only**. Please complete per the objectives and specifics of the project.

Not Applicable

Name of the market that the project seeks to affect (sector and sub-sector)	Unit of measure of market impact	Market condition at the start of the project	Market condition at midterm evaluation of project	Market condition at final evaluation of the project

15. b. Please also note which (if any) market changes were directly caused by the project.

____

____

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V. Improved Livelihoods

16. For those projects that have identified improving the livelihoods of a beneficiary population based on sustainable use /harvesting as a project objective, please list the targets identified in the logframe and record progress at the mid-term and final evaluation.

Improved Livelihood Measure	Number of targeted beneficiaries (if known)	Please identify local or indigenous communities project is working with	Improvement Foreseen at project start	Achievement at Mid-term Evaluation of Project	Achievement at Final Evaluation of Project
1. Increased and more reliable food supply through the use of crop genetic diversity to minimize crop losses	10% of the families from 14 local and indigenous communities at the project sites	14 local and indigenous communities across the project sites and includes: Goujie, Nanyang, Xiaoshuijing, Dayutang, Shengcun, Sicun, Nixi, Xiding, Hanizu, Jiuguo, Meitan, Zunyi Profecture, Huojing, and Wolong	10% increase over baseline estimates		

2. Reduction in pesticide use	15% of project site region (equivalent to 50,243 ha) have reduced pesticide use	14 local and indigenous communities across the project sites and includes: Goujie, Nanyang, Xiaoshuijing, Dayutang, Shengcun, Sicun, Nixi, Xiding, Hanizu, Jiuguo, Meitan, Zunyi Profecture, Huojing, and Wolong	15% reduction over the estimated baseline at project sites		

VI. Project Replication Strategy

17. a . Does the project specify budget, activities, and outputs for implementing the replication strategy? Yes__X_ No___

17. b. Is the replication strategy promoting incentive measures & instruments (e.g. trust funds, payments for environmental services, certification) within and beyond project boundaries?
Yes__X_ No___

If yes, please list the incentive measures or instruments being promoted:
1. Development and establishment of benefit sharing protocols with farming communities
2. Increased access of locally adapted farmers seeds across villages and regions
3. Inclusion of local crop diversity and diversity management techniques in agricultural extension packages
4. Availability of seed cleaning methods for local crop varieties
5. Supporting farmers representatives' participation in national decision making for a
6. Cost benefit analysis of diversity rich practices versus other (IPM, pesticide application) crop management approaches

17. c. For all projects, please complete box below. Two examples are provided.

Replication Quantification Measure (Examples: hectares of certified products, number of resource users participating in payment for environmental services programs, businesses established, etc.)	**Replication Target Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Land contributing to conservation and sustainable use of crop genetic diversity increased	167,320 ha		
2. Crop yield increased from reduced crop losses from diseases and pests damage at the project site region	24,722 ha		
3. Reduction in pesticide consumption	50,243 ha		

VII. Enabling Environment

For those projects that have identified addressing policy, legislation, regulations, and their implementation as project objectives, please complete the following series of questions: 18a, 18b, 18c.

An example for a project that focused on the agriculture sector is provided in 18 a, b, and c.

18. a. Please complete this table at **work program inclusion for each sector** that is a primary or a secondary focus of the project. Please answer YES or NO to each statement under the sectors that are a focus of the project.

Not Applicable

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	Agriculture	Fisheries	Forestry	Tourism	Other (please specify)	Other (please specify)
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

18. b . Please complete this table at **the project mid-term for each sector** that is a primary or a secondary focus of the project. Please answer YES or NO to each statement under the sectors that are a focus of the project.

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

18. c. Please complete this table at **project closure for each sector** that is a primary or a secondary focus of the project. Please answer YES or NO to each statement under the sectors that are a focus of the project.

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

All projects please complete this question at the project mid-term evaluation and at the final evaluation, if relevant:

18. d. Within the scope and objectives of the project, has the private sector undertaken **voluntary** measures to incorporate biodiversity considerations in production? If yes, please provide brief explanation and specifically mention the sectors involved.

____
____
____
____
____

<u>VIII. Mainstreaming biodiversity into the GEF Implementing Agencies' Programs</u>

19. At each time juncture of the project (work program inclusion, mid-term evaluation, and final evaluation), please check the box that depicts the status of mainstreaming biodiversity through the implementation of this project with on-going GEF Implementing Agencies' development assistance, sector, lending, or other technical assistance programs.

Time Frame **Status of Mainstreaming**	**Work Program Inclusion**	**Mid-Term Evaluation**	**Final Evaluation**
The project is not linked to IA development assistance, sector, lending programs, or other technical assistance programs.			
The project is indirectly linked to IAs development assistance, sector, lending programs or other technical assistance programs.			
The project has direct links to IAs development assistance, sector, lending programs or other technical assistance programs.	X		
The project is demonstrating strong and sustained complementarity with on-going planned programs.			

<u>IX. Other Impacts</u>

20. Please briefly summarize other impacts that the project has had on mainstreaming biodiversity that has not been recorded above.

____
____
____
____
____

Ib. Project General Information (ECUADOR)

1. Project name: Conservation and Use of Crop Genetic Diversity to Control Pests and Diseases in Support of Sustainable Agriculture

2. Country (ies): **Ecuador** (also separate sheets for China, Morocco, and Uganda)

National Project:_______ Regional Project:_______ Global Project:______X___

3. Name of reviewers completing tracking tool and completion dates:

	Name	Title	Agency
Work Program Inclusion	**Devra Jarvis**	**Senior Scientist**	**IPGRI, Rome**
Project Mid-term			
Final Evaluation/project completion			

4. Funding information

GEF support: 897,200
Co-financing: 1,737,980
Total Funding: 2,635,180

5. Project duration: ***Planned***____5___ years ***Actual*** _______ years

6. a. GEF Agency: ☐ UNDP ☒ UNEP ☐ World Bank ☐ ADB ☐ AfDB
☐ IADB ☐ EBRD ☐ FAO ☐ IFAD ☐ UNIDO

6. b. Lead Project Executing Agency (ies):

Yunnan Agricultural University, Kunming, Yunnan, China
Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP), Quito, Ecuador
Institut Agronomique et Vétérinaire (IAV) Hassan II, Rabat, Morocco
National Agricultural Research Organisation (NARO), Entebbe, Uganda
International Plant Genetic Resources Institute (IPGRI), Rome, Italy

7. GEF Operational Program:
☐ drylands (OP 1)
☐ coastal, marine, freshwater (OP 2)
☐ forests (OP 3)
☐ mountains (OP 4)

☒ agro-biodiversity (OP 13)
☐ integrated ecosystem management (OP 12)
☐ sustainable land management (OP 15)

Other Operational Program not listed above:_________None________________

8. Project Summary (one paragraph):

The outcome of the project will be that resource-poor rural populations will benefit from reduced crop vulnerability to pest and disease attacks through increased use of genetic diversity on-farm. By providing farmers and NARS researchers with the tools and practices needed to manage local crop (intra-specific) genetic diversity, farmers' options to combat pest and disease on-farm will be expanded, food security will be increased, genetic diversity conserved, and ecosystem health improved. The project will develop tools to determine when and where intra-specific crop diversity can be used to manage pest and disease pressures by integrating existing farmer knowledge, belief and practices with advances in the analysis of crop-pest/disease interactions. Unlike Integrated Pest Management (IPM) strategies, which have focused on using agronomic management techniques to modify environment around predominantly modern cultivars, this project is unique in that it concentrates on the management of the local crop cultivars themselves as the key resource, making use of the intra-specific diversity among cultivars maintained by farmers.

9. Project Development Objective:

The *development objective* of this project is to conserve crop genetic diversity in ways that increase food security and improve ecosystem health.

10. Project Purpose/Immediate Objective:

The *immediate object* of the project is to enhanced conservation and use of crop genetic diversity by farmers, farmer communities, and local and national institutions to minimize pest and disease damage on-farm.

Key project outputs are: *Output 1*: Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases; *Output 2*: Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures; *Output 3*: Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures; and *Output 4*: Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases.

11. Expected Outcomes (GEF-related):

The project has three anticipated outcomes:

Outcome 1: Rural populations in the project sites benefit from reduced crop vulnerability to pest and disease attacks;

Outcome 2: Increased genetic diversity of target crops in respect to pest and disease management;

Outcome 3: Increased capacity and leadership abilities of farmers, local communities, and other stakeholders to make diversity rich decisions in respect to pest and disease management.

12. Production sectors and/or ecosystem services directly targeted by project:

12. a. Please identify the main production sectors involved in the project. Please put "**P**" for sectors that are primarily and directly targeted by the project, and "**S**" for those that are secondary or incidentally affected by the project.

Agriculture____P____
Fisheries_________
Forestry__________
Tourism__________
Mining_______
Oil__________
Transportation_________
Other (please specify)___________

12. b. For projects that are targeting the conservation or sustainable use of ecosystems goods and services, please specify the goods or services that are being targeted, for example, water, genetic resources, recreational, etc

1. _Conservation of crop genetic resources (maize, common bean, faba bean and plantain)
2. _Conservation of associated biodiversity in farming system

II. Project Landscape/Seascape Coverage

13. a. What is the extent (in hectares) of the landscape or seascape where the project will directly or indirectly contribute to biodiversity conservation or sustainable use of its components?

Targets and Timeframe **Project Coverage**	**Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
Landscape/seascape area directly covered by the project (ha)	39,160 ha		
Landscape/seascape area indirectly covered by the project (ha)	78,320 ha		

Explanation for indirect coverage numbers:

The indirect benefits will be through the project output 3 and 4 activities relating to training programmes for farmers and farming communities; increasing public awareness; field demonstration visits by policy makers and communication media; farmers exchange visits. Based on these project activities, the diversity rich practices may be adopted by farmers in other provinces outside the project sites regions. The figures provided are based on the estimates during field survey by the national partners during PDF B phase of the project . However, more accurate baseline estimates for individual crops and each of the project sites will be derived during the first year of the project and some of these figures indicted above may change.

13. b. Are there Protected Areas within the landscape/seascape covered by the project? If so, names these PAs, their IUCN or national PA category, and their extent in hectares.

Not Applicable

	Name of Protected Areas	**IUCN and/or national category of PA**	**Extent in hectares of PA**
1.			
2.			
3.			
4…			

III. Management Practices Applied

14.a. Within the scope and objectives of the project, please identify in the table below the management practices employed by project beneficiaries that integrate biodiversity considerations and the area of coverage of these management practices? Note: this could range from farmers applying organic agricultural practices, forest management agencies managing forests per Forest Stewardship Council (FSC) guidelines or other forest certification schemes, artisanal fisherfolk practicing sustainable fisheries management, or industries satisfying other similar agreed international standards, etc.

Targets and Timeframe **Specific management practices that integrate BD**	**Area of coverage foreseen at start of project**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Use of intra-specific crop diversity for maize (*Zea mays*), Common bean (*Phaseolus vulgaris*), faba bean (*Vicia faba*), and plantain (*Musa* spp.) to manage pests and diseases problem in farming system	39,160 ha		

14. b. Is the project promoting the conservation and sustainable use of wild species or landraces?

__X__Yes ____ No

If yes, please list the wild species (WS) or landraces (L):

Species (*Genus sp*., and common name)	Wild Species (please check if this is a wild species)	Landrace (please check if this is a landrace)
1. Maize (*Zea mays*)		X
2. Common bean (*Phaseolus vulgaris*),		X
3. Faba bean (*Vicia faba*)		X
4. Plantain (*Musa* spp.)		X

14. c. For the species identified above, ***or other target species of the project not included in the list above (E.g., domesticated species)***, please list the species, check the boxes as appropriate regarding the application of a certification system, and identify the certification system being used in the project, if any.

Not Applicable

Certification / **Species**	A certification system is being used	A certification system will be used	Name of certification system if being used	A certification system will not be used

14. d. Is carbon sequestration an objective of the project?

☐ Yes X No

If yes, the estimated amount of carbon sequestered is: ______________________

IV. Market Transformation and Mainstreaming Biodiversity

15. a. **For those projects that have identified market transformation as a project objective**, please describe the project's ability to integrate biodiversity considerations into the mainstream economy by measuring the market changes to which the project contributed. The sectors and subsectors and measures of impact in the table below **are illustrative examples, only**. Please complete per the objectives and specifics of the project.

Not Applicable

Name of the market that the project seeks to affect (sector and sub-sector)	**Unit of measure of market impact**	**Market condition at the start of the project**	**Market condition at midterm evaluation of project**	**Market condition at final evaluation of the project**

15. b. Please also note which (if any) market changes were directly caused by the project.

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V. Improved Livelihoods

16. For those projects that have identified improving the livelihoods of a beneficiary population based on sustainable use /harvesting as a project objective, please list the targets identified in the logframe and record progress at the mid-term and final evaluation. An example is provided in the table below

Improved Livelihood Measure	**Number of targeted beneficiaries (if known)**	**Please identify local or indigenous communities project is working with**	**Improvement Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Increased and more reliable food supply through the use of crop genetic diversity to minimize crop losses	10% of the families from 6 local and indigenous communities at the project sites	Local and indigenous communities across the 6 project sites (Carchi, Imbabura, Bolivar, Cañar, Loja, and Manabi) includes: El Angel, Morocho, Santiago, matriz Tambo, Tenta, and San Lucas	10% increase over baseline estimates		

2. Reduction in pesticide use	15% of project site region (equivalent to 11,759 ha) have reduced pesticide use	Local and indigenous communities across the 6 project sites (Carchi, Imbabura, Bolivar, Cañar, Loja, and Manabi) includes: El Angel, Morocho, Santiago, matriz Tambo, Tenta, and San Lucas	15% reduction over the estimated baseline at project sites		

VI. Project Replication Strategy

17. a . Does the project specify budget, activities, and outputs for implementing the replication strategy? Yes__X_ No___

17. b. Is the replication strategy promoting incentive measures & instruments (e.g. trust funds, payments for environmental services, certification) within and beyond project boundaries?
Yes__X_ No___

If yes, please list the incentive measures or instruments being promoted:
1. Development and establishment of benefit sharing protocols with farming communities
2. Increased access of locally adapted farmers seeds across villages and regions
3. Inclusion of local crop diversity and diversity management techniques in agricultural extension packages
4. Availability of seed cleaning methods for local crop varieties
5. Supporting farmers representatives' participation in national decision making for a
6. Cost benefit analysis of diversity rich practices versus other (IPM, pesticide application) crop management approaches

17. c. For all projects, please complete box below. Two examples are provided.

Replication Quantification Measure (Examples: hectares of certified products, number of resource users participating in payment for environmental services programs, businesses established, etc.)	**Replication Target Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Land contributing to conservation and sustainable use of crop genetic diversity increased	39,160 ha		
2. Crop yield increased from reduced crop losses from diseases and pests damage at the project site region	5,786 ha		
3. Reduction in pesticide consumption	11,759 ha		

VII. Enabling Environment

For those projects that have identified addressing policy, legislation, regulations, and their implementation as project objectives, please complete the following series of questions: 18a, 18b, 18c.

An example for a project that focused on the agriculture sector is provided in 18 a, b, and c.

18. a. Please complete this table at **work program inclusion for each sector** that is a primary or a secondary focus of the project. Please answer YES or NO to each statement under the sectors that are a focus of the project.

Not Applicable

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

18. b . Please complete this table at **the project mid-term for each sector** that is a primary or a secondary focus of the project.
Please answer YES or NO to each statement under the sectors that are a focus of the project.

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	Agriculture	Fisheries	Forestry	Tourism	Other (please specify)	Other (please specify)
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

18. c. Please complete this table at **project closure for each sector** that is a primary or a secondary focus of the project.
Please answer YES or NO to each statement under the sectors that are a focus of the project.

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	Agriculture	Fisheries	Forestry	Tourism	Other (please specify)	Other (please specify)
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

All projects please complete this question at the project mid-term evaluation and at the final evaluation, if relevant:

18. d. Within the scope and objectives of the project, has the private sector undertaken **voluntary** measures to incorporate biodiversity considerations in production? If yes, please provide brief explanation and specifically mention the sectors involved.

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VIII. Mainstreaming biodiversity into the GEF Implementing Agencies' Programs

19. At each time juncture of the project (work program inclusion, mid-term evaluation, and final evaluation), please check the box that depicts the status of mainstreaming biodiversity through the implementation of this project with on-going GEF Implementing Agencies' development assistance, sector, lending, or other technical assistance programs.

Time Frame **Status of Mainstreaming**	**Work Program Inclusion**	**Mid-Term Evaluation**	**Final Evaluation**
The project is not linked to IA development assistance, sector, lending programs, or other technical assistance programs.			
The project is indirectly linked to IAs development assistance, sector, lending programs or other technical assistance programs.			
The project has direct links to IAs development assistance, sector, lending programs or other technical assistance programs.	X		
The project is demonstrating strong and sustained complementarity with on-going planned programs.			

IX. Other Impacts

20. Please briefly summarize other impacts that the project has had on mainstreaming biodiversity that has not been recorded above.

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Ic. Project General Information (MOROCCO)

1. Project name: Conservation and Use of Crop Genetic Diversity to Control Pests and Diseases in Support of Sustainable Agriculture

2. Country (ies): **Morocco** (also separate sheet for China, Ecuador, and Uganda)

National Project:_______ Regional Project:_______ Global Project:______X___

3. Name of reviewers completing tracking tool and completion dates:

	Name	Title	Agency
Work Program Inclusion	**Devra Jarvis**	**Senior Scientist**	**IPGRI, Rome**
Project Mid-term			
Final Evaluation/project completion			

4. Funding information

GEF support: 1,344,799
Co-financing: 1,615,217
Total Funding: 2,960,016

5. Project duration: ***Planned*** ____5___ years ***Actual*** _______ years

6. a. GEF Agency: ☐ UNDP ☒ UNEP ☐ World Bank ☐ ADB ☐ AfDB
☐ IADB ☐ EBRD ☐ FAO ☐ IFAD ☐ UNIDO

6. b. Lead Project Executing Agency (ies):

Yunnan Agricultural University, Kunming, Yunnan, China
Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP), Quito, Ecuador
Institut Agronomique et Vétérinaire (IAV) Hassan II, Rabat, Morocco
National Agricultural Research Organisation (NARO), Entebbe, Uganda
International Plant Genetic Resources Institute (IPGRI), Rome, Italy

7. GEF Operational Program:
☐ drylands (OP 1)
☐ coastal, marine, freshwater (OP 2)
☐ forests (OP 3)
☐ mountains (OP 4)

X agro-biodiversity (OP 13)
□ integrated ecosystem management (OP 12)
□ sustainable land management (OP 15)

Other Operational Program not listed above:_________None__________________

8. Project Summary (one paragraph):

The outcome of the project will be that resource-poor rural populations will benefit from reduced crop vulnerability to pest and disease attacks through increased use of genetic diversity on-farm. By providing farmers and NARS researchers with the tools and practices needed to manage local crop (intra-specific) genetic diversity, farmers' options to combat pest and disease on-farm will be expanded, food security will be increased, genetic diversity conserved, and ecosystem health improved. The project will develop tools to determine when and where intra-specific crop diversity can be used to manage pest and disease pressures by integrating existing farmer knowledge, belief and practices with advances in the analysis of crop-pest/disease interactions. Unlike Integrated Pest Management (IPM) strategies, which have focused on using agronomic management techniques to modify environment around predominantly modern cultivars, this project is unique in that it concentrates on the management of the local crop cultivars themselves as the key resource, making use of the intra-specific diversity among cultivars maintained by farmers.

9. Project Development Objective:

The *development objective* of this project is to conserve crop genetic diversity in ways that increase food security and improve ecosystem health.

10. Project Purpose/Immediate Objective:

The *immediate object* of the project is to enhanced conservation and use of crop genetic diversity by farmers, farmer communities, and local and national institutions to minimize pest and disease damage on-farm.

Key project outputsare: *Output 1*: Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases; *Output 2*: Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures; *Output 3*: Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures; and *Output 4*: Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases.

11. Expected Outcomes (GEF-related):

The project has three anticipated outcomes:

Outcome 1: Rural populations in the project sites benefit from reduced crop vulnerability to pest and disease attacks;

Outcome 2: Increased genetic diversity of target crops in respect to pest and disease management;

Outcome 3: Increased capacity and leadership abilities of farmers, local communities, and other stakeholders to make diversity rich decisions in respect to pest and disease management.

12. Production sectors and/or ecosystem services directly targeted by project:

12. a. Please identify the main production sectors involved in the project. Please put "**P**" for sectors that are primarily and directly targeted by the project, and "**S**" for those that are secondary or incidentally affected by the project.

Agriculture____P____
Fisheries_________
Forestry__________
Tourism__________
Mining_______
Oil__________
Transportation_________
Other (please specify)___________

12. b. For projects that are targeting the conservation or sustainable use of ecosystems goods and services, please specify the goods or services that are being targeted, for example, water, genetic resources, recreational, etc

1. _Conservation of crop genetic resources (faba bean and barley)
2. _Conservation of associated biodiversity in farming system

II. Project Landscape/Seascape Coverage

13. a. What is the extent (in hectares) of the landscape or seascape where the project will directly or indirectly contribute to biodiversity conservation or sustainable use of its components?

Targets and Timeframe **Project Coverage**	**Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
Landscape/seascape area directly covered by the project (ha)	56,960 ha		
Landscape/seascape area indirectly covered by the project (ha)	205,056 ha		

Explanation for indirect coverage numbers:

The indirect benefits will be through the project output 3 and 4 activities relating to training programmes for farmers and farming communities; increasing public awareness; field demonstration visits by policy makers and communication media; farmers exchange visits. Based on these project activities, the diversity rich practices may be adopted by farmers in other provinces outside the project sites regions. The figures provided are based on the estimates during field survey by the national partners during PDF B phase of the project . However, more accurate baseline estimates for individual crops and each of the project sites will be derived during the first year of the project and some of these figures indicted above may change.

13. b. Are there Protected Areas within the landscape/seascape covered by the project? If so, names these PAs, their IUCN or national PA category, and their extent in hectares.

Not Applicable

	Name of Protected Areas	**IUCN and/or national category of PA**	**Extent in hectares of PA**
1.			
2.			
3.			
4…			

III. Management Practices Applied

14.a. Within the scope and objectives of the project, please identify in the table below the management practices employed by project beneficiaries that integrate biodiversity considerations and the area of coverage of these management practices? Note: this could range from farmers applying organic agricultural practices, forest management agencies managing forests per Forest Stewardship Council (FSC) guidelines or other forest certification schemes, artisanal fisherfolk practicing sustainable fisheries management, or industries satisfying other similar agreed international standards, etc.

Targets and Timeframe **Specific management practices that integrate BD**	**Area of coverage foreseen at start of project**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Use of intra-specific crop diversity for barley (*Hordeum vulgare*) and faba bean (*Vicia faba*) to manage pests and diseases problem in farming system	56,960 ha		

14. b. Is the project promoting the conservation and sustainable use of wild species or landraces?

__X__Yes ____ No

If yes, please list the wild species (WS) or landraces (L):

Species (*Genus sp*., and common name)	Wild Species (please check if this is a wild species)	Landrace (please check if this is a landrace)
1. Barley (*Hordeum vulgare*)		X
2. Faba bean (*Vicia faba*)		X

14. c. For the species identified above, ***or other target species of the project not included in the list above (E.g., domesticated species)***, please list the species, check the boxes as appropriate regarding the application of a certification system, and identify the certification system being used in the project, if any. **Not Applicable**

Certification / **Species**	A certification system is being used	A certification system will be used	Name of certification system if being used	A certification system will not be used

14. d. Is carbon sequestration an objective of the project?

☐ Yes X No

If yes, the estimated amount of carbon sequestered is: ________________________

IV. Market Transformation and Mainstreaming Biodiversity

15. a. **For those projects that have identified market transformation as a project objective**, please describe the project's ability to integrate biodiversity considerations into the mainstream economy by measuring the market changes to which the project contributed.
The sectors and subsectors and measures of impact in the table below **are illustrative examples, only**. Please complete per the objectives and specifics of the project.

Not Applicable

Name of the	**Unit of measure of**	**Market**	**Market**	**Market**

market that the project seeks to affect (sector and sub-sector)	**market impact**	**condition at the start of the project**	**condition at midterm evaluation of project**	**condition at final evaluation of the project**

15. b. Please also note which (if any) market changes were directly caused by the project.

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V. Improved Livelihoods

16. For those projects that have identified improving the livelihoods of a beneficiary population based on sustainable use /harvesting as a project objective, please list the targets identified in the logframe and record progress at the mid-term and final evaluation. An example is provided in the table below

Improved Livelihood Measure	**Number of targeted beneficiaries (if known)**	**Please identify local or indigenous communities project is working with**	**Improvement Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Increased and more reliable food supply through the use of crop genetic diversity to minimize crop losses	10% of the families from 6 local and indigenous communities at the project sites	6 local and indigenous communities across the project sites and includes: Ghafsai, Outzagh, Tissa, Ourtzagh, Ras El Ould and Outaboubane	10% increase over baseline estimates		

2. Reduction in pesticide use	15% of project site region (equivalent to 17,104 ha) have reduced pesticide use	6 local and indigenous communities across the project sites and includes: Ghafsai, Outzagh, Tissa, Ourtzagh, Ras El Ould and Outaboubane	15% reduction over the estimated baseline at project sites		

VI. Project Replication Strategy

17. a . Does the project specify budget, activities, and outputs for implementing the replication strategy? Yes__X_ No___

17. b. Is the replication strategy promoting incentive measures & instruments (e.g. trust funds, payments for environmental services, certification) within and beyond project boundaries?
Yes__X_ No___

If yes, please list the incentive measures or instruments being promoted:
1. Development and establishment of benefit sharing protocols with farming communities
2. Increased access of locally adapted farmers seeds across villages and regions
3. Inclusion of local crop diversity and diversity management techniques in agricultural extension packages
4. Availability of seed cleaning methods for local crop varieties
5. Supporting farmers representatives' participation in national decision making for a
6. Cost benefit analysis of diversity rich practices versus other (IPM, pesticide application) crop management approaches

17. c. For all projects, please complete box below. Two examples are provided.

Replication Quantification Measure (Examples: hectares of certified products, number of resource users participating in payment for environmental services programs, businesses established, etc.)	**Replication Target Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Land contributing to conservation and sustainable use of crop genetic diversity increased	56,960 ha		
2. Crop yield increased from reduced crop losses from diseases and pests damage at the project site region	8,416 ha		
3. Reduction in pesticide consumption	17,104 ha		

VII. Enabling Environment

For those projects that have identified addressing policy, legislation, regulations, and their implementation as project objectives, please complete the following series of questions*:* 18a, 18b, 18c.

An example for a project that focused on the agriculture sector is provided in 18 a, b, and c.

18. a. Please complete this table at **work program inclusion for each sector** that is a primary or a secondary focus of the project. Please answer YES or NO to each statement under the sectors that are a focus of the project.

Not Applicable

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

18. b . Please complete this table at **the project mid-term for each sector** that is a primary or a secondary focus of the project.
Please answer YES or NO to each statement under the sectors that are a focus of the project.

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

18. c. Please complete this table at **project closure for each sector** that is a primary or a secondary focus of the project.
Please answer YES or NO to each statement under the sectors that are a focus of the project.

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

All projects please complete this question at the project mid-term evaluation and at the final evaluation, if relevant:

18. d. Within the scope and objectives of the project, has the private sector undertaken **voluntary** measures to incorporate biodiversity considerations in production? If yes, please provide brief explanation and specifically mention the sectors involved.

An *example* of this could be a mining company minimizing the impacts on biodiversity by using low-impact exploration techniques and by developing plans for restoration of biodiversity after exploration as part of the site management plan.

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VIII. Mainstreaming biodiversity into the GEF Implementing Agencies' Programs

19. At each time juncture of the project (work program inclusion, mid-term evaluation, and final evaluation), please check the box that depicts the status of mainstreaming biodiversity through the implementation of this project with on-going GEF Implementing Agencies' development assistance, sector, lending, or other technical assistance programs.

Time Frame **Status of Mainstreaming**	**Work Program Inclusion**	**Mid-Term Evaluation**	**Final Evaluation**
The project is not linked to IA development assistance, sector, lending programs, or other technical assistance programs.			
The project is indirectly linked to IAs development assistance, sector, lending programs or other technical assistance programs.			
The project has direct links to IAs development assistance, sector, lending programs or other technical assistance programs.	X		
The project is demonstrating strong and sustained complementarity with on-going planned programs.			

IX. Other Impacts

20. Please briefly summarize other impacts that the project has had on mainstreaming biodiversity that has not been recorded above.

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Id. Project General Information (UGANDA)

1. Project name: Conservation and Use of Crop Genetic Diversity to Control Pests and Diseases in Support of Sustainable Agriculture

2. Country (ies): **Uganda** (also separate sheet for China, Ecuador, and Morocco)

National Project:_______ Regional Project:_______ Global Project:_____X___

3. Name of reviewers completing tracking tool and completion dates:

	Name	Title	Agency
Work Program Inclusion	**Devra Jarvis**	**Senior Scientist**	**IPGRI, Rome**
Project Mid-term			
Final Evaluation/project completion			

4. Funding information

GEF support: 1,369,455
Co-financing: 1,213,466
Total Funding: 2,582,921

5. Project duration: ***Planned***____5___ years ***Actual*** _______ years

6. a. GEF Agency: ☐ UNDP ☒ UNEP ☐ World Bank ☐ ADB ☐ AfDB ☐ IADB ☐ EBRD ☐ FAO ☐ IFAD ☐ UNIDO

6. b. Lead Project Executing Agency (ies):

Yunnan Agricultural University, Kunming, Yunnan, China
Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP), Quito, Ecuador
Institut Agronomique et Vétérinaire (IAV) Hassan II, Rabat, Morocco
National Agricultural Research Organisation (NARO), Entebbe, Uganda
International Plant Genetic Resources Institute (IPGRI), Rome, Italy

7. GEF Operational Program:
☐ drylands (OP 1)
☐ coastal, marine, freshwater (OP 2)
☐ forests (OP 3)
☐ mountains (OP 4)
☒ agro-biodiversity (OP 13)

□ integrated ecosystem management (OP 12)
□ sustainable land management (OP 15)

Other Operational Program not listed above:_________None__________________

8. Project Summary (one paragraph):

The outcome of the project will be that resource-poor rural populations will benefit from reduced crop vulnerability to pest and disease attacks through increased use of genetic diversity on-farm. By providing farmers and NARS researchers with the tools and practices needed to manage local crop (intra-specific) genetic diversity, farmers' options to combat pest and disease on-farm will be expanded, food security will be increased, genetic diversity conserved, and ecosystem health improved. The project will develop tools to determine when and where intra-specific crop diversity can be used to manage pest and disease pressures by integrating existing farmer knowledge, belief and practices with advances in the analysis of crop-pest/disease interactions. Unlike Integrated Pest Management (IPM) strategies, which have focused on using agronomic management techniques to modify environment around predominantly modern cultivars, this project is unique in that it concentrates on the management of the local crop cultivars themselves as the key resource, making use of the intra-specific diversity among cultivars maintained by farmers.

9. Project Development Objective:

The *development objective* of this project is to conserve crop genetic diversity in ways that increase food security and improve ecosystem health.

10. Project Purpose/Immediate Objective:

The *immediate object* of the project is to enhanced conservation and use of crop genetic diversity by farmers, farmer communities, and local and national institutions to minimize pest and disease damage on-farm.

Key project outputs are: *Output 1*: Criteria and tools to determine when and where intra-specific genetic diversity can provide an effective management approach for limiting damage caused by pests and diseases; *Output 2*: Practices and procedures that determine how to optimally use crop genetic diversity to reduce pest and disease pressures; *Output 3*: Enhanced capacity of farmers and other stakeholders to use local crop genetic diversity to manage pest and pathogen pressures; and *Output 4*: Actions that support adoption of genetic diversity rich methods for limiting damage caused by pests and diseases.

11. Expected Outcomes (GEF-related):

The project has three anticipated outcomes:

Outcome 1: Rural populations in the project sites benefit from reduced crop vulnerability to pest and disease attacks;

Outcome 2: Increased genetic diversity of target crops in respect to pest and disease management;

Outcome 3: Increased capacity and leadership abilities of farmers, local communities, and other stakeholders to make diversity rich decisions in respect to pest and disease management.

12. Production sectors and/or ecosystem services directly targeted by project:

12. a. Please identify the main production sectors involved in the project. Please put "**P**" for sectors that are primarily and directly targeted by the project, and "**S**" for those that are secondary or incidentally affected by the project.

Agriculture____P____
Fisheries_________
Forestry__________
Tourism__________
Mining_______
Oil__________
Transportation_________
Other (please specify)___________

12. b. For projects that are targeting the conservation or sustainable use of ecosystems goods and services, please specify the goods or services that are being targeted, for example, water, genetic resources, recreational, etc

1. _Conservation of crop genetic resources _(common bean, and banana and plantain)
2. _Conservation of associated biodiversity in farming system

II. Project Landscape/Seascape Coverage

13. a. What is the extent (in hectares) of the landscape or seascape where the project will directly or indirectly contribute to biodiversity conservation or sustainable use of its components?

Targets and Timeframe Project Coverage	Foreseen at project start	Achievement at Mid-term Evaluation of Project	Achievement at Final Evaluation of Project
Landscape/seascape area directly covered by the project (ha)	92,560 ha		
Landscape/seascape area indirectly covered by the project (ha)	212,888 ha		

Explanation for indirect coverage numbers:

The indirect benefits will be through the project output 3 and 4 activities relating to training programmes for farmers and farming communities; increasing public awareness; field demonstration visits by policy makers and communication media; farmers exchange visits.

Based on these project activities, the diversity rich practices may be adopted by farmers in other provinces outside the project sites regions. The figures provided are based on the estimates during field survey by the national partners during PDF B phase of the project . However, more accurate baseline estimates for individual crops and each of the project sites will be derived during the first year of the project and some of these figures indicted above may change.

13. b. Are there Protected Areas within the landscape/seascape covered by the project? If so, names these PAs, their IUCN or national PA category, and their extent in hectares.

Not Applicable

	Name of Protected Areas	**IUCN and/or national category of PA**	**Extent in hectares of PA**
1.			
2.			
3.			
4…			

III. Management Practices Applied

14.a. Within the scope and objectives of the project, please identify in the table below the management practices employed by project beneficiaries that integrate biodiversity considerations and the area of coverage of these management practices? Note: this could range from farmers applying organic agricultural practices, forest management agencies managing forests per Forest Stewardship Council (FSC) guidelines or other forest certification schemes, artisanal fisherfolk practicing sustainable fisheries management, or industries satisfying other similar agreed international standards, etc.

Targets and Timeframe **Specific management practices that integrate BD**	**Area of coverage foreseen at start of project**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Conservation of crop genetic diversity through use of intra-specific crop diversity for common bean (*Phaseolus vulgaris*), and banana and plantain (*Musa* spp.) to manage pests and diseases problem in farming system	92,560 ha		

14. b. Is the project promoting the conservation and sustainable use of wild species or landraces?

__X__Yes ____ No

If yes, please list the wild species (WS) or landraces (L):

Species (*Genus sp*., and common name)	Wild Species (please check if this is a wild species)	Landrace (please check if this is a landrace)
1. Common bean (*Phaseolus vulgaris*)		X
2. Banana and plantain (*Musa* spp.)		X

14. c. For the species identified above, ***or other target species of the project not included in the list above (E.g., domesticated species)***, please list the species, check the boxes as appropriate regarding the application of a certification system, and identify the certification system being used in the project, if any.
Not Applicable

Certification **Species**	A certification system is being used	A certification system will be used	Name of certification system if being used	A certification system will not be used

14. d. Is carbon sequestration an objective of the project?

☐ Yes ☒ No

If yes, the estimated amount of carbon sequestered is: ______________________

IV. Market Transformation and Mainstreaming Biodiversity

15. a. **For those projects that have identified market transformation as a project objective**, please describe the project's ability to integrate biodiversity considerations into the mainstream economy by measuring the market changes to which the project contributed. The sectors and subsectors and measures of impact in the table below **are illustrative examples, only**. Please complete per the objectives and specifics of the project.

Not Applicable

Name of the market that	**Unit of measure of market impact**	**Market condition**	**Market condition**	**Market condition at**

the project seeks to affect (sector and sub-sector)		**at the start of the project**	**at midterm evaluation of project**	**final evaluation of the project**

15. b. Please also note which (if any) market changes were directly caused by the project.

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V. Improved Livelihoods

16. For those projects that have identified improving the livelihoods of a beneficiary population based on sustainable use /harvesting as a project objective, please list the targets identified in the logframe and record progress at the mid-term and final evaluation. An example is provided in the table below

Improved Livelihood Measure	**Number of targeted beneficiaries (if known)**	**Please identify local or indigenous communities project is working with**	**Improvement Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Increased and more reliable food supply through the use of crop genetic diversity to minimize crop losses	10% of the families from 5 local and indigenous communities at the project sites	5 local and indigenous communities across the project sites and includes: Banyankole, Bakiga, Banyarwanda and Baganda	10% increase over baseline estimates		

2. Diversity rich practices leads to reduction in pesticide use	15% of project site region (equivalent to 27,794 ha) have reduced pesticide use	5 local and indigenous communities across the project sites and includes: Banyankole, Bakiga, Banyarwanda and Baganda	15% reduction over the estimated baseline at project sites		

<u>VI. Project Replication Strategy</u>

17. a . Does the project specify budget, activities, and outputs for implementing the replication strategy? Yes__X_ No___

17. b. Is the replication strategy promoting incentive measures & instruments (e.g. trust funds, payments for environmental services, certification) within and beyond project boundaries?
Yes__X_ No___

If yes, please list the incentive measures or instruments being promoted:

1. Development and establishment of benefit sharing protocols with farming communities
2. Increased access of locally adapted farmers seeds across villages and regions
3. Inclusion of local crop diversity and diversity management techniques in agricultural extension packages
4. Availability of seed cleaning methods for local crop varieties
5. Supporting farmers representatives' participation in national decision making for a
6. Cost benefit analysis of diversity rich practices versus other (IPM, pesticide application) crop management approaches

17. c. For all projects, please complete box below. Two examples are provided.

Replication Quantification Measure (Examples: hectares of certified products, number of resource users participating in payment for environmental services programs, businesses established, etc.)	**Replication Target Foreseen at project start**	**Achievement at Mid-term Evaluation of Project**	**Achievement at Final Evaluation of Project**
1. Land contributing to conservation and sustainable use of crop genetic diversity increased	92,560 ha		
2. Crop yield increased from reduced crop losses from diseases and pests damage at the project site region	13,676 ha		
3. Reduction in pesticide consumption	27,794 ha		

VII. Enabling Environment

For those projects that have identified addressing policy, legislation, regulations, and their implementation as project objectives, please complete the following series of questions: 18a, 18b, 18c.

An example for a project that focused on the agriculture sector is provided in 18 a, b, and c.

18. a. Please complete this table at **work program inclusion for each sector** that is a primary or a secondary focus of the project. Please answer YES or NO to each statement under the sectors that are a focus of the project.

Not Applicable

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

18. b . Please complete this table at **the project mid-term for each sector** that is a primary or a secondary focus of the project.
Please answer YES or NO to each statement under the sectors that are a focus of the project.

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

18. c. Please complete this table at **project closure for each sector** that is a primary or a secondary focus of the project.
Please answer YES or NO to each statement under the sectors that are a focus of the project.

Sector **Statement: Please answer YES or NO for each sector that is a focus of the project.**	**Agriculture**	**Fisheries**	**Forestry**	**Tourism**	**Other (please specify)**	**Other (please specify)**
Biodiversity considerations are mentioned in sector policy						
Biodiversity considerations are mentioned in sector policy through specific legislation						
Regulations are in place to implement the legislation						
The regulations are under implementation						
The implementation of regulations is enforced						
Enforcement of regulations is monitored						

All projects please complete this question at the project mid-term evaluation and at the final evaluation, if relevant:

18. d. Within the scope and objectives of the project, has the private sector undertaken **voluntary** measures to incorporate biodiversity considerations in production? If yes, please provide brief explanation and specifically mention the sectors involved.

VIII. Mainstreaming biodiversity into the GEF Implementing Agencies' Programs

19. At each time juncture of the project (work program inclusion, mid-term evaluation, and final evaluation), please check the box that depicts the status of mainstreaming biodiversity through the implementation of this project with on-going GEF Implementing Agencies' development assistance, sector, lending, or other technical assistance programs.

Time Frame **Status of Mainstreaming**	**Work Program Inclusion**	**Mid-Term Evaluation**	**Final Evaluation**
The project is not linked to IA development assistance, sector, lending programs, or other technical assistance programs.			
The project is indirectly linked to IAs development assistance, sector, lending programs or other technical assistance programs.			
The project has direct links to IAs development assistance, sector, lending programs or other technical assistance programs.	X		
The project is demonstrating strong and sustained complementarity with on-going planned programs.			

IX. Other Impacts

20. Please briefly summarize other impacts that the project has had on mainstreaming biodiversity that has not been recorded above.